INTERNSHIP AT BASIL AUTOMACHINE

AN INTERNSHIP REPORT

Submitted by

Shashank Ranjitbhai Barot

190390119002

In partial fulfillment for the award of the degree of

BACHELOR OF ENGINEERING

In

Mechanical Engineering

S.P.B. Patel Engineering College, Mehsana

S.P.B. PATEL
ENGINEERING COLLEGE
SAFFRONY INSTITUTE OF TECHNOLOGY

GUJARAT TECHNOLOGICAL UNIVERSITY

Gujarat Technological University, Ahmedabad

May, 2023

S.P.B. Patel Engineering College

Near Shanku's Water Park, Ahmedabad – Mehsana Highway, Linch, Gujarat

CERTIFICATE

This is to certify that the project report submitted along with the project entitled **Internship at Basil Automachine** has been carried out by **Shashank Ranjitbhai Barot** under my guidance in partial fulfillment for the degree of Bachelor of Engineering in Mechanical Engineering, 8th Semester of Gujarat Technological University, Ahmedabad during the academic year 2022-23.

Sign

Internal Guide

Prof. Ashutosh Gohel
Mechanical Engineering dep,
S.P.B Patel Engineering College
Mehsana

Sign

HOD

Prof. Kunalsinh Kathia
Mechanical Engineering dep,
S.P.B Patel Engineering College
Mehsana

COMPANY CERTIFICATE

Basil Automachine

Date:01/05/2023

To whom it may concern

This is to certify that **Mr. SHASHANK R BAROT**, a student of **S.P.B. PATEL ENGINEERING COLLEGE** has successfully completed his internship in the field of **PRODUCTION** and **ASSEMBLY** from **30/01/23 to 29/04/23 (13 Weeks)** under the guidance of **Mr. HARSH PATEL**.

His internship activities include learning the manufacturing process flow, Assembly of machine, Panel connections, operating machine.

During the period of his internship program with us, he had been exposed to different processes and was found diligent, hardworking and inquisitive.

We wish him every success in his life and career.

For, Basil Automachine

Partner

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PMMS CERTIFICATE

GUJARAT TECHNOLOGICAL UNIVERSITY

CERTIFICATE FOR COMPLETION OF ALL ACTIVITIES AT ONLINE PROJECT PORTAL

B.E. SEMESTER VIII, ACADEMIC YEAR 2022-2023

Date of certificate generation : 16 May 2023 (18:42:35)

This is to certify that, ***Barot Shashank Ranjitbhai*** (Enrolment Number - 190390119002) working on project entitled with ***Internship at Basil Automachine*** from ***Mechanical Engineering*** department of ***S. P. B. PATEL ENGINEERING COLLEGE, MEHSANA*** had submitted following details at online project portal.

Internship Project Report	**Completed**

Name of Student : Barot Shashank Ranjitbhai

Name of Guide : Mr. Ashutosh Gohel

Signature of Student : ____________

*Signature of Guide : ____________

Disclaimer :
This is a computer generated copy and does not indicate that your data has been evaluated. This is the receipt that GTU has received a copy of the data that you have uploaded and submitted as your project work.

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S.P.B. Patel Engineering College, Mehsana

Near Shanku's Water Park, Ahmedabad – Mehsana Highway, Linch, Gujarat

DECLARATION

We hereby declare that the Internship / Project report submitted along with the Internship / Project entitled **Internship at Basil Automachine** submitted in partial fulfillment for the degree of Bachelor of Engineering in **Mechanical Engineering** to Gujarat Technological University, Ahmedabad, is a bonafide record of original project work carried out by me under the supervision of **Prof. Ashutosh Gohel** & **Mr. Harsh Patel (External Guide)** and that no part of this report has been directly copied from any students reports or taken from any other source, without providing due reference.

Name of the Student	Sign of Student
Shashank Ranjitbhai Barot	___________________

ACKNOWLEDGMENT

I am writing to express my appreciation to prof. Ashutosh Gohel and prof. Kunalsinh kathia for knowledge imparted during my academic tenure at saffrony institute of technology. A special thanks to prof. Ashutosh Gohel for making sure that I gained sufficient knowledge during my academic tenure. I would like to express my sincerest gratitude to all those who have contributed to the successful completion of my 12 weeks internship.

I would like to thank Mr. Harsh Patel, my internship supervisor for providing me with the opportunity to undertake this internship and gave guidance, support and encouragement throughout the internship period. I am grateful for his insightful feedback, constructive criticism and valuable advice, which helped me to develop my skills and knowledge in production and assembly department. I would like to express my appreciation to the staff and colleagues of Basil Automachine, who welcomed me into their team and provide me with a conducive environment to learn and grow. I am grateful for their patience, kindness and willingness to share their expertise and experience with me.

Finally, I would like to thank my family and friends for their unwavering support, encouragement and understanding throughout my internship and academic journey. Their love and support have been my constant source of motivation and inspiration.

Thank you all for your contribution and support.

ABSTRACT

This 12 weeks industrial internship course that Gujarat Technological University is offering in the 8 semester of the bachelor of engineering programmed. I chose to complete a 12 weeks internship at Basil Automachine, The opportunity to gain greater industrial experience which has been provided to the students by GTU.

This 12 weeks industrial internship program in the production and assembly department at Basil Automachine company had provided me with a valuable learning opportunities to gain hands on experience in the manufacturing industry. The internship had cover various aspects of the production and assembly process, including material handling, marking, manufacturing, assembly line, dispatching and installation. I had work under the supervision of experienced professionals and they gave me a exposure to different Production methodologies. The program aims to enhance the technical skills, problem solving abilities, and team work capabilities. By the end of the internship, I had gained practical experience in the production and assembly process, which will be invaluable for the future carrers in the manufacturing industry.

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Abbreviations

BOM - Bill Of Material

CAD - Computer Aided Design

PDI - Pre Dispatch Inspection

PB - Pipe Bender

PBMH - Pipe Bending Machine with Hydraulic System

PBMCR - Pipe Bending Machine with Computerized Rotation

PBMCHR - Pipe Bending Machine with Hydraulic System and Computerized Rotation

PBMM - Pipe Bending Machine with Mandrel

ERP - Enterprise Resource Planning

JIT - Just In Time

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CHAPTER 1
OVERVIEW OF THE COMPANY

1.1 Introduction Of The Company

Fig: 1.1 Basil Automachine Logo

The company Established in the year 2012, at Gandhinagar (Gujarat, India). The company “Basil Automachine”, are renowned as an affluent Manufacturer and Supplier of a wide array of NC Hydraulic Pipe Bending Machine, Semi Automatic Hydraulic Pipe Bending Machine and Manual Hydraulic Pipe Bending Machine, etc. Their professionals fabricate these machines in compliance with the international standards making optimum utilization of supreme grade basic material and the most-modern production technology. The basic material used in the manufacturing process is procured from the reputed and trustworthy vendors of the market to ensure that the finished products are flawless in all aspects. This assortment is widely used in numerous industrial applications due to its study construction, longer service life and optimum functionality. In addition, they offered range can be customized as per the detailed specifications of their clients without affecting its quality features

Empowered by their state-of-the-art infrastructural facilities, they are constantly meeting the qualitative as well as quantitative requirements of their clients. The processes of their manufacturing unit, quality-testing unit, warehousing & packaging unit, etc. are efficiently supervised and managed by their highly qualified team of professionals, ensuring production of supreme quality products. This segregation of departments helps in carrying out the entire business operation in an organized and smooth manner. Further, they had installed the most-advanced technology and equipment in their production unit, which empowers them to meet the ever-growing requirements of their clients in timely manner. Company are blessed with a hard working team of professionals, who hold immense years of work experience, knowledge and expertise in their relative fields. With the support of their industry experts, they are able to bring continuous improvisation in the quality of their offered gamut. Their competent team of store keepers takes precautionary measures to ensure that the stored products are safe from all kinds of environmental hazards. With prompt delivery, customization facility, competitive prices and ethical business policies, they are constantly garnering a huge base of contented clients across the nation.

Table: 1.1 Fact Sheet

Nature Of Business	Manufacturer And Exporter
Company C.E.O	Mr. Niravkumar Patel
Total Number Of Employees	Upto 10 People
Year Of Establishment	2012
Legal Status Of Firm	Partnership Firm
Annual Turnover	Rs 1-2 crore
Quality Measures / Testing Facilities	Yes
Customized Packaging	Yes
Shipment Mode	By Road
Address	No -1009, 1 Floor, G.I.D.C, Sector 28, Gandhinagar - 382028, Gujarat, India

Backed by an expert team of quality analysts, they assure that their offered array stands high on quality, functionality and sturdiness. They stringently inspect each machine on certain parameters utilizing advanced testing tools to detect all kinds of manufacturing flaws and discrepancies. Also, they follow a strict quality management system throughout their entire manufacturing process in order to bring forth quality-assured products. Apart from providing quality machines, their professionals also ensure that these are timely delivered at the client's end. Since the inception of their organization, they had been a client-centric enterprise aimed to achieve their maximum satisfaction. By maintaining constant interaction with clients, their professionals are able to understand their exact requirements and accordingly provide them suitable products. Moreover, their spacious warehousing and packaging facility assists them in safe storage and transit of products. They make use of sturdy packaging material of the finest quality to pack the products, which ensures that the consignments are delivered to the clients in their ideal state.

1.2 Mission And Vision Of The Company

Mission of the company is to deliver superior services with a passion that ensures a thriving future built on a solid reputation of goodness, honesty and integrity.

Their key-differentiating feature is their fanatical approach to customer satisfaction through offering their positive corporate brand image and organizational performance. They consider it as a pillar of success to their business, which makes them more dedicated to satisfying their customers. Basil Automation has always succeeded in gaining personal sense of the moral content of own conduct and intentions with regard to a feeling of obligation to do right. They promise customers the best value for their money and always strive to over deliver than promised in affordability, quality and on-time delivery.

They have always believed that environmental protection and economic growth are not always in conflict and thus they have considered it as our duty to cover the environmental implications of the company's operations through - products and facilities; eliminate waste and emissions; maximize the efficiency and productivity of resources; and minimize practices that might adversely affect the enjoyment of the country's resources by future generations. Their projects always aim to exert a decisive factor in influencing environmental performance and long-term environmental sustainability in areas such as pollution prevention, energy efficiency, environmentally oriented design, supply-chain management and industrial ecology. Their goals are quite detailed as possible, in order to make them measurable which in turn help us in setting clear targets of performance and evaluation of the operation. Basil automachine goals are action oriented, realistic and challenging, with set deadlines in order to be timely. They break down their objectives into action plans-smaller, more manageable projects. This process not only helps them to decide where they are going and how they are going to get there, but also provide foresight of a map for their journey.

They have always been what they would call, well, different. Great ideas aren't floating around in the ether-ripe, ready, just waiting to be plucked. They have worked and fought for them. Maybe even sweat a little. Bringing the energy of innovation and the discipline of management together along with glimmers of inspiration, they apply market insights and smart strategy for turning the vision to reality. The success of Basil automachine reveals that the one strand that binds us is - Innovation. So it's very important to ensure that cutting edge is instilled in their organization, which is aspiring to achieve greater heights. Each day their organization revitalize through an approached innovation in a systematic and pragmatic way to assist their clients in well nurtured and managed living culture. They ensure that a steady flow of ideas and building processes for identifying high potential are converted into projects.

1.3 Infrastructure And Values Of The Company

Company has the support of their modern infrastructural facility, they are able to meet the diversified requirements of their prestigious clients within predetermined time frame. This facility is divided into various functional units like production, quality-testing, warehousing, packaging, etc. to ensure systematic and streamlined workflow. Well-equipped with the most-modern technology and equipment, their production unit assists them in manufacturing products in tandem with the latest technological advancements. Basil Automation's strength is generated by holding the values in all its actions, for creating a promising future.

Fig: 1.2 Company Exterior

Basil Automation consists of an accomplished team of experienced professionals in key positions. Once properties are acquired or developed, the Company provides all of the adjunct services, skills and systems necessary to maintain each property to the highest standards of quality, to achieve the greatest operating efficiencies to support them with the most advanced systems. They take responsibility for quality.

Fig:1.3 Company Interior 1

Fig:1.4 Company Interior 2

Their projects will be "best in class" in terms of value received for the paid amount. They deliver excellence, strive for continuous improvement and respond vigorously to change. Each of them is responsible for the quality of whatever they do.

They are each personally accountable for the highest standards of behavior, including honesty and fairness in all aspects of their work and thereby fulfill their commitments as machine manufacturers. They l consistently treat customers and company resources with the respect they deserve.

1.4 Team And Client Satisfaction

Fig:1.5 Customer Satisfaction

The tremendous growth and success they have achieved in the industry is the result of the adept team of professionals. They have hired their team members after evaluating their understanding, skills and knowledge in their concerned domain. Their professionals of different departments work in the most cohesive manner with each other to ensure the production process of Their offered gamut is carried out in adherence to the international standards. In addition, they work with dedication and passion to provide clients utmost satisfaction by customizing products as per their specific application requirements.

They are constantly achieving utmost client satisfaction by providing them qualitative product range at highly affordable prices. Their industry experts manufacture the machines in tandem with the exact specifications laid down by their clients. They have established an in-house quality-testing unit, wherein each machine is subjected to stringent tests ensuring, no defect is detected at the client’s end. Moreover, they welcome the feedback and suggestions of their clients in order to improvise their product gamut as per their specific needs. Owing to the customization facility, timely delivery, flexible payment modes and fair business policies, they have been able to garner a wide client base across the nation.

CHAPTER 2
OVERVIEW OF DIFFERENT SHOP OF THE ORGANIZATION

2.1 Work Carried Out In Each Department

Basil Automachine is divided into a number of departments, each having a distinct purpose.

1. Design Department
2. Production Department
3. Assembly Department
4. Quality Inspection Department
5. Installation Department

2.1.1 Design Department

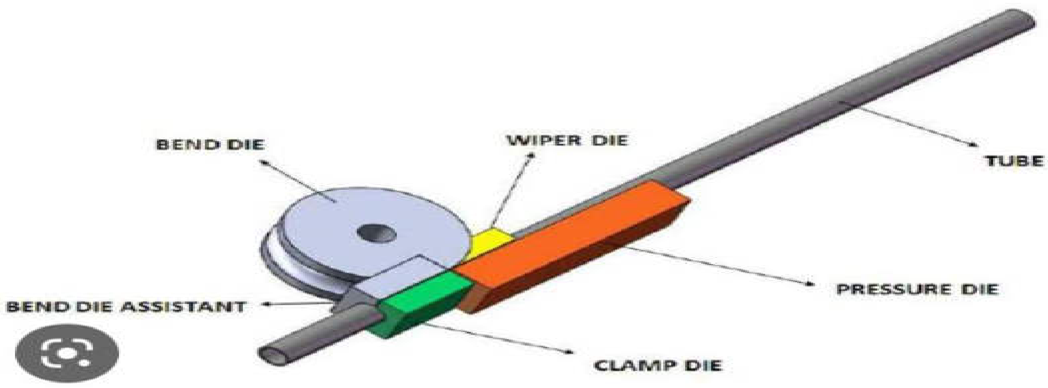

Fig: 2.1 Pipe Bending 3D Design

A pipe bending machine's design is created and developed by the design department of the machine. This department normally consists of a group of engineers and designers who collaborate to design, test, and improve the parts and overall structure of the machine. The identification of customer wants and requirements is usually the first step in the design process, which is then followed by the production of concept sketches, 3D models, and precise engineering drawings. To make sure the machine's functionality and performance meet the required criteria, the team will also run simulations and tests.

To guarantee that the finished product complies with all necessary requirements and is produced efficiently, the design department will closely collaborate with other departments, including manufacturing and quality control. They might also collaborate with outside suppliers and vendors to find supplies and machine parts.

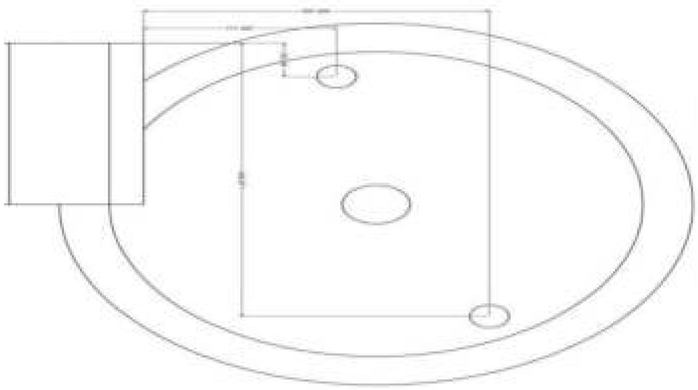

Fig:2.2 Die And Clamping Arm

In the design department, a pipe bending machine's 2D design involves utilising 2D computer-aided design (CAD) software to create a thorough technical drawing of the machine. This design will normally include all necessary fabrication and assembly instructions, as well as the measurements and specs of each component.

To guarantee that the design complies with the necessary specifications and functional demands of the pipe bending machine, the design department will closely collaborate with engineers and other stakeholders. In order to accomplish this, the initial design may need to be modified or revised in light of user feedback and testing.

Normally, the 2D design will also include details about the components, the manufacturing procedure, and the assembly guidelines. The manufacturing division will utilise this data to create the parts and put the machine together.

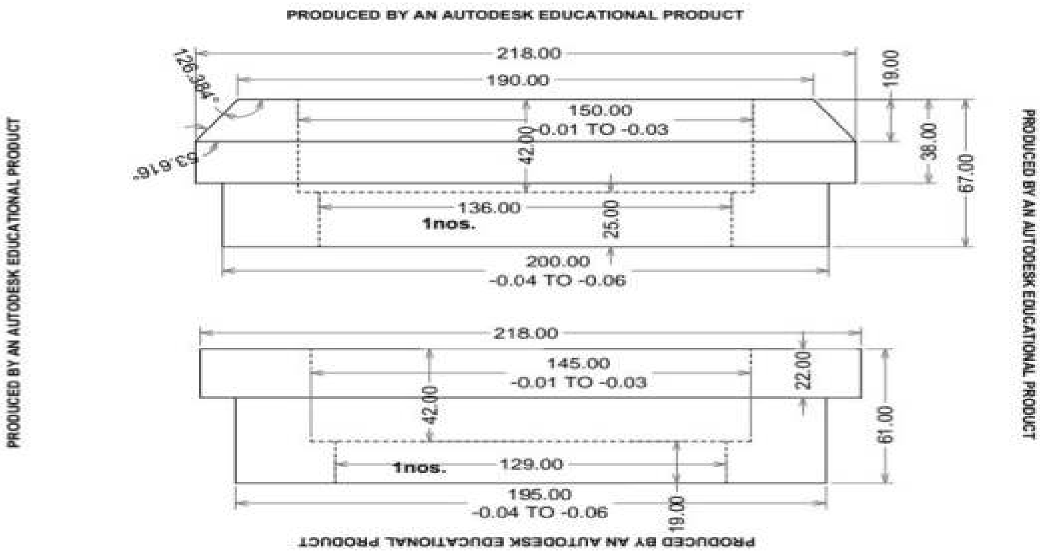

Fig: 2.3 Bearing Housing Top And Bottom

2.1.2 Production Department

Fig: 2.4 1-Axis Pipe Bending Machine

A pipe bending machine company's production division is in charge of creating and putting together the machines. They are in charge of making sure the machines are produced in accordance with the needed specifications, are of excellent quality, and are delivered to customers on schedule. Production manager is in charge of managing the complete production process in the production department. The division is made up of teams for machining, assembly, quality assurance, and logistics.

Each team is in charge of the various pieces of the machine are cut, shaped, and drilled by the machining crew. The numerous parts must be put together into the finished product by the assembly crew. The machines has to conform to the necessary quality requirements, according to the quality control team. The packaging and delivery of the machines to consumers fall within the responsibility of the logistics staff.

The success of the pipe bending machine company is greatly dependent on the production division, which is in charge of on-time delivery of high-quality machines to clients. To make sure that customers' expectations are addressed and the business maintains its competitiveness in the market, they closely collaborate with other departments including engineering, sales, and customer service.

Fig: 2.5 3-Axis Pipe Bending Machine

3-axis pipe bending machine normally goes through several manufacturing phases in the production department after being designed.

1. Material selection: The production team will choose the right materials for the machine after the design is finished. Depending on the particular needs of the machine, this could consist of steel, aluminium, or other materials.

2. Cutting and Shaping: After that, the raw materials will be used to create the necessary machine parts. The required parts may then be produced using CNC equipment, lathes, or other devices.

2.1.3 Assembly Department

Fig: 2.6 Assembly Of 3 - Axis Pipe Bending Machine Components

A pipe bending machine's assembly department is in charge of assembling all of the machine's parts to form a working whole. Usually, the fabrication or manufacturing departments deliver the various components of the pipe bending machine to this department, which then employs specialised tools and equipment to assemble them in accordance with the machine's specifications.

Once the machine has been put together, the assembly department may also be in charge of testing it to make sure it functions properly and meets the necessary performance and quality standards. In some circumstances, this division may also be in charge of installing any software or programming required for the machine to function.

Fig: 2.7 Assembly Of M.D Center

The numerous parts of a 3-axis pipe-bending machine must be put altogether into a functional whole by the assembly department. A group of knowledgeable technicians from the department normally collaborate to assemble and test the machine. The bending arm, bending head, mandrel, clamping mechanism, and control system make up a 3-axis pipe bending machine's major parts. Usually, each of these parts is produced individually before being put together in the assembly section. The assembly procedure entails connecting and programming the control system in addition to fitting and fastening the various components together. After being put together, the device is put through an array of tests to make sure it functions correctly and adheres to all requirements.

Fig:2.8 Assembly Of Clamping Mechanism

2.1.4 Quality Inspection Department

Fig: 2.9 80 mm Pipe Without Wrinkles

It is crucial to carefully inspect a pipe after it has been bent by a pipe-bending machine to make sure it was bent according to the exact specifications and is free of flaws or damage. Both visible and non-destructive testing techniques may be used during the inspection process.

During a visual inspection, it is important to check the pipe for any obvious flaws like cracks, dents, or deformations as well as to make sure the pipe has been bent at the proper angle and radius. Ultrasonic testing, magnetic particle testing, and dye penetrant testing are a few non-destructive testing techniques that can find hidden flaws that aren't always apparent to the naked eye.

The inspection procedure should also check the pipe's dimensions to make sure they fit the necessary requirements and look for any residual stresses that might have been added during the bending operation. Before using the pipe for its intended application, any flaws or variations from the specified standards should be recorded and corrected.

Fig:2.10 80 mm Pipe With Wrinkles

After pipes have been bent, visual inspection is an important and popular technique for checking them. It entails carefully inspecting the pipe to look for any obvious flaws or deformations. Visual inspection can be carried out with or without the use of magnifying glasses or other inspection equipment.

During a visual inspection, an inspector may check for a variety of things, such as:

- **Pipe Cracks or Splits:** These can be brought on by too much bending, tiredness,or other things. They may be easy to see on the pipe's surface or may need close inspection of the pipe's corners or edges.

- **Dents:** Excessive bending or impact damage might also result in dent or deformation damage. The performance of the pipe may be impacted if the cross-sectional area is reduced due to dents.

- **Irregular Bending:** Incorrect bending parameters or a problem with the bending machine can both result in uneven or irregular bending. It might lead to a pipe that doesn't adhere to the necessary requirements for angle and radius.

- **Pipe Surface Finish or Coating Damage:** Pipes are frequently painted or coated to prevent corrosion or to enhance their look. It may be possible to tell if the pipe has been mishandled or exposed to extreme environmental conditions by damage to the coating or finish.

- **Welding Defects:** If the pipe has been welded, the inspector will look for any welding flaws or irregularities, such as voids, cracks, or a lack of fusion.

Visual inspection is a rapid and economical technique to find obvious pipe flaws, but it might not be enough to find any concealed flaws that might be present. In addition to visual examination, non-destructive testing techniques like ultrasonic testing or magnetic particle testing may also be employed if there is any uncertainty regarding the state of the pipe or if it is crucial to verify that it is free of flaws.

Fig: 2.11 Pipe Inspection Plate

2.1.5 Installation Department

Fig: 2.12 Dispatching The Machine

A pipe bending machine's installation department is in charge of setting it up, testing it, and making sure it works as it should. Typically, the department is made up of technicians or engineers with knowledge and experience installing industrial gear.

The department is in charge of putting the pipe-bending machine's numerous parts together during installation, including the bending head, clamps, mandrel, and control panel. Additionally, they need to make sure the machine is put in its allocated spot safely and correctly.

The department runs a number of tests and inspections after the machine is installed to make sure it is running appropriately and within predetermined limits. This involves inspecting for any leaks or other problems, testing the machine's mechanical and electrical systems, and confirming the precision of the bending angles and radii.

The department may also be in charge of training operators and maintenance staff on how to use and maintain the machine in addition to installation. If a customer's machine has problems, they might additionally provide technical support and troubleshooting services.

The installation department of a pipe-bending machine is in charge of a number of duties, including:

- **Component Assembly and Connection:** The installation division is in charge of assembling the various parts of the pipe bending machine. The bending head, clamps, mandrel, and control panel must all be installed before the machine can be powered on and connected to any utilities that may be required.

- **Ensure Appropriate Installation:** It's critical that the computer is set up in its intended place accurately and securely. Making ensuring the machine is level, stable, and bolted down or otherwise secured to the floor or mounting surface.

- **Testing and Inspection:** The installation department will carry out a number of tests and inspections after the machine is installed to make sure it is running properly and within the required parameters. This entails validating the mechanical and electrical systems of the machine, checking for leaks, and ensuring the precision of the bending angles and radii.

- **Training and Assistance:** The installation department might also give operators and maintenance staff instruction on how to use and care for the machine. If a customer's machine has problems, they might additionally provide technical support and troubleshooting services.

- **Documentation:** Detailed documentation of the installation and testing methods, as well as any problems or difficulties found throughout the process, is normally created and maintained by the department during installation. If issues with the computer emerge in the future, this documentation may be useful for future reference, troubleshooting, and problem-solving.

2.2 Equipments Used In Each Department

The equipment that is typically used in the design department, production department, assembly department, installation department are given below in detail.

2.2.1 Softwares Used In Design Department

Fig: 2.13 AutoCAD Software Logo

Software called AutoCAD originally became accessible by Autodesk in 1982. With millions of users in numerous different industries, such as engineering, architecture, construction, and manufacturing, it has grown to be one of the most commonly used CAD software programmes in the world.

AutoCAD is a computer-aided design (CAD) programme that is frequently used in many industries, including the production of pipe bending machines. Users of the software can precisely and accurately design and construct 2D and 3D models of parts and assemblies. The machine frame, bending head, clamping mechanism, and other parts can all be designed using AutoCAD in the production of pipe bending machines. It can also be used to write the code or programme that directs how the machine bends.

AutoCAD has many features that make it perfect for manufacturing pipe bending machines, like parametric modeling, which enables users to quickly adjust designs by altering dimensions and parameters. Additionally, it provides cutting-edge tools for producing precise, intricate geometries like curves and surfaces.AutoCAD for Bending Pipe. Additionally, the software incorporates functions made especially for using with pipes and tubing. It has a Pipe Network module, for instance, which enables designers to develop and edit pipe networks with pipes, fittings, and accessories. In order to mimic the bending process and guarantee that the finished product will satisfy criteria, it also offers tools for building 3D models of pipes and tubing.

The bending programme or code that governs the functioning of the pipe bending machine can also be created using AutoCAD. It is possible to export this code in a format that is compatible with the controller for the machine, enabling seamless fusion of the design and production processes.

Fig: 2.14 Autodesk Inventor Software Logo

Engineers and designers can construct and simulate digital prototypes of mechanical parts and systems using the 3D mechanical design programme Autodesk Inventor. It provides tools for producing 2D drawings, simulating scenarios, and doing analyses as well as designing parts and assemblies.

Autodesk Inventor may be used to design and model the parts and operations of pipe bending machines, including the bending head, clamping mechanisms, and hydraulic or electrical controllers. Additionally, it can aid in spotting potential design flaws and performance optimisation.

Autodesk Inventor additionally provides tools for planning and revising piping systems, which might be helpful when designing the pipes and tubing that the machine will bend. These tools make it simple for designers to construct 3D pipe models, route pipes along a path, and alter the piping system as necessary.

- **Design Tools:** A complete collection of design tools are available in Autodesk Inventor to assist engineers and designers in building 3D models of pipe bending equipment and its constituent parts. These technologies, which enable designers to build, change, and test the design in a virtual environment, include parametric modeling, sheet metal design, assembly modeling, and animation tools.

- **Analysis and Simulation:** Autodesk Inventor has capabilities for analysis and simulation that let designers test the functionality of the pipe-bending machine and its parts. By simulating actual conditions like bending force, material deformation, and thermal stresses, these tools can assist pinpoint potential design defects and improve the functionality of the machine.

- **Piping Design:** Autodesk Inventor has a number of tools that may be used to develop and modify plumbing systems. To improve the efficiency of the piping system, designers can use these technologies to develop 3D pipe models, produce precise bills of materials, and simulate fluid flow and pressure drop.

- **Collaboration:** Autodesk Inventor comes with tools that make it easier for team members and stakeholders to work together. With the aid of these tools, designers may communicate and work together in real-time, which can hasten and lessen design errors.

- **Integration With Other Applications:** Autodesk Inventor is compatible with other design applications for pipe bending machines, including MATLAB, SolidWorks, and AutoCAD. Collaboration with other members of the design team is facilitated by this integration, which enables designers to import and export design data between programmes.

2.2.2 Machinery Used In Production Department

The following is a list of the tools used in the production of pipe bending machines.

- **Tube Bender:** The main tool used in the manufacturing of pipe bending machines is a tube bender. The pipes are bent using it to get the desired form and angle.

- **CNC Machine:** In the manufacturing process, Computer Numerical Control (CNC) machines are utilized to accurately cut and shape the different parts of the pipe bending machine.

Fig: 2.15 Lathe And Drilling Machine

Fig: 2.16 Cutting Machine

Fig: 2.17 One Axis Pipe Bendine Machine

- **Welding Equipment:** The several parts of the pipe bending machine are connected together using welding equipment including welding machines and torches.

- **Grinding and Finishing Tools:** The many components of the pipe bending machine are polished and smoothed using grinding and finishing equipment.

- **Drilling Machine:** Using drilling equipment, holes are drilled into the different parts of the pipe bending machine.

- **Material Handling Equipment:** Equipment used to move and manipulate large metal pipes during the manufacturing process of pipe bending machines includes a variety of material handling tools.

- **Lathe Machine:** A lathe machine is an equipment used to shape and cut materials, usually metal or wood. In order to cut the material into the appropriate shape, a cutting tool is moved across the material as the material is spun on its axis. There are several uses for lathe machines, including turning, drilling, and threading.

- **Laser Cutting Machine:** Laser cutting machines can be used to cut a variety of components, including frames, brackets, and other structural parts, in the manufacturing of pipe bending machines.

2.2.3 Equipment Used In Assembly Department

Fig: 2.18 SMAW Machine

Fig: 2.19 Grinding/Buffing

Fig: 2.20 Overhead Crane

Fig: 2.21 Hand Tool

The particular machinery and equipment's utilized in the assembly process:

- **Welding Equipment:** Equipment used to weld various components together, such as welding machines, welding torches, and other accessories.

- **Power Tools:** To cut and shape materials and components, a variety of power tools, including drills, grinders, and saws, may be employed.

- **Hand Tools:** It's usual practise to assemble components using hand tools like wrenches, pliers, hammers and screwdrivers.

- **Hoists and Cranes:** During assembly, large components can be lifted and moved with the help of hoists and cranes.

- **Equipment for Testing and Measuring:** To check that the machine is appropriately installed and operating, equipment like pressure gauges, flow metres, and other testing and measuring devices may be employed.

- **Assembly Jigs & Fixtures:** Specialised tools and equipment are used to hold components in place during assembly, such as assembly jigs and fixtures.

- **Safety Gear:** To safeguard employees during assembly, safety gear like gloves, safety glasses, and ear protection may be employed.

2.2.4 Equipments Used In Installation Department

The equipment typically used to install a pipe bending machine:

Fig: 2.22 Leveling Screw

Fig: 2.23 Sprit Level

- **Forklift or Crane:** The pipe bending machine typically needs to be lifted and moved into place using a forklift or crane. The machine's size and weight will determine the kind of equipment needed. For smaller machines, a forklift is often employed, whereas a crane would be needed for larger ones. It's crucial to confirm that the apparatus being utilized is rated for the machine's weight.

- **Anchoring Equipment:** This equipment is used to anchor the machine. This could comprise concrete anchors, nuts, bolts, and washers. The installation location and the kind of surface the machine is being fastened to will determine the precise sort of anchoring equipment needed. To ensure the machine's stability and safety, it's crucial to make sure the anchoring equipment is placed properly.

- **Leveling Equipment:** To ensure that the machine is mounted on a level surface, leveling equipment is employed. This is crucial in order to guarantee proper machine operation, avoid machine damage, and stop materials from being twisted. A pipe bending machine can be levelled using shims, levelling screws, and spirit levels.

- **Electrical Equipment:** To connect the machine to a power source, utilise electrical equipment. Cables, conduits, and electrical boxes may be a part of this. Making sure the electrical equipment is installed properly and in accordance with local electrical standards and regulations is crucial.

- **Plumbing Tools:** These tools are used to attach the machine to a water supply or other liquids. This could apply to valves, fittings, and pipes. Making ensuring the plumbing fixtures are installed properly and in accordance with local plumbing laws and regulations is crucial.

- **Tools:** To build and install the machine, common instruments such wrenches, screwdrivers, pliers, and hammers are usually utilised. To avoid causing harm to the machine or bending the materials, it is crucial to use the right tools that are in good shape.

2.3 Schematic Layout Of Manufacturing Process

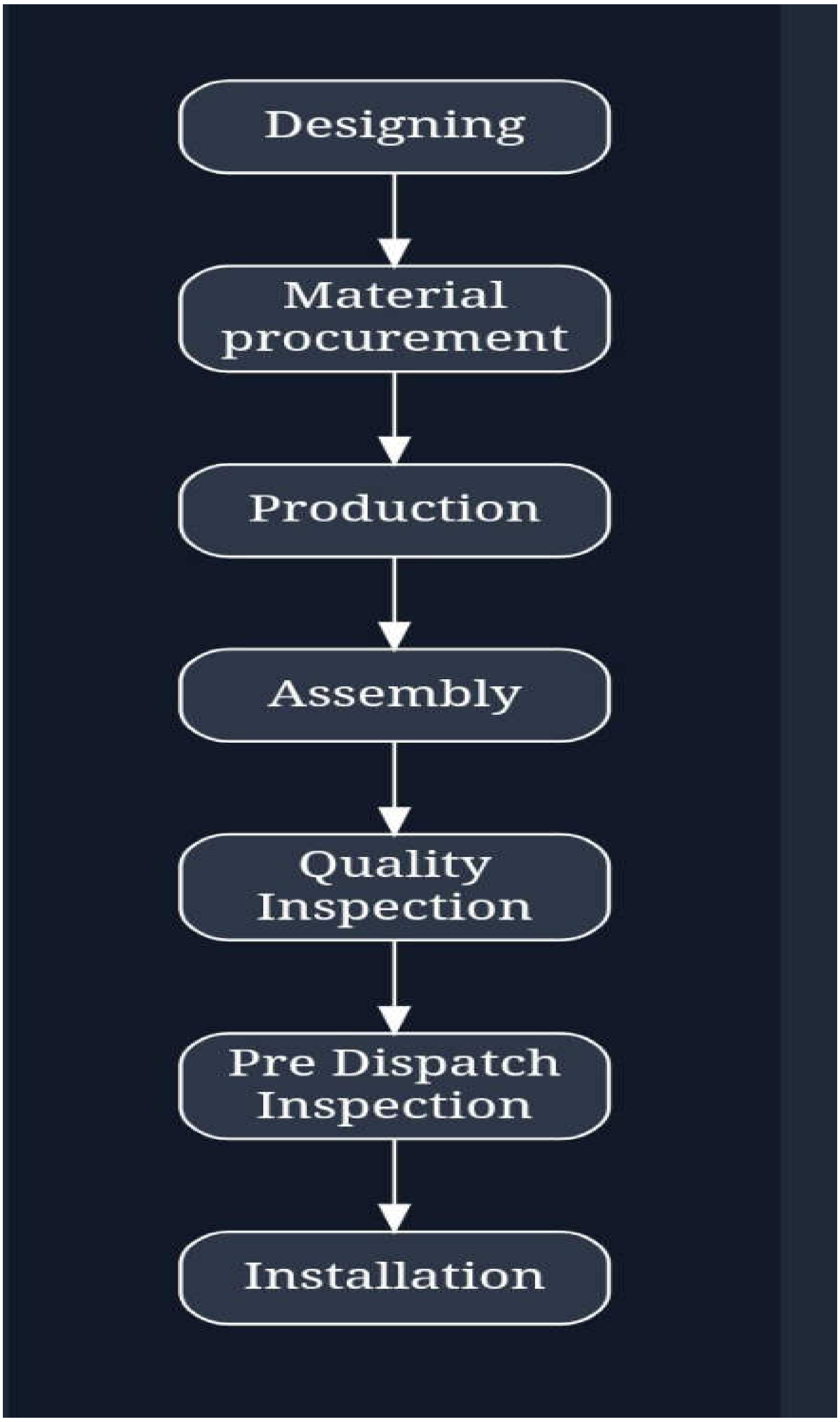

Fig: 2.24 Schematic Layout Of Manufacturing process

CHAPTER 3
PRODUCT MANUFACTURED BY COMPANY

3.1 List Of Machines Manufactured By Company

Basil Automachine are renowned as an affluent Manufacturer and Supplier of a wide array of 3-Axis,2-Axis,1-Axis pipe bending machine, double pinch hydraulic bending machine, three roller section bending machine, motorized degree pipe bending machine.

3.1.1 CNC Pipe Bending Machine / 3 to 1 axis Pipe Bending Machine

Fig: 3.1 3-Axis Pipe Bending Machine

A tool used in the metalworking industry to bend pipes and tubes into the desired shape is a 3-axis pipe bending machine. Precision and consistency in bends are made possible by the CNC technology that controls the machine.

3-axis pipe bending machine has the following three axes:

X-axis: The bending arm, which holds the pipe or tube and executes the bending process, is moved by the X-axis.

Y-axis: During the bending operation, the pipe or tube can be positioned and rotated using this axis to regulate its movement.

Z-axis: The mandrel, a rod or support put into the pipe or tube to keep it from collapsing, is moved along the Z-axis, which is a rotating axis.

3-axis pipe bending machine can bend pipes and tubes of various sizes and materials using these three axes to produce a wide variety of bends. It is frequently employed in fields where accurate and effective pipe and tube bending is necessary, including the automotive, aerospace, and construction sectors.

3-Axis pipe bending machine having features like

- Fully automatic high quality 3-Axis bending system.
- Hydraulic system assisted bending.
- "Moving ahead" and "Rotating" axis are servo control.
- Controlling ability of servo axis speed from control panel.
- Step by step as well as fully automatic working.
- One line die operation ability.
- Die-sets can be designed for customized sizes.
- Operational ability with/without mandrel.
- Capable for simple/complex bending for all type of metal.
- Hydraulic oil cooler.
- PLC based automation.
- Only a short period training required.

Table: 3.1 Specification of 3 Axis and 2 Axis Machine

Machine	**3 - Axis**	**2 - Axis**
Maximum die CLR	150 mm	150 mm
Carriage travel length	3.5 meter	2 meter
Axis accuracy	+0.25° & -0.25°	+0.25° & -0.25°
HMI memory capacity	100 programs (each contain 10 bend)	100 program (each contain 10 bend)

Automated machinery called CNC pipe benders are used to correctly and effectively bend pipes. They can be used in a variety of sectors. Here are a few typical uses for CNC pipe bending equipment:

- **Automotive Sector:** Exhaust systems, roll cages, and other automotive parts that require accurate bending are produced on a large scale in the automobile sector using CNC pipe bending equipment.

- **Aerospace Industry:** The fabrication of components for the aerospace industry must be done with extreme precision and accuracy. Hydraulic tubing, exhaust systems, and fuel lines are just a few of the aviation parts that may be produced with CNC pipe bending machines.

- **HVAC Industry:** For the transport of air and liquids, HVAC (heating, ventilation, and air conditioning) systems require pipes in a variety of forms and sizes. These pipes are produced precisely using CNC pipe bending machines.

- **Furniture Industry:** Chair, table, and cabinet frames are made using a variety of shapes and designs using CNC pipe bending equipment.

- **Construction Sector:** Pipes are used in the construction sector for a variety of applications, including plumbing, electrical conduit, and structural supports.

Table: 3.2 Specification of 1-Axis pipe bending machine

Model No.	**BA 38.1 - 3M CLHM+**	**BA 50.8 - 3M CLHM+**	**BA 76.2 - 3M CLHM+**
Automation	Encoder - counter based	Encoder - counter based	Encoder - counter based
Capacity (tube O.D. × wall)	1.5"×3mm	2"×3mm	3"×3mm
Max. round bar	25mm	35mm	45mm
Bending angle range	0°-180°	0°-180°	0°-180°
Bend accuracy	+-0.25°	+-0.25°	+-0.25°
Clamping	Hydraulic motor	Hydraulic motor	Hydraulic motor
Power	3 H.P.	5 H.P.	7.5 H.P.

3.1.2 Double Pinch Hydraulic Bending Machine

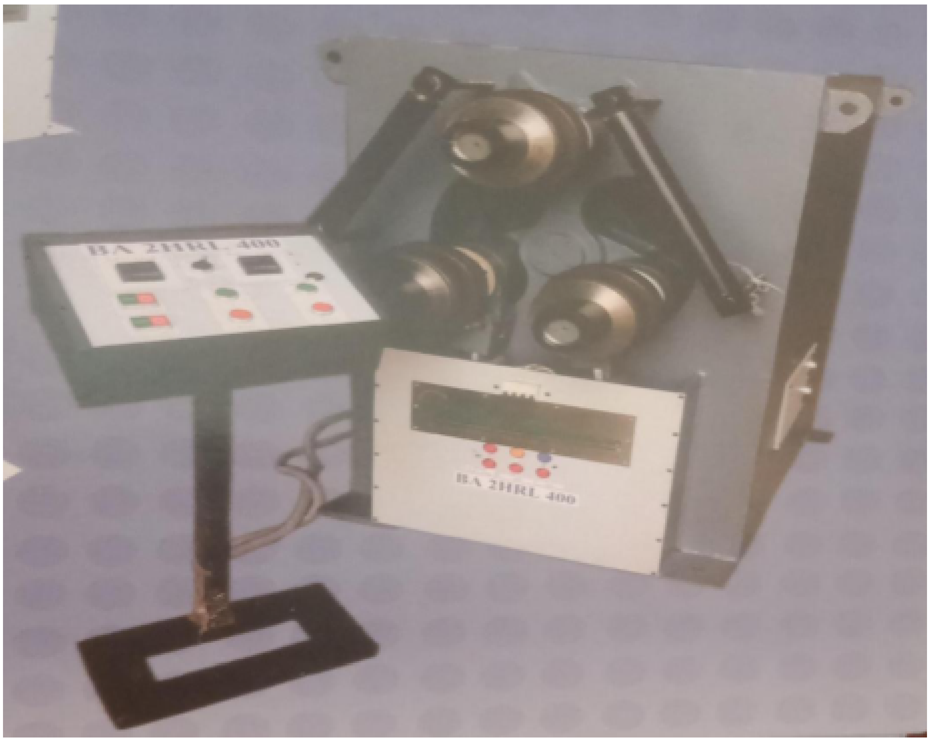

Fig:3.2 Double Pinch Pipe Bending Machine

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An industrial machine used to bend pipes and tubes is a twin pinch hydraulic pipe bending machine. The pipe or tube is forced to bend around a die (a specifically formed instrument that defines the bend radius) by this machine's utilisation of hydraulic pressure. The term "double pinch" refers to the fact that the machine contains two sets of rollers that grab the pipe or tube during the bending operation, one above and one below the die. This aids in keeping the pipe or tube's roundness and preventing deformation.

In order to bend pipes and tubes made of different materials, such as steel, aluminium, and copper, double pinch hydraulic pipe bending machines are frequently used in the construction, automotive, and HVAC (heating, ventilation, and air conditioning) industries. They are a popular option for mass producing bent pipe or tube components because they can produce precise and repeatable bends. From small pipes used in plumbing to huge pipes used in structural applications, these machines are available in a variety of sizes and can handle a variety of pipe and tube diameters.

Additional information on double pinch hydraulic pipe benders is provided below:

- **Hydraulic Pressure:** To exert force on the pipe or tube being bent, double pinch hydraulic pipe bending machines use hydraulic pressure. The hydraulic system, which moves the machine's numerous parts, is made up of a pump, a set of hoses, and hydraulic cylinders. The degree of bend is controlled by the hydraulic system, which may be modified to control the amount of pressure supplied.

- **Bend Radius:** The shape of the die that is utilised in the machine determines the bend radius. Dies are available in a variety of sizes and shapes to produce various bend radii. On some machines, it is possible to employ numerous dies, which enables the production of bends with various radii.

- **Control Systems:** Double pinch hydraulic pipe benders have cutting-edge control systems that let operators set the machine up to make particular bends. Depending on the machine, the controls may be computerised or manual. Greater precision and reproducibility are possible with computerised controls for bending.

- **Material Handling:** The automated loading and unloading of pipes or tubes into some equipment is accomplished by use of material handling systems. This may increase efficiency and lessen operator fatigue.

- **Safety Features:** To safeguard operators from mishaps, double pinch hydraulic pipe bending machines have guards and emergency stop buttons.

Sheet metal, plate steel, and aluminium may all be bent using double pinch hydraulic bending machines because of their adaptability. They are frequently used in factories, metal fabrication companies, and other businesses that need to bend metal precisely and effectively.

Here are some uses for hydraulic double pinch bending machines:

- **Metal Fabrication:** In metal fabrication shops, double pinch hydraulic bending machines are frequently used to bend sheet metal and plate steel into different forms and sizes. They can be used to create parts for a variety of products, such as machinery, building supplies, and automotive parts.

- **HVAC Industry:** Ductwork and other HVAC system components are bent by double pinch hydraulic bending equipment in the HVAC (heating, ventilation, and air conditioning) industry. These tools can precisely bend sheet metal, ensuring that all of the parts fit together and that the system works as intended.

- **Architectural Metalwork:** Custom metal components for use in building design are made using double pinch hydraulic bending machines in the architectural metalwork sector. These tools let architects and designers to build one-of-a-kind, complicated creations by bending metal into a range of forms and sizes.

- **Aerospace Industry:** Production of parts for aircraft and spacecraft is done in the aerospace industry using double pinch hydraulic bending machines. Aluminium and other metals can be bent precisely using these devices, guaranteeing that the components adhere to strict quality and safety standards.

- **Marine Industry:** To make parts for boats and ships, the marine industry uses double pinch hydraulic bending equipment. These tools let producers to produce unique components that are tailored to each vessel's particular requirements by bending metal into intricate forms and sizes.

Table 3.3 Specification Of Double Pinch Hydraulic Bending Machine

Model No.	**BA 2HRL 60**	**BA 2HRL 80**	**BA 2HRL 101**
Power	7kw	9kw	11.5kw
Shaft	70mm	80mm	90mm
	Max size and Min diameter	Max size and Min diameter	Max size and Min diameter
Round pipe	4"×5mm & 1200mm	5"×5mm & 1800mm	6"×5mm & 2000mm
Square pipe	3"×3"×5mm & 4000mm	4"×4"×5mm & 3000mm	5"×5"×5mm & 3500mm
Round Bar	40mm & 800mm	60mm & 1000mm	70mm & 800mm
Patta vertical	75×20mm & 2000mm	100×20mm & 2000mm	120×25mm & 1600mm
Patta horizontal	75×20mm & 1200mm	120×30mm & 800 mm	170×35mm & 1600 mm
Angle	50×50×5mm & 500mm	80×80×8mm & 1600mm	100×100×10mm & 1600mm
T section	70×35×6mm & 1200mm	80×80×8mm & 1400mm	100×100×10mm & 1000mm

3.1.3 Three Roller Section Bending Machine

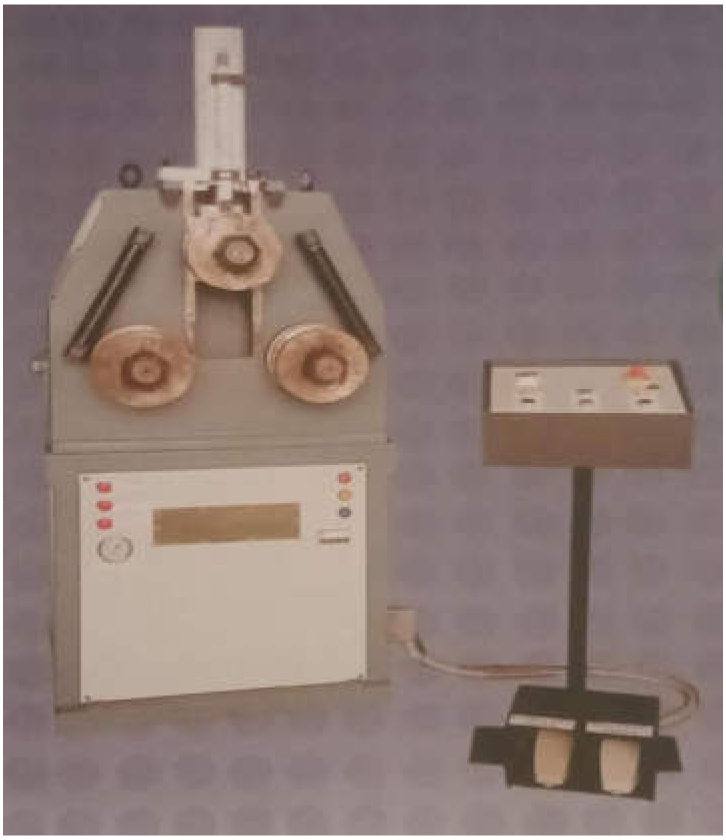

Fig: 3.3 Three Roller Section Bending Machine

A kind of industrial machinery known as a three roller section bending machine is used to curve portions of various materials, including metal, plastic, and wood. Three rollers, two at the bottom and one at the top, rotate in opposite directions to exert force on the portion being bent in order for it to bend. While the top roller is adjustable,the below rollers is fixed to meet various section sizes. The piece is fed through the rollers, which apply force as they move to progressively bend the segment into the appropriate shape. For activities like shaping curved metal beams and pipes for use in building and construction projects, three roller section bending machines are frequently employed in sectors including construction, manufacturing, and metalworking. They are a crucial piece of equipment for many firms because of their effectiveness and accuracy.

Here are some additional details about three roller section bending machines:.

- **Type of Section Bent:** Sections that can be bent include I-beams, channels, angle iron, square and rectangular tubes, round and flat bars, and many other types. These sections can all be bent using three roller section bending machines.

- **Capacity:** A three roller section bending machine's capacity varies based on its size and brand, although they can often handle sections up to several inches thick and several feet wide.

- **Precision and Repeatability:** High precision and repeatability are features that three roller section bending machines are built to offer during the bending operation. To assure accuracy, they frequently have digital readouts and other measurement instruments.

- **Control Systems:** Contemporary three-roller section bending machines may be equipped with cutting-edge control systems that enable automated operation, lowering the requirement for manual labour and boosting productivity.

- **Safety Features:** To prevent mishaps, three roller section bending machines are built with features including emergency stop buttons, guards, and safety interlocks.

- **Maintenance:** For a three roller section bending machine to operate effectively over time, proper maintenance is crucial. The rollers and other components may need to be cleaned, lubricated, and inspected as part of routine maintenance.

- **Cost:** Depending on the model, capacity, and features, three roller section bending machines can range in price. Although they are often pricey, organisations that extensively rely on curved portions in their production processes may find the investment to be justified.

A 3-roller section bending machine is mostly used in the metal fabricating sector. For a number of purposes, it is utilised to create curved metal sections and profiles. The following are some particular uses for a 3-roller section bending machine:

- **Structural Steel Bending:** For use in building projects, the machine can be used to bend structural steel pieces like beams and channels.

- **Pipe and Tube Bending:** The device is capable of bending pipes and tubes of different sizes for uses such as handrails, fencing, and furniture.

- **Automotive Industry:** Roll cages and exhaust pipes are only a couple of the metal components that may be bent using this machine.

- **Shipbuilding:** Metal pieces for use in shipbuilding, such as hull plates and deck beams, can be bent using the machine.

- **Aerospace Industry:** The device can be used to bend metal pieces for the aerospace sector, including aeroplane frames and engine components.

Table: 3.4 Specification Of Three Roller Section Bending Machine

Model No.	**BA RL 250**	**BA RL 300**	**BA HRL 300**	**BA HRL 400**	**BA HRL 400V**
Capacity (tube O.D. ×wall)	Upto 1.5"OD ×3mm thickness	Upto 2"OD× 3mm thickness	Upto 3"OD× 3mm thickness	Upto 4"OD× 3mm thickness	Upto 4"OD× 3mm thickness
Operation	Vertical operation only	Vertical & Horizontal operation	Vertical & Horizontal operation	Vertical & Horizontal operation	Vertical & Horizontal operation

3.1.4 Motorized Degree Pipe Bending Machine

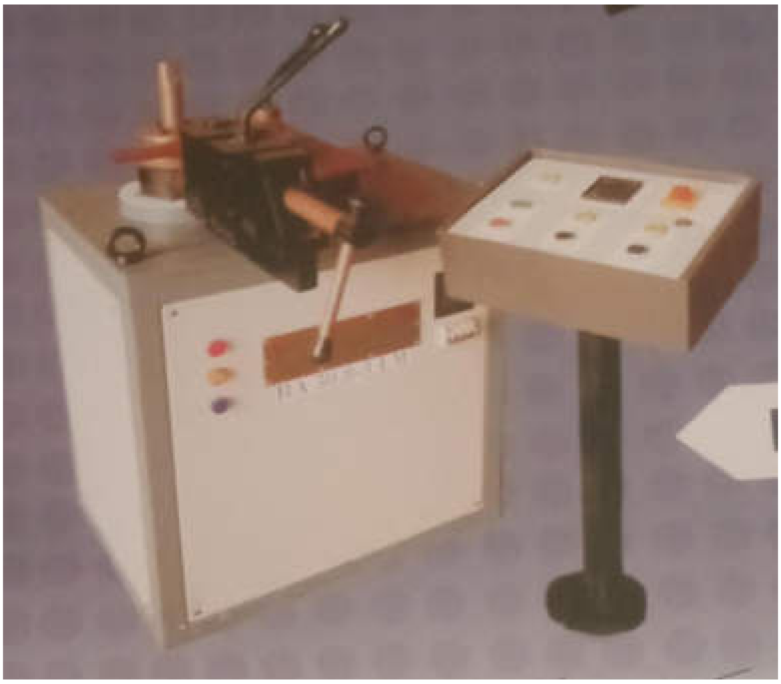

Fig: 3.4 Motorized Degree Pipe Bending Machine

A machine type used to bend pipes into different shapes and angles is known as a motorized degree pipe bending machine. It is frequently employed in fields like engineering, manufacturing, and construction where pipes must be bent to certain angles or forms.

The machine typically comprises a hydraulic system powered by an electric motor that generates the force required to bend the pipe. After being attached in place, the pipe is fed through the bending mechanism and bent to the required angle. Modern motorized degree pipe benders frequently have computerized controls that let the user programme the exact angles and curves needed for each bend. Due of this, the machine is incredibly adaptable and capable of creating a variety of complex bends.

Manufacturing vehicle exhaust systems, developing pipelines for the transportation of oil and gas, and producing metal furniture and fixtures are a few common uses for motorized degree pipe bending machines.

The following are some examples of how a motorized degree pipe bending machine is used:

- **Exhaust Systems for Automobiles:** In the automobile industry, motorised degree pipe bending machines are frequently used to create exhaust systems for cars and other vehicles. In addition to guaranteeing optimal flow and efficiency, the machine can bend pipes to the precise angles needed for the exhaust system to fit snugly within the vehicle's chassis.

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- **Pipelines for Oil and Gas Transport:** To create pipelines that can carry significant amounts of oil and gas over long distances, the oil and gas sector mainly relies on motorized degree pipe bending devices. Because these pipelines must be sturdy, resilient, and able to resist high pressure, they are frequently constructed from thick-walled pipes that demand careful bending.

- **Metal Furniture and Fixtures:** The production of metal furniture and fixtures, such as chairs, tables, and lighting fixtures, also makes use of motorized degree pipe bending equipment. The tools let designers produce distinctive and fashionable products that are both useful and aesthetically beautiful. The machines can bend metal tubes and pipes into a variety of forms and angles.

A hydraulic system, a bending die, a mandrel, and a control system make up the major parts of a motorised degree pipe bending machine. The pipe is under pressure from the hydraulic system, which is what causes it to bend. While the mandrel is used to support the pipe and keep it from collapsing during the bending process, the bending die is the element that bends the pipe to the appropriate angle. The control system enables the operator to determine the required bend angle as well as the speed and hydraulic system pressure.

There are several different shapes and sizes of motorized degree pipe bending equipment, some of which can bend pipes up to several inches in diameter. They can be fully automated with computer-controlled systems that can produce accurate bends with little user involvement, or they can be operated manually with the operator turning a hand crank to bend the pipe.

The ability to produce precise and repeatable bends, the ability to work with a variety of materials, including steel, aluminium, and copper, and the ability to produce complex bends and shapes that would be challenging or impossible to achieve with manual bending techniques are some of the main advantages of motorized degree pipe bending machines.

However, the cost and available space requirements for motorized degree pipe bending equipment can be high. To ensure their safe and efficient use, they also need operators with training.

Table: 3.5 Specification Of Motorized Degree Pipe Bending Machine

Model No.	**BA 38.1-3 LM+**	**BA 50.8-3 LM+**	**BA 50.8-3 LM**
Automation	Encoder counter based	Encoder counter based	Encoder counter based
Capacity (tube O.D.× wall)	1.5"× 3mm	2"× 3mm	2"× 3mm
Bending angle range	0°-180°	0°-180°	0°-180°
Bend accuracy	+-0.25°	+-0.25°	+-0.25°
Clamping	Toggle system	Toggle system	Cam system
Power	2 HP	3 HP	3 HP
Speed Control	AC Drive	AC Drive	AC Drive
Plug Assistance	Yes	Yes	No

3.2 Components / Material Required For 3-Axis Pipe Bending Machine

Various components / materials are used for manufacturing of 3 axis pipe bending machine , which are given below.

3.2.1 Components Of 3 Axis Machine

Depending on the unique design and features of the machine, several components may be needed to create a 3-axis pipe bending machine. However, the following are some of the fundamental parts that are generally required:

Fig: 3.5 Frame

Fig: 3.6 Carrier

Fig: 3.7 Clamp Die

Fig: 3.8 PLC Panel

Fig: 3.9 Guide Slider & Main Clamp

Fig: 3.10 Oil Cooler

Fig: 3.11 Motor & Manifold

- **Frame:** The machine's major structural element, the frame supports the other parts by acting as a support structure.Heavy-duty steel or cast iron is commonly used for the frame of a 3-axis pipe bending machine. This gives the machine's moving parts the essential strength and stability.

- **Bending Arm:** The machine's bending arm is the component that supports the pipe while exerting pressure on it to bend it. Typically, it consists of a clamp, a mandrel, and a hydraulic cylinder.

- **Hydraulic System:** The hydraulic system supplies the force needed to move the machine's bending arm and other parts.

- **Control System:** The control system, which typically consists of a computer, software, and user interface, controls how the machine operates.

- **Electric Motor**: The electric motor powers the machine's hydraulic pump as well as other parts. It has a servo motor and a three-phase motor.

- **Pipe Support Roller:** Rollers used to support pipes during bending and keep them from sagging or collapsing are known as pipe support rollers. Additionally uses MD center to hold pipe when pipe bend is accomplished.

- **Mandrels:** During bending, mandrels are utilized to support the interior of the pipe to stop it from collapsing or wrinkling. The mandrel is the element that holds the interior of the pipe steady while it bends to avoid collapse or deformation. In order to reduce friction, it is often made of steel or aluminium and may have been coated or given a special surface treatment.

- **Clamp Die:** During bending, the pipe is held firmly in place using a clamp die.The element that actually bends the pipe is the bending die. To withstand the strains of bending, it is often constructed of hardened steel or tool steel.

- **Tooling:** The various dies, mandrels, and mandrel rod required to bend pipes of various diameters and forms are referred to as tooling.

- **Safety Features:** To ensure a machine's safe operation, safety features including emergency stop buttons, safety interlocks, limit switches, and pressure switches are crucial components.

- **Gears:** In pipe bending machines, gears are used to transfer power from the motor to the bending die, which bends the pipe into the required shape.A pipe bending machine's gears can also be used to change the bending die's speed, which is useful when working with various materials or pipe sizes. The operator may regulate the speed at which the pipe is bent and make sure it is done precisely and quickly by adjusting the gear ratio.

- **Electrical Components:** In order to automate and manage the bending operation, pipe bending machines employ electrical components. These parts comprise the panel box, the HMI Display, the motors, the temperature and pressure gauges.

- **Other Components**: The other parts include the powerpack, carriage, manifold, oil filter, and oil cooler.

3.2.2 Material Of 3 Axis Machine

A 3-axis pipe bending machine's construction materials may vary depending on the design and manufacturer, but in general, these machines are made of strong and long-lasting materials like:

Steel or Iron: Because they are sturdy, stiff, and long-lasting, steel and iron are frequently utilized for the machine's frame, base, and other structural elements. They are capable of withstanding large loads and stresses, which is crucial for a machine that must bend metal pipes.Depending on the particular needs of the equipment, different types of steel may be employed. For components that need to be strong and stiff, for example, high carbon steel may be utilized, but low carbon steel may be used for components that need more flexibility. A few components may also be made of cast iron because of its great compressive strength and wear resistance

Aluminum: Some machines use aluminum, a thin metal, to lighten them and make them more portable. But because aluminum is weaker than steel or iron, it might not be appropriate for some components that must bear severe loads and stress.Aluminium is frequently used for elements that need to be lighter to reduce the machine's total weight or for parts that don't need to be as strong, like coverings or panels. In addition, aluminum is corrosion-resistant, so it is good choice to use for components that may be exposed to moisture or other harsh environments.

Hydraulic Components: A pipe bending machine's hydraulic system is essential since it gives the pipes the force they need to bend. High-grade steel or other materials that can survive the high pressures and forces required to bend metal pipes are often used to make hydraulic components like cylinders, pumps, and hoses.A pipe bending machine's cylinders are commonly built of steel or aluminum, with the choice of material depending on the machine's particular specifications. Steel or other materials that are resistant to wear and corrosion may also be utilized to make the hydraulic system's pumps and hoses.

Electrical Components: Motors, control panels, sensors, and switches are all parts of a pipe-bending machine's electrical system. Copper, aluminum, and plastic are just a few of the materials that are frequently used to make these components.Because metal is a good conductor of electricity, copper is frequently used for electrical wiring and connections. Some electrical components are also made of aluminum because of its light weight and ease of shaping into different shapes. For some electrical components that do not require a lot of strength or conductivity, plastics like PVC or nylon may be utilized.

3.3.3 3 - Axis Pipe Bending Machine Operation

After connecting 3 – phase power connections along with neutral, Machine control panel will be powered on when MCB is on, Power Healthy Light will be on if input Power Supply is healthy, Machine can be operated by HMI connected with the panel as below.

- Users can start/stop the machine by pressing push buttons connected to the control board, after the machine is started it can be operated by HMI.

- User also need to start hydraulic motor by the Hydraulic start push button with a view to operate cylinders, if the Hydraulic motor is off then cylinders can not be operated.

Fig: 3.12 Screen No.1 - Welcome Screen

- With power on, after initialization of HMI Display, this welcome screen will appear on HMI display, Touch anywhere on the screen with a view to move ahead to screen no. 2.

Fig:3.13 Screen No.2 - Home screen

- This is Home Screen, where user need to select the type of operation as AUTO or MANUAL.

- For Automatic operation of machine, press AUTO switch and for Manual operation of cylinders or Servo, press MANUAL switch.

- When you press AUTO switch it will redirect you to the screen no. 3, and if you press MANUAL switch it will redirect you to Screen no. 5.

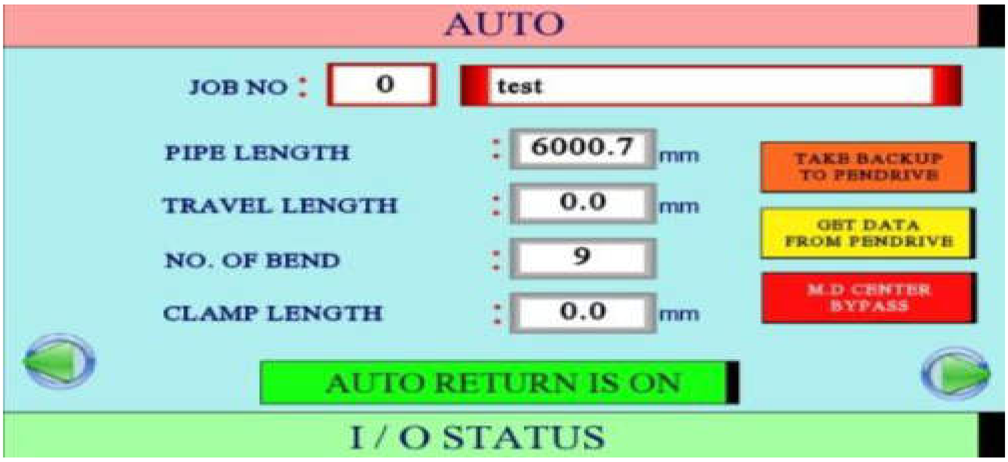

Fig:3.14 Screen No.3 - AUTO Operation Screen

- This is AUTO operation Screen, Select Job No. as per requirement. User can save total 100 (0 to 99) different types of job.

- Set Pipe Length, No. of bend and Clamp length. Keep in mind that Pipe Length should be less than travel length.

- Once you fill Job no. and name it will save that data for that particular job.

- You can also choose whether to bypass Main Drill Center Cylinder or not by selecting M.D Bypass Switch in HMI.

- If you need to require the Servo motor return automatically after band is finished, then do on the AUTO RETURN switch located at bottom side of screen in HMI. It is recommended to keep Auto Return ON.

- If you want to check the Input / Output status of peripherals then touch on I/O STATUS Switch.

- Press the right arrow switch to move ahead to JOB operation Screen.

- Touch on AUTO button (top) to return to HOME Screen.

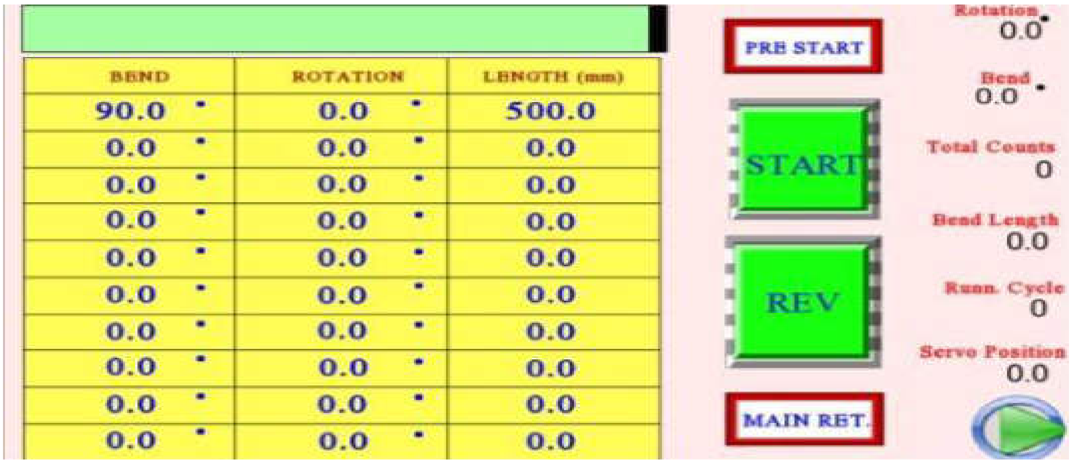

Fig:3.15 Screen No.4 - Job Screen (Auto Mode)

- This is JOB operation Screen. In case of new job, input the degree of bend and length data along with degree of rotation of pipe.
- PRE START switch is to move servo ahead up to pipe length. (also can be operate using pushbutton)
- The START switch is to start auto operation of bending process. (also can be operate using pushbutton)
- REV switch is to operate all cylinders and Servo to return at their home position.
- ARM RETURN switch is to return the main bending cylinder up to home position after finishing the job. (also can be operate using pushbutton)
- Before ARM RETURN please make sure that Servo is already at Home position.
- Total Counts will show the number of job finished, with a view to reset it user need to touch it for 5 Seconds.
- Touch on right arrow button (bottom) to move back to AUTO Screen.

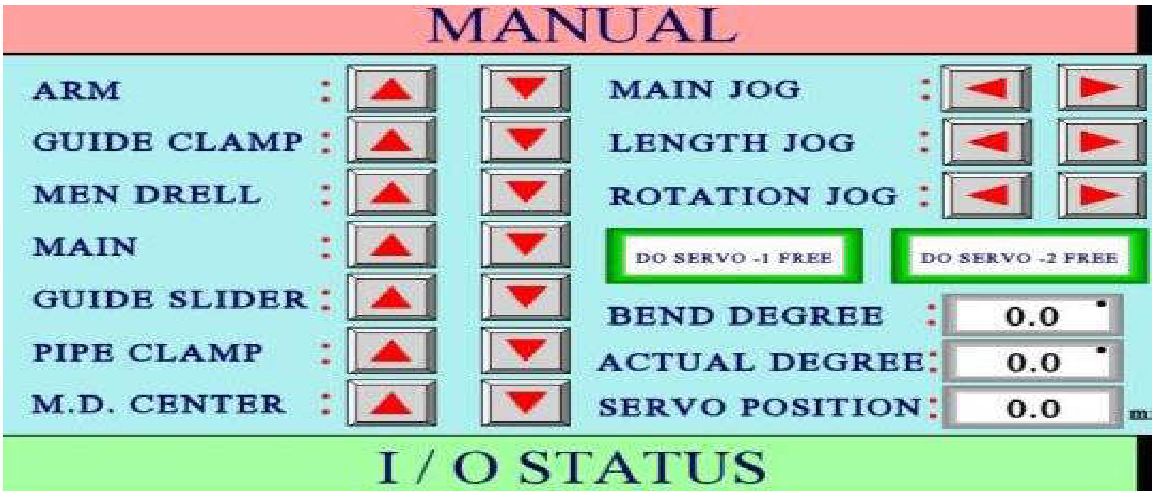

Fig:3.16 Screen No.5 - Manual Operation Screen

- This is MANUAL operation screen.
- Users can operate all cylinders and servo manually as displayed in screen.
- Main cylinder can be operated in JOG Mode also.
- If you want to check the Input / Output status of peripherals then touch on I/O STATUS Switch.
- Touch on MANUAL button (top) to return to HOME Screen.

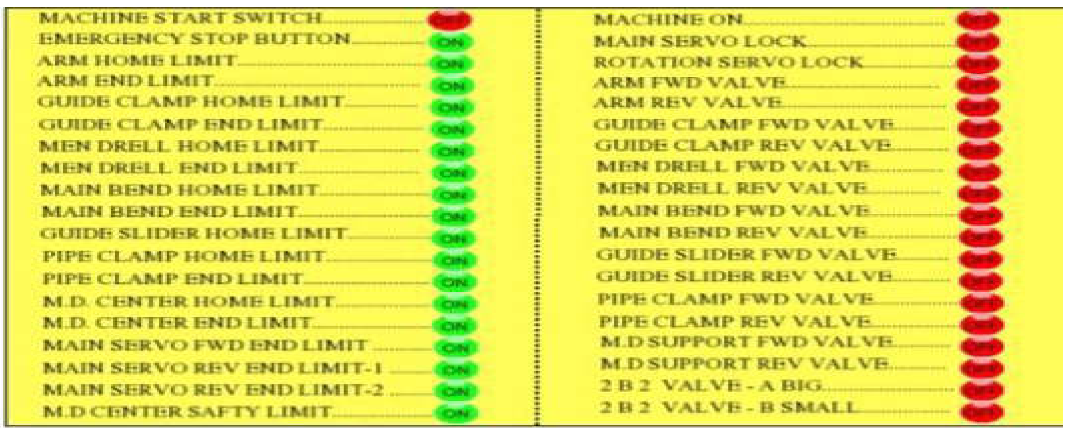

Fig:3.17 Screen No.6 - Input/Output Status

- This Screen shows the actual status of input and output peripherals.

- Green color indicates ON Status and Red color indicates OFF Status.

- Touch anywhere on Screen, Which will redirected to the HOME Screen.

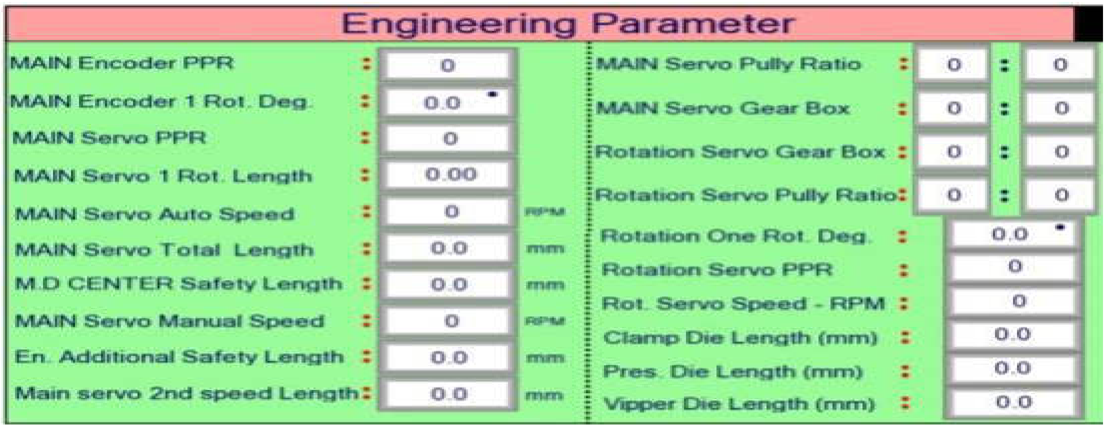

Fig:3.18 Screen No.7 - Machine Engineering Data

- This Screen is to set Engineering (Machine) Parameters of equipments.

- Take care of accuracy of all data while setting as if it is set wrong, machine will malfunction.

- Only responsible engineer is allowed to set this data.

- Touch at ENGINEERING PARAMETER (top) button to move back to HOME Screen.

- This Screen is password protected, i.e.user need correct password to reach this screen.

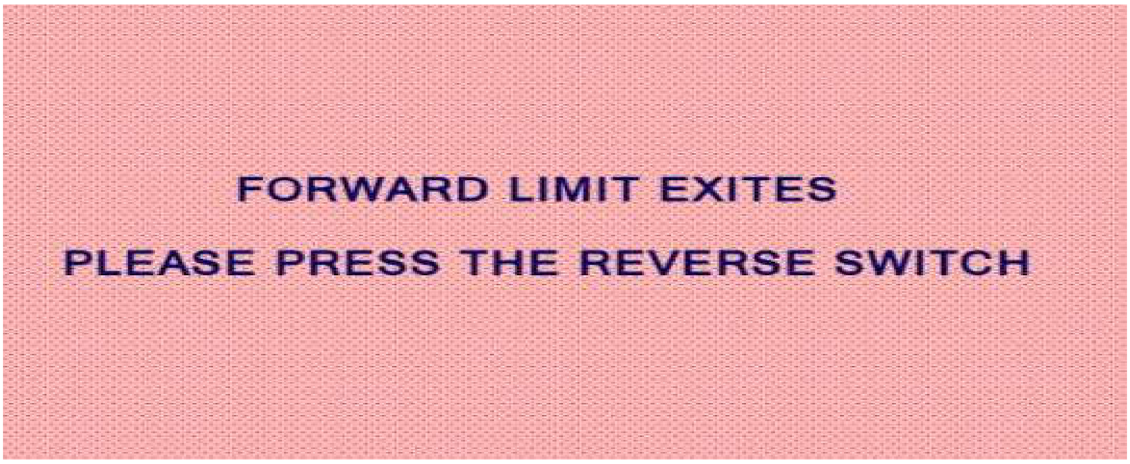

Fig:3.19 Screen No.8 Forward Limit Exites

- This screen will appear if servo travelled up to its maximum forward limit.

- Touch anywhere on screen to move to the Home Screen.

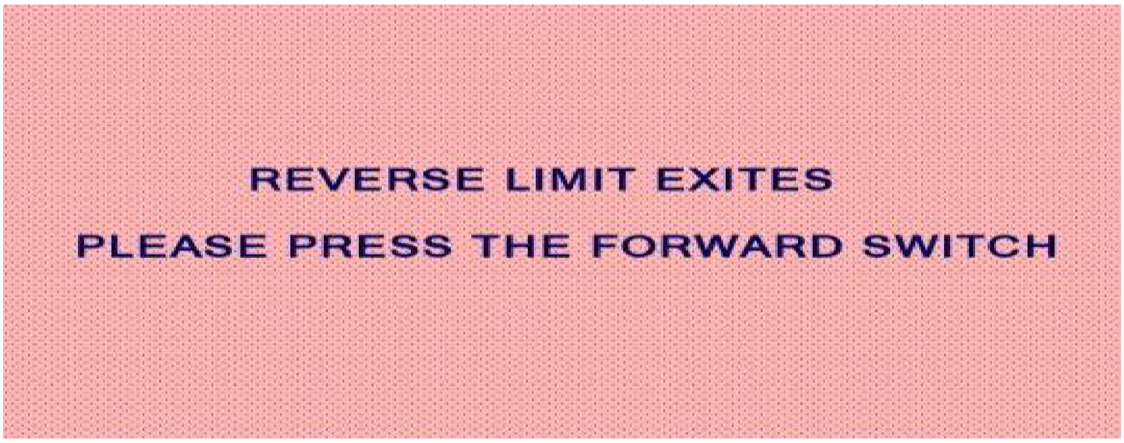

Fig: 3.20 Screen No.9 Reverse Limit Exits

- This screen will appear if servo travelled up to its maximum reverse limit.

- Touch anywhere on screen to move to the Home Screen.

CHAPTER 4
INTRODUCTION TO INTERNSHIP

4.1 Purpose & Objectives

The purpose of doing an internship in a pipe-bending machine manufacturing facility's production and assembly division is to obtain hands-on experience and exposure to the manufacturing sector. It offers the chance to put theoretical knowledge into practise, comprehend the procedures involved in the manufacture and assembly of pipe bending machines, and develop the relevant skills necessary for a job in manufacturing.

- **Practical Experience:** The goal of the internship is to get hands-on expertise in the production and assembly procedures related to the manufacture of pipe bending machines. Working directly in this department will provide the chance to put academic learning to use and develop a practical abilities.

- **Exposure to The Company Operations:** The internship offers a chance to learn about the problems and best practises in the pipe bending machine manufacturing company. From the acquisition of raw materials to the finished product, the full production and assembly workflow will be exposed, which will help in the development of an in-depth understanding of the manufacturing process.

- **Skill Building:** Technical skills that are essential to production and assembly activities will be improved during the internship & get up skills including using machinery, reading technical drawings, using fine measuring equipment, and understanding quality control methods. For a career in engineering or manufacturing, these abilities are crucial.

- **Teamwork and Collaboration:** The internship will provide experience working in a group setting & work with experts from many fields, including engineers, technicians, and quality control specialists. Interpersonal communication, teamwork, and professional setting skills will all increase as a result of this experience.

- **Company Networking:** Get the chance to meet people in the manufacturing sector throughout the internship. Making connections with knowledgeable people can help to find mentorship, references, and potential employment prospects.

- **Personal Development and Confidence:** Taking part in an internship in the production and assembly division of a manufacturing facility for pipe bending machines will give a worthwhile opportunity for personal development & learn to adapt to new obstacles, grow in self-assurance, and strengthen work ethic. The whole professional development of career will benefit from this internship.

4.2 Roles And Responsibilities

I had the opportunity to take on a number of significant duties and responsibilities while interning in the production and assembly division of a manufacturing facility for pipe bending machines.

1. Material Procurement
2. Marking & Punching
3. Drilling & Tapping
4. Assembly/Fitting
5. Electrical work

4.2.1 Material Procurement

Table :4.1 List of Material

Material	Quantity
6 X 10 Round Bolt	30
6 X 25 Round Bolt	20
3/8 X 3/8 Hose Pipe 2200mm	01
3/8 X 3/8 Hose Pipe 2000mm	01
3/8 X 3/8 Nipple	04
8 X 25 Allen key Bolt	15
8 X 45 Allen key Bolt	35
12 X 40 Allen key Bolt	06

In order to guarantee efficient manufacturing processes and satisfy client requests, material acquisition is essential. A variety of parts and materials, such as structural steel, hydraulic cylinders, motors, electronic control systems, rack, rail, hose pipe, power pack, tools and more are frequently used to create pipe bending machines.

A Bill Of Materials (BOM), is an extensive list of all the parts and components needed to make a pipe bending machine. The BOM, which details the quantities and specifications of each item, is used as a guide when ordering materials. To reduce manufacturing delays, the assembly department normally keeps a stock of frequently used components.

The assembly department builds connections with dependable vendors who can deliver high-quality supplies on schedule. To guarantee correct and timely material deliveries, it is essential to keep clear channels of communication and collaborate closely with suppliers.

The assembly department creates a material requisition or purchase request when materials are required for assembly. This document outlines the necessary components, their quantities, due dates, and any other useful data. The purchasing division receives it immediately for additional processing.

Once the materials arrive at the assembly department, they are inspected to ensure they meet the specified quality standards and match the order details. Any discrepancies or issues are communicated with the supplier for resolution. If everything is satisfactory, the materials are accepted and moved to the assembly line.

Table:4.2 List Of Suppliers

Materials	**Suppliers**
Cylinders	Ganga hydraulics
Tools	Anjani hardware traders
Hose pipe	Anjani hardware traders
Welding electrodes	Bhavani, sector 28
Powder coating	Sadguru, ahmedabad
Structure	Tortuga machines
Panel	DRY - CAN Technologies
Electric items	Siddheshwari electricals
Rack & rail	HIWIN company, mumbai
Servo motor	JSK automation and electrical solutions

4.2.2 Marking & Punching

Fig 4.1 AutoCAD Drawing Of 68 mm Pin

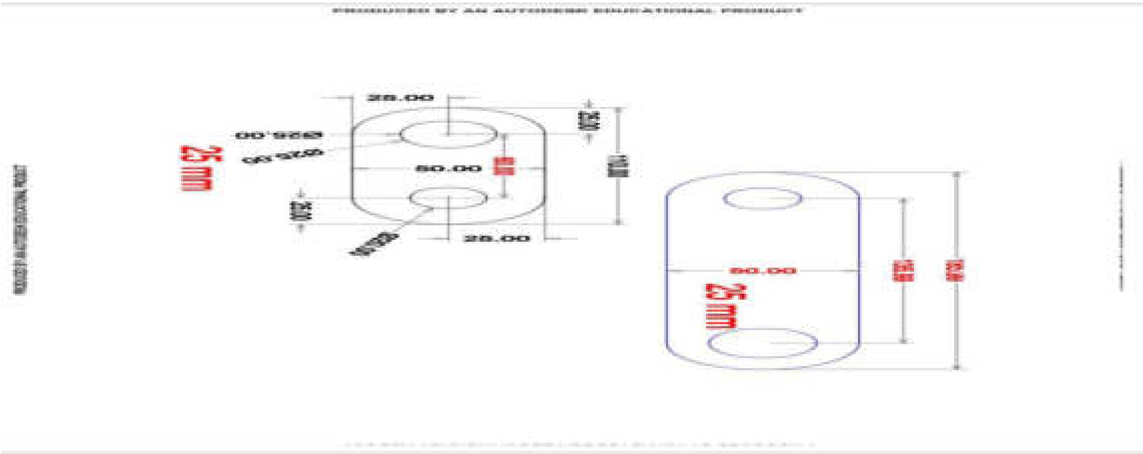

Fig 4.2 AutoCAD Drawing Of 110 mm Pin

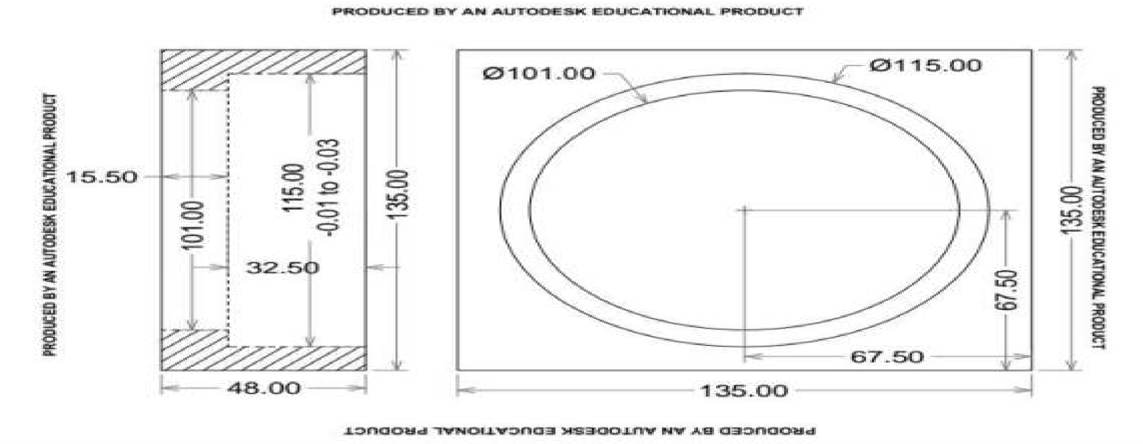

Fig: 4.3 AutoCAD Drawing Of Bearing Housing Pipe Clamp

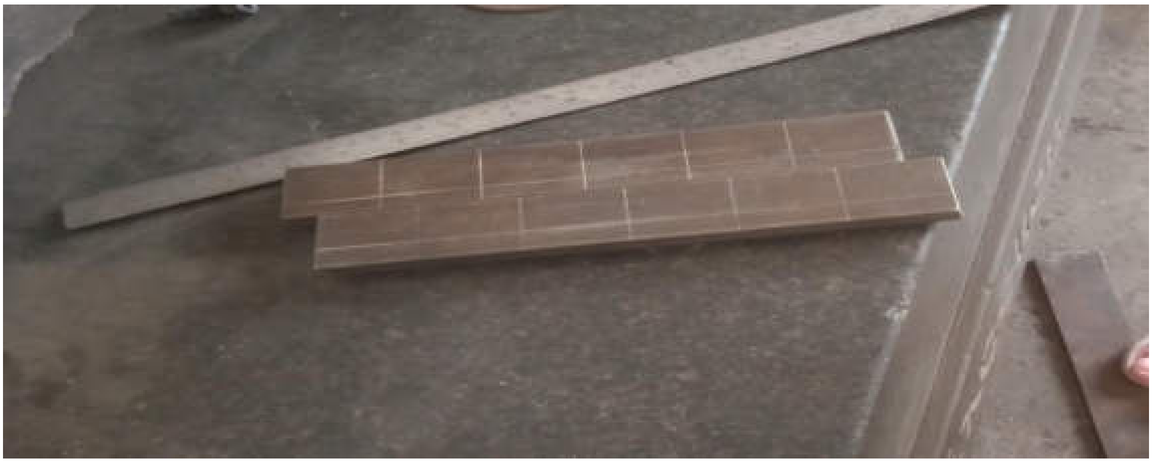

Fig 4.4 Marking On Plate

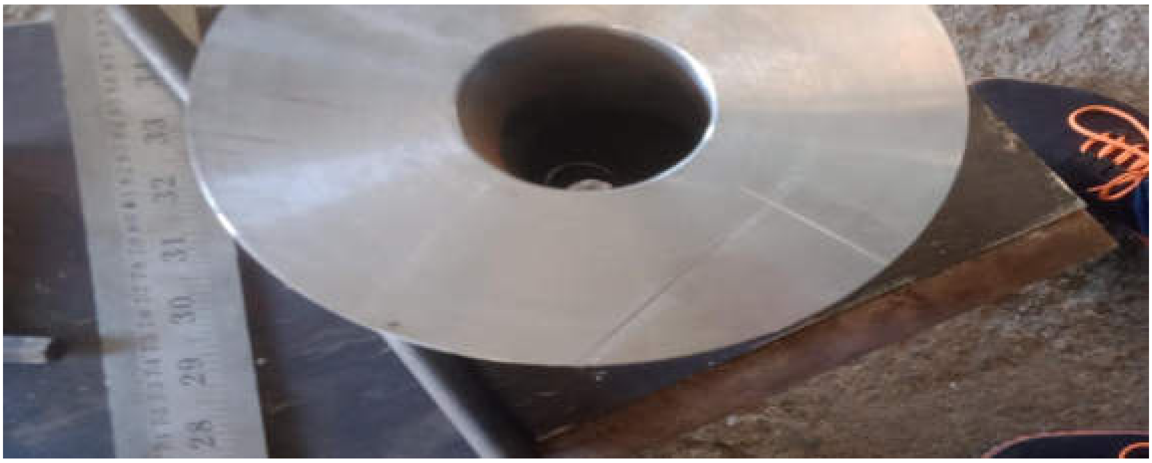

Fig 4.5 Marking On Die

Fig: 4.6 Punching On Circular Plate

For the construction of pipe bending machines, plates made of suitable materials, such as steel or aluminum, are chosen. Typically, these plates have a flat, rectangular shape.

The pipe bending machine is designed and engineered using precise blueprints or computer-aided design (CAD) models. This includes defining the locations of the necessary holes for parts like hydraulic cylinders, guide rails, encoder house,servo house and also for pitch circle diameter (PCD). After the design is complete, a layout is made for marking the plates. Specifically locating and measuring the holes to be drilled is required. The layout may be created manually using measuring devices and templates or it may be based on a CAD model.

Several techniques are used to transfer the marking arrangement onto the plates. Utilizing a scribe, center punch, or layout fluid are common methods. These techniques aid in producing clear and precise markings on the plate's surface that show the precise locations where the holes need to be drilled. The plates are brought to the drilling machine after the markings have been applied. Determine the places on the machine's plates where drill holes must be made for assembly or attachment needs and then mark the precise locations of the holes on the plates using measuring tools such rulers, calipers, or templates.

Utilizing marking implements like center punches, scribes, or markers, transfer the markings onto the plates and Use the proper drilling tools, such as a drill press, to drill the designated holes.

Table: 4.3 PCD Formula

Hole	**Formula**
3	PCD×0.866
4	PCD×0.7071
5	PCD×0.5878
6	PCD×0.5
7	PCD×0.4339
8	PCD×0.3827
9	PCD×0.342
10	PCD×0.309

4.2.3 Drilling & Tapping

Fig: 4.7 Drilling

Using a turning cutting instrument called a drill bit, drilling means making holes in a work piece. Drilling is frequently done during the manufacture of pipe bending machines on a number of parts, including the base frame, support structures, and fixing clamps. These holes have several uses, including allowing fasteners like bolts, screws, or a variety of others to attach extra parts or join various parts together.

While different materials may call for different bit sizes and drilling procedures, manufacturers must take the material being drilled into account. To fit varied materials and hole diameters, drill bits are available in a variety of sizes and designs. Twist, step, and hole saw drill bits are frequently utilized in the production of pipe bending machines. The material being drilled, the necessary hole size, and the desired hole polish are just a few examples of the variables that affect the drill bit selection.

Table: 4.4 Pitch Chart

Size	Pitch
M1.7	0.35
M2	0.45
M2.3	0.40
M2.6	0.45
M3	0.35
M3	0.60
M4	0.50
M4	0.75
M5	0.50
M5	0.90
M5.5	0.90
M6	0.75
M8	0.75
M8	1.00
M9	1.00
M10	0.75
M10	1.00
M10	1.25
M12	1.00
M12	1.25
M12	1.50
M14	1.25
M14	1.50
M16	1.00
M16	1.50
M18	1.50
M20	1.00
M20	1.50
M20	2.00
M22	1.50
M24	1.00
M24	1.50
M24	2.00
M25	1.50

A coolant or lubricant may be used during the drilling process, depending on the material being drilled. Coolant helps to disperse heat produced during drilling and guards against drill bit and work piece damage. Lubrication, like cutting oil, can increase drilling efficiency and lengthen the drill bit's lifespan. To make it easier for screws, bolts, and other threaded fasteners to be inserted, internal threads are created inside a hole through the process of tapping. In the production of pipe bending machines, tapping is frequently done on parts like mounting plates, frames, or housings.

A hand tap or a tapping machine can be used for manual or automated tapping. To cut threads into the material, the tap must be rotated while being lined up with the drilled hole. To make sure that the tap size and thread type are suitable with the bolts being used, it is crucial to make these choices.

Based on the needed thread size and pitch for the particular application, taps are chosen. Metric thread standards (such as M6, M10) are frequently used in the production of pipe bending machines.

There is a formula for making a hole in a material:

Drill size = Diameter of thread - Pitch of thread

4.2.4 Assembly/Fitting

Fig 4.8 Assembly Of Rail Guide

Fig 4.9 Assembly Of Encoder House

Fig 4.10 Assembly Of Pipe Clamping Mechanism

Fig 4.11 Assembly Of Guide Slider And Pipe Clamp Arm

Fig 4.12 Assembly Of Die Supporting Plate

Fig 4.13 Final Assembly Of Pipe Banding Machine

In order to produce a working machine for pipe bending, the various parts of the machine must be assembled. To make sure that each component has been placed and connected properly, the assembly procedure normally follows a predetermined order of steps. Individual parts are examined for compatibility and quality prior to assembly. This involves searching for any flaws, damage, or irregularities that could impair the machine's functionality.

To ensure effective and correct construction, assembly follows a predetermined set of stages. This can include segmenting the process into smaller groupings of component assemblies known as sub-assemblies, which are then brought together for the final assembly.

To help with component alignment and positioning during assembly, jigs and fixtures are frequently employed. Through the whole assembly process, consistency and accuracy are guaranteed by these specialized equipment.

Depending on the design and materials utilized, several fastening methods are used, such as bolts, screws, rivets, or welding. In order to achieve secure connections without over tightening or harming the components, the proper torque settings and procedures are used.

To achieve optimum functionality, fitting entails modifying and aligning the components. In order to reduce friction and guarantee smooth operation, this involves making sure that the alignment of the gears, shafts, and bearings. Skilled personnel with an in-depth knowledge of the machine's design, functionality, and assembly instructions are needed for both the assembly and fitting processes.

Assembly/Fitting of 3 axis pipe bending machine components like powerpack, hose pipe, nipples, manifold, direction control valve, motors, mandrel, cylinders, rack & rail, teeth shaft, guide slider, rail, tray(carrier), encoder house, servo house, mandrel rod, oil cooler, M.D. center, conveyor belt, pipe clamp arm, slotter, gear box, panel box and other components.

4.2.5. Electrical Work

Fig 4.14 Servo Motor Connection

Fig 4.15 Limit Switch And Pressure Switch Connection

Fig 4.16 PLC Panel Connection

Fig:4.17 HMI Display

The electrical system of the pipe bending machine is centred on the control panel. It has a variety of electrical parts and controllers needed to run the machine. Circuit breakers to prevent electrical overloads, relays to manage power to various machine functions, switches for human control, and indicators to track machine condition are some of these components.In accordance with the machine's design and functionality, the electrical expert carefully wires and arranges these components in the control panel. Typically, an electric motor is used to power the bending movement of the pipe bending device. Based on the machine's bending requirements, the electrical specialist chooses the best motor by taking power, speed, and torque into account. They mount the motor and attach it to the control system, making sure it is properly aligned and securely mounted.In some circumstances, variable frequency drives (VFDs) are utilised to regulate the motor's speed and torque, giving the bending process more exact control. To connect the VFDs to the control system, the electrical technician wires and configures them.

Various sensors are used by pipe bending devices to precisely monitor and regulate the bending operation. Depending on how the machine is built, these sensors may be pressure, position, or angle sensors. These sensors are installed and connected to the control system

by the electrical technician, ensuring exact measurement and feedback for bending operations.The machine also includes safety features like pressure switch, limit switches, and emergency stop buttons. To maintain operator safety and avoid accidents, the electrical technician connects and installs various safety measures.

The pipe bending machine's wiring and connections are the responsibility of the electrical technician. Using electrical rules and standards as a guide, they meticulously choose the right wires, cables, and connectors. To securely handle the electrical load, proper wire sizing is essential, and the insulation should be appropriate for the machine's operating environment. The electrical expert also maintains correct cable management for organisation and accessibility and makes sure the electrical system is properly grounded to prevent electrical risks.

The electrical specialist does extensive testing once the electrical installation is finished to ensure that all electrical systems and components are operating correctly. They monitor voltages and currents to make sure they comply with the required levels and conduct continuity tests to ensure good wiring connections. Additionally, they check the operation of the control system to make sure the motor, sensors, and safety measures are functioning properly. The electrical technician investigates any problems or malfunctions found and makes any necessary corrections or adjustments to guarantee the machine runs dependably and securely. I had made connections for the limit switch, pressure switch, and direction control valve to the panel and also attached a ferrule to it.

4.3 Opportunities & Challenges

A pipe bending machine manufacturing facility internship might give a important possibilities to study and advance in the field.

Opportunities:

Professional Training: Working as an intern at a manufacturing facility enables to receive first-hand exposure to pipe bending equipment. These devices will be available to use, troubleshoot, and maintain, which can help to become more technically skilled.

Manufacturing Knowledge: Working in a factory that makes pipe bending machines exposes to the workings of the sector and learn about various machine kinds, production techniques, quality assurance procedures, and safety regulations. Find this information useful in professional endeavours.

Networking: Interning offers a great chance to establish a network of professionals within the field and get to talk to other interns, engineers, technicians, and seasoned professionals. The connections make during internship may open up prospects for mentoring, career recommendations, or even future employment.

Problem-Solving Abilities: During internship, encounter a variety of difficulties relating to machine use, maintenance, or production. As work with the team to discover answers, these difficulties might help to develop problem-solving skills and it will gain resilience and resourcefulness by overcoming challenges.

Challenges:

Technical Difficulty: Understanding the various systems and controls of pipe bending devices can be difficult because of their complexity. To overcome this difficulty, need to take the initiative to ask questions, get clarification, and pick up tips from knowledgeable people.

Safety Measures: There are inherent risks when using heavy equipment. Strict adherence to safety procedures and awareness of potential risks are essential. For the sake of health and the health of coworkers, it is essential that to follow safety regulations and receive the necessary training.

Time Management: Deadlines and specified project objectives are frequently included in internships. It can be difficult to efficiently manage time while juggling other obligations in order to achieve these objectives. During internship, it will be crucial to learn how to efficiently manage workload and set priorities.

Collaboration & Teamwork: Collaboration with many teams and departments inside the manufacturing facility necessitates good cooperation and communication abilities. To accomplish shared goals, it's imperative to listen intently, communicate properly, and work together. It may be difficult to adjust to various communication philosophies and personality types.

Making Adjustments to The Manufacturing Environment: Manufacturing facilities can be hectic, dynamic places. It may take some getting used to to change priorities, deal with the noise, and work in an organised environment. It will be advantageous to develop adaptability, resilience, and the capacity to thrive in such an environment.

CHAPTER 5
CONCLUSION & DISCUSSION

5.1 Overall Analysis Of Internship

At Basil Automachine, I had an excellent internship during which I gained a lot of knowledge about the production and assembly lines. I enjoyed the training very much and learned a lot about purchasing materials, inspecting materials, marking, drilling, tapping, welding, assembling, electrical work, and to operate pipe-bending machines. The entire staff extends a warm welcome while acknowledging, disclosing, and sharing the knowledge they have gained over a long career path.

In addition, I had seen firsthand how to manage high levels of stress in an organization. when there is a lot of stuff to do and make the right choices at work.

5.2 Problem Encountered And Possible Outcome

Their are some problem encountered during these internship in 3 Axis pipe bending machine of 80mm O.D. are as follow

It was required to perform certain corrective actions in order to address the problem of an error appearing in the motion of the guide clamp. To better understand the underlying source of the issue, the guiding clamp was disassembled as the initial step. On closer inspection, it was discovered that the clamp's backside surface had a few problems. An operation of surface buffing was done to correct issue. This approach worked well in addressing the issue and restoring the guiding clamp's smooth operation.

Sometimes the surface of the pipe develops wrinkles during the bending operation. Two pins that are inserted into the die, however, have been designed as a fix for this issue. These pins keep the die from slipping, resulting in a surface bend of the pipe that is wrinkle-free and smooth. This unique strategy guarantees that the finished product is of the highest calibre and free of any unsettling flaws

After the pipe was bent, there were some inaccuracies in its length which were brought on by faulty estimates that were input into the programme. In order to resolve this problem and guarantee correct findings, new measurements were taken and entered into the system..

A common problem that occurs while bending an S-bend pipe takes place when the pipe touches the guide slider after the initial bend. A supporting element has been added to the guidance slider to help solve this issue. This addition provides an additional space for the pipe to bend smoothly, improving the efficiency and effectiveness of the bending operation. The S-bend pipe can now be bent without the obstruction that was previously impeding the process because of to this adjustment.

The bolt of the pipe clamp arm may come into touch with a bent pipe. To solve this problem, an opening was added to the pipe clamp arm so that the bolt could fit inside of it easily. Without harming the structural integrity, this adjustment enables appropriate fitting of the pipe clamp arm and makes it easier to install the pipe securely. By putting this approach into practise, potential problems caused by the pipe's contact with the bolt can be avoided, resulting in a safe and effective operation.

Inaccurate bending angles are a common issue in the production of pipe bending machines. This could lead to a product that doesn't satisfy the necessary requirements, which could be expensive for the manufacturer & end users.

Utilizing cutting-edge software and technology to ensure exact bending angles is one potential solution to this issue. Before the pipes are constructed, this can involve using computer-aided design (CAD) and computer-aided manufacturing (CAM) software to create 3D models of the pipes and test various bending angles. The accuracy and consistency of the bending process can also be guaranteed by the bending machine's usage of sensors and feedback systems.

Another option is to perform routine calibration and maintenance on the bending machine to make sure it is operating properly. This can involve completing routine inspections to find any potential faults early on, inspecting and modifying the machine's settings, replacing damaged parts, and so on.

A 3 axis pipe bending machine can potentially run into a number of issues during production. These are a few typical problems.

- **Material Selection:** It's critical to select materials for a 3 axis pipe bending machine that are of good quality, long-lasting, and appropriate for the equipment's particular use. For instance, strong, stiff materials like steel or aluminium should be used to construct the machine's frame and essential components. The bending die, for example, and other parts that come into touch with the pipe being bent should be built of materials that are durable enough to withstand wear and strain without damaging the pipe. The correct components can be used to create a machine that is robust, long-lasting, and durable.

- **Alignment:** With a three-axis pipe-bending machine, accurate and reliable alignment is essential. Uneven or deformed bends from misalignment may even cause machine damage. Manufacturers must thoroughly inspect each machine part and use accurate measuring equipment to ensure appropriate alignment. This entails inspecting the pipe position during bending as well as the alignment of the pipe with the mandrel and the main frame of the machine.

- **Programming:** To accomplish the appropriate bending angles and radii, the control system and programming for a 3 axis pipe bending machine must be properly configured. This necessitates a detailed comprehension of the machine's capabilities as well as the particular work requirements. Manufacturers should utilise a dependable and user-friendly control system that enables simple entry of bending parameters in order to assure precise programming. Before starting production, they should thoroughly test the machine and the programming to make sure everything is working as it should.

- **Maintenance:** To maintain a three-axis pipe-bending machine running smoothly and precisely over time, regular maintenance is necessary. This includes performing activities like lubricating moving parts, examining them for damage, and changing out worn parts. The risk of machine failure, uptime, and machine longevity can all be decreased by manufacturers by creating a regular maintenance schedule and making sure that all maintenance chores are finished on time.

- **Operator Training:** To operate a three-axis pipe-bending machinery safely and efficiently, operators must receive the appropriate training. This entails being aware of the machine's capabilities and constraints, following to safety procedures, and carrying out simple maintenance procedures. Manufacturers should offer thorough training programmes that cover every area of machine operation and maintenance in order to guarantee that operators are adequately taught. Additionally, they ought to offer constant assistance and instruction as required to keep staff members informed of the most recent methods and best practises.

5.3 Summary Of Internship

I finished a 12-week internship with an company that produces pipe-bending machines. I had acquired crucial first-hand knowledge of the creation of pipe bending machinery during this time. Assembling and disassembling the equipment, completing quality checks, and fixing problems that occurred during production were some of the duties I was involved in. Along with using various tools and equipment connected to production, I also learned how to read and understand technical drawings and specifications.

I collaborated closely with a group of experienced professionals throughout my internship who offered direction and support as I expanded my knowledge and skills. I also had the chance to watch the many steps of the manufacturing process, starting with the raw ingredients to finished product. I learned a lot about the manufacturing of pipe bending machines during my internship, and I acquired useful skills and knowledge that will help me in my future professional endeavours

REFFERANCE

1. https://www.basilautomachine.com
2. https://m.indiamart.com/basilautomachine
3. https://www.tubebendingconcepts.com
4. https://www.hinesbending.com
5. https://www.hornmachinetools.com
6. https://www.schwarze-robitec.com
7. https://www.baileigh.com

APPENDIX-1

Annexure 1(weekly Report week-1)

GUJARAT TECHNOLOGICAL UNIVERSITY
(Established under Gujarat Act No. 20 of 2007)
ગુજરાત ટેકનોલોજીકલ યુનિવર્સિટી
(ગુજરાત અધિનિયમ ક્રમાંક: ૨૦/૨૦૦૭ દ્વારા સ્થાપિત)

Annexure 1

Enrollment no: 190390119002

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: Shashank Ranjitbhai Barot.

DIARY OF THE WEEK: Dt: 30/01/23 TO 03/02/23

DEPARTMENT: Mechanical SEM: 8th.

NAME OF THE ORGANISATION: Basil Automachine.

NAME OF THE PLANT/SECTION/DEPARTMENT: production & Assembly Section.

NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT: Mr. Harsh Patel

DESCRIPTION OF THE WORK DONE IN BRIEF

- Basil Automachine office is situated in Gandhinagar & workshop in Gozaria
- company manufactured 1 Axis, 2 Axis, 3-Axis. pipe Bending machine, Hydraulic / Manual three roller section Bending Machine and also Encoder-counter Based Motorized degree pipe Bending machine.
- Company has number of machines like lathe, Drilling, cutting, Arc welding, MIG welding, grinding, buffing machine & etc.
- on these week days, Mechanical & Electrical work was done.

Mechanical Work :- Fitting of clamp, 3 phase motor, oil tank, 3 cylinder, Rail, Tray, pipe clamp on tray, 2 cylinders on pipe clamp, slider house fitting, Die fitting, mandrel fitting & welding of thin sheet of conveyor Belt and welding of hande on working table, Black colour spray on parts of Machine By spray gun & also pannel box & display Box fitting

Electrical Work :- servo motor, switch Board & fan fitting in pannel Box, pannel Box connection with display Box, wiring inside the working table, pannel Box connection with machine.

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(ગુજરાત અધિનિયમ ક્રમાંક: ૨૦/૨૦૦૭ દ્વારા સ્થાપિત)

TOTAL HOURS: 35

SIGNATURE OF STUDENT

- The above entries are correct and the grading of work done by Trainee is EXCELLENT / VERY GOOD / GOOD / FAIR / BELOW AVERAGE / POOR

Signature of Faculty Mentor

Signature of officer-in-charge of Dept. / Section / Plant

Date:

Date: 6/2/23

- Grading of Work, for trainee may be given depending upon your judgement about his Punctuality, Regularity, Sincerity, Interest taken, Work done etc.

Annexure 1(weekly Report week-2)

GUJARAT TECHNOLOGICAL UNIVERSITY
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(ગુજરાત અધિનિયમ ક્રમાંક: ૨૦/૨૦૦૭ દ્વારા સ્થાપિત)

Annexure 1
Enrollment no: 190390119002

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: Shashank Ranjitbhai Barot.

DIARY OF THE WEEK: Dt: 06/02/23 **TO** 10/02/23

DEPARTMENT: Mechanical **SEM:** 8th

NAME OF THE ORGANISATION: Basil Automachine

NAME OF THE PLANT/SECTION/DEPARTMENT: Production & Assembly Section

NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT: Mr. Harsh patel.

DESCRIPTION OF THE WORK DONE IN BRIEF

- on these week days, ~~the~~ mechanical work, Electrical work, testing & problem and their solution was done.
- Mechanical work :- fitting of nipple, Die clamp in 1-Axis machine, limiting & pressure switch, Servo motor in pannel Box, Hose pipe, Bolt on slider for pushing, 3 cylinder on front side, Rod & Rack & pinion gear, mandrel for servomotor, Gear on mandrel. welding of conveyor Belt plate & display Box, drilling holes on working table of 6mm & also on gear, drilling holes in die clamp.
- Electrical work :- Connection of limit switch & pressure switch with pannel Box and also programmed was done in winpro ladder software
- testing :- checking of servo motor & Gear Box fitting. testing of motor & its operations, testing of tray motion & testing of servomotor rotations, measurement of hose pipe taken & make order of it, Assembly of Encoder house
- problem & solution :- error was produced in guide clamp motion so to solve these problem dissemble the guide clamp & buffing is done on its downside surface.
- on these week, plant incharge of thermotech company were come to check the progress of their 5-band 3-Axis pipe bending machine.

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TOTAL HOURS: 35

SIGNATURE OF STUDENT

○ The above entries are correct and the grading of work done by Trainee is EXCELLENT / VERY GOOD / GOOD / FAIR / BELOW AVERAGE / POOR

Signature of Faculty Mentor

Signature of officer-in-charge of Dept. / Section / Plant

Date:

Date: 13/2/23

○ Grading of Work, for trainee may be given depending upon your judgement about his Punctuality, Regularity, Sincerity, Interest taken, Work done etc.

Annexure 1(weekly Report week-3)

GUJARAT TECHNOLOGICAL UNIVERSITY
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Annexure 1

Enrollment no: 190390119002

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: Shashank Ranjitbhai Barot

DIARY OF THE WEEK: Dt: 13/02/23 **TO** 17/02/23

DEPARTMENT: Mechanical **SEM:** 8th

NAME OF THE ORGANISATION: Basil Automachine

NAME OF THE PLANT/SECTION/DEPARTMENT: Production & Assembly Section.

NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT: Mr. Harsh patel

DESCRIPTION OF THE WORK DONE IN BRIEF

- on these week days, the mechanical work, Electrical work, calculations, testing & problem and their solution was done.
- Mechanical work :- Fitting of Belt Between two gears, Spring in pipe clamp, oil filter in oil tank, Stopper at end of axil, die holder plate on front side & Rod & mandrel in machine, Grinding on the 3-Axis machine & also on oil tank, cutting of plate (650mm) for 400 machine, offset at 610mm, plate of (1210mm) of 3-Axis machine & plate of 620mm, welding on leakage pipe, Structure of oil tank, Structure of 400 machine, die holder plate on front side, & cylinder rack plate. on lathe machine 45mm plate & 280mm pin is made, drilling hole of 32mm in die, Front plate of display box, on oil tank cover
- Electrical work :- Calculations of machine operation & Acco to their programme Feed
- Calculations :- Calculations of tray moving, PCD on circular plate, made punch on die to make drill hole of 32mm & calculation of pipe length = 6100 mm, travel length = 6141, no of Bend = 2, clamp length = 200mm, pressure die length = 2120 mm.
- Testing :- 4 to 5 pipe bend, Bearing is fitted in shaft or not checking, checking cross plate fit in machine or not, pipe bending at 90° & 128°, Assembly shaft by fitting wiser, Bearing, gear, pressure, Bearing & wiser.
- problem & Solution :- During the pipe Bending, the wrinkles are produced on the pipe surface so to solve these problem 2 Pins are fitted in die for perfect pipe bending without any wrinkles on surface of pipe.

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TOTAL HOURS: 35

SIGNATURE OF STUDENT

- The above entries are correct and the grading of work done by Trainee is EXCELLENT / VERY GOOD / GOOD / FAIR / BELOW AVERAGE / POOR

Signature of Faculty Mentor

Signature of officer-in-charge of Dept. / Section / Plant

Date:

Date: 20|2|23

- Grading of Work, for trainee may be given depending upon your judgement about his Punctuality, Regularity, Sincerity, Interest taken, Work done etc.

Annexure 1(weekly Report week-4)

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Annexure 1
Enrollment no: 190390119002

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: Shashank Ranjitbhai Barot.
DIARY OF THE WEEK: Dt: 20/02/23 TO 24/02/23
DEPARTMENT: Mechanical SEM: 8th
NAME OF THE ORGANISATION: Basil Automachine.
NAME OF THE PLANT/SECTION/DEPARTMENT: production & Assembly section
NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT: Mr. Harsh patel

DESCRIPTION OF THE WORK DONE IN BRIEF

- on these week days, the mechanical work, calculations, checking, problem and their solution was done.
- Mechanical work :- Fitting of nipple on oil tank, key in shafting, pins in slider, wiser in 2 cylinder of mandrel, oil cooler between tank & motor, welding of Base plate & cross plate on 3Axis, manifold on plate, inlet pipe on oil tank, Grinding on 3Axis surface, on 400 Machine structure, slotter of working table, upper body & lower body of 400 machine. Drilling on oil tank for level guage, 8mm hole on working table; on upper body of 400 machine. cutting of pipe of 180 mm (2) & 120 mm (4). On ~~front~~ lathe machine, plate of 200x80mm & 100x 30mm was ready
- Calculations :- calculation or measurement of pipe between motor & oil tank, hese pipe between motor & mandrel.
- checking :- checking hydraulic pump on motor, 3 Axis machine By Bending 90° pipe, 3 Axis machine in Automation mode, chief engineer of thermotech arrived for checking progress, list of machining plates.
- problem & solution :- Their was problem in pipe clamp, It becomes loose After so many time used so it is tightly fitted.
- These were some errors in pipe length After Bending it. Because of wrong calculation was fetched in programmed so these problem solved By yogi Bhai (Electrical Engineer)

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TOTAL HOURS: 35

SIGNATURE OF STUDENT

- The above entries are correct and the grading of work done by Trainee is EXCELLENT / VERY GOOD / GOOD / FAIR / BELOW AVERAGE / POOR

Signature of Faculty Mentor

Signature of officer-in-charge of Dept. / Section / Plant

Date:

Date: 27/2/23

- Grading of Work, for trainee may be given depending upon your judgement about his Punctuality, Regularity, Sincerity, Interest taken, Work done etc.

Annexure 1(weekly Report week-5)

GUJARAT TECHNOLOGICAL UNIVERSITY
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Annexure 1

Enrollment no: 190390119002

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: Shushank Ranjitbhai Barot

DIARY OF THE WEEK: Dt: 27/02/23 TO 03/03/23

DEPARTMENT: Mechanical SEM: 8th

NAME OF THE ORGANISATION: Basil Automachine

NAME OF THE PLANT/SECTION/DEPARTMENT: production & Assembly section

NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT: Mr. Harsh patel

DESCRIPTION OF THE WORK DONE IN BRIEF

- on these week days, owner of 3 Axis machine arrived for their personnel purpose, the mechanical work, Calculations, checking, colouring.
- The owner of 3 Axis (Thermotech) were arrived for make pipe bend because they had urgent order of Boiler so due to shortage of time they Bend their pipe in our workshop.
- mechanical work :- fitting Rack, Rail, cylinder, Frontside Shaft on 3 Axis (New) machine, tray on 3 Axis (New). make punch & drilling on pannel plate, make punch on working table drill 30 mm holes for hose pipe, make drill on Slider plate, make drill on cover & Structure of 3 Axis machine. welding of 4 stands for storing pipes, hooks inside 3 Axis machine for wire connection, Structure of 3 Axis (New order machine). Cutting 10 pipes of 1200mm. Pannel plate is machined on lathe.
- calculation :- Calculation or measurement of ~~pipe~~ S-bend pipe in 3 Axis Machine
- checking :- Slider, tray on 3 Axis machine, Rail & Rack on working table, covers of 3 Axis machine, tray on Rail By sliding.
- on thursday their was power drop so due to that, no work had been possible in workshop so cleaning of workshop is done.
- Dissemble the whole 3 Axis (Thermotech) machine for washing & colouring machine in Grey colour.

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TOTAL HOURS: 32 hours

SIGNATURE OF STUDENT

○ The above entries are correct and the grading of work done by Trainee is EXCELLENT / VERY GOOD / GOOD / FAIR / BELOW AVERAGE / POOR

Signature of Faculty Mentor

Signature of officer-in-charge of Dept. / Section / Plant

Date:

Date: 06/03/23

○ Grading of Work, for trainee may be given depending upon your judgement about his Punctuality, Regularity, Sincerity, Interest taken, Work done etc.

Annexure 1(weekly Report week-6)

GUJARAT TECHNOLOGICAL UNIVERSITY
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Annexure 1
Enrollment no: 190390119002

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: Shashank Ranjitbhai Barot

DIARY OF THE WEEK: Dt: 06/03/23 TO 10/03/23

DEPARTMENT: Mechanical SEM: 8th

NAME OF THE ORGANISATION: Basil Automachine

NAME OF THE PLANT/SECTION/DEPARTMENT: Production & Assembly section

NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT: Mr. Harsh patel

DESCRIPTION OF THE WORK DONE IN BRIEF

on these week days, mechanical work, problem & solution and colouring work was done.

Mechanical work :- Fitting of cylinder in guide clamp, Shaft between Slider plate, Rack & Rail on machine, M.D center & hydraulic cylinder of it, pipe clamping house, pipe clamp arm tray & Adjusting screw, Cylinders(2) on pipe clamping house, pipe clamp arm tray & Adjusting screw, cylinders(2) on pipe clamping house, pipe clamp arm Assembly of pins for fitting cylinder on Guide clamp. welding of cylinder, Assembly of pins for fitting Cylinder on Guide clamp. welding of guide clamp on structure, Crane Hook welding. Cutting pipes of 1100mm for 600 machine, drilling for M.D Center on machine. measurements were taken for Conveyor Belt. marking on die for drilling & tapping. pipe clamp house parts and Guide clamp plates were machined on lathe, also Slider parts were machined on lathe. Dissemble the parts of 3 Axis machine (Thermotech) like rack, rail, tray, die, slider etc for washing & colouring the machine

Problem & solution

- During Bending of S-Bend pipe, after the 1st Bend the pipe touches the slider so due to these, one part was fitted on the slider so It creates some space for pipe for Bending.

Colouring work

- colouring the whole machine (Thermotech) from inside & outside with grey colour.

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TOTAL HOURS: 24

SIGNATURE OF STUDENT

- The above entries are correct and the grading of work done by Trainee is EXCELLENT / VERY GOOD / GOOD / FAIR / BELOW AVERAGE / POOR

Signature of Faculty Mentor

Signature of officer-in-charge of Dept. / Section / Plant

Date:

Date: 13/03/23

- Grading of Work, for trainee may be given depending upon your judgement about his Punctuality, Regularity, Sincerity, Interest taken, Work done etc.

Annexure 1(weekly Report week-7)

GUJARAT TECHNOLOGICAL UNIVERSITY
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Annexure 1
Enrollment no: 190390119002

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: Shashank Ranjitbhai Barot.

DIARY OF THE WEEK: Dt: 13/03/23 TO 17/03/23

DEPARTMENT: Mechanical SEM: 8th

NAME OF THE ORGANISATION: Basil Auto machine

NAME OF THE PLANT/SECTION/DEPARTMENT: Production & Assembly section

NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT: Mr. Harsh patel

DESCRIPTION OF THE WORK DONE IN BRIEF

on these week days, mechanical work, Checking, Electrical work & Dispatch of machine was done. & also problem & Solution.

Mechanical work :- Fitting of hose pipe & nipple Between manifold & motor, Direction control valve, pressure gauge & temp gauge, pannel in pannel Box, Suction strainer in oil tank, Covers on machine, pannel Box in machine, servo motor (1 kw) on working table with Encoder house, Roller in machine, Gear Box on mandrel, mandrel on pipe clamp house, pulley on servo motor & pipe clamp shaft, pipe with oil tank & motor, slider on guide clamp, pressure switch in cylinder, transformer in pannel Box, limit switch, Encoder with Belt, Conveyor Belt on Sheet, Encoder house & Servo house with Belt, servo motor (1 kw, 1.5 kw) in pannel. welding of Roller parts, plates Between tray & conveyor Belt. marking on plates for drilling & tapping, keys of pipe clamp house for drilling & tapping. cutting the pannel plate

Checking - checking covers on machine, temp gauge works or not, servo motor moves tray or not, guide clamp works or not.

Electrical work :- Electrical connection like pressure switch, limit switch & connection of direction control valve with pannel.

Problem & solution - In front side, the material of cover was not arrived due to some reasons so we had take sheet of it's measurement & cutted it & then drilling, tapping, welding & colouring was done on it.

Dispatch :- 3 Axis pipe Bending machine of thermotech Company was dispatched on Tuesday.

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TOTAL HOURS: 35

SIGNATURE OF STUDENT

- The above entries are correct and the grading of work done by Trainee is EXCELLENT / VERY GOOD / GOOD / FAIR / BELOW AVERAGE / POOR

Signature of Faculty Mentor

Signature of officer-in-charge of Dept. / Section / Plant

Date:

Date: 17/03/23

- Grading of Work, for trainee may be given depending upon your judgement about his Punctuality, Regularity, Sincerity, Interest taken, Work done etc.

Annexure 1(weekly Report week-8)

GUJARAT TECHNOLOGICAL UNIVERSITY
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Annexure 1
Enrollment no: 190390119002

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: Shashank . R. Barot
DIARY OF THE WEEK: Dt: 20/03/23 TO 24/03/23
DEPARTMENT: Mechanical SEM: 8th
NAME OF THE ORGANISATION: Basil Automachine
NAME OF THE PLANT/SECTION/DEPARTMENT: production & Assembly
NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT: Mr. Harsh patel.

DESCRIPTION OF THE WORK DONE IN BRIEF

on these days, mechanical work, Electrical work & Dispatch the machine was done & also problem & solution.

Mechanical work : making structure of 600 machine its upper body & lower body, drilling of plate on upper body, marking on working table, Assembly of powerpack was done, checking the list of materials, Assembly of servo house, gear box, rack, mill, tray, screw guage, encoder house, pipe clamp house, die, slider, pipe clamp arm etc., make pcd on circular plate, cutting covers for temp gauge, fitting of M.D centers & it's cylinder, oil filter ~~fitting~~ & oil cooler fitting, limit switch & encoder fitting, hose pipe connection, make trial for tray movement, servo ~~rotating~~, die rotates, mandrel movement, pipe clamp works, slider clamp, Gear Box, drilling & tapping on 400 machine.

Electrical work : changes in the programme, fitting limit switch, pressure switch fitting.

Problem & solution : pipe is not clamp properly so grinding / Buffing was done on their keys & spring were attached between them. & Also make counter on structure.

Dispatch : Dispatch the 400 machine structure.

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TOTAL HOURS: 38

SIGNATURE OF STUDENT

The above entries are correct and the grading of work done by Trainee is
EXCELLENT / VERY GOOD / GOOD / FAIR / BELOW AVERAGE / POOR

Signature of Faculty Mentor

Signature of officer-in-charge
of Dept. / Section / Plant

Date:

Date: 24/03/23

Grading of Work, for trainee may be given depending upon your judgement about his Punctuality, Regularity, Sincerity, Interest taken, Work done etc.

Annexure 1(weekly Report week-9)

GUJARAT TECHNOLOGICAL UNIVERSITY
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Annexure 1
Enrollment no: 190780119002

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: Shashank Ramjitbhai Barot.
DIARY OF THE WEEK: Dt: 27/03/23 **TO** 31/03/23
DEPARTMENT: Mechanical **SEM:** 8th
NAME OF THE ORGANISATION: Basil Automachine
NAME OF THE PLANT/SECTION/DEPARTMENT: production & Assembly.
NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT: Mr. Harsh patel.

DESCRIPTION OF THE WORK DONE IN BRIEF

on these days, mechanical work, Electrical work & problem & solution

Mechanical work :- Base plate welded & also cross plate was welded for support, grinding on structure., drilling on oil tank. & check hydraulic pump on motor, checking mandrel, grinding was done on structure of 400, welding was done on inlet pipe of oil tank., pins are fitted in slider, Removing Burs from shafting plate.
- washers was fitted on 2 cylinders of mandrel., Assembly of oil cooler was done, cutting plates of 170 mm (2) & 410 mm (3); slotter is welded on structure., list of machining
- plates were checked

Electrical work :- Make connection of limit switch & pressure switch in machine. & attach Ferrul to the wire connection

problem & solution :- The oil doesn't flow in the machine. Because of the nipple. nipple has some manufacturing defect. so By Replacing it the machine works in better condition.

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TOTAL HOURS: 35

SIGNATURE OF STUDENT

The above entries are correct and the grading of work done by Trainee is EXCELLENT / VERY GOOD / GOOD / FAIR / BELOW AVERAGE / POOR

Signature of Faculty Mentor

Signature of officer-in-charge of Dept. / Section / Plant

Date:

Date: 31/03/23

Grading of Work, for trainee may be given depending upon your judgement about his Punctuality, Regularity, Sincerity, Interest taken, Work done etc.

Annexure 1(weekly Report week-10)

GUJARAT TECHNOLOGICAL UNIVERSITY
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Annexure 1
Enrollment no: 190390119002

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: Shashank Ranjitbhai Barot.
DIARY OF THE WEEK: Dt: 03/04/23 TO 07/04/23.
DEPARTMENT: Mechanical SEM: 8th.
NAME OF THE ORGANISATION: Basil Automachine.
NAME OF THE PLANT/SECTION/DEPARTMENT: production & Assembly Section
NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT: Mr. Harsh patel

DESCRIPTION OF THE WORK DONE IN BRIEF

on the week, only mechanical work was done & Also dispatch of machine.
Mechanical work : make punch of plate of pannel for drilling make punch on working table for hose pipe, hooks fitting inside machine, take measurements for pipe & cutting of it. then welding was done, checking of slider, trey etc material, make punch on slider plate, marking on machine for drilling hole for fitting cover., dissemble the 3 Axis machine & colouring was done & then Rack, Rail, cylinder, front side shaft were fitted on 3 Axis machine.

- Dispatch :- The 3 Axis machine was dispatch on these week.

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TOTAL HOURS: 35

SIGNATURE OF STUDENT

● The above entries are correct and the grading of work done by Trainee is
EXCELLENT / VERY GOOD / GOOD / FAIR / BELOW AVERAGE / POOR

Signature of Faculty Mentor

Signature of officer-in-charge
of Dept. / Section / Plant

Date:

Date: 07/04/23

● Grading of Work, for trainee may be given depending upon your judgement about his Punctuality, Regularity, Sincerity, Interest taken, Work done etc.

Annexure 1(weekly Report week-11)

GUJARAT TECHNOLOGICAL UNIVERSITY
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Annexure 1
Enrollment no: 190380119002

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: Shashank Ranjitbhai Barot.
DIARY OF THE WEEK: Dt: 10/04/23 TO 14/04/23
DEPARTMENT: Mechanical SEM: 8th
NAME OF THE ORGANISATION: Basil Automachine.
NAME OF THE PLANT/SECTION/DEPARTMENT: production & Assembly section
NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT: Mr. Harsh patel

DESCRIPTION OF THE WORK DONE IN BRIEF

on these week day, mechanical & Electrical work was done
mechanical work :- cylinder fitting in guide clamp., shaft was fitted between slider plates., measurements are taken for conveyor Belt, fitting rack & rail on the machine, drilling for 3 Axis machine for M.D centers. & fitting hydraulic cylinder below the M.D centers, clamping pipe house fitting & also screw fitting., tray & adjusting screw was fitted, Bolting of part was done on slider, Assembly of pins were done on guide clamp.
Electrical work :- pannel connection with pressure guage & temp gauge & also connection with the control valve of cylinder.

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TOTAL HOURS: 35

SIGNATURE OF STUDENT

- The above entries are correct and the grading of work done by Trainee is EXCELLENT / VERY GOOD / GOOD / FAIR / BELOW AVERAGE / POOR

Signature of Faculty Mentor

Signature of officer-in-charge of Dept. / Section / Plant

Date:

Date: 14/04/23

- Grading of Work, for trainee may be given depending upon your judgement about his Punctuality, Regularity, Sincerity, Interest taken, Work done etc.

Annexure 1(weekly Report week-12)

GUJARAT TECHNOLOGICAL UNIVERSITY
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Annexure 1
Enrollment no: 190390119002

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: Shashank Ranjitbhai Barot.

DIARY OF THE WEEK: Dt: 17/04/23 TO 21/04/23

DEPARTMENT: Mechanical. SEM: 8th

NAME OF THE ORGANISATION: Basil Automachine

NAME OF THE PLANT/SECTION/DEPARTMENT: production & Assembly section

NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT: Mr. Harsh patel

DESCRIPTION OF THE WORK DONE IN BRIEF

on these week days, mechanical, electrical work was done, ~~Mechanical work~~

Mechanical work :- marking on plate for drilling & tapping, Hose pipe & nipple fitting Between manifold & motor, pressure guage & temp gauge ~~wire~~ fitting on machine, pannel fitted in pannel Box, suction scanner fitting in oil tank, check the temperature guage, fitting of servo motor, Gear Box fitted on mcmetrel., pipe fitting with oil tank & motor, pressure switch fitted in cylinder, limit switch fitting.

Electrical work :- make electrical connection with pressure switch & limit switch & also connection with Direction control valve. with pannel.

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(ગુજરાત અધિનિયમ ક્રમાંક: ૨૦/૨૦૦૭ દ્વારા સ્થાપિત)

TOTAL HOURS: 35

SIGNATURE OF STUDENT

The above entries are correct and the grading of work done by Trainee is
EXCELLENT / VERY GOOD / GOOD / FAIR / BELOW AVERAGE / POOR

Signature of Faculty Mentor

Signature of officer-in-charge of Dept. / Section / Plant

Date:

Date: 21/04/23

Grading of Work, for trainee may be given depending upon your judgement about his Punctuality, Regularity, Sincerity, Interest taken, Work done etc.

Annexure 1(weekly Report week-13)

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Annexure 1
Enrollment no: 190390119002

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: Shashank Ranjitbhai Barot.

DIARY OF THE WEEK: Dt: 24/04/23 **TO** 29/04/23

DEPARTMENT: Mechanical. **SEM:** 8th

NAME OF THE ORGANISATION: Basil Automachine

NAME OF THE PLANT/SECTION/DEPARTMENT: Production & Assembly section

NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT: Mr. Harsh patel.

DESCRIPTION OF THE WORK DONE IN BRIEF

On these week days, Mechanical & electrical work was done

Mechanical work :- Dissemble the machine, wrapping of pipes, panel etc. & Grey & Black colour apply, Assemble the machine, cutting of plate was done, the lower body & upper body structure was ready & colouring also done. alle pins are made by grinding & Buffing, Pressure gauge fitting, Fitting hydraulic cylinders of top of the upper body, Gears are fitted with shaft in machine, Fitting the powerpack, manifold, Control valve. Guide slides not fitted properly so, Buffing & grinding was done on it.

Electrical work :- make connection of panel with direction control valve, display Box & etc.
- limit switch & pressure switch fitting done.

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TOTAL HOURS: 42

SIGNATURE OF STUDENT

The above entries are correct and the grading of work done by Trainee is
EXCELLENT / VERY GOOD / GOOD / FAIR / BELOW AVERAGE / POOR

Signature of Faculty Mentor

Signature of officer-in-charge of Dept. / Section / Plant

Date:

Date: 29/04/23

Grading of Work, for trainee may be given depending upon your judgement about his Punctuality, Regularity, Sincerity, Interest taken, Work done etc.

APPENDIX-2

Annexure 2 (Feedback Form)

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Annexure 2

Feedback Form by Industry expert

Student Name: Shashank . R. Barot		Date:

Work Supervisor: Mr. Haresh patel		Title:

Company/Organization: Basil Automachine.

Enrollment No: 190390119002

Internship Address: Plot No:- 85, 101/1, G.I.D.C, Gozaria, Mehsana.

Dates of Internship: From 30/01/23 to 29/04/23

Please evaluate your intern by indicating the frequency with which you observed the following behaviors:

Parameters	Needs improvement	Satisfactory	Good	Excellent
Shows interest in work and his/her initiatives				✓
Produces high quality work and accepts responsibility				✓
Uses technical knowledge and expertise				✓
Analyzes problems effectively				✓
Communicates well and writes effectively				✓

Overall performance of student intern: (Needs improvement/ Satisfactory/Good/Excellent):

Additional comments, if any: No.

Signature of Industry person with name and Stamp:

Signature of the Faculty Mentor

GTU-BOSCH CENTER OF EXCELLENCE IN AUTOMATION

AN INTERNSHIP REPORT

Submitted by

BHUVA GAURANGKUMAR JAYESHBHAI

190390119003

In partial fulfillment for the award of the degree of

BACHELOR OF ENGINEERING

In

Mechanical Engineering

S.P.B. Patel Engineering College, Meshana

S.P.B. PATEL
ENGINEERING COLLEGE
SAFFRONY INSTITUTE OF TECHNOLOGY

GUJARAT TECHNOLOGICAL UNIVERSITY

Gujarat Technological University, Ahmedabad

May, 2023

S.P.B. PATEL
ENGINEERING COLLEGE
SAFFRONY INSTITUTE OF TECHNOLOGY

GUJARAT TECHNOLOGICAL UNIVERSITY

S.P.B. Patel Engineering College

Near Shanku's Water Park, Ahmedabad – Mehsana Highway, Linch, Gujarat

CERTIFICATE

This is to certify that the project report submitted along with the project entitled **Internship at GTU-BOSCH CENTER OF EXCELLENCE IN AUTOMATION** has been carried out by **BHUVA GAURANGKUMAR JAYESHBHAI** under my guidance in partial fulfillment for the degree of Bachelor of Engineering in Mechanical Engineering, 8th Semester of Gujarat Technological University, Ahmedabad during the academic year 2022-23.

Internal Guide	**Head of Department**
Prof. Ashutosh Gohel Mechanical Engineering dep, S.P.B Patel Engineering College Mehsana	Prof. Kunalsinh Kathia Mechanical Engineering dep, S.P.B Patel Engineering College Mehsana

Certificate

rexroth
A Bosch Company

CENTER OF EXCELLENCE IN AUTOMATION

CERTIFICATE
OF THE COMPLETION

This is to certify that

Mr./Ms Gaurangkumar Jayeshbhai Bhuva

of 039- S. P. B. Patel Engineering College, Mehsana has participated in

"Twelve - Week Industrial Automation Internship Program"

Duration 13-02-2023 to 10-05-2023 at

Gujarat Technological University- Bosch Center of Excellence in Automation.

Date: 10/05/2023
Venue: GTU Chandkheda Campus, Ahmedabad
Certificate No.: GBCOEIP0103

Dr. K. N. Kher
Registrar

Pmms certificate

GUJARAT TECHNOLOGICAL UNIVERSITY

CERTIFICATE FOR COMPLETION OF ALL ACTIVITIES AT ONLINE PROJECT PORTAL

B.E. SEMESTER VIII, ACADEMIC YEAR 2022-2023

Date of certificate generation : 09 May 2023 (13:54:57)

This is to certify that, ***Bhuva Gaurang Kumar Jayeshbhai*** (Enrolment Number - 190390119003) working on project entitled with ***Industrial Automation - Internship*** from ***Mechanical Engineering*** department of ***S. P. B. PATEL ENGINEERING COLLEGE, MEHSANA*** had submitted following details at online project portal.

Internship Project Report	**Completed**

Name of Student : Bhuva Gaurang Kumar Jayeshbhai

Name of Guide : Mr. Ashutosh Gohel

Signature of Student : ______________

*Signature of Guide : ______________

Disclaimer :
This is a computer generated copy and does not indicate that your data has been evaluated. This is the receipt that GTU has received a copy of the data that you have uploaded and submitted as your project work.

*Guide has to sign the certificate, Only if all above activities has been Completed.

S.P.B. Patel Engineering College, Mehsana

Near Shanku's Water Park, Ahmedabad – Mehsana Highway, Linch, Gujarat

DECLARATION

We hereby declare that the Internship / Project report submitted along with the Internship / Project entitled **Internship at GTU-BOSCH CENTER OF EXCELLENCE IN AUTOMATION** submitted in partial fulfillment for the degree of Bachelor of Engineering in **Mechanical Engineering** to Gujarat Technological University, Ahmedabad, is a bonafide record of original project work carried out by me under the supervision of **DR. Margam Suthar** and that no part of this report has been directly copied from any students's reports or taken from any other source, without providing due reference.

Name of the Student	Sign of Student
Bhuva Gaurangkumar J	______________________

ACKNOWLEDGEMENT

I would like to thank the professors from Saffrony Institute of Technology, Prof. Kunalsinh Kathia, Prof. Monil Shah, Prof. Ashutosh Gohel, and Prof. Tausif Shaikh for the knowledge they shared with me during my academic career there. I want to express my gratitude in particular to Professor Kunalsinh Kathi for his support and for making sure I learned enough during my graduate studies.

I want to start off by thanking GTU and Mr. Jeet Joshi for giving me the chance to do an internship with the organization.

I want to convey my deep gratitude to my external guide, Mr. Jeet Joshi, for patiently and consistently coaching me through the organization. I also want to express gratitude to Prof. Ashutosh Gohel, my internal guide, for his assistance in guiding me through my internship and for his helpful coordination in getting it done.

I also want to express my gratitude to my parents, friends, and family members for their invaluable help and inspiration in getting my work done. Additionally, I would like to thank the staff member & Professor of the organization who allowed me to use and utilize the priceless resources needed for the internship. I view this chance as a significant turning point in my professional progress. In order to achieve my intended career goals, I will make every effort to use the knowledge and skills I have acquired as effectively as possible and to keep working to enhance them.

Finally, in light of all that has been discussed, I would like to express my gratitude to the GTU Bosch Rexroth employees & Professors for their invaluable assistance in completing the internship.

ABSTRACT

Thanks to his internship, the author got the ability to better understand the concepts and ideas that underlie PLC, sensor technology, hydraulic, and pneumatic circuits. The author was able to obtain understanding of the operation of PLCs, improve his or her programming skills for developing control programmers for various industrial applications, and gain knowledge of programming languages like Ladder Logic and Function Block Diagrams.

The author also became interested in sensor technology, learning about the many types of sensors and their applications. They also had the opportunity to learn firsthand how to set up, configure, and programme sensors to perform specific functions. The author now has a greater grasp of how sensors are used to monitor, regulate, and guarantee the effectiveness and safety of many industrial operations.

The author also gained a deeper comprehension of hydraulic and pneumatic systems, including their components, operation, and maintenance. The identification and selection of the appropriate components for diverse applications, as well as the design, building, and troubleshooting of hydraulic and pneumatic circuits, allowed them to gain knowledge and skill in these areas. Particularly the industrial, construction, and transportation industries profited immensely from this knowledge.

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Abbreviations

PB Push Button

PLC programable logic control

DCV Directional control valve

FRL filter, regulator, and lubricator

Table of Contents

CHAPTER 1
ABOUT THE CENTER

1.1 Overview of the GTU-Bosch Centre of Excellence in Automation

1.1.1 Introduction

In collaboration with Bosch - Rexroth India Limited (BRIN), Gujarat Technological University has begun to construct a Centre of Excellence (COE) in I-4.0 frontiers of today's technology in Automation Technologies. This is being done to foster industry-institute partnerships in the automation sector.

The center comprises five laboratories for hydraulics, pneumatics, sensors, PLCs, and robotics that are up to worldwide standards. The center's mission is to train engineering undergraduate and graduate students as well as working professionals to satisfy industry standards.

On February 3, 2017, Shri. Jaydrathsinhji Parmar, Hon. Minister State, Education Department, Government of Gujarat, officially opened the nation's first ultra-modern five labs. He then addressed the students and said, "These labs will be helpful for students of Mechanical Engineering, Electronics and Communications, Instrumentation and Control, and Mechatronics.

1.1.2 Vision

To be a world-class training institute in automation that is recognised as a job creator via a genuine dedication to quality, training, and corporate social responsibility.

1.1.3 Objective

To bridge the technical gap, improve technical competence, employability, and entrepreneurship among rural students.

To provide training to PG, UG, and diploma students in order to meet industrial requirements.

To promote and assist industry personnel's educational and training needs.

To give an overview of key research in the subject of Automation Technology.

CHAPTER 2
INTRODUCTION TO PLC

2.1 What is PLC?

Industrial computers called Programmable Logic Controllers (PLCs) are used to monitor and manage industrial equipment based on customized programming. PLCs include a variety of inputs and outputs. PLCs are available in a wide range of sizes and form factors.

A PLC's primary function is to automate operations by transmitting control functions that have been preprogrammed to output devices depending on signals from associated input devices. An input device, such as a sensor, switch, thermometer, or relay, collects and sends data from your system.

2.2 History of PLC

Dick Morley developed PLCs in 1964. PLC has since transformed the manufacturing and industrial industries. Numerous PLC operations, including timing, counting, computing, comparing, and processing different analogue signals, are available.

2.3 Components of PLC

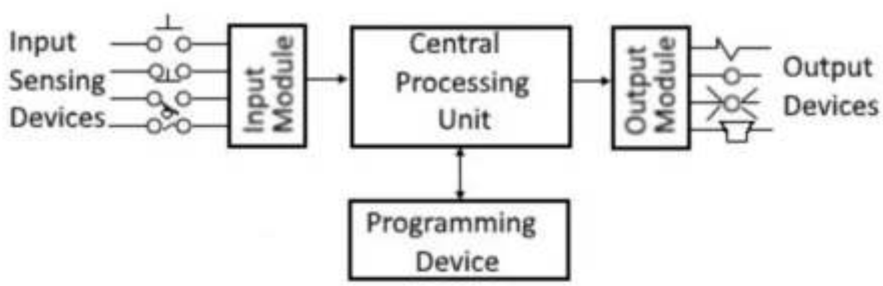


Fig 2.1 Components of PLC

2.3.1 Power Supply

For supply voltage, the Power Supply is connected to the main AC power source. All of the other modules connected to the PLC are powered by the DC voltage produced by the power supply's output.

Power for field equipment is NOT provided by the power supply.

2.3.2 Input/output Module

Digital or analogue field devices are connected to the input/output modules. Devices used in the input field include switches, encoders, and transmitters, for instance. Relays, lights, and proportional valves are examples of common output field devices.

2.3.3 Processor

The processor is made up of a central processing unit (CPU) and memory.

To view and control the field devices attached to the input/output modules, the processor section takes the necessary decisions.

The choices are based on a user-created programme that has been stored in the memory. Additionally, the memory keeps track of the state of each input field device and contains instructions for the output field devices.

2.3.4 Programming Device

The Programming Device in today’s industrial applications is usually a laptop or a desktop computer that facilitates the creation of decision-making programs destined for the PLC. Studio 5000 for Allen Bradley PLCs, SIMATIC Step 7 for Siemens PLCs, and indraworks for Bosch Rexroth are a few examples of programming software that can be found on a laptop or PC.

2.4 language of PLC

1. Ladder logic
2. structured text
3. function block diagrams
4. sequential function charts and
5. Instruction lists.

Are five different PLC programming languages that are described in the International Electro technical Commission 61131-3 These languages each have their strengths, flaws, and ideal use cases.

The most popular programming language for programmable logic controllers (PLCs) in the US is ladder logic.

2.5 Types of PLC

1. Fixed
2. Flexible
3. DCS
4. PLC
5. SCADA
6. HMI

2.6 Networking and communication

1. EtherNet/IP: - It is an open application layer protocol that operates under the common industrial protocol (CIP). It is a more sophisticated version of Ethernet that can only be used for residential and business applications; it cannot be used in an industrial setting.

2. Profibus: -It is comparable to Modbus RTU, which uses serial line connection as well. The ownership by Siemens Automation is the only distinction.

3. Modbus: - Based on master-slave technology, the Modbus protocol is used to transport data across Ethernet or serial lines.

4. Interbus: - It is a serial network protocol that utilises the RTU standard and RS-232/RS-485. Phoenix Contact created it.

5. ProfiNet: - The seven-layer ISO/OSI model, which generally represents the abstraction layers of a communication system, has a communication protocol called PROFINET that resides at layer seven.

6. ControlNet.: - By using programming that sets the logic to specified timing across the network, ControlNet was created to enable dependable, high-speed control and I/O data delivery.

7. DeviceNet: -. DeviceNet is a digital, multi-drop fieldbus network that links and functions as a communication network between industrial controllers and I/O devices, offering users a convenient way to distribute and manage basic devices across the architecture.

2.7 Application and advantages of PLC

2.7.1 Application

- Automatic Car Wash
- Elevator
- Conveyor belt for production
- Automatic Door Close/Open
- Car Washing and Parking
- Remote monitoring for controlling AC,Fan or light
- Power Plant
- Robotics Automation System
- Road Traffic Signal
- Home Automation
- Time and Counter based System

2.7.2 Advantages

- Flexible
- low power consumption
- Easy Maintenance
- High Reliability
- increased operation speed
- Reprogram Capability

- Quick Response
- Communication Capability
- Small Size Available
- Easy visualization of running process
- Less trouble shooting time

2.8 Practical Perform on PLC

Practical 1:- A temperature sensor is used to monitor the temperature of a process continuously. If process temperature is between 95 to 105 degrees then lamp L1 must be "Steady-ON" If temperature is less than 95 degrees then lamp L1 must flash slowly. If temperature is more than 105 degrees then lamp L1 must flash speedily.(Use of **timers, counters and comparator)**

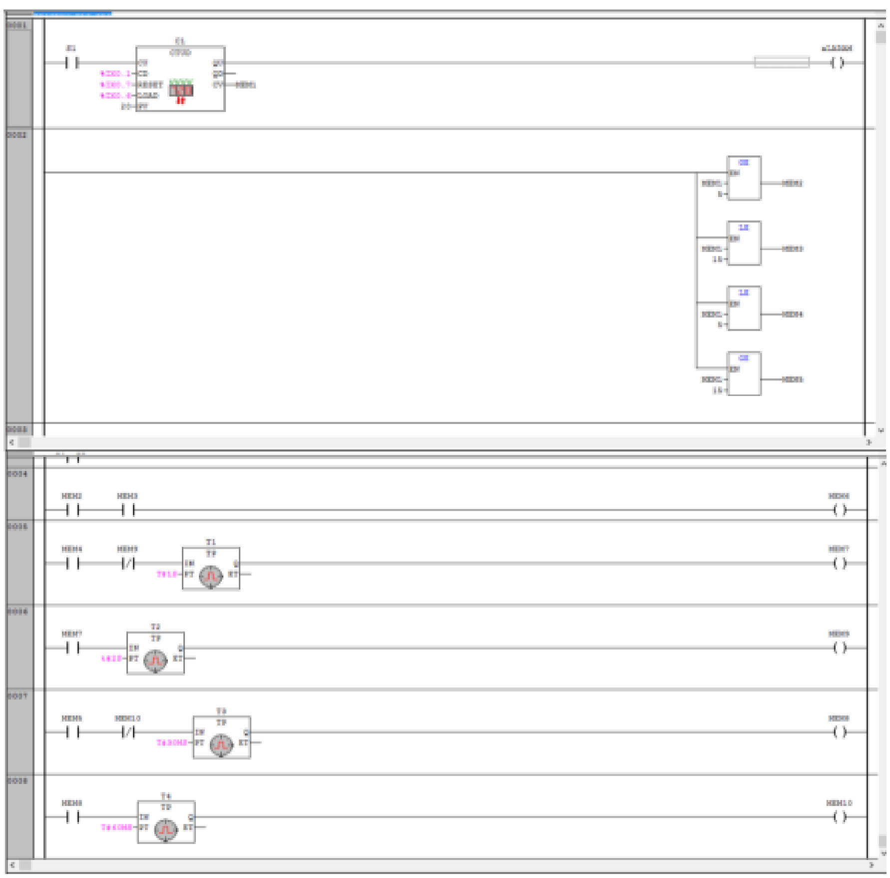


Fig 2.2 Practical Perform on PLC 1

Practical 2:- In a food process plant when start switch is pressed Motor 1 turns ON for 5 and Motor 2 turns ON for 10 sec, after motor 2 turns OFF motor 3 turns on after 5 and motor 4 turns after 10 sec then 2 sec off delay and process repeats until stop button pressed.

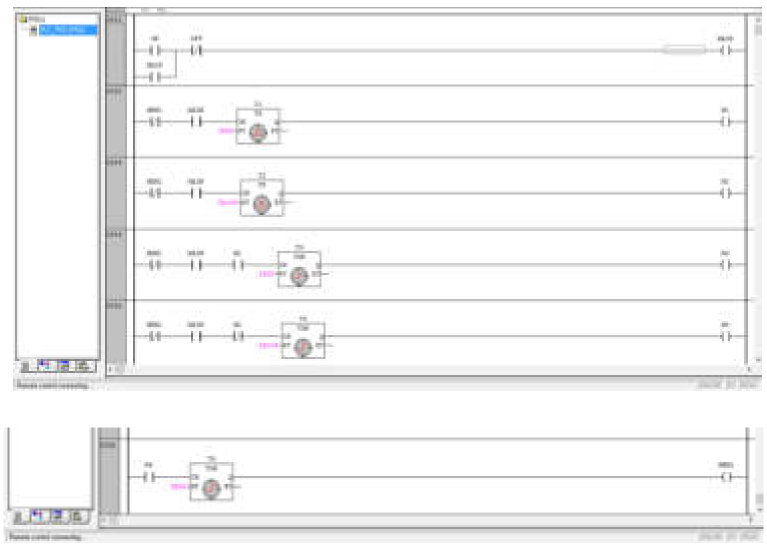


Fig 2.3 Practical Perform on PLC 2

Practical 3:- There are three fans: Fan F1, fan F2 & "Stand-By fan F3 along with a Main Contactor. Start and Stop Switch is used to ON Main contactor. Two Fans F1, F2 start only after Main Contactor is started. If any one fan fails F1 or F2 then "Stand-By" fan F3 goes "ON". If any two fans from F1, F2 and F3 fail then main contactor must stop and a lamp must flash at 5Hz frequency. Note: here fan failure indication is to provide by input.

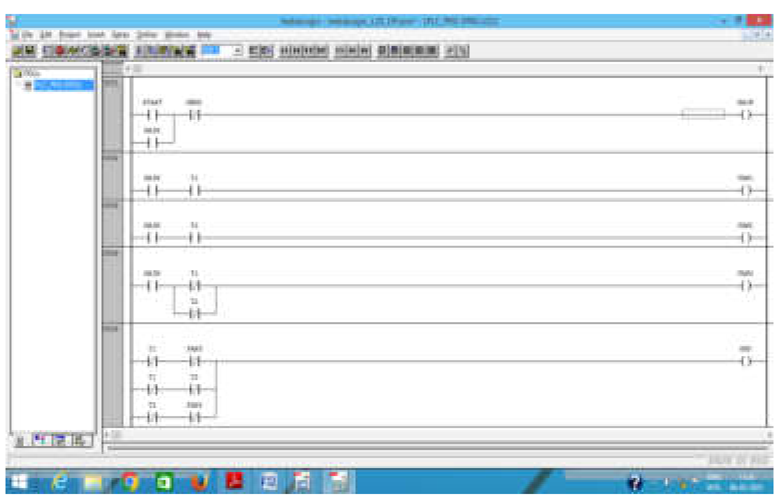


Fig 2.4 Practical Perform on PLC 3

Practical 4:- When Start PB pressed Lamp L1 turns ON after 5 sec, L2 turns ON after 7 sec and L3 turns ON after 10 sec. Give Delay of 2sec to turns OFF after all 3 lamp turns ON and process repeats until stop button is pressed.

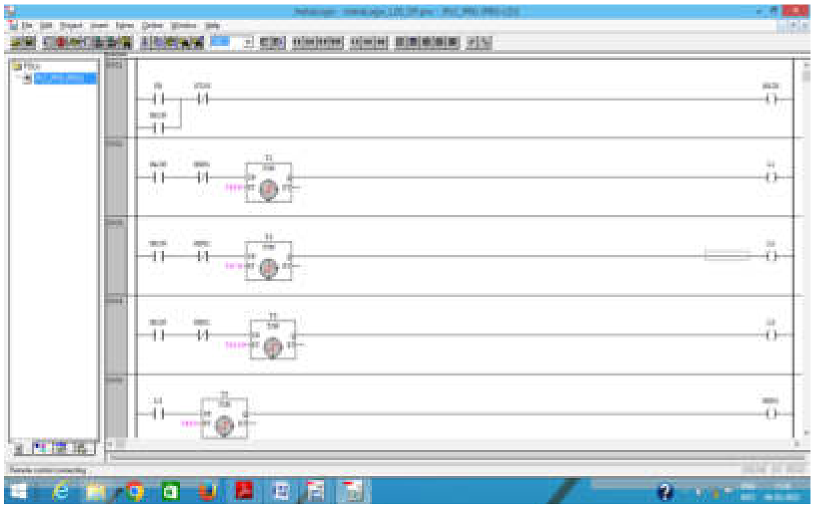
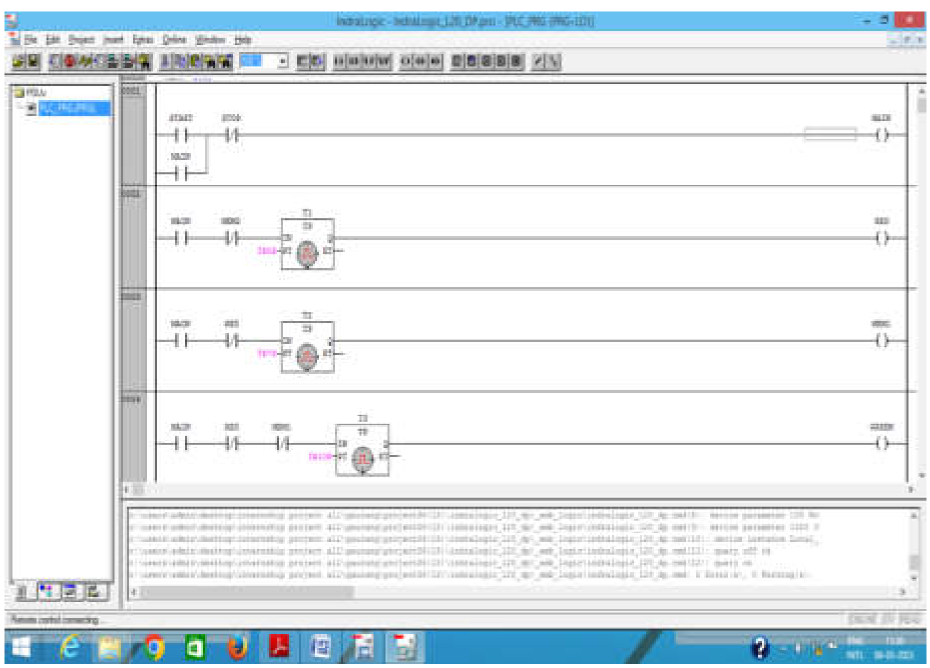


Fig 2.5 Practical Perform on PLC 4

Practical 5:- In a Traffic Signal when input is given then Red Lamp turns ON for 5 Sec, yellow lamp turns ON for 7sec and green lamp turns ON for 10 sec again yellow lamp turns ON for 3 sec and then process repeats.



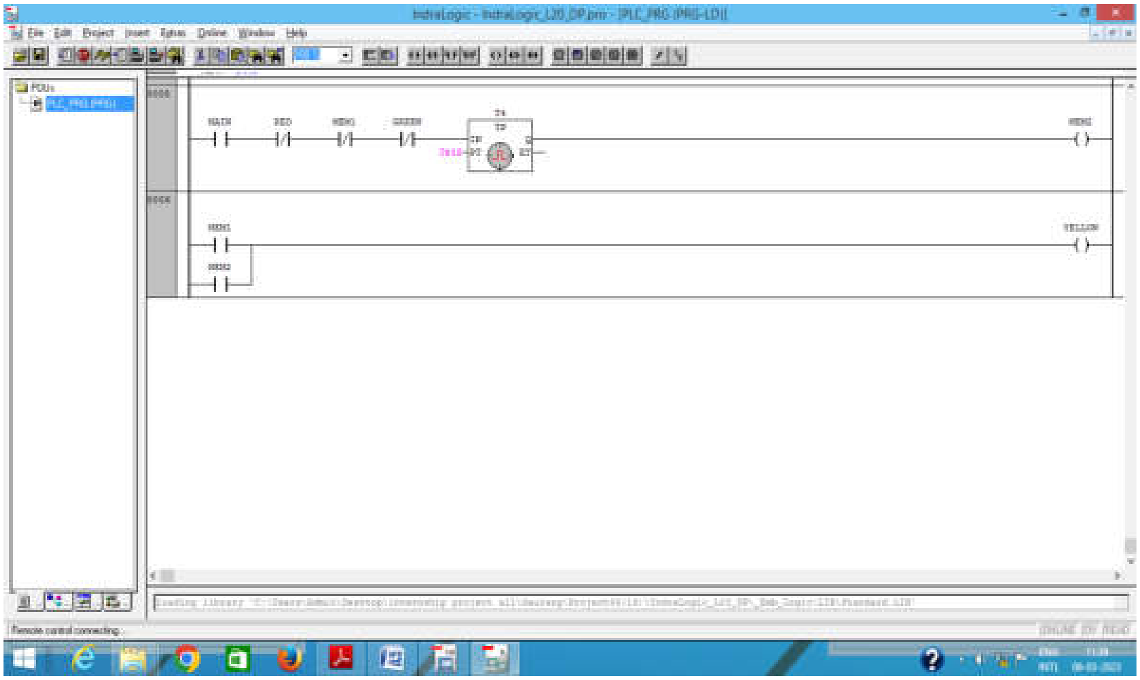
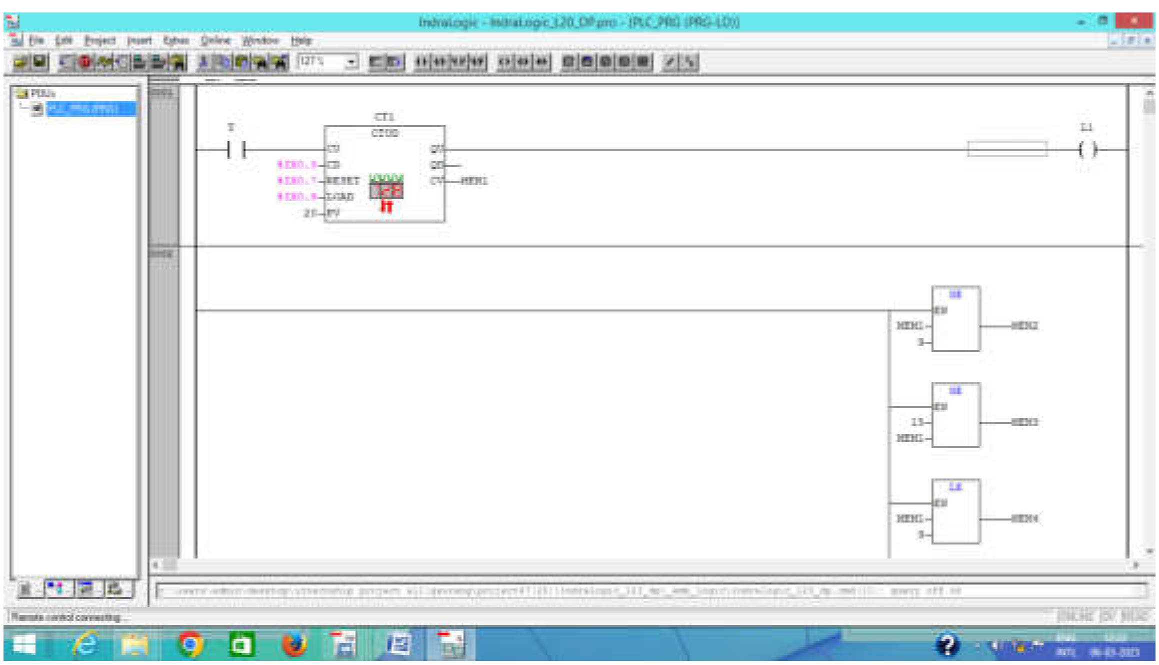
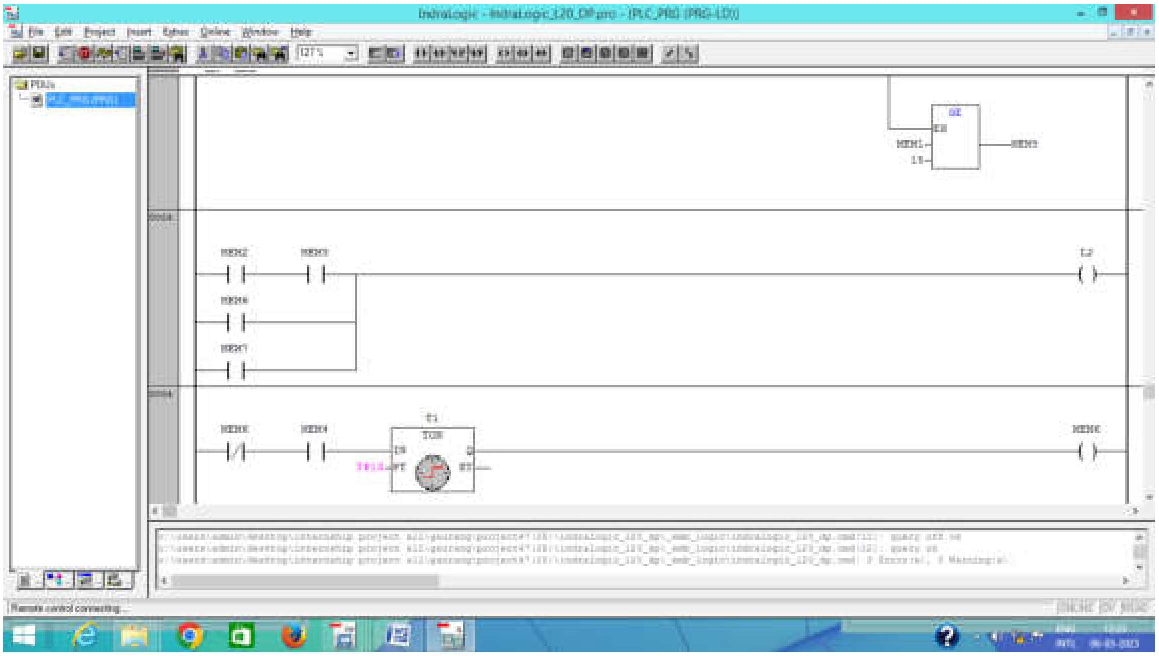


Fig 2.6 Practical Perform on PLC 5

Practical 6:- Problem Statement: A temperature sensor is used to monitor the temperature of a process continuously. If process temperature is between 95 to 105 degrees then lamp L1 must be "Steady-ON “If temperature is less than 95 degrees then lamp L1 must flash slowly. If temperature is more than 105 degrees then lamp L1 must flash speedily.





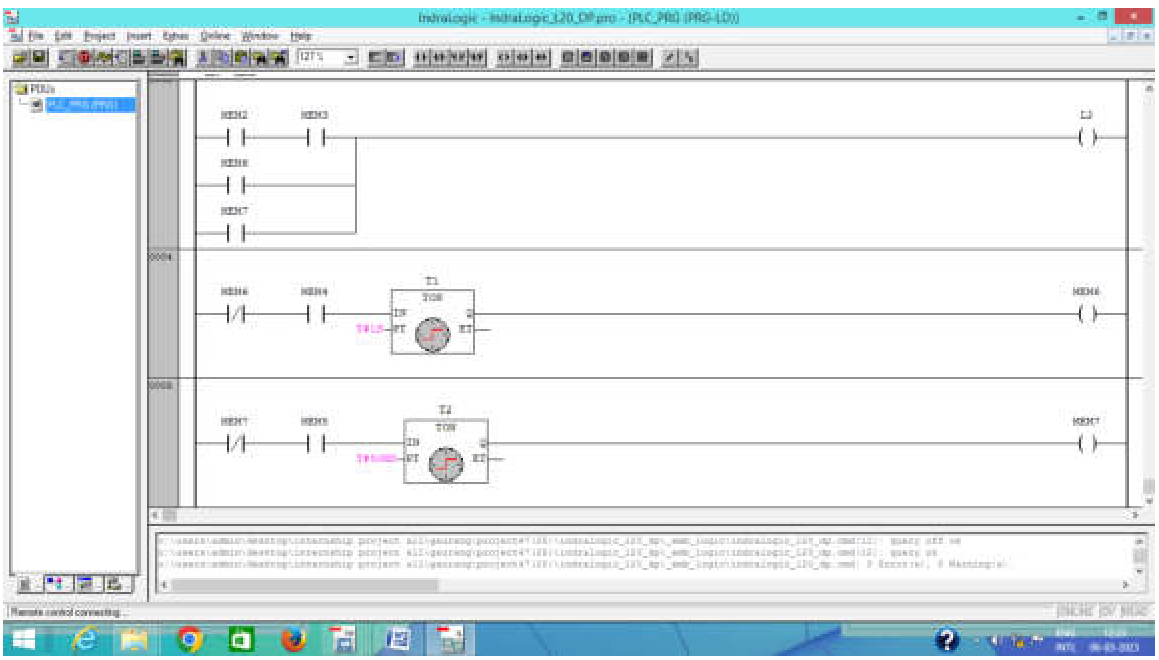


Fig 2.7 Practical Perform on PLC 6

CHAPTER 3
SENSORS

3.1 Introduction

A sensor measures a physical quantity and transforms it into a Signal that can be read by an instrument or by an observer.

Most sensors are calibrated against some well-known standards to ensure accuracy. An object that receives signals and responds to them is a sensor. This communication requires the presence of energy of some kind, such as heat, light, motion, electricity, or chemical reaction. A sensor converts these signals into analogue or digital representations when it detects one or more of these signals (an input).

For instance, the sensor is the most crucial piece of hardware in an automation system that feeds information to the programmable logic controller (PLC). Different types of sensors are employed in various applications in daily life, business and industry, and educational initiatives.

Most sensors are calibrated against some well-known standards to ensure accuracy. An object that receives signals and responds to them is a sensor. This communication requires the presence of energy of some kind, such as heat, light, motion, electricity, or chemical reaction. A sensor converts these signals into analogue or digital representations when it detects one or more of these signals (an input).

The four primary categories of sensors are as follows. For instance, analogue, digital, active, passive, and other types of sensors.

3.2 Introduction to Proximity Sensor

Without making a physical contact, switches or sensors known as proximity sensors can detect an object that is nearby. All frequently want a stance that is fewer than 12 inches away from the object being detected. Most proximity sensors are resistant to environmental toxins and conditions, and they hardly ever require upkeep. Under challenging conditions, such as caustic or hazardous substances, extremely hot or cold temperatures, certain proximity switches may be made to work.

3.3 Types of Proximity Sensors

3.3.1 Inductive Sensor

Other than metals, the sensor cannot detect any other object. Anytime an object is detected, and the electromagnetic field is disturbed, an eddy current is created and circulated inside the target.

Proximity sensing, metal object detection, and position sensing are all frequent uses for these sensors in industrial automation. For locating the presence of metal components, they are frequently employed in the automotive sector.

Fig 3.1 Inductive Sensor

Behavior of Inductive Sensor

Practice Implementation: Approach sensor with different material sample one after another. While doing so, observe the switching status of the led display.

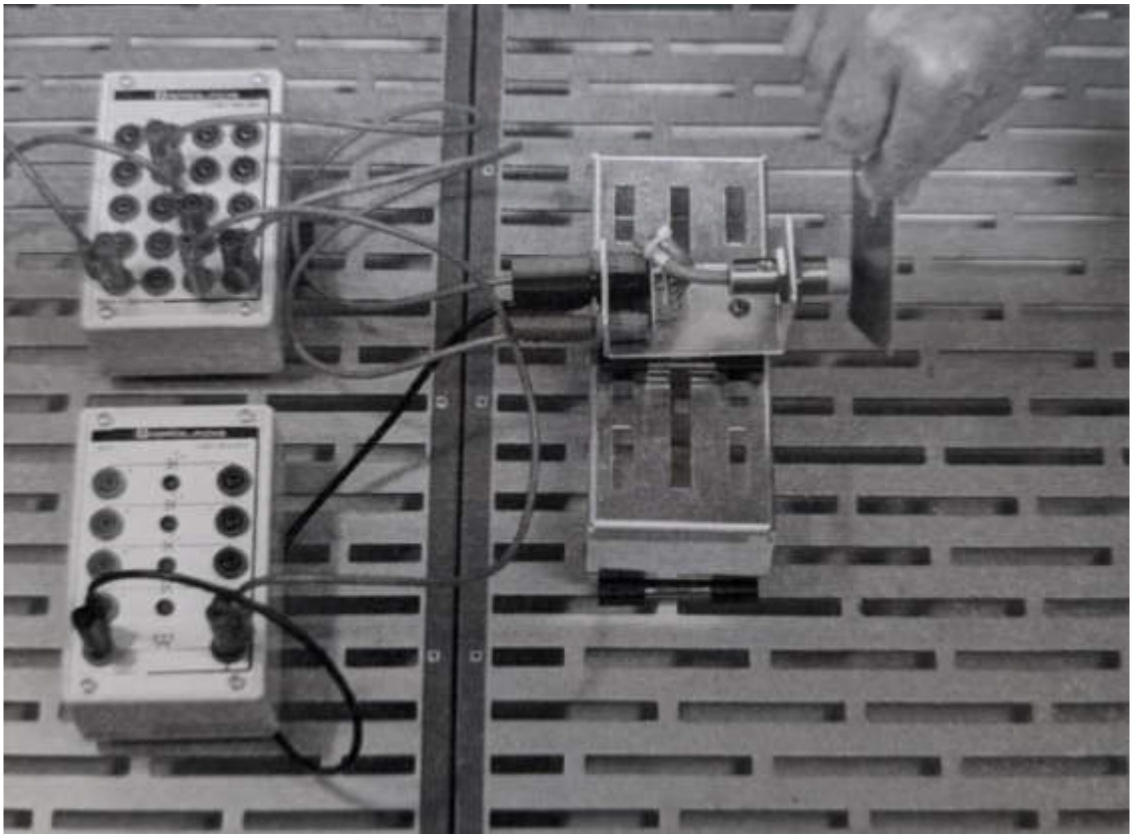


Fig 3.2 Inductive Sensor Practical

Table 3.1 Practical Reading

Material	Sample Detected?
Steel	Yes
Plastic	No
Plastic clear	No
Copper	Yes
Cardboard	No
Aluminum	Yes
Solenoid	Yes
Brass	Yes
Sheet of Paper	No
Foam	No

3.3.2 Capacitive Sensor

This type of detector picks up on everything, including glass, paper, human hands, metal, and wood.

Capacitive sensors transmit an electrical field from the sensor's sensing end to these targets in order to detect them. A capacitive sensor may pick up on any object that can sabotage this electrical field.

Capacitive sensors are commonly used in industrial automation for proximity sensing, level sensing, and position sensing. They are widely used in the food and beverage industry for detecting the presence of liquids and solids.

Fig 3.3 Capacitive Sensor

Behavior of Inductive Sensor

Practice Implementation: Approach sensor with different material sample one after another. While doing so, observe the switching status of the led display.

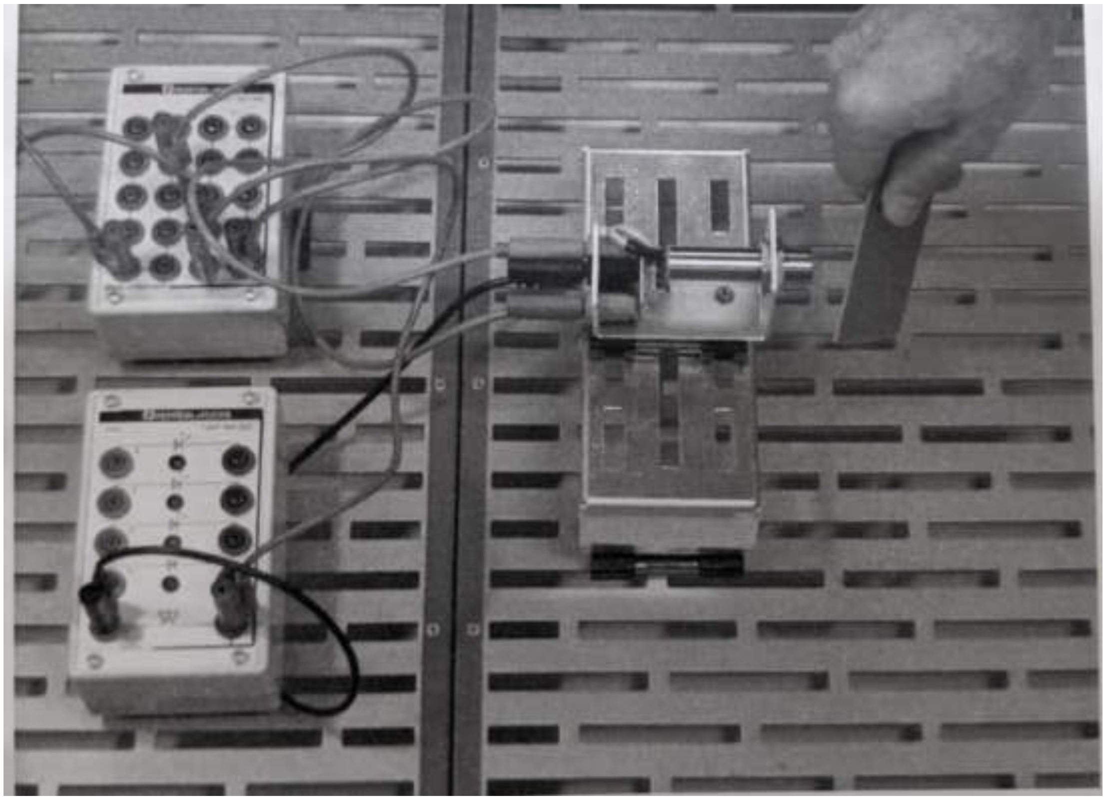


Fig 3.4 Capacitive Sensor Practical

Table 3.2 Practical Reading

Material	Sample Detected?
Steel	Yes
Plastic	Yes
Plastic clear	Yes
Copper	Yes
Cardboard	Yes
Aluminum	Yes
Solenoid	Yes
Brass	Yes
Sheet of Paper	Yes
Foam	Yes

3.3.3 Magnetic Sensor

A magnetic sensor is a device that translates the magnitude and fluctuations of a magnetic field into electric impulses.

Magnetic sensors detect ferrous metal in motion. The most basic magnetic sensor is a wire wrapped around a permanent magnet. When a ferrous object approaches the sensor, the magnetic flux through the coil changes, resulting in a voltage at the coil terminals.

Industrial automation frequently uses magnetic sensors for sensing direction, position, and speed. To determine where aero plane parts are located, the aerospace industry uses them frequently.

They are commonly used in navigation and positioning systems, such as in compasses and gyroscopes.

Fig 3.5 Magnetic Sensor

Behavior of Magnetic Sensor

Practice Implementation: Approach sensor with the solenoid vertically and in parallel to the sensor axis. While doing so, observe the switching status of the led display.

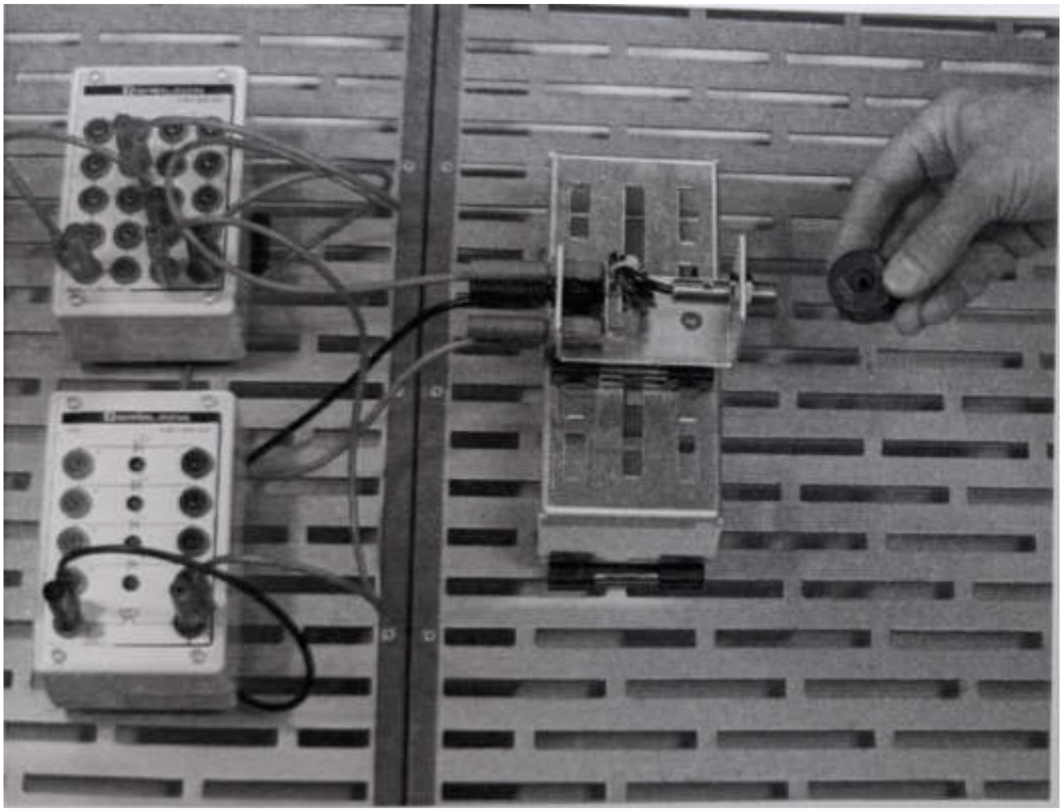


Fig 3.6 Magnetic Sensor Practical

Table 3.3 Practical Reading

Material	Sample Detected?
Steel	No
Plastic	No
Plastic clear	No
Copper	No
Cardboard	No
Aluminum	No
Solenoid Parallel	Yes
Solenoid Vertical	Yes
Sheet of Paper	No
Foam	No

3.3.4 Photoelectric Sensor

A photoelectric sensor's essential parts are an emitter for emitting light and a receiver for receiving light.in simple word A Photoelectric Sensor is a device that detects the presence or absence of an object by using light.

When light is obstructed or reflected by a detecting device, the amount of light that reaches the receiver changes. This change is detected by the Receiver and converted into an electrical output.

They are made up of a light source, which is usually an LED, and a receiver, which detects the light reflected or transmitted by the item being detected.

Photoelectric sensors can detect a wide range of items, from clear or translucent materials to opaque objects, and are useful in a variety of applications such as automation, robotics, and packaging.

Fig 3.7 Photoelectric Sensor

Behavior of Photoelectric Sensor

Practice Implementation: Set the sensor sensitivity and check the material sample one by one that sensor just detected or not. Check clear plastic that light source passing or not.

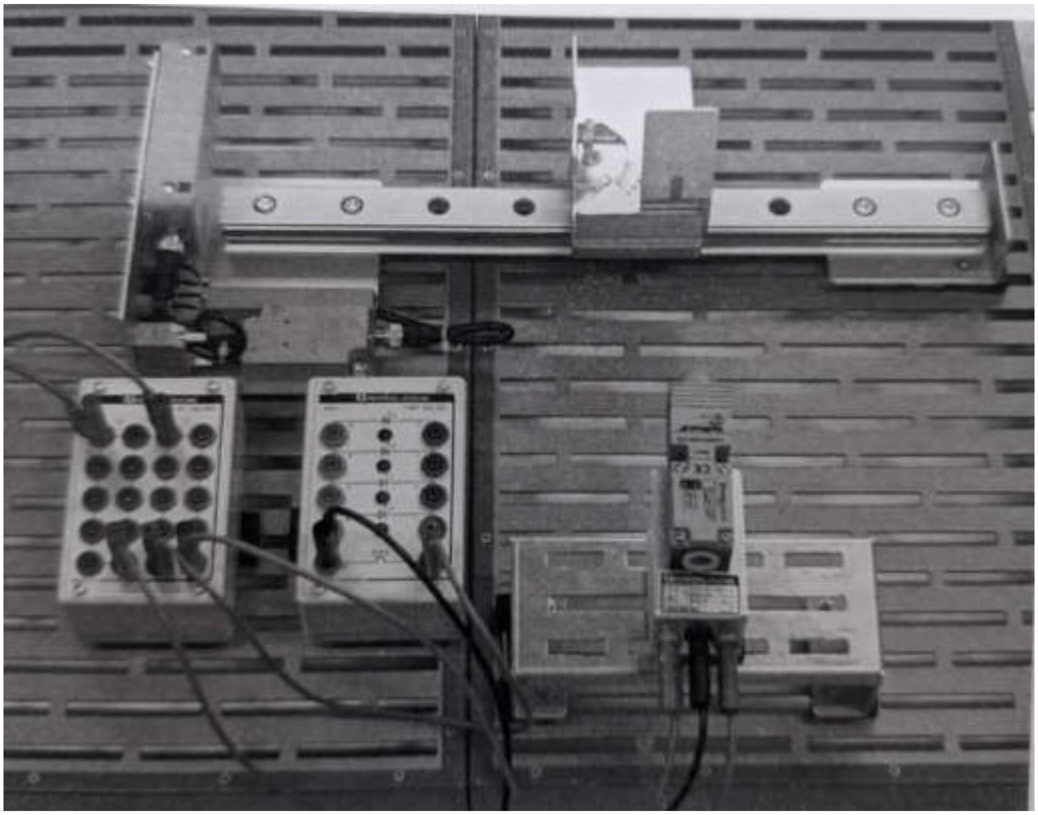


Fig 3.8 Photoelectric Sensor Practical

Table 3.4 Practical Reading

Material	Sample Detected?
Steel	Yes
Plastic	Yes
Copper	Yes
Cardboard	Yes
Aluminum	Yes
Solenoid	Yes
Brass	Yes
Sheet of Paper	Yes
Foam	Yes
Mirror Vertical	Yes
Mirror Rotated 45degree	No

3.3.5 Ultrasonic Sensor

An ultrasonic sensor is a type of electronic device that uses ultrasonic sound waves to measure the distance between two objects and converts the reflected sound into an electrical signal.

Ultrasonic sensors are classified into two types: proximity sensors and distance sensors. Proximity sensors detect items within a specific range, often a few meters, and can detect the presence or absence of objects. Distance sensors have a range of several meters and can measure the distance between the sensor and the object being detected.

Ultrasonic sensors are widely utilized in industrial automation and manufacturing applications such as material handling, level detection, and flow monitoring. They are also utilized in robotics and distance measurement applications to detect the location and orientation of objects.

Fig 3.9 Ultrasonic Sensor

Behavior of Ultrasonic Sensor

Practice Implementation: Calibrating the switching point (250 mm): Using function 3 of the connected UB-Prog programming unit, you can calibrate the desired switching point.

In this connection, the NO contact function is determined. Move the target about 250 mm away from the sensor. After the white sample, approach the ultrasonic sensor with all other material samples from the following table and observe the switching status of the LED display.

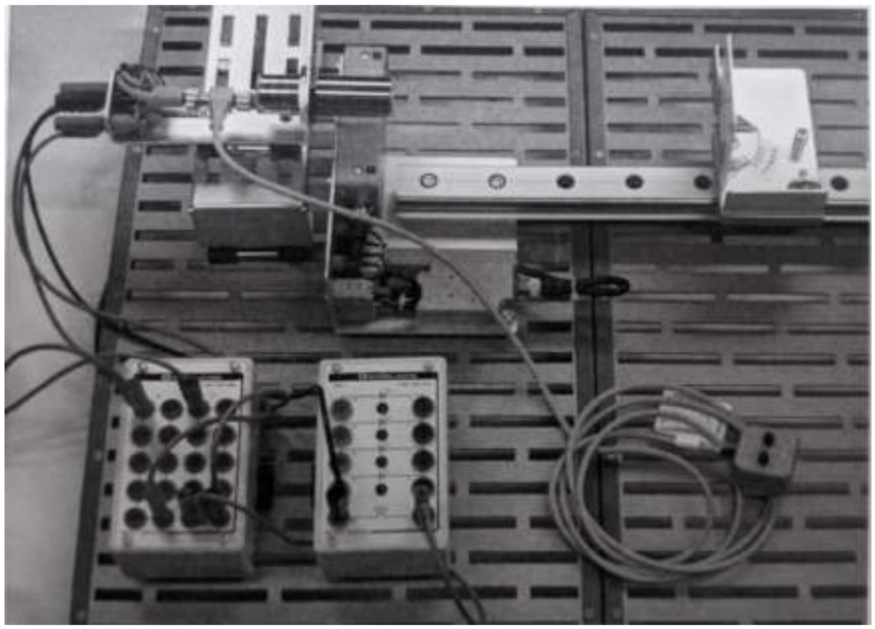


Fig 3.10 Ultrasonic Sensor Practical

Table 3.5 Practical Reading

Material	Sample Detected?
Steel	Yes
Plastic	Yes
Plastic clear	Yes
Copper	Yes
Cardboard	Yes
Aluminum	Yes
Solenoid	Yes
Brass	Yes
Sheet of Paper	Yes
Foam	Yes

CHAPTER 4
HYDRULICS

4.1 Introduction

The use of pressurized liquid fluids to transmit and control power is known as hydraulics. In industrial automation, hydraulic systems are frequently utilized for a variety of tasks include lifting large objects, running machines, and regulating the movement of pieces throughout production. We will go over the fundamentals of hydraulics, its elements, and its uses in industrial automation in this study.

4.2 Basic Principles of Hydraulics

Pascal's law, which asserts that pressure applied to a confined fluid is transferred equally in all directions, is the foundation of hydraulic systems. In a hydraulic system, pressure is created by forcing a fluid through a number of pipes and tubes. The fluid's pressure is then utilized to do tasks. Actuators, a reservoir, a control valve, and a pump are the common components of hydraulic systems.

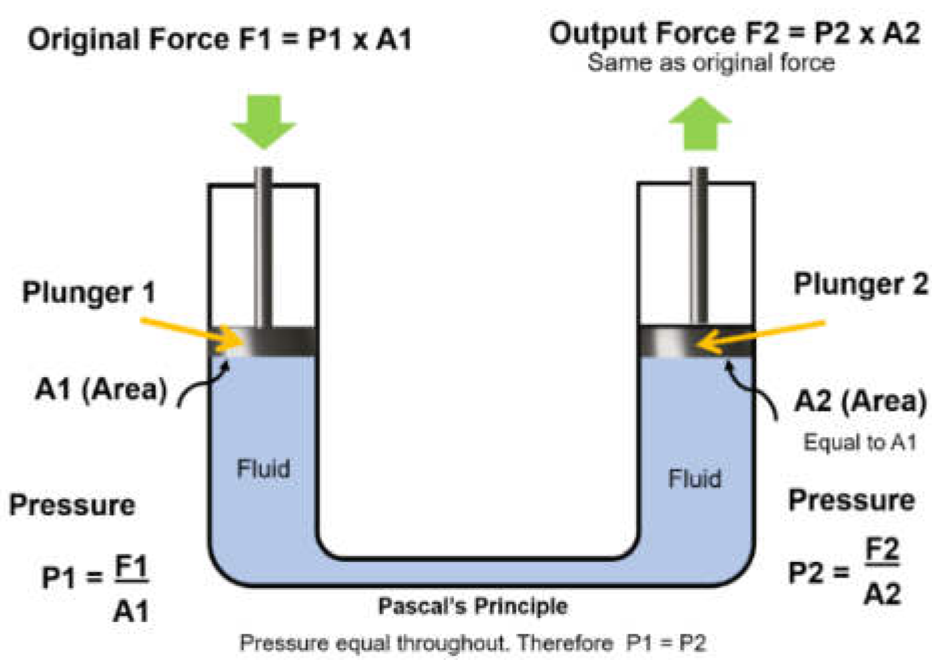


Fig 4.1 Basic Principles of Hydraulics

4.3 Components of Hydraulics

The following are a hydraulic system's primary parts:

- Pump: The hydraulic pump circulates fluid through the hydraulic system to create pressure in the fluid.
- Reservoir: The reservoir maintains a constant supply of fluid by storing the hydraulic fluid.
- Control Valve: The actuators' operation is managed by the control valve, which is used to guide fluid flow via the hydraulic system.
- Actuators: The actuators transform the fluid's pressure into mechanical work. Hydraulic cylinders, hydraulic motors, and hydraulic pumps are a few examples of actuators.

4.3.1 Hydraulic Pump

Fluid is supplied to the system's components by hydraulic pumps. As a result of the load, the system's pressure increases. Electric motors connected by gears and belts power pumps. They produce flow with sufficient force to counteract pressure brought on by a load at the pump outlet. When a hydraulic pump is in operation, a vacuum is created at the pump inlet, forcing liquid from the reservoir into the pump's inlet line. This liquid is then mechanically forced to the pump output, where it is forced into the hydraulic system.

- **Gear Pump**

Two varieties of gear pumps exist:

- External gear pump
- Internal gear pump

Pumps with fixed displacement, often known as positive displacement pumps, are gear pumps. This indicates that the same amount of flow is generated with each shaft revolution of the pump. In terms of the pump's maximum pressure rating, cubic inch displacement, and maximum input speed restriction, gear pumps are rated. Typically, open center hydraulic systems employ gear pumps. Gear pumps transfer oil around the perimeter of the gear cavity, trap it in the spaces between the teeth of the pump's two gears and the body of the pump, and then force it out the outlet port as the gears mesh. To increase pump efficiency, a tiny amount of pressurized oil is used behind the brass alloy thrust plates, also known as wear plates, to force the plates firmly against the gear ends.

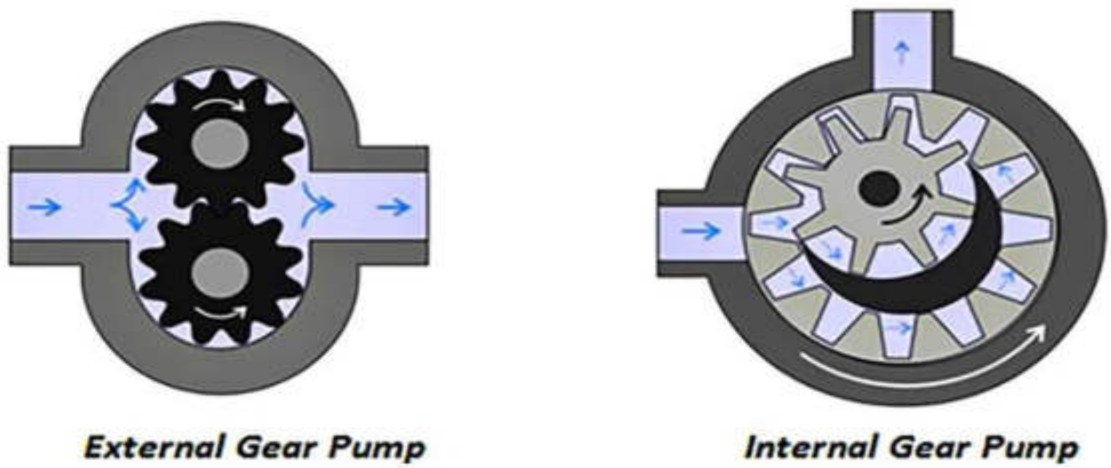
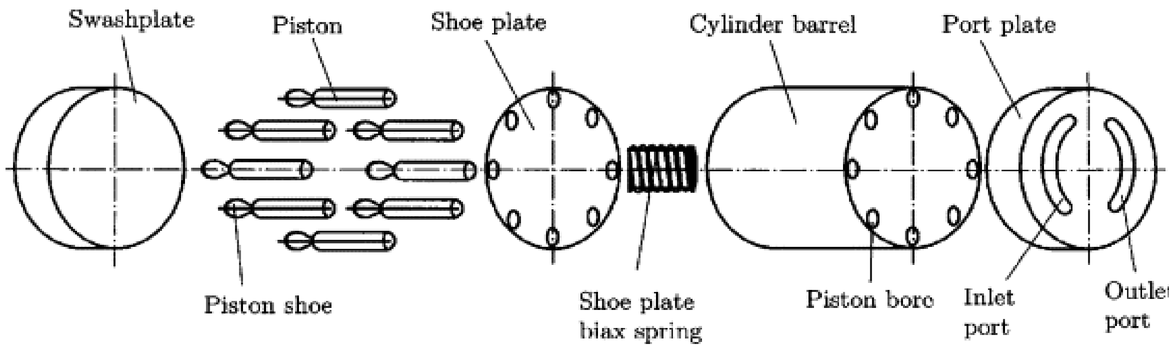


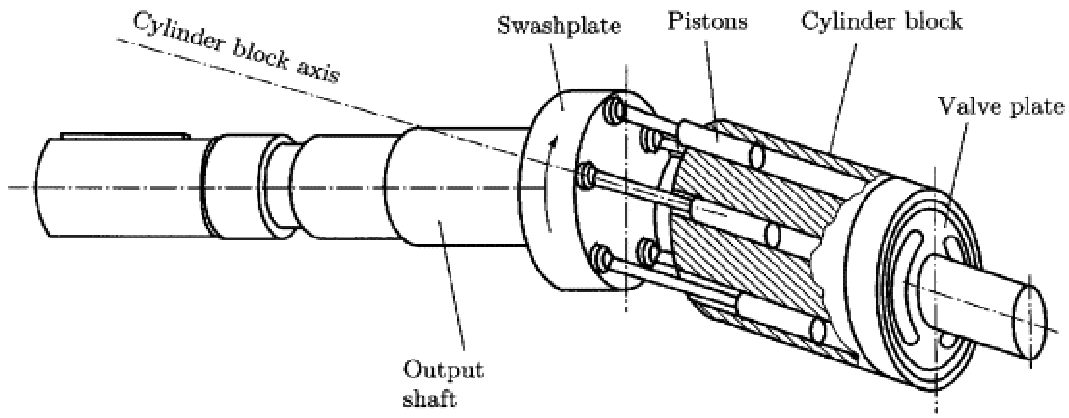
Fig 4.2 External gear pump and Internal gear pump

- **Piston pump**

Piston pumps are frequently utilized when high operating pressures are required. With equivalent displacements, piston pumps will typically handle higher pressures than gear pumps. However, piston pumps have a higher initial cost, a lesser resistance to contamination, and additional complexity. In order to ensure that the piston pump is operating properly with its more moving components, tougher filtration requirements, and closer tolerances, it is the responsibility of the equipment designer and service professional to understand this complexity. Although piston pumps are frequently employed with truck-mounted cranes, they are also used in other situations where it may be necessary to adjust system flow without changing engine speed, such as snow and ice control.



(a)



(b)

Fig 4.3 Piston pump

- **Pressure compensated pump.**

The compensator spool moves against the spring force when the pressure at the outlet port reaches the compensator setting. This makes it possible for the internal servo piston to be reached by the pump output pressure. The swash plate of the pump is pushed to a lower degree of stroke angle as a result of the surface area of the servo piston and the pressure applied to that region. Lower fluid flow is produced at the pump's outlet port as a result of reduced piston travel in the rotating group.

The compensator spool is pulled back in the opposite direction by the spring force after the system pressure falls below the compensator setting. As a result, the oil in the servo piston chamber can exhaust into the pump's case and then be drained back into the tank through a case drain line.

The bias spring pushes the swash plate back on stroke at full angle and flow as a result of the decreased servo piston force that was previously holding the swash plate at a low angle. The pump will supply any flow (up to its maximum flow rate) required to achieve the compensator setting pressure in an effort to maintain that pressure.

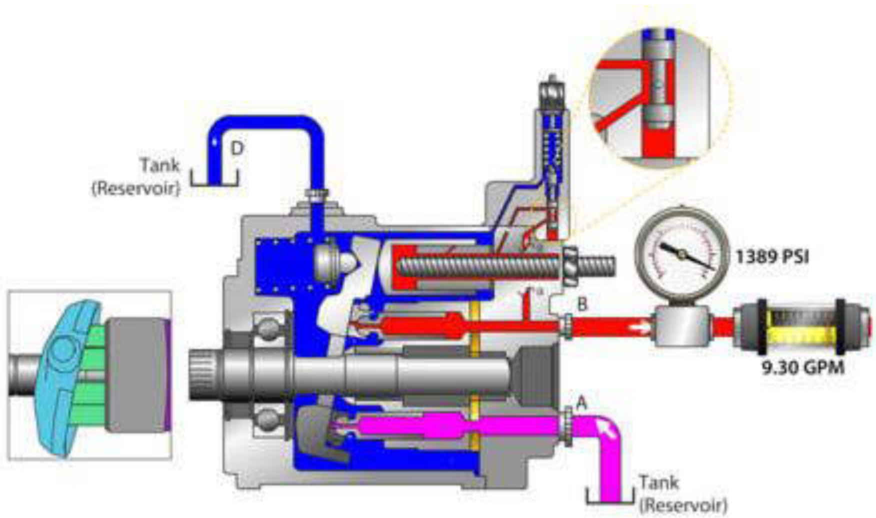


Fig 4.4 Pressure compensated pump.

- **Vane Pump**

Vane pumps frequently represent a middle ground between gear and piston pumps. Due to their relative brittleness to gear and piston pumps, they are constrained by their maximum pressure rating. They are not frequently used in mobile equipment because of their susceptibility to dirt, which causes them to operate poorly in unclean fluids. This restricts them to industrial power units with low pressure, especially when little noise is necessary. Additionally, they frequently are less expensive than piston pumps, however this benefit is eroding.

Vane pumps are hydraulic pumps that make relatively little noise when they're working. Hydraulic vane pumps run with constant flow, which has substantially lower flow pulsation. Vane pumps, which can run at up to 3,000 rpm, thereby make less noise while operating at a reasonably high speed.

Vane pumps typically operate at pressures between 180 and 210 bar. However, the operating pressure in specifically constructed vane pumps may exceed 200 bar and even reach 300 bar.

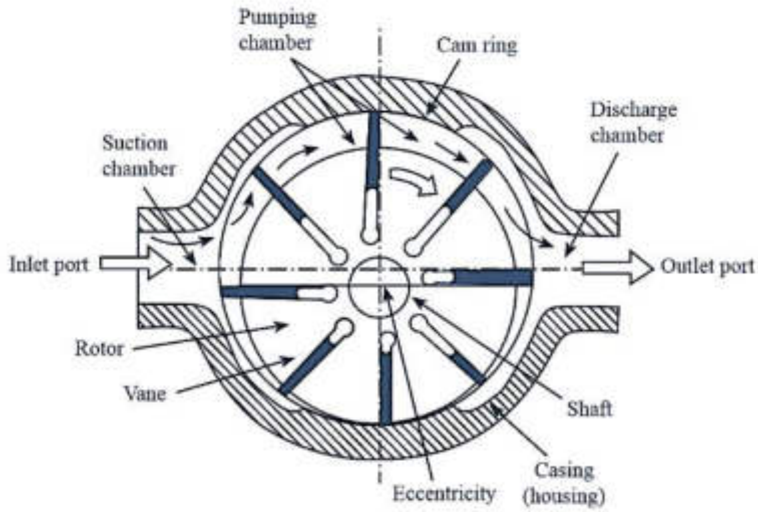


Fig 4.5 Vane Pump

4.3.2 Hydraulic reservoir

Hydraulic fluid is a hydraulic system's lifeblood. A reservoir or tank is used to store the fluid needed to power the hydraulic system. Depending on the hydraulic system and application, the reservoir's size will change. Aeration-related issues will arise from air trapped within the fluid. In order to release trapped air and cool the pressurized hydraulic fluid, a reservoir is created. Additionally, extra room is built into the system to prevent overfilling brought on by oil expansion.

The two types of reservoirs are vented reservoirs and pressurized reservoirs. The vented reservoir is exposed to atmospheric pressure, and air enters and exits the reservoir through its vent line. To clean the air of contaminants, a filter is built into the vent line. These reservoirs are positioned at the hydraulic system's highest point to maximize the flow's gravitational and mechanical forces. Hydraulic fluids are stored in pressurized reservoirs for high altitude applications like aircraft. The fluid will be pressurized and sealed off from the atmosphere.

Fig 4.6 Hydraulic reservoir

4.3.3 Hydraulic control valves

Valves in a hydraulic system serve many different purposes. They control fluid flow, adjust fluid pressure, and steer the flow of fluid through the system. The valve just opens and closes in order to carry out all of these tasks. The market has pilot operated, electric solenoid operated, and mechanically operated valves. Most hydraulics-related applications require pilot operated valves. Three significant types of hydraulics valves are directional control valves, pressure control valves, and flow control valves. The flow control valve regulates the flow of fluid through the system, while the directional control valve and pressure control valve monitor and control fluid pressure.

- **Flow control valve**

The fluid or gas flow through the system is managed and adjusted by the flow control valves. The performance of the hydraulic system can be enhanced using these valves. Pressure variations in the system will be monitored and controlled using flow control valves. It stops the flow of unreliable system components.

The several types of flow control valves include the throttle valve, speed control valve, manifold set flow valve, etc. Flow dividers are yet another variety of flow control valve. This valve diverts fluid to one or more sources by taking input from another source.

- **Pressure control valve**

The hydraulic pressure control valve is essential for preventing leaks and pipe bursts. By releasing the surplus pressure, pressure control valves manage the fluid's pressure as it flows through the pipe. The pressure entered manually by the operator is maintained by these valves. The many varieties include pressure lowering valves, counter-balance valves, sequence valves, and hydraulic pressure relief valves. The sequence valve monitors the extreme pressure while the counterbalance valve establishes dynamic control inside the system. One of the crucial types that establish the pressure limit by returning excess to the tank is the pressure relief valve.

Fig 4.7 Pressure control valve

- **Directional Valve**

The system's fluid flow is controlled by the directional control valves. These valves have the ability to stop and start the flow of fluids. They can also alter the direction in which fluid flows. The different directional control valves utilized to guarantee proper fluid flow inside the system include check valves, prefill valves, spool valves, and others. They are non-return valves, as are the check and prefill valves. Check valves prevent fluid flow in both directions and regulate pressure. The prefill valve, in contrast, allows fluid to flow via the hydraulic cylinder and tank. Spool valves regulate the flow of fluid inside the system.

The 2-way directional control valve, which has two ports named inlet and exit, is the most basic directional control valve. These valves may initiate or halt the flow of fluid and are utilized in water faucets. The three operating ports of a 3-way directional control valve are known as inlet, outlet, and exhaust. The third working port can stop the flow of all other ports, and they are employed in single acting cylinders. Similar to this, 4-way and 5-way valves are employed in air circuits and double acting actuators, respectively.

4.4 Application of Hydraulic

Numerous industrial automation applications involve hydraulic systems, including:

Lifting Heavy weights: In manufacturing facilities, building sites, and other industries where heavy lifting is necessary, hydraulic systems are employed to raise big weights.
Managing Parts Movement: Hydraulic systems are utilized to manage parts movement in assembly lines and other manufacturing operations.

Brakes and Steering Systems: Automobiles and other vehicles use hydraulic systems for their brake and steering systems.

4.5 Practical Perform on Hydraulic

Practical 1: Sequencing of two double acting cylinder using pressure relief valve and 4/2 Lever operated DCV.

Fig 4.8 Practical Perform on Hydraulic 1

Practical 2: Control the extension speed of double acting cylinder using throttle valve With check valve**.**

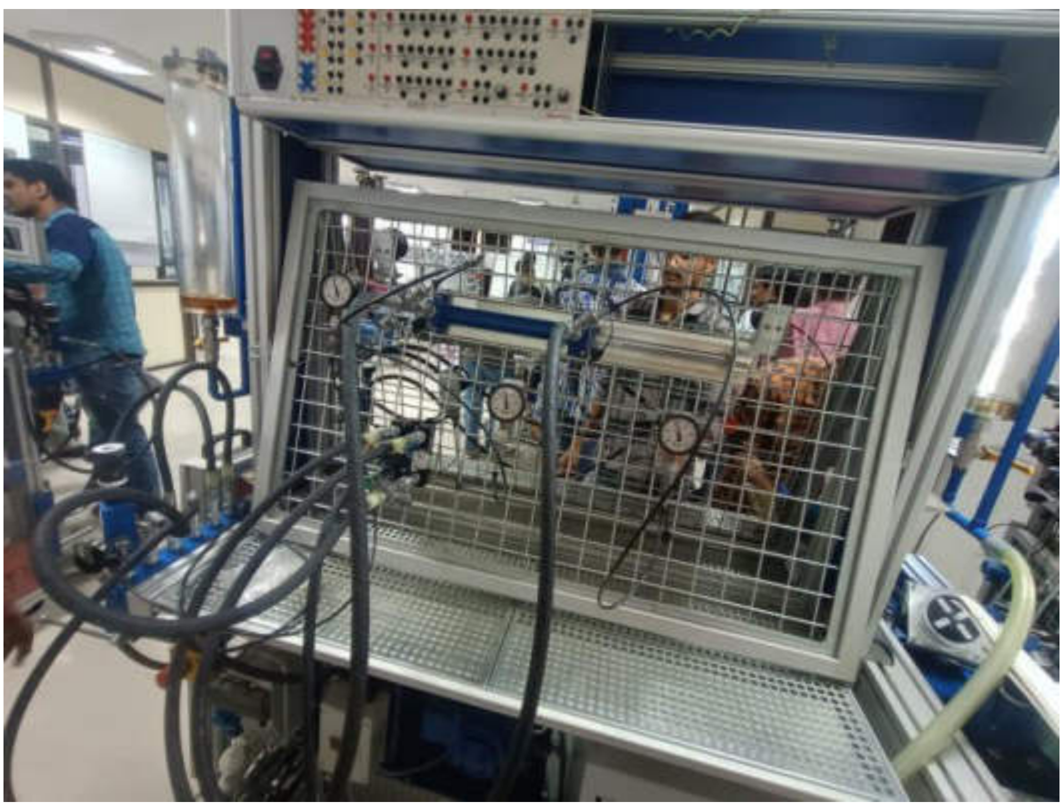


Fig 4.9 Practical Perform on Hydraulic 2

Practical 3: Operating double acting cylinder with spring return lever operated DCV.

Fig 4.10 Practical Perform on Hydraulic 3

Practical 4: operate a bidirectional hydraulic motor using 4/3 DCV with centre spool Having isolated, with different load condition.

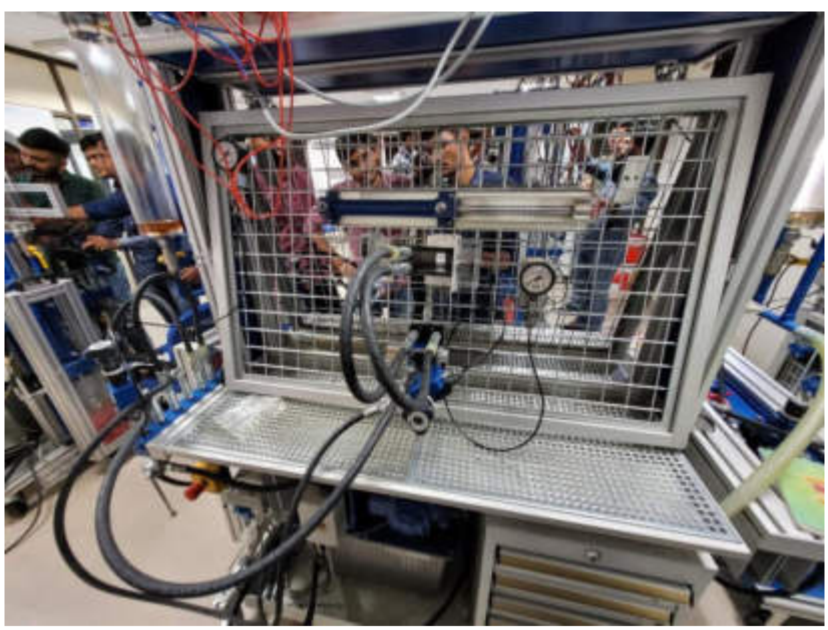


Fig 4.11 Practical Perform on Hydraulic 4

Practical 5: Moving a cylinder with the help of a potentiometer using proportional Valve.

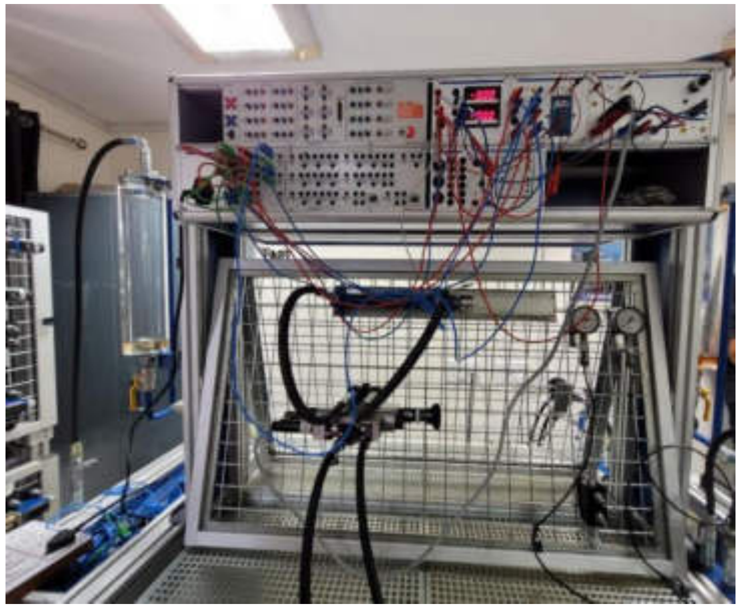


Fig 4.12 Practical Perform on Hydraulic 5

Practical 6: Check flow characteristics of a throttle valve operate hydraulic motor With 4/3 lever operated DCV, Find out inlet pressure at inlet of throttle Valve, find out differential pressure across the throttle valve.

Fig 4.13 Practical Perform on Hydraulic 6

Practical 7: Assuming that hydraulic cylinder is punching press that required to Punch hole in three different types of material for three different speed For individual.

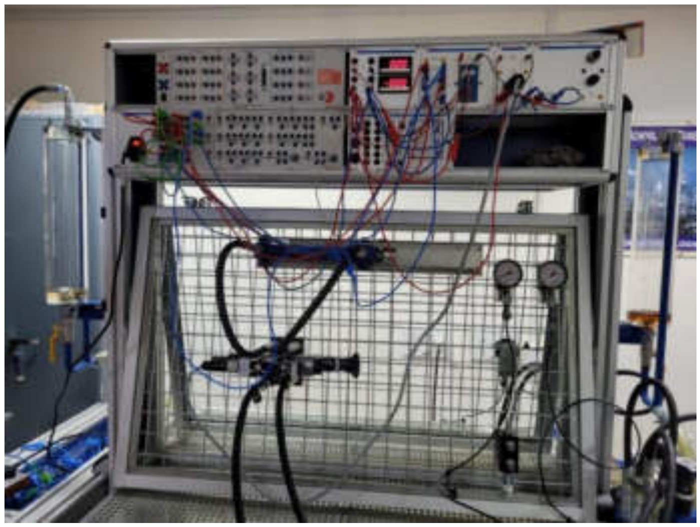


Fig 4.14 Practical Perform on Hydraulic 7

CHAPTER 5
PNEUMATICS

5.1 Introduction of Pneumatics

Pneumatics is a discipline of engineering that performs certain processes using wind or high-pressure air. A pneumatic system is a combination of multiple parts that uses the pressure energy of compressed air to do mechanical work. These parts include compressors, filters, controllers, and actuators.

Where human strength and accuracy are insufficient, pneumatic methods are employed. These days, many companies use pneumatic systems to automate numerous processes. In addition to lifting large objects and improving precision, it also cuts down on the time needed to do specific tasks. Air brakes, pneumatic arms, pneumatic cable jetting, and pneumatic shock absorbers are a few of the more prevalent examples of pneumatic systems.

5.2 Pneumatic System Components

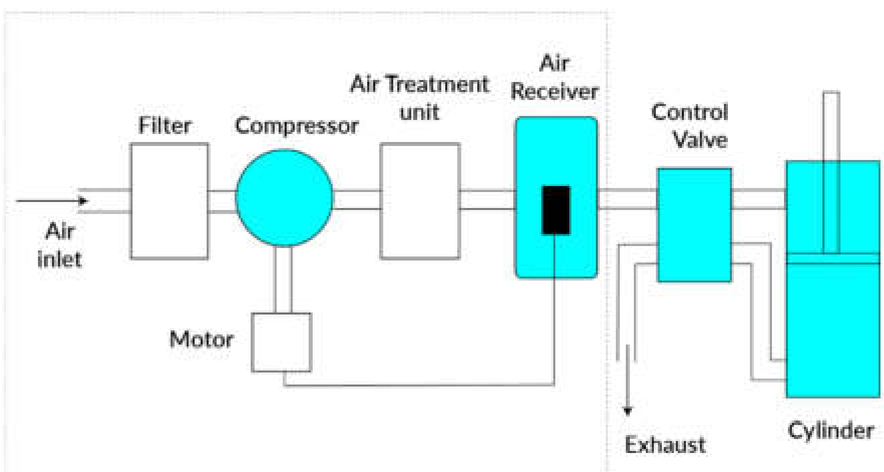


Fig 5.1 Pneumatic System Components

5.2.1 Air filter

Pollen grains, dust particles, soot, and other contaminants are found in air. Prior to entering a pneumatic circuit, the air must be cleansed of these impurities. In order to prevent these contaminants from entering the pneumatic circuit, an air filter is used. The air filter is made of a porous or fibrous substance that collects solid particles while allowing air to pass through. Additionally, it could include some absorbent components like charcoal, which can take up soot and polluting gas particles.

Fig 5.2 Air filter

5.2.2 Air compressor

An air compressor is what it sounds like—a device that compresses air. In pneumatic systems, axial flow air compressors are typically employed. These compressors have impellers, which are rotating blades that are powered by a motor. A hoover is produced by the impeller, sucking air through an air filter. At the impeller's exit, air pressure is greater than atmospheric pressure. The compression ratio is the ratio of the compressor's exit pressure to its inlet pressure. For various applications, there are various compression ratios.

Fig 5.3 Air compressor

5.2.3 Air cooler

When the air is compressed in the compressor, the air's temperature rises. It is not safe to continue using this heated air. The hot air that is flowing from the air compressor must therefore be cooled. An air cooler is used to cool the air. Reduced temperature and moisture levels in the air leaving the air compressor are the primary goals of an air cooler.

Two different types of air coolers are frequently utilized.

1. Air cooled air cooler
2. Water cooled air cooler

In an air-cooled air cooler, a fan forces cold air onto hot air that is contained in pipes. Without lowering pressure, this cold air dissipates heat from the heated air. In contrast, heat is transferred through indirect contact between cold water and hot air from a compressor in a water-cooled air cooler.

In comparison to an air-cooled air cooler, a water-cooled air cooler may achieve much lower temperatures. Since there is a plentiful supply of cold water, water-cooled air coolers are efficient and speedy.

5.2.4 Storage reservoir

Storage reservoirs are crucial to pneumatic systems because they guarantee a prompt response to customer demand. Depending on the need, storage reservoirs can hold both dry and moist air. A storage reservoir needs to be sturdy, have a high tensile strength, and last for a long time. Thus, mild steel, aluminum, carbon steel, and stainless steel are the materials that are most frequently utilized to make storage reservoirs. The parts of a storage reservoir are numerous. Each component is first reduced to the necessary size. Then, welding and bending are used to put these pieces together.

5.2.5 FRL unit

The full name of FRL is "filter, regulator, and lubricator." These three components are typically employed in a pneumatic system as a single unit, but they can also be used separately. An essential part of a pneumatic system, FRL decreases losses and boosts system effectiveness. The following are the three fundamental duties of a FRL unit.

To remove debris, pollutants, and wastewater from the air leaving the storage reservoir. This is typically the initial step in a FRL unit and is carried out by filers. The FRL unit's second purpose is to control the pressure and prevent it from rising above the upper limit. A pressure regulator does this. Pressure regulation is a crucial step because it protects the system from harm and lowers unintended losses brought on by high pressure.

Air lubrication is the FRL unit's final step. By combining a fine mist of oil or other lubricants with compressed air, lubrication is accomplished in the air. Typically, this is carried out following filtration and control. This lubricated air decreases friction in a pneumatic system's moving elements, which lowers energy waste and lengthens the life of the machinery. An absence of a FRL unit in a pneumatic system would shorten system life, increase energy consumption, and impair system efficiency.

Fig 5.4 FRL unit

5.2.6 Pneumatic Cylinder

Mechanical pneumatic cylinders use the energy from pressurized air to generate force. These gadgets are made up of a cylinder, piston, and piston rod. As air enters the cylinder from one side, the pressure inside the cylinder increases. The piston moves in a certain direction as a result of an increase in internal pressure. The produced force is transferred to the item to be pushed by the piston rod.

Compressed air serves as the operating fluid in pneumatic cylinders. Pneumatic cylinders are therefore preferred for locations needing a high level of cleanliness because, in the event of a leak, the fluid won't pollute the surroundings. Pneumatic cylinders run silently and don't need big working fluid storage tanks.

Machines and industrial processes can be automated using pneumatic cylinders. Pneumatic cylinders can be used to provide force and motion for processes including clamping, ejecting, blocking, and lifting. They are used in manufacturing to repeatedly pick up and put items into machinery or equipment. They are utilized in the operation of valves in piping systems.

Fig 5.5 Pneumatic Cylinder

5.2.7 Directional control valve

In a pneumatic system, directional control valves are the most crucial component. The volume and direction of air entering the actuators are managed by the directional control valves, or DVCs. In accordance with the operator's instructions, the valves send the air's pressure energy to the actuators. The solenoid valve, sometimes referred to as a spool valve occasionally, is the valve that is typically utilized in a pneumatic system. The operation of a solenoid coil paired with an electromagnet opens and closes these valves.

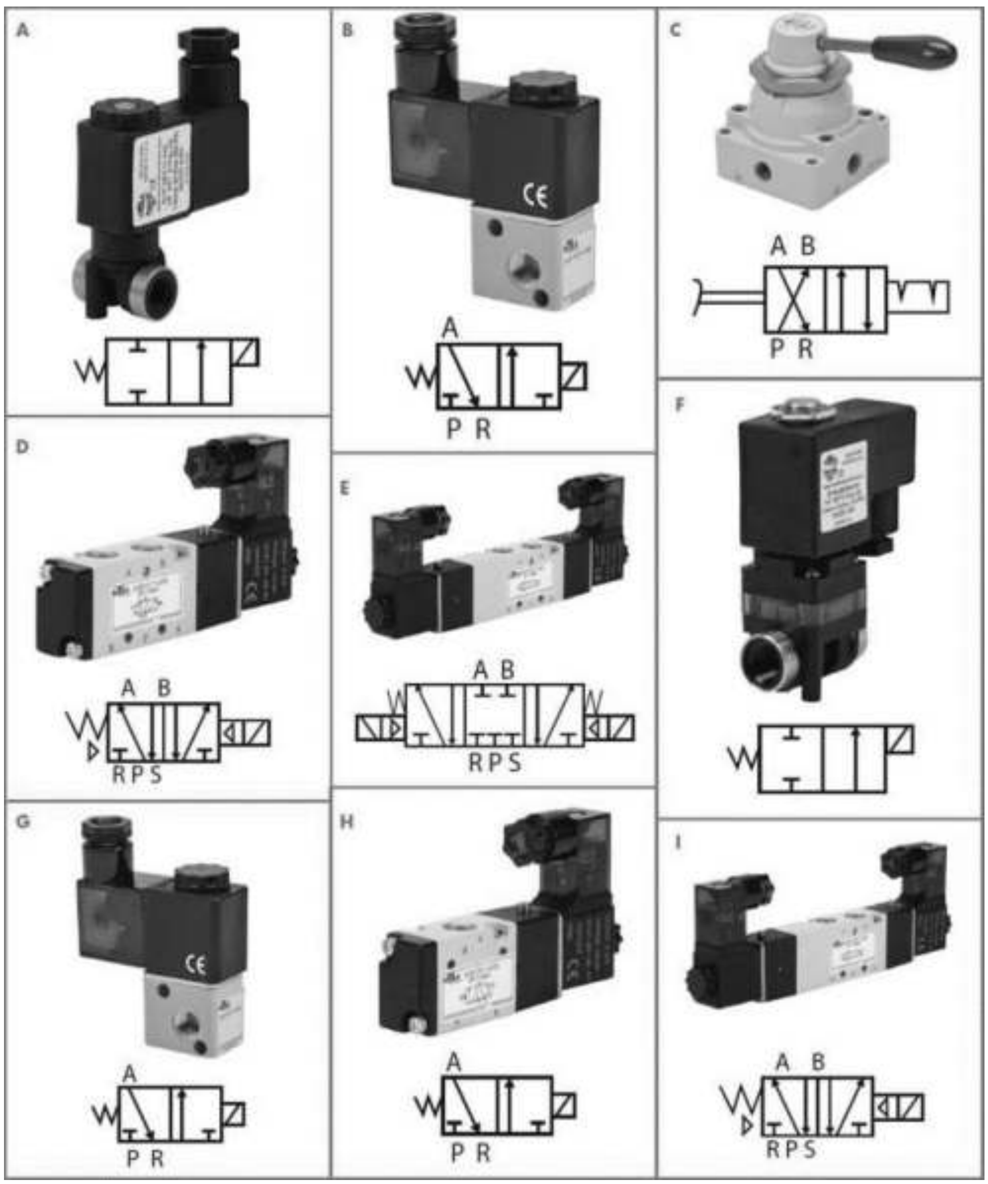


Fig 5.6 Directional control valve

5.2.8 Application of Pneumatics

There are countless uses for pneumatic systems in the modern world. The following are some of the primary uses for pneumatic systems.

Production lines using automation.
Metro train doors.
Medical equipment.
Vehicle cleaning.
Brakes with pneumatics.

5.3 Practical Perform on Pneumatic

Practical 1:- controlling the spool of extension of double acting cylinder using throttle valve withintegrated check valve.

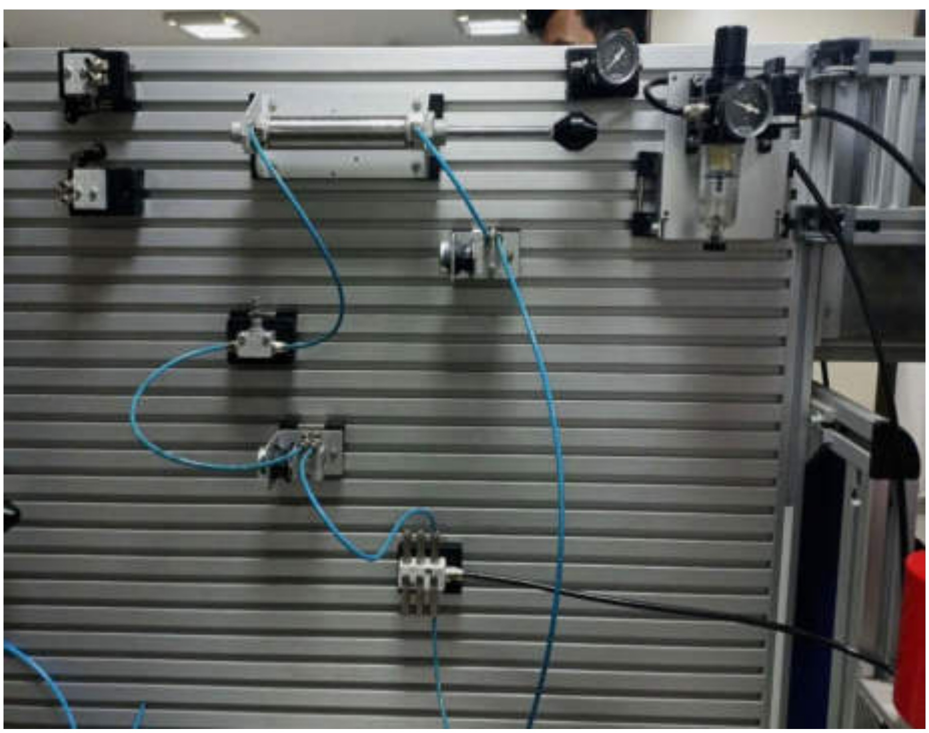


Fig 5.7 Practical Perform on Pneumatic 1

Practical 2:- In this experiment both cylinders will operate in sequence. When we pressed first P.B. thencylinder 1 will extend when cylinder 1 will complete extend and limit switch will be operated then cylinder 2 will extend. Same way when we pressed retract P.B. then cylindertwo will retract first and then cylinder 1 will retract.

Fig 5.8 Practical Perform on Pneumatic 2

Practical 3:- Electrical control of a double acting cylinder using sensor such that piston does notretracts more than 50 %, use 5/3 DCV solenoid operated with spring return.

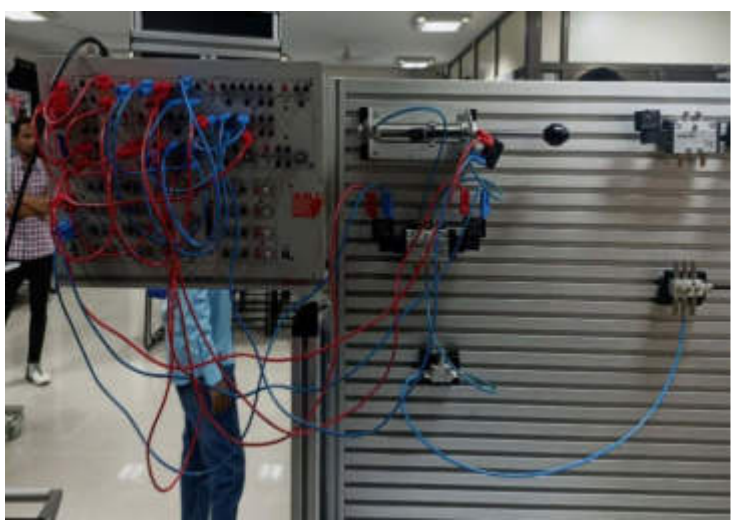


Fig 5.9 Practical Perform on Pneumatic 3

CHAPTER 6
PROJECT WORK

6.1 Introduction of Project

Hydraulic drill control system

A project called the hydraulic drill control system aims to automatically adapt the hydraulic drill's force and speed depending on the toughness of the material being drilled. With the help of this project, drilling efficiency and accuracy will be increased. Drill and material damage will also be avoided, and safe drilling procedures will be followed.

The hydraulic drill control system consists of the following components:

- Hydraulic cylinder
- Capacitive sensor
- Inductive sensor
- Programmable Logic Controller (PLC)
- Flow control valve
- Pressure regulator valve
- Hydraulic pump and hoses
- Power supply
- Hydraulic Proportional valve
- Two Pneumatic cylinder
- Solenoid operated pneumatic DCV
- Two Proximity sensor
- Pressure gauge

6.1.1 Construction

The following procedures are taken to develop the hydraulic drill control system:

1. The hydraulic pump and hoses are assembled, as well as hydraulic drill, flow control valve, and pressure regulator valve.

2. To identify the presence of metal and plastic, a capacitive sensor and an inductive sensor are attached to the material and hydraulic systems, respectively.

3. The sensors are connected to the PLC so that data can be sent to the system and the drilling force and speed can be changed.

4. The system is programmed using ladder logic or any other programming language and is powered by a power supply.

6.2 Project working

A capacitive and inductive sensor used by the system determines if the substance being drilled is made of metal or plastic. To determine whether the material being drilled is made of metal or plastic, the PLC receives the material data and compares it to a pre-set threshold value. Based on the information, the PLC adjusts the hydraulic drill's drilling speed and force by sending signals to the flow control valve and pressure regulator valve.

The hydraulic pump provides the drill with the necessary pressure, and the flow control valve modifies the hydraulic fluid's flow rate to regulate the drill's speed. The pressure regulator valve modifies the hydraulic fluid's pressure in order to regulate the drill force.

6.3 PLC Programming

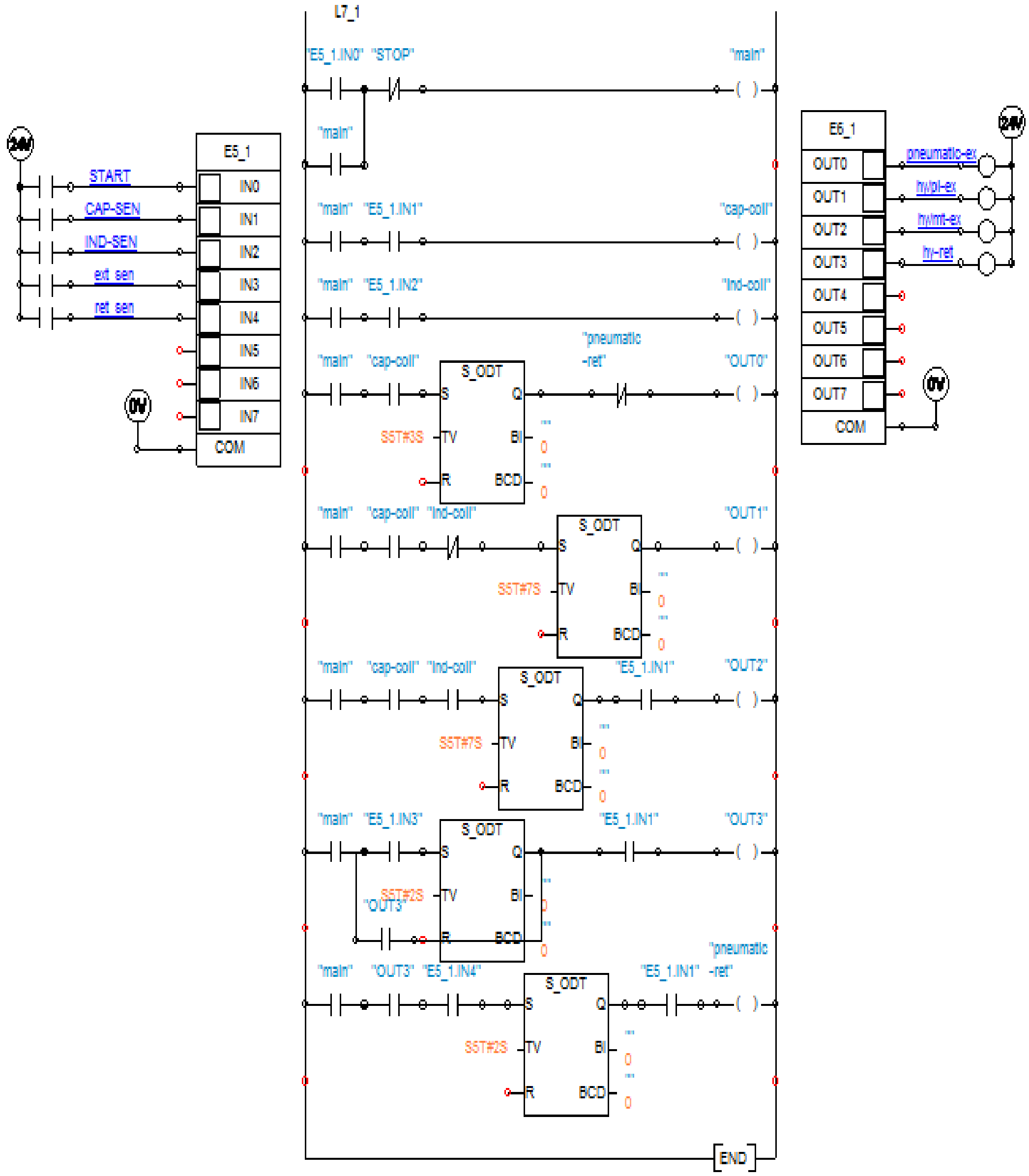


Fig 6.1 PLC Programming

6.4 Circuit Diagram

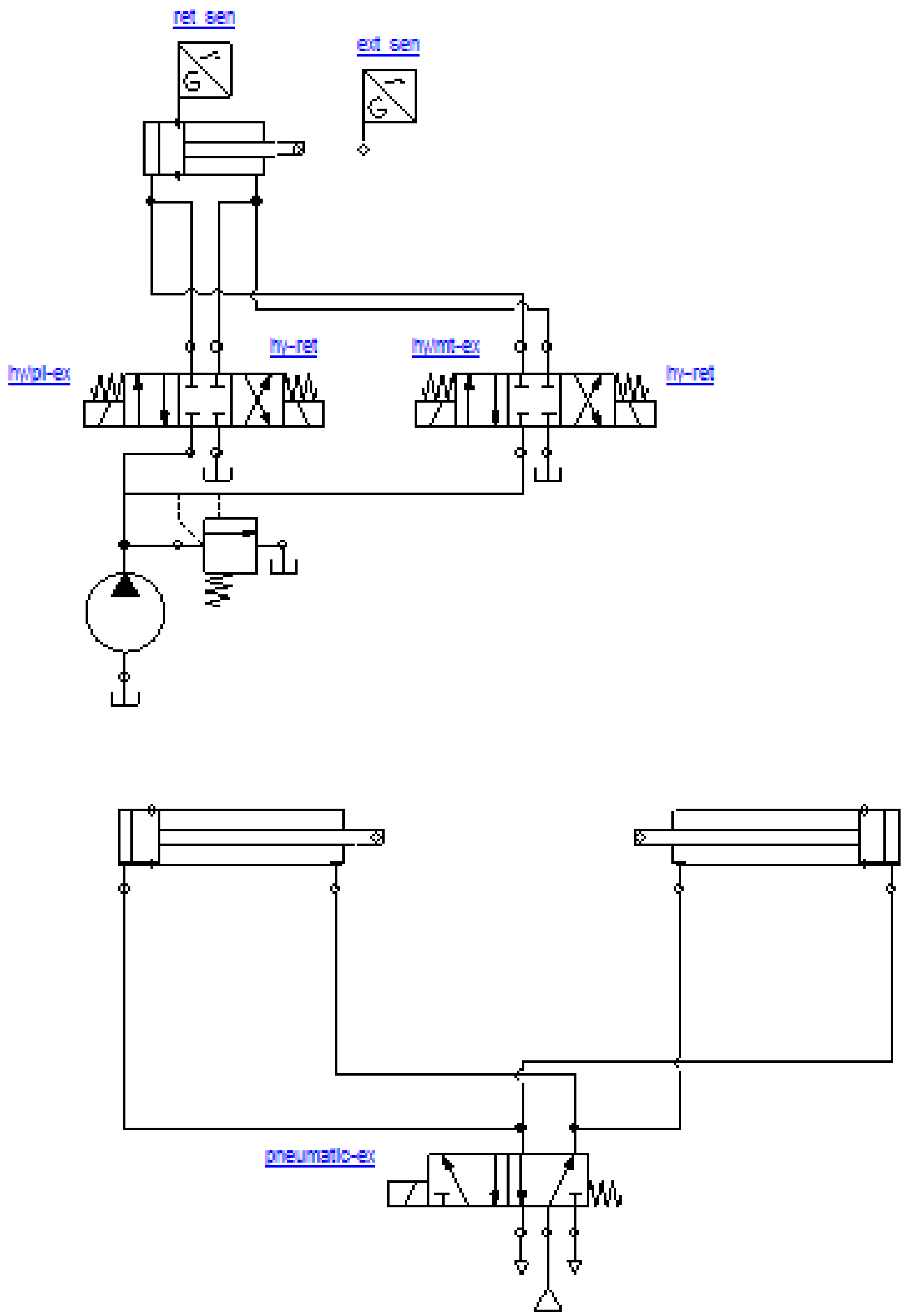


Fig 6.2 Circuit Diagram

6.5 Simulation in Automation Studio

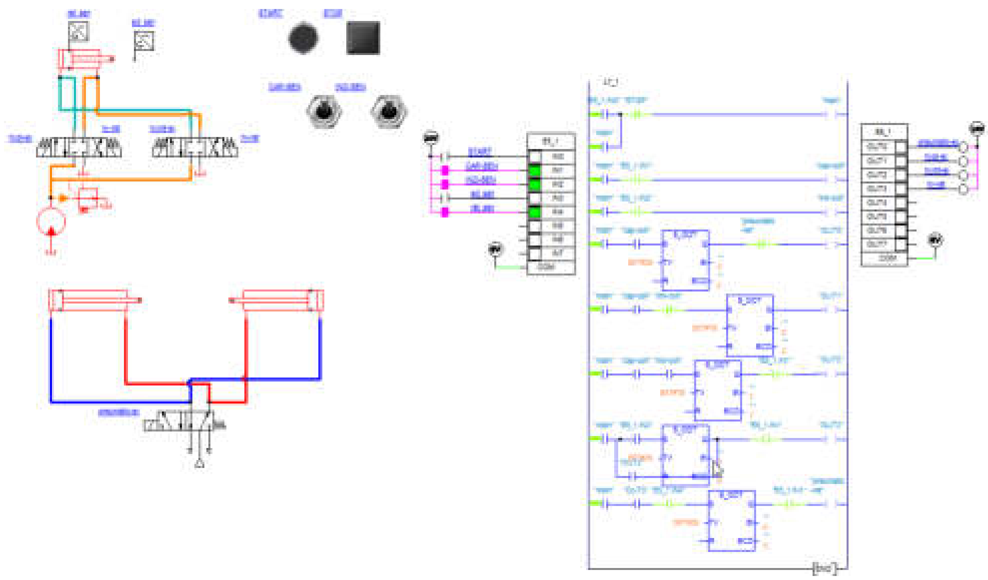


Fig 6.3 Simulation in Automation Studio

6.6 Project Prototype

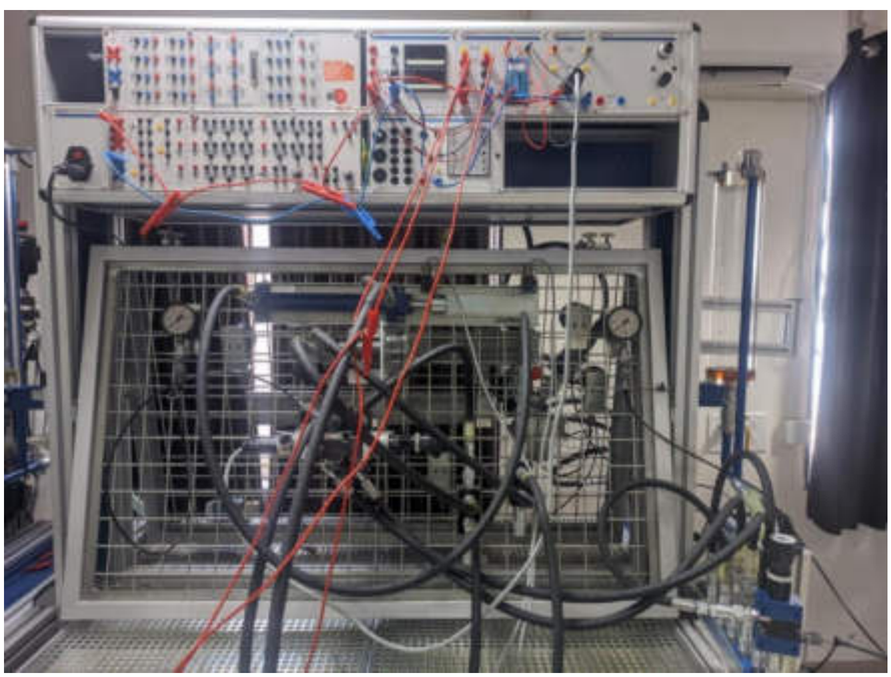


Fig 6.4 Hydraulic connection

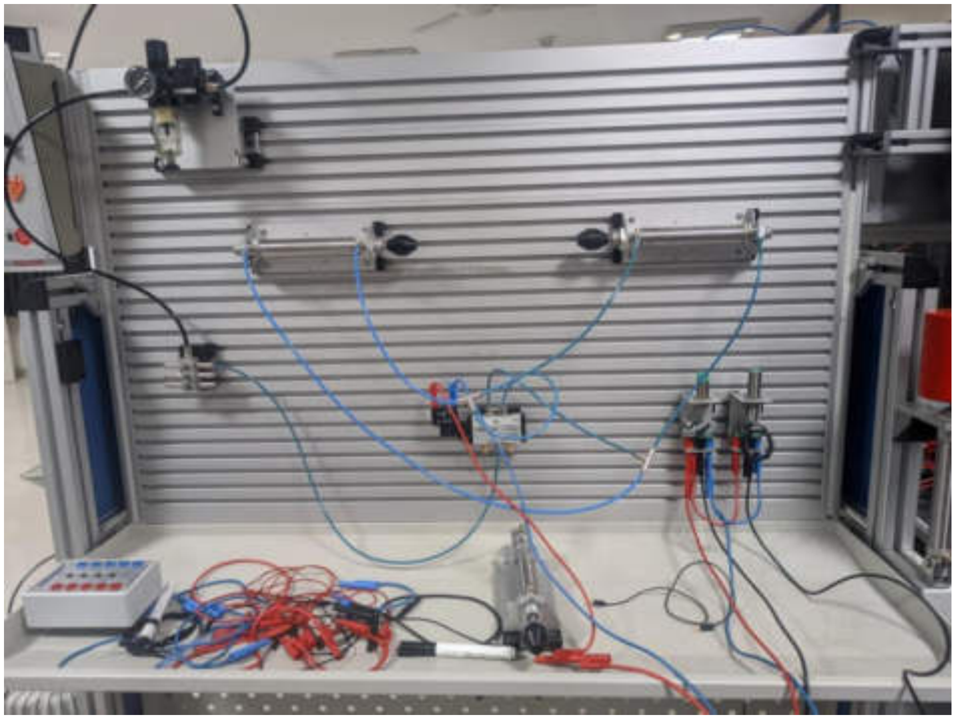


Fig 6.5 Pneumatics connection

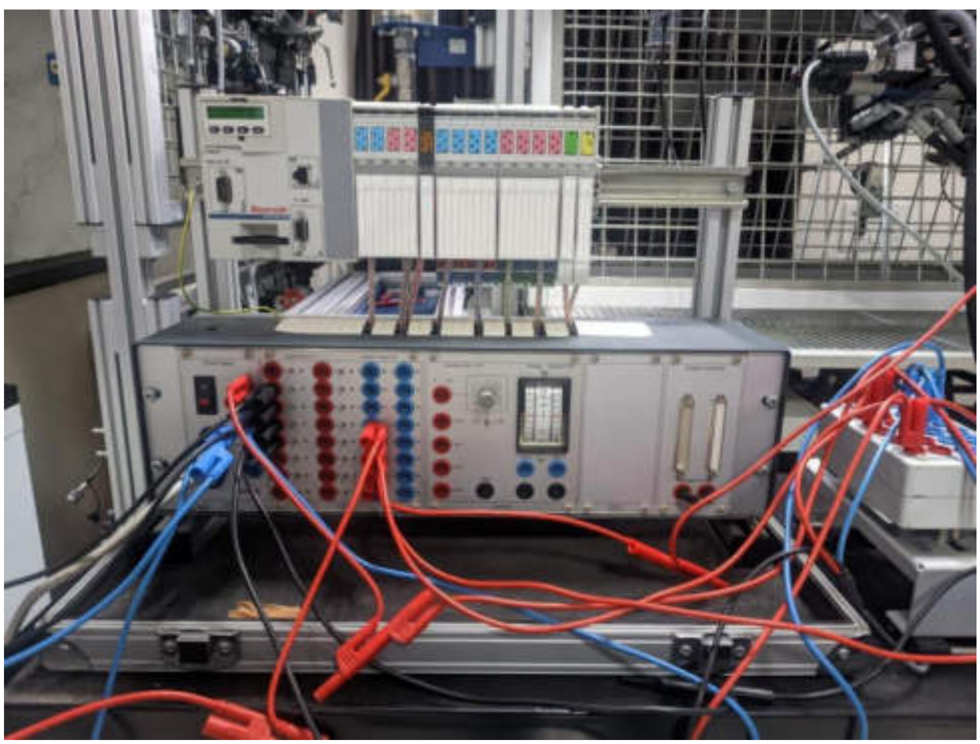


Fig 6.6 PLC Connection

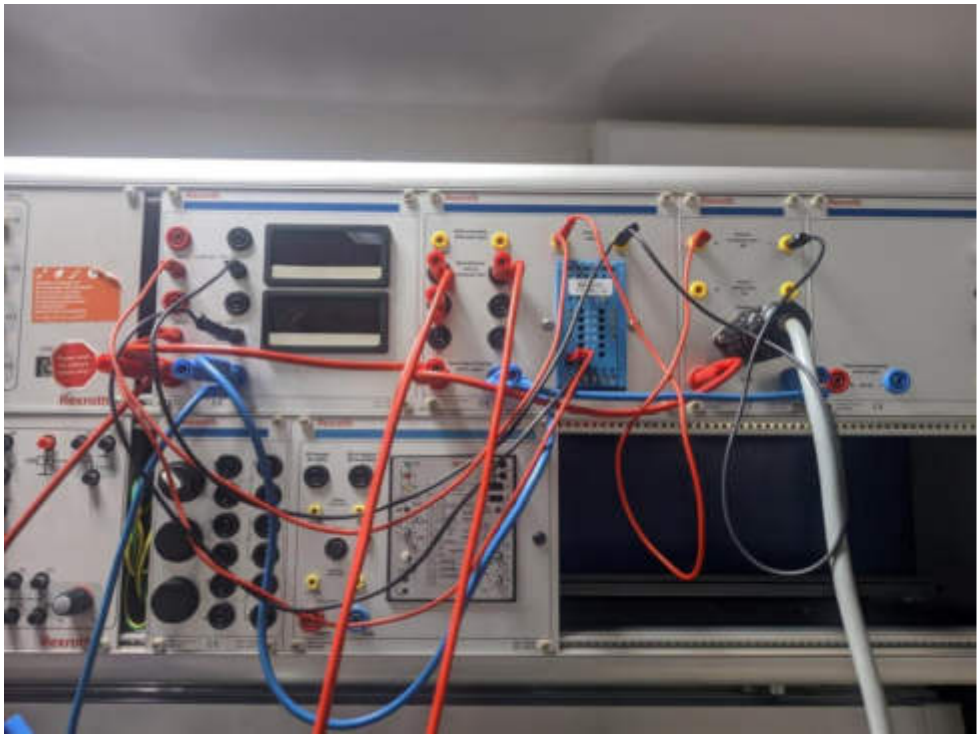


Fig 6.7 Analogue module connection

CHAPTER 7
CONCLUSION

The 12-week summer internship we completed at Bosch Rexroth under the supervision of industrial professionals in the fields of hydraulics, pneumatics, and PLC programming has been extremely educational and beneficial. This programme has given us the information required for a fresher with a mechanical background as well as understanding about the operation of hydraulic and pneumatic components used in manufacturing lines and their integration with PLC programming.

CHAPTER 8
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- https://www.sanfoundry.com/plc-program-control-traffic-lights/
- https://www.researchgate.net/publication/292154885_Intelligent_traffic_control_system_using_PLC
- https://www.theengineeringprojects.com/2023/01/traffic-signal-control-with-plc-ladder-logic-programming.html

APPENDIX -1

ANNEXURE-1 (WEEKLY REPORT 1)

GUJARAT TECHNOLOGICAL UNIVERSITY
(Established under Gujarat Act No. 20 of 2007)
ગુજરાત ટેકનોલોજીકલ યુનિવર્સિટી
(ગુજરાત અધિનિયમ ક્રમાંક: ૨૦/૨૦૦૭ દ્વારા સ્થાપિત)

Annexure I
Enrollment no: 190390119003

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: Ghanshyamkumar Jayeshbhai Bhuva

DIARY OF THE WEEK: Dt: 13/02/23 TO 19/02/23

DEPARTMENT: GTU- Skill Development (Mechanical) SEM: 8th Sem

NAME OF THE ORGANISATION: GTU-[GSET- Graduate school of Engineering & Technology

NAME OF THE PLANT/SECTION/DEPARTMENT: GTU- Bosch Center Excellence in Automation

NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT: Jeet Joshi

DESCRIPTION OF THE WORK DONE IN BRIEF

- Receiving Comprehensive details about Bosch Rexroth automation equipment and taking a lab tour.
- Understanding of PLCs and programming Software
- Understand PLC modules, buttons, pads, and how to use PLC
- Ethernet is used to link PLCs to computers, and computers are used to set PLC IP Addresses
- knowing "Indra logic" Software for PLC programming and how to enter PLC Data into the Software
- "Ladder Diagram" was the language used to programme PLCs.
- Recognize the fundamentals of an electronic circuit Schematic
- Understand the fundamentals of Switches, such as NO/NC Switches.

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TOTAL HOURS: 30

SIGNATURE OF STUDENT

- The above entries are correct and the grading of work done by Trainee is EXCELLENT / VERY GOOD / GOOD / FAIR / BELOW AVERAGE / POOR

Signature of Faculty Mentor

Signature of officer-in-charge of Dept. / Section / Plant

Date: 18/3/23

Date: 20/02/23

- Grading of Work, for trainee may be given depending upon your judgement about his Punctuality, Regularity, Sincerity, Interest taken, Work done etc.

ANNEXURE-1 (WEEKLY REPORT 2)

GUJARAT TECHNOLOGICAL UNIVERSITY
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Annexure I
Enrollment no: 190390119003

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: Gaurangkumar Jayeshbhai Bhuva

DIARY OF THE WEEK: Dt: 20/02/23 TO 26/02/23

DEPARTMENT: GTU- Skill Development (Mechanical) SEM: 8th Sem

NAME OF THE ORGANISATION: GTU-[GSET - Graduate school of Engineering & Technology

NAME OF THE PLANT/SECTION/DEPARTMENT: GTU- Bosch Center of Excellence

NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT: Jeet Joshi

DESCRIPTION OF THE WORK DONE IN BRIEF

- Using a ladder digram in practise, logic gate such as NO, NC, NOR, XNOR, OR, XOR, etc. are simulated in software.
- Simple programming, such as switching system for various light and motors, has been performed.
- By providing memory input, a programme on push button that use the PB button to genrate a loop system.
- Practical has been done on the parking system and traffic lights.
- Learn about using function blocks such as the timer and counter blocks.
- Practical is done with function like a motor that turns on and off at predetermined times.
- Comparing two or more inputs to control a motor or light by using comparator function.

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TOTAL HOURS: 30

SIGNATURE OF STUDENT

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EXCELLENT / VERY GOOD / GOOD / FAIR / BELOW AVERAGE / POOR

Signature of Faculty Mentor

Signature of officer-in-charge
of Dept. / Section / Plant

Date: 18/3/23

Date: 27/02/23

✪ Grading of Work, for trainee may be given depending upon your judgement about his Punctuality, Regularity, Sincerity, Interest taken, Work done etc.

ANNEXURE-1 (WEEKLY REPORT 3)

GUJARAT TECHNOLOGICAL UNIVERSITY
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Annexure I

Enrollment no: 190390119003

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: Gauravkumar Jayeshbhai Bhuva

DIARY OF THE WEEK: Dt: 27/02/23 **TO** 05/03/23

DEPARTMENT: Mechanical Engineering **SEM:**

NAME OF THE ORGANISATION: GTU - [GSET - Graduate School of Engineering & Technology

NAME OF THE PLANT/SECTION/DEPARTMENT: GTU - Bosch Center of Excellence

NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT: Jeet Joshi

DESCRIPTION OF THE WORK DONE IN BRIEF

- Learn the fundamentals of Sensor technology, Circuit and terminology used in sensors.
- Get familiar with the Bosch Rexroth Sensor training kit.
- Learn about the basics of electronics and instrument, such as AC, DC, Voltage, resistance, and Rating, etc.
- Understanding the basic operating principles of Relay switches.
- Understanding how to use sensor technology training's various components, such as the SMPS proximity Sensor kit, module, motor, counter, tool and material box.
- Understand the entire theory of Sensors, including their circuit diagram, operating mechanism and Internal component Structure.
- Proximity Sensors :- Inductive, capacitive, Ultrasonic, photoelectric.

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TOTAL HOURS: 30

SIGNATURE OF STUDENT

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Signature of Faculty Mentor

Signature of officer-in-charge of Dept. / Section / Plant

Date: 18/03/23

Date: 06/03/23

Grading of Work, for trainee may be given depending upon your judgement about his Punctuality, Regularity, Sincerity, Interest taken, Work done etc.

ANNEXURE-1 (WEEKLY REPORT 4)

GUJARAT TECHNOLOGICAL UNIVERSITY
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Annexure I

Enrollment no: 190341011 9003

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: Gaurangkumar Jayeshbhai Bhuva

DIARY OF THE WEEK: Dt: 06/03/23 TO 12/03/23

DEPARTMENT: Mechanical Engineering SEM: 8th

NAME OF THE ORGANISATION: GTU - GSET - Graduate School of Engineering & Technology

NAME OF THE PLANT/SECTION/DEPARTMENT: GTU - Bosch Center of Excelence in Automation

NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT: Jeet Joshi

DESCRIPTION OF THE WORK DONE IN BRIEF

- Learn how to attach a sensor to an smps module
- Practical done on Behavior of Inductive Sensor and Capacitive Sensors
- Behavior of magnetic field Sensors.
- Behavior of the reflection light Scanner
- Behavior of one-way light barrier.
- Behavior of the reflection light barier (OBS)
- Behavior of an ultrasonic Sensors.
- Check distance measuring equipment with the help of ultra sonic sensor and software " Ultra 3000".
- All are above mentation practicale peform for check the condition of Sensor that how it can behave with different material like metal, plastic, paper, wood, Sheet and get the limitation of that Sensor.

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TOTAL HOURS: 30

SIGNATURE OF STUDENT

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Signature of Faculty Mentor

Signature of officer-in-charge of Dept. / Section / Plant

Date: 13/03/23

Date: 13/03/23

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ANNEXURE-1 (WEEKLY REPORT 5)

GUJARAT TECHNOLOGICAL UNIVERSITY
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Annexure I
Enrollment no: 190790119003

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: Gauravkumar Jayeshbhai Bauva

DIARY OF THE WEEK: Dt: 13/03/2023 **TO** 19/03/2023

DEPARTMENT: Mechanical **SEM:** 8th

NAME OF THE ORGANISATION: GTU [GSET- (Graduate school of Engineering & Technology]

NAME OF THE PLANT/SECTION/DEPARTMENT: GTU- Bosch Center of Excelence in Automation

NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT: Jeet Joshi

DESCRIPTION OF THE WORK DONE IN BRIEF

- A Description of the basics of the hydraulic and pneumatic System.
- Pumps, motors, actuators, and valves in hydraulic System & their principles.
- Various valve type, Including Solenoid, Liver and Spring operated ones.
- Pneumatic and hydraulic System saftey issues.
- knowing the hydraulic parts kit provided by Bosch Rexroth.
- Obtain the following basic information about pumps:
  1) Positive Displacement pump 2) Non-Positive Displacement pump
- Implementing of Pressure Reducing valve, Directional control valve, pressure control valve, Throttle valve, Accumulators, check valve of hydraulic as well as pneumatic.

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TOTAL HOURS: 30

SIGNATURE OF STUDENT

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Signature of Faculty Mentor

Signature of officer-in-charge of Dept. / Section / Plant

Date: 09/05/23

Date: 20/03/23

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ANNEXURE-1 (WEEKLY REPORT 6)

GUJARAT TECHNOLOGICAL UNIVERSITY
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Annexure I
Enrollment no: 190390119003

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: Gauravkumar Jayeshbhai Bhuva
DIARY OF THE WEEK: Dt: 20/03/2023 **TO** 26/03/2023
DEPARTMENT: Mechanical **SEM:** 8th
NAME OF THE ORGANISATION: GTU [GSET - Gradute school of Engineering & Technology]
NAME OF THE PLANT/SECTION/DEPARTMENT: GTU- Bosch Center of Excellence in Automation
NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT: Jeet Joshi

DESCRIPTION OF THE WORK DONE IN BRIEF

- Detailed description of the software called Automation Studio and it's use.
- Fundamentals of System design, creation, and simulation of hydraulic and pneumatic circuits.
- Simple electrical circuit, such as Single acting cylinder with Spring Return
- Application of Proximity Sensors in circuit, Application of Accumulator, Sequencing of cylinders using Solenoid operated DCV, Application of proportional valve, pressure compensated pump, Load Sensing and pressure compensated pump, meter out & meter in circuit, Bleed-off circuit using flow control valve, Application of counter balance valve, Application of unloading valve (high-low circuit), Basic Pneumatic circuit, All type of gate- And, NOR, OR, NOT, XNOR etc. continuously operating Double acting Pneumatic circuit.

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TOTAL HOURS: 30

SIGNATURE OF STUDENT

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Signature of Faculty Mentor

Signature of officer-in-charge of Dept. / Section / Plant

Date: 09/03/23

Date: 27/03/23

Grading of Work, for trainee may be given depending upon your judgement about his Punctuality, Regularity, Sincerity, Interest taken, Work done etc.

ANNEXURE-1 (WEEKLY REPORT 7)

GUJARAT TECHNOLOGICAL UNIVERSITY
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Annexure I

Enrollment no: 190390119003

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: Gaurangkumar Jayeshbhai Bhuva

DIARY OF THE WEEK: Dt: 27/03/2023 **TO** 02/04/2023

DEPARTMENT: Mechanical **SEM:** 8th

NAME OF THE ORGANISATION: GTU [GSET- Graduate School of Engineering & Technology]

NAME OF THE PLANT/SECTION/DEPARTMENT: GTU- Bosch center of Excellence in Automation

NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT: Jeet Joshi

DESCRIPTION OF THE WORK DONE IN BRIEF

- Carried out simulations in the automation studio.
- Use the 4/2, 4/3 DCV Lever Operated Valve and the DCV with Detent to operate the double acting cylinder.
- As the DAC is operating, measure the rod end and piston side pressure, with a DCV of 4/3.
- Used a 'J' type DCV to complete a regenerative hydraulic circuit.
- Recognise the fundamental of the relay board used in the hydraulic kit.
- Simple NO, NC connections were made, basic DCV operations were carried out, and the fundamentals of an electro-hydraulic circuit were learned.

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TOTAL HOURS: 30

SIGNATURE OF STUDENT

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Signature of Faculty Mentor

Signature of officer-in-charge of Dept. / Section / Plant

Date: 09/05/23

Date: 03/04/23

Grading of Work, for trainee may be given depending upon your judgement about his Punctuality, Regularity, Sincerity, Interest taken, Work done etc.

ANNEXURE-1 (WEEKLY REPORT 8)

GUJARAT TECHNOLOGICAL UNIVERSITY
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Annexure I
Enrollment no: 190390119003

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: Gaurangkumar Jayeshbhai Bhuva

DIARY OF THE WEEK: Dt: 03/04/2023 TO 09/04/2023

DEPARTMENT: Mechanical SEM: 8th

NAME OF THE ORGANISATION:

NAME OF THE PLANT/SECTION/DEPARTMENT:

NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT:

DESCRIPTION OF THE WORK DONE IN BRIEF

- Utilising a pressure relief valve in a practical manner to sequence two different double acting cylinders.
- A Relay board and electrically powered DCVs are used to sequence two double acting cylinders.
- Different operations with Double acting Cylinders using Different DCV, such as 4/2, 4/3.
- Monitoring the speed of a hydraulic motor at various speeds.
- Pressure and flow characteristics of a pressure relief valve, meter out and meter in circuit, as well as the characteristics of a throttle valve and a flow control valve, are all visible.
- hydraulic cable crane with load employing pressure switch and hydraulic motor.
- circuit for a hydraulic rectifier.

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TOTAL HOURS: 30

SIGNATURE OF STUDENT

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Signature of Faculty Mentor

Signature of officer-in-charge of Dept. / Section / Plant

Date: 09/05/23

Date: 10/04/23

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ANNEXURE-1 (WEEKLY REPORT 9)

GUJARAT TECHNOLOGICAL UNIVERSITY
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Annexure I
Enrollment no: 190390119003

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: Gauravkumar Jayeshbhai Bhuva

DIARY OF THE WEEK: Dt: 10/04/23 **TO** 16/04/23

DEPARTMENT: Mechanical **SEM:** 8th

NAME OF THE ORGANISATION: GTU [GSET - Graduate School of Engineering & Technology

NAME OF THE PLANT/SECTION/DEPARTMENT: GTU - Bosch Center of Excellence in Automation

NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT: Jeet Joshi

DESCRIPTION OF THE WORK DONE IN BRIEF

- Fundamentals of Proportional Valves. [Integrated electronics in a 4/3 proportional DCV.]
- Used a potentiometer to move a cylinder utilising proportional DCV as an example of a practical use.
- PDCV is used to change the system pressure.

=> Practicals using the command value module were completed:- Traversing a cylinder with different speed, Accelerating & decelerating the cylinder using ramps., setting braking distance after proximity switch during extension of cylinder.

=> Pneumatic Practicals:- Operate single acting and double acting cylinder using 3/2 push button, pilot, roller operated DCV.
- Utilising the throttle valve to control the cylinder's speed.
- Use on time delay to operate the cylinder extension and retraction.
- Performed many logic gates, including AND, NOR, NAND and NOT.

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TOTAL HOURS: 30

SIGNATURE OF STUDENT

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Signature of Faculty Mentor

Signature of officer-in-charge of Dept. / Section / Plant

Date: 09/05/23

Date: 17/04/23

Grading of Work, for trainee may be given depending upon your judgement about his Punctuality, Regularity, Sincerity, Interest taken, Work done etc.

Team ID: 299350

ANNEXURE-1 (WEEKLY REPORT 10)

GUJARAT TECHNOLOGICAL UNIVERSITY
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Annexure I
Enrollment no: 190390119003

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: Gauravkumar Jayeshbhai Bhuva

DIARY OF THE WEEK: Dt: 17/04/23 **TO** 23/04/23

DEPARTMENT: Mechanical **SEM:** 8th

NAME OF THE ORGANISATION: GTU [GSET- Graduate School of Engineering & Technology]

NAME OF THE PLANT/SECTION/DEPARTMENT: GTU- Bosch Center of Excellence in Automation

NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT: Jeet Joshi

DESCRIPTION OF THE WORK DONE IN BRIEF

- Performed both manually and electronically on the cylinder sequencing
- Performed Practicals on Controlling Speed and position of cylinder using sensor and limit Switch
- Control of a double acting cylinder utilising a sensor that detects 50% of the cylinder's retraction.
- Peneumatic cylinder with sequencing is used to press a sleeve into a metal block
- Using a vaccum cup gripper and pilot pressure to hold material.
- The use of a proportional PRV in circuit to control System pressure.

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TOTAL HOURS: 30

SIGNATURE OF STUDENT

- The above entries are correct and the grading of work done by Trainee is
EXCELLENT / VERY GOOD / GOOD / FAIR / BELOW AVERAGE / POOR

Signature of Faculty Mentor

Signature of officer-in-charge
of Dept. / Section / Plant

Date: 09/05/23

Date: 24/04/23

- Grading of Work, for trainee may be given depending upon your judgement about his Punctuality, Regularity, Sincerity, Interest taken, Work done etc.

ANNEXURE-1 (WEEKLY REPORT 11)

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ગુજરાત ટેકનોલોજીકલ યુનિવર્સિટી
(ગુજરાત અધિનિયમ ક્રમાંક: ૨૦/૨૦૦૭ દ્વારા સ્થાપિત)

Annexure I

Enrollment no: 190390119003

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: Bhuva Gaurangkumar Jayeshbhai

DIARY OF THE WEEK: Dt: 24/04/2023 **TO** 30/04/2023

DEPARTMENT: Mechanical **SEM:** 8th

NAME OF THE ORGANISATION: GTU GSET - Graduate School of Engineering & Technology

NAME OF THE PLANT/SECTION/DEPARTMENT: GTU - Bosch Center of Excellence in Automation

NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT:

DESCRIPTION OF THE WORK DONE IN BRIEF

- this week we had to make one application of hydraulic and pneumatic system using PLC that would include a pneumatic or Hydraulic system or integrated based on our learning.
- Application : Automation Drill control System
- Discussion on which components are suitable for our application
- Component list:

Capacitive Sensor	Double acting Hydraulic cylinder
Inductive Sensor	Two Double-acting Pneumatic cylinder
Proportional valve	2/3 DCV Solenoid Operated
Analog output module	PLC

- Complete simulation of our application in the automation studio software.

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(ગુજરાત અધિનિયમ ક્રમાંક: ૨૦/૨૦૦૭ દ્વારા સ્થાપિત)

TOTAL HOURS: 30

SIGNATURE OF STUDENT

- The above entries are correct and the grading of work done by Trainee is EXCELLENT / VERY GOOD / GOOD / FAIR / BELOW AVERAGE / POOR

Signature of Faculty Mentor

Signature of officer-in-charge of Dept. / Section / Plant

Date: 09/05/23

Date: 01/05/23

- Grading of Work, for trainee may be given depending upon your judgement about his Punctuality, Regularity, Sincerity, Interest taken, Work done etc.

ANNEXURE-1 (WEEKLY REPORT 12)

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(ગુજરાત અધિનિયમ ક્રમાંક: ૨૦/૨૦૦૭ દ્વારા સ્થાપિત)

Annexure I

Enrollment no: 190790119003

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: Bhavsar Gaurangkumar Jayeshbhai

DIARY OF THE WEEK: Dt: 01/05/2023 **TO** 07/05/2023

DEPARTMENT: Mechanical **SEM:** 8th

NAME OF THE ORGANISATION: GTU [GSET- Graduate school of Engineering & Technology

NAME OF THE PLANT/SECTION/DEPARTMENT: GTU- Bosch centre of Excellence in Automation

NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT: Jeet Joshi

DESCRIPTION OF THE WORK DONE IN BRIEF

- Complete the ladder diagram of the System in indra logic software.
- checking ladder diagram in PLC Simulator that working or not.
- Had done the physical Connection of hydraulic and pneumatic circuits and PLC connection with System
- Set Proportional value according to differende Speed requirement with the help of analog output module.
- Connect input and output sensor for Start the process
- check the System work properly according to the set value of proportional valve.

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TOTAL HOURS: ___30________

SIGNATURE OF STUDENT

The above entries are correct and the grading of work done by Trainee is EXCELLENT / VERY GOOD / GOOD / FAIR / BELOW AVERAGE / POOR

Signature of Faculty Mentor

Signature of officer-in-charge of Dept. / Section / Plant

Date: 09/05/23

Date: 06/05/23

Grading of Work, for trainee may be given depending upon your judgement about his Punctuality, Regularity, Sincerity, Interest taken, Work done etc.

APPENDIX-2

ANNEXURE-2 (FEEDBACK FORM)

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Annexure 2

Feedback Form by Industry expert

Student Name: Gaurangkumar Jayeshbhai Bhuva Date: 10/05/23

Work Supervisor: Jeet Joshi Title: Feedback Form

Company/Organization: GTU - BOSCH Center of Excellence in Automation

Enrollment No: 190390119003

Internship Address: GTU - Nr. Vishwakarma Government Engineering College Nr. Visat Three Road, Visat - Gandhinagar Highway

Dates of Internship: From 13/02/2023 to 10/05/23

Please evaluate your intern by indicating the frequency with which you observed the following behaviors:

Parameters	Needs improvement	Satisfactory	Good	Excellent
Shows interest in work and his/her initiatives				✓
Produces high quality work and accepts responsibility			✓	
Uses technical knowledge and expertise				✓
Analyzes problems effectively				✓
Communicates well and writes effectively			✓	

Overall performance of student intern: (Needs improvement/ Satisfactory/Good/Excellent)

Additional comments, if any: No

Signature of Industry person with name and Stamp:

Signature of the Faculty Mentor Ashutosh Gohel

McCain`s Foods PVT LTD

AN INTERNSHIP REPORT

Submitted by

HARSHITSINH BHUPENDRASINH CHAUHAN

190390119004

In partial fulfillment for the award of the degree of

BACHELOR OF ENGINEERING

In

Mechanical Engineering

S.P.B. Patel Engineering College, Mehsana

Gujarat Technological University, Ahmadabad
May, 2023

S.P.B. Patel Engineering College

Near Shanku's Water Park, Ahmadabad – Mehsana Highway, Linch Gujarat

CERTIFICATE

This is to certify that the project report submitted along with the project entitled **Internship at McCain`s Food PVT LTD** has been carried out by **HARSHITSINH BHUPENDRASINH CHAUHAN** under my guidance in partial fulfillment for the degree of Bachelor of Engineering in Mechanical Engineering, 8th Semester of Gujarat Technological University, Ahmedabad during the academic year 2022-23.

Sign	Sign
Internal Guide	HOD
Prof. Ashutosh Gohel Mechanical Engineering dep, S.P.B Patel Engineering College Mehsana	Prof. Kunalsinh kathia Mechanical Engineering dep, S.P.B Patel Engineering College Mehsana

Company Certificate

Great Place To Work Certified

JULY 2022 - JULY 2023 INDIA

Date: 09 May'2023

TO WHOMSOEVER IT MAY CONCERN

This is to certify that **Mr. Harshitsinh Chauhan** is a student of **S.P.B. Patel Engineering College, Mehsana** Studying **B.E Mechanical Engineering** has successfully completed his Internship training from 06th Feb 2023 to 05th May 2023 at our Mehsana plant.

During his training period, he took an active interest and exerted a sincere approach toward learning and understanding various aspects covered during the training period.

We wish him all the best for his successful learning journey ahead.

For, McCain Foods India Private Limited

Sr. Manager Manufacturing, Agriculture & Quality and Lead Talent Acquisition- India

McCain Foods (India) Private Limited
Factory Address :
SH-41, Milestone #54, Survey No. 165, P.O. Baliyasan,
Distt. Mehsana, Gujarat - 384 455 INDIA
Tel. : +91 2762 614000 (30 Lines) Fax : +91 2762 283101
Registered Office :
Ground Floor, The Crescent, Plot No 1 to 7, LSC, Lado Sarai,
New Delhi - 110030 INDIA Tel. : +91 11 46699000

+91 11 46699000
www.mccainindia.com
CIN : U15139DL1996PTC077452

PMMS CERTIFICATE

GUJARAT TECHNOLOGICAL UNIVERSITY

CERTIFICATE FOR COMPLETION OF ALL ACTIVITIES AT ONLINE PROJECT PORTAL

B.E. SEMESTER VIII, ACADEMIC YEAR 2022-2023

Date of certificate generation : 13 May 2023 (08:08:47)

This is to certify that, ***Chauhan Harshitsinh Bhupendrasinh*** (Enrolment Number - 190390119004) working on project entitled with ***Internship at McCains Foods PVT ltd*** from ***Mechanical Engineering*** department of ***S. P. B. PATEL ENGINEERING COLLEGE, MEHSANA*** had submitted following details at online project portal.

Internship Project Report	**Completed**

Name of Student : Chauhan Harshitsinh Bhupendrasinh

Name of Guide : Mr. Ashutosh Gohel

Signature of Student : ____________

*Signature of Guide : ____________

Disclaimer :
This is a computer generated copy and does not indicate that your data has been evaluated. This is the receipt that GTU has received a copy of the data that you have uploaded and submitted as your project work.

*Guide has to sign the certificate, Only if all above activities has been Completed.

S.P.B. Patel Engineering College, Mehsana

Near Shanku's Water Park, Ahmadabad – Mehsana Highway, Linch, Gujarat

DECLARATION

We hereby declare that the Internship report submitted along with the Internship entitled **McCain`s Foods PVT LTD** submitted in partial fulfillment for the degree of Bachelor of Engineering in **Mechanical Engineering** to Gujarat Technological University, Ahmedabad, is a bonafide record of original project work carried out by me under the supervision of **Prof. Ashutosh Gohel** & **Ajitsinh Rathod (External Guide)** and that no part of this report has been directly copied from any students' reports or taken from any other source, without providing due reference.

Name of the Student	Sign of Student
1. **Harshitsinh Bhupendrasinh Chauhan**	________________

ACKNOWLEDGMENT

It was indeed an opportunity for me to do an internship at McCAIN`S FOODS PVT LTD, MEHSANA and prepare a Report on the same during B.E 8th semester. During my internship at the company for training and also preparing this Report. I learnt many interesting things about the company, along with the aspects of industry as a whole.

Preparation of such a report, which is based on secondary information, requires data gathering from many sources like Company Personnel, Company Websites. Other Websites, Company Reports, and Other Literature.

I am thankful to Mr. AJITSINH RATHOD , who permitted me for internship in the company and allowed me to prepare the Report. I am also thankful to the Departmental Heads of the company, who provided me with the required information. Moreover I thank all those who supported me directly or indirectly in preparing this Report.

I would like to express my gratitude to PROF. ASHUTOSH GOHEL & PROF. KUNALSINH KATHIA for helping me in the preparation of this Report Last but not least, I am thankful to all other my sir and my college and also my university GTU for providing me such a helpful Summer Internship or Industrial Engineering Training.

Abstract

This report contains the work done by the author during his internship at **McCain`s Foods PVT LTD** . Since 1998, McCain has been engaged in agriculture R&D and in development of the frozen food market in India. This company makes different types of packaged food like McCain Aloo Tikki, Veggie Nuggets, Masala Fries, Pudina Chatka Smiles, Chilli Garlic Potato Bites. This Company has a 500 cr turnover in India. In this company there are 1000 workers who work in shifts. This company has different types of departments like Marketing, Finance, Sales, Human Resources, Logistics, Procurement, Agriculture, Research and Development, Digital Technology, Engineering, Legal, Utility, Production and Manufacturing etc . In this i am in Utility department the Utility management keeps track of asset performance and enables you to monitor & analyze performance to minimize consumption and I am working in this department as a intern.

List of Figures

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Chapter 1
INTRODUCTION

1.1 COMPANY PROFILE

McCain Foods Ltd. is one of the world's largest producers of French Fries and Potato Specialties. Located in Florenceville, New Brunswick, Canada, McCain has grown to become a global leader in the frozen food industry. From Canada, across the world to Japan, from the tip of Argentina to suburbs in Australia, our tasty and convenient food products are served in restaurants and sold in retail stores, adding nutrition and flavor to family meals time after time. From Canada, across the world to Japan, from the tip of Argentina to suburbs in Australia, our tasty and convenient food products are served in restaurants and sold in retail stores, adding nutrition and flavor to family meals time after time.

McCain Foods (India) is a wholly-owned subsidiary of McCain Foods Limited in Canada. Since 1998, McCain has been engaged in agriculture R&D and in development of the frozen food market in India and subcontinent countries. McCain products are used by leading fast food chains, hotels, restaurants, catering companies and are popular forin-home consumption.

At McCain, it's our constant endeavor to create good food that is delightfully fresh. In order to maintain an impeccable standard of quality, we strive to use the highest quality ingredients. Our products are prepared simply with wholesome ingredients made by good people who care about delivering quality in every box, every bag and every bite.

McCain focuses on providing great variety to customers and consumers. A delectable range of products is available, world favorites like McCain French Fries, McCain Smiles and local delights such as McCain Aloo Tikki, and cheese appetizers like Potato Cheese Shotzand Mini Samosa. ***One In Every French Fries Around The World Is A McCain Fry. World Class Potato Processing Plant In Mehsana District Of Gujarat.***

Table 1.1 Company Intro

Global Sales Of Over	$ 9.1 Billon
Products Marketed In World Over	160 Countries
Market Share	26%
Production Facilities Around The World	53
No. Of Employees	26,000

Figure 1.1 McCain`s Business at a Glance

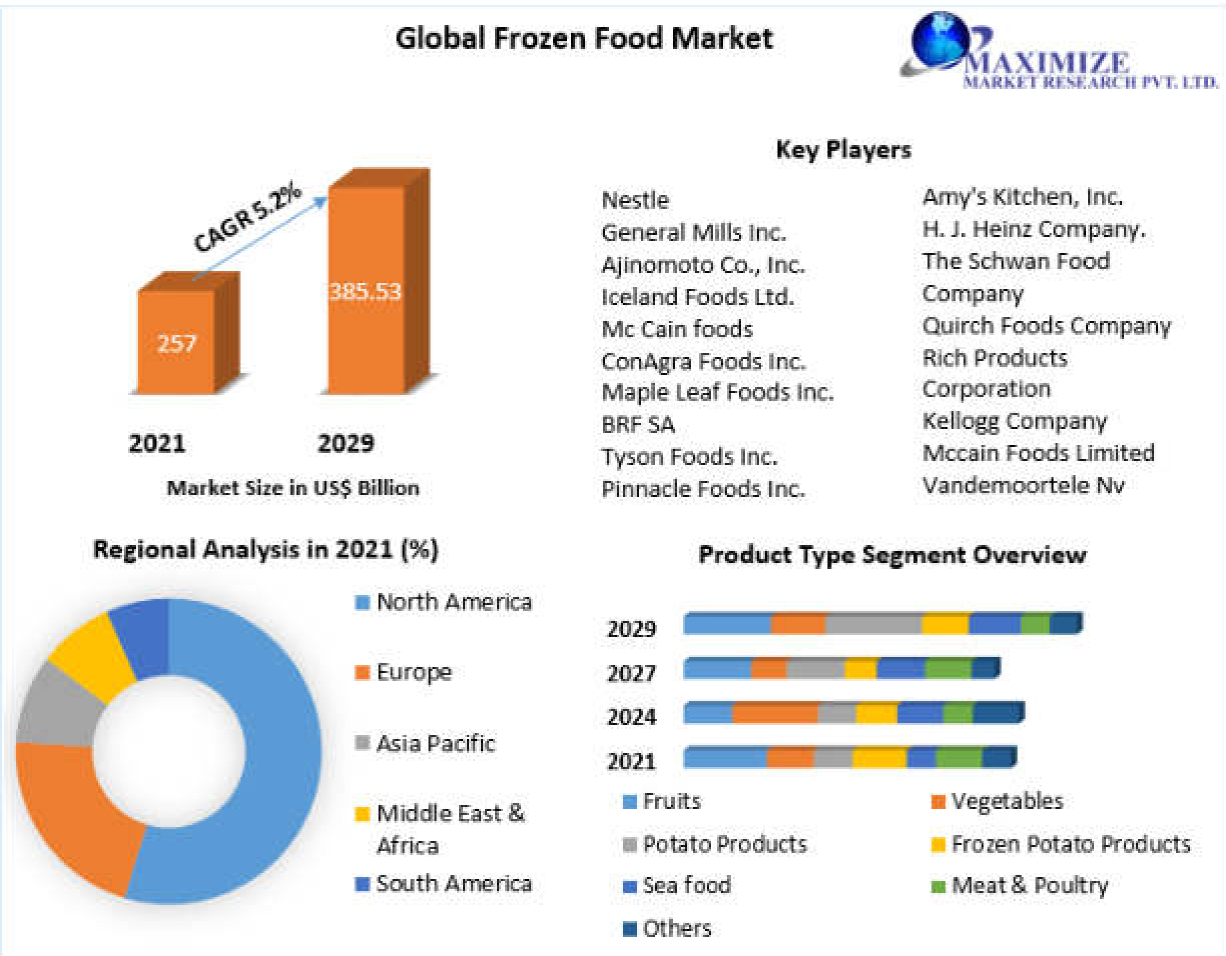

Figure 1.2 Global Frozen food McCain`s Share

1.2 COMPANY AT GLOBAL

McCain Foods is a global business with presence across Canada, US, Brazil, Argentina, Colombia, UK, Ireland, France, Belgium, Netherlands, Poland, Australia, New Zealand, South Africa, India, Japan, Malaysia, China…and more. We have a significant food production network with a total of 51 production facilities globally, 95% located in rural communities.

As well as our founding location of Florenceville Canada, our significant network of global and local market teams around the world are supported by our corporate head office based in the heart of Toronto Canada.

Figure 1.3 McCain`s

Figure 1.4 Global Footprint

1.3 Company Product.

The McCain`s Company has so many products of cheese, potato etc. And all products are Frozen Foods. In which the product was categories in three ways :-

1) All Time Favorite
2) Local Delight
3) Cheese Lovers

1.3.1 All Time Favorite.

McCain`s words for All Time Favourite “ There are many snacks that come to mind when one thinks about all time favourite snacks and we are sure that most of you would have French Fries, Burgers Patty and Wedges, on that list! These have, over-time, quickly become our go to goodies!”

1) McCain's Crazy Fries with Masala Mix (Herb ‘N’ Garlic)

Figure 1.5 McCain's Crazy Fries with Masala Mix (Herb ‘N’ Garlic)

Now spice up your snack time with New Crazy Fries with Masala Mix.Your favorite crispy mix sachet and sprinkle it all over the hot fries to experience the magic of flavors. Fries in a crazy shape & lip-smacking Herb n Garlic Masala Mix inside. Just cut open the masala.

2) McCain`is Crazy Fries with Masala Mix (Hot 'N' Tangy).

Figure 1.6 McCain`is Crazy Fries with Masala Mix (Hot 'N' Tangy)

Now spice up your snack time with New Crazy Fries with Masala Mix.Your favorite crispy fries in a crazy shape & lip-smacking Hot n Tangy Masala Mix inside. Just cut open the masala mix sachet and sprinkle it all over the hot fries to experience the magic of flavors.

3) McCain Smiles Tangy Tomato.

Figure 1.7 McCain Smiles Tangy Tomato

Your Favourite McCain Smiles, now in a lip smacking tangy saucy taste. Add more zing to your evening snacks with the all new Tangy Tomato Smiles.

4) McCain Veggie Burgers.

Figure 1.8 McCain Veggie Burgers

McCain Veggie Burger Patty is a fine blend of fresh vegetables and mashed potatoes. Sprinkled with delicious spices and coated with crispy bread crumbs, these burger patties ensure that each mouthful of burger tastes absolutely delectable

5) McCain Super Wedges.

Figure 1.9 McCain Super Wedges

McCain Super Wedges are crispy coated potatoes, shaped into wedges and tossed in a special blend of seasoning and herbs. Ready in minutes and perfect as snacks

6) McCain Similes.

Figure 1.10 McCain Similes

McCain Smiles are appetizing delicacies that are made up of mashed potatoes, seasoned and shaped into happy faces that can easily brighten up your day.

7) McCain French Fries.

Figure 1.11 McCain French Fries

McCain French Fries are sensational to taste-they are crispy on the outside and fluffy on the inside and have a great taste that lingers on your palate throughout!

1.3.2 Local Delight.

1) McCain Aloo Tikki

Figure 1.12 McCain Aloo Tikki

McCain Aloo Tikki recreates the magic of the blend of mashed potatoes and the traditional Indian spices. This is a perfect pick for an instant indulgence!

2) McCain Veggie nuggets

Figure 1.13 McCain Veggie nuggets

McCain Veggie Nuggets is an amazing combination of potatoes, vegetables and a bold tandoori seasoning, that is finely coated in crispy golden bread crumbs, our Veggie Nuggets will make sure that you enjoy every bite thoroughly!

3) McCain Masala Fries.

Figure 1.14 McCain Masala Fries

McCain Masala Fries are made with a combination of six authentic Indian Spices, with a twist of a hot and spicy seasoning ensures that you cannot say no to this wonderful snack!

4) McCain Smiles Pudina Chatka.

Figure 1.15 McCain Smiles Pudina Chatka

McCain Smiles Pudina Chatka, is a brilliant amalgamation of mashed potatoes, seasoned with a chatpata pudina flavor and shaped into happy faces. The tangy flavor of this snack, will keep your taste buds craving for more.

5) McCain Chilli Garlic Potato Bites.

Figure 1.16 McCain Chilli Garlic Potato Bites

McCain Chilli Garlic Potato Bites are delicious potato nuggets that are seasoned with the amazing flavors of chili and garlic. A single bite of this little delight, will leave you craving for more!

1.3.3 Cheese Lovers

1) McCain Potato Cheese Shotz.

Figure 1.17 McCain Potato Cheese Shotz

McCain Potato Cheese Shotz are a union of potatoes and herbs that is stuffed with the gooiest cheese that you can come across. Coated in crunchy golden breadcrumbs, this titbit offers you taste and texture in every bite!

2) McCain “Cheese Corn Filling” Mini Samosa.

Figure 1.18 McCain “Cheese Corn Filling” Mini Samosa

Our McCain "Cheese Corn Filling" Mini Samosa is a combination of Cheese & Corn. Crunchy outside and gooey inside. This makes for an ideal snack, anytime during the day!

3) McCain “Cheese Pizza Style Filling” Mini Samoa.

Figure 1.19 McCain “Cheese Pizza Style Filling” Mini Samoa

Our McCain "Cheese Pizza Style Filling" Mini Samosa is a combination of Cheese & Pizza. Crunchy outside and gooey inside. This makes for an ideal snack, anytime during the day!

4) McCain Chilli Nuggets.

Figure 1.20 McCain Chilli Nuggets

McCain Chilli Cheese Nuggets are delicious bite sized snacks which are hot and crispy on the outside with a melting cheddar cheese filling and flavorful hit of red chili and jalapenos on the inside.

Chapter 2
INTRODUCTION OF DEPARTMENT

A department is a separate functional area within an entity that has its own organizational structure. A department typically has its own manager and operating budget. Departments may be classified as cost centers, revenue centers, or investment centers .

Departments tend to result in higher levels of process efficiency, because they are staffed with specialists that have a solid understanding of how those processes are supposed to function.

2.1 Marketing

A marketing department promotes your business and drives sales of its products or services. It provides the necessary research to identify your target customers and other audiences. Depending on the company's hierarchical organization, a marketing director, manager or vice president of marketing might be at the helm. In some businesses, a vice president of sales and marketing oversees both the marketing and sales departments with a strong manager leading each department.

2.2 Finance

A finance department is the unit of a business responsible for obtaining and handling any monies on behalf of the organization. The department controls the income and expenditure in addition to ensuring effective business running with minimum disruptions. Besides the traditional roles of handling the payroll, income and expenses, finance department responsibilities also include economic analysis to improve key business strategies.

2.3 Sales

A sales department is responsible for selling products or services for a company. The department comprises a sales team that works together to make sales, increase profitability and build and maintain relationships with customers to encourage repeat purchases and brand loyalty. If you're a job seeker interested in sales, you may want to know more about the functions of a sales department . In this article, we discuss sales department functions and the objectives of a sales department, explain why the sales department is important in a company and describe how to become a sales representative.

2.4 Human Resources (HR) Department

Within a company, human resources (HR) is responsible for screening, recruiting, and training employees, as well as implementing employee processes. In effect, HR departments are specifically responsible for managing a company's entire employee experience, from the moment an individual applies to a position to when they begin working there, and, finally, when they leave it.

In some companies, HR also administers compensation benefits. HR departments exist to add value to an organization by providing objective guidance to managers and employees on people-related matters. This work is done through a combination of day-to-day support for employees, project work, and long-term strategic planning. A well-managed HR department finds the right people for the job and does what it takes to keep them content and productive.

2.5 Procurement Department

For professionals, procurement means the process of identifying, shortlisting, selecting, and acquiring needed goods or services from a third-party vendor.

It can be done through direct purchase, competitive bidding, or tendering process while making sure that the delivery of the supplies is done in a timely manner.

2.6 Logistics Department

Logistics actually has many roles. The most well known role of logistics is sales logistics that moves products from the producer to the consumer. In addition to sales logistics, logistics can also be split into four other roles depending on the field. These are procurement logistics, production logistics, recovery logistics, and recycling logistics.

The roles of logistics feature transportation/delivery, storage, packaging, cargo handling, distribution processing, and information processing, and many systems have been put in place to deliver products from the production location or factory to the consumer quickly and on time.

2.7 Agriculture Department

The main objective of the Department of Agriculture is to give pace to the growth rate of agriculture development and crop production and productivity which will strengthen the economic status of the farmers and uplift their life-style. In addition to this, the objective of the department is to implement suitable scheme for removal of regional disparity and employment generation .

2.8 Digital, Technology, IT Department

The IT department oversees the installation and maintenance of computer network systems within a company. This may only require a single IT employee, or in the case of larger organizations, a team. Its primary function is to ensure that the network runs smoothly.

2.9 Engineering Department

Engineering departments are in charge of developing innovative devices to bring out advanced materials into the world and designing, introducing, preserving and improving plants for stable and efficient production.

2.10 Research and Development Department

Research and development includes the many tasks a company undertakes in order to invent and introduce new products and services for consumers or clients. Most of these tasks involve tasks to better understand which specific products and services are most desired, useful and marketable to their clients or consumer base. These tasks may include:

Analyzing
consumer data
Testing product
builds
Designing and implementing
surveys
Reviewing market research

2.11 Legal Department

The legal department is the section of a company responsible for keeping that company's operations compliant with all the relevant laws and regulations in force. It is staffed by lawyers and legal experts, who can be considered the company's legal counsel.

2.12 Production and Marketing Department

The marketing department works closely with the production department to ensure that: adequate research and development is planned to satisfy current and future customer needs. the item can be manufactured to the quality and design desired by the consumer.

2.13 Project Department

A project management office (PMO) is a group, agency or department that defines and maintains the standards of project management for a company. The PMO retains the documentation and metrics for executing projects and is tasked with ensuring projects are delivered on time and within budget.

2.14 Utility Department

Utilities (gas, water, and electricity) are essential services that play an important role in social and economic development. The utility industries are companies that develop and support the infrastructure required to provide gas, electricity, and water or to manage wastewater and sewage; they additionally provide other associated services that utilize that infrastructure. Utility services play a crucial role in modern Society and worked as interns in this Utility department in McCain's Foods company. And I am working in this department as a intern

CHAPTER 3
UTILITY DEPARTMENT

Utilities (gas, water, and electricity) are essential services that play an important role in social and economic development. The utility industries are companies that develop and support the infrastructure required to provide gas, electricity, and water or to manage wastewater and sewage; they additionally provide other associated services that utilize that infrastructure. Utility services play a crucial role in modern Society and worked as interns in this Utility department in McCain's Foods company.

McCain's Utility department provides RO Water, Surface Water, Steam, Cooling and also does the Oil separation; these all are cycles that work 24/7. There were Ten Operators and One head on them. The ten operators work on shift base and Head only came in General shift. Because all the Utility system works 24/7 then it is necessary to have two operators every time 24/7 to the system. ALL systems have their own automation with all parameters, temperature etc. Because of this every small or big problem is solved before that problem damages the system. Because of this the system gets more work-life. Because of this there is no downtime in the plant and the production is done on time but also delivered on time. That is why we say the Utility Department is the backbone of the company because without resources everything stops working. The utility system is given below.

3.1 Boiler

The McCain`s is a Food Company Which makes different types of Frozen Foods.In McCain`s Foods ingredients have 90% availability of potato. So, Because of this we have to wash it, clean it. Then there was a peeler, blanture, sapp tank, dryer, and at last there was a fryer. For all this process we need a Steam to done work and that steam is given from Boiler.So, Boiler produces high pressure steam & high temperature steam and sends that steam to the product making process or machines. So, In McCain`s there was Three Plants of Production, One Plant of Oil Separation and Waste Water Treatment Plant and Boiler steam is used in that all places.

So, for work done in a comfortable manner, McCain`s company has two boiler. In which one boiler produced steam is given to plant one & plant two and also to oil separation plant and second boiler steam is given to the plant three and waste water treatment plant. This first boiler has lower capacity than other boilers. This boiler have only capacity of 10 TPH, working pressure is 24.00 kg/cmsq. This boiler was manufactured and supplied to the company in 2006 and it was made by forbes marshall. This boiler has low capacity then it is only useful for plant one & plant two and just for oil separation. Because plant one & plant two have low capacity of production like plant one has only two tonnes in one hour and plant two has only 2.5 tonnes in one hour.

So, This all about boiler one but now we talk about second boiler. Which more capacity than first one and this boiler capacity of 16 TPH, working pressure is 24.00 kg/cms. This Boiler was manufactured and supplied to the company in 2013 and It was made by Thermax company. This Boiler steam is used in plant three and waste water treatment plant. This boiler has large capacity because the plant three have a very high intensity production rate which makes 14 tonnes in one hour.That's why this boiler has more capacity than the first boiler. But there was also a bypass for boiler two which was connected to the Plant one & Plant two so in an emergency situation it also gives steam to that plant one & plant two.

3.1.1 Boiler Accessories and Mountings.

The boiler accessories are the devices, which form an integral part of a boiler but are not mounted on it. They include a super heater, economizer, feed pump etc. It may be noted the accessories help in controlling and running the boiler efficiently.

The boiler accessories are required to improve the efficiency of the steam power plant and to enable the proper working of the boiler. The boiler accessories aren’t mounted directly on the boiler.

1. Economizer
2. Air preheater
3. Superheater
4. Feed pump
5. Steam Separator
6. Steam trap

In this Accessories only two are used in McCain's Boiler and it is Economizer and Feed pump.

1. Economizer

The combustion gasses coming out of the boiler contain a large quantity of heat. Therefore the maximum amount of heat from the gasses should be recovered before it escapes to the chimney. In the economizer, heating the feed water does the recovery of heat in the flute glasses. The economizer is placed in the path of the gasses. They improve the overall efficiency of the boiler by reducing fuel consumption.

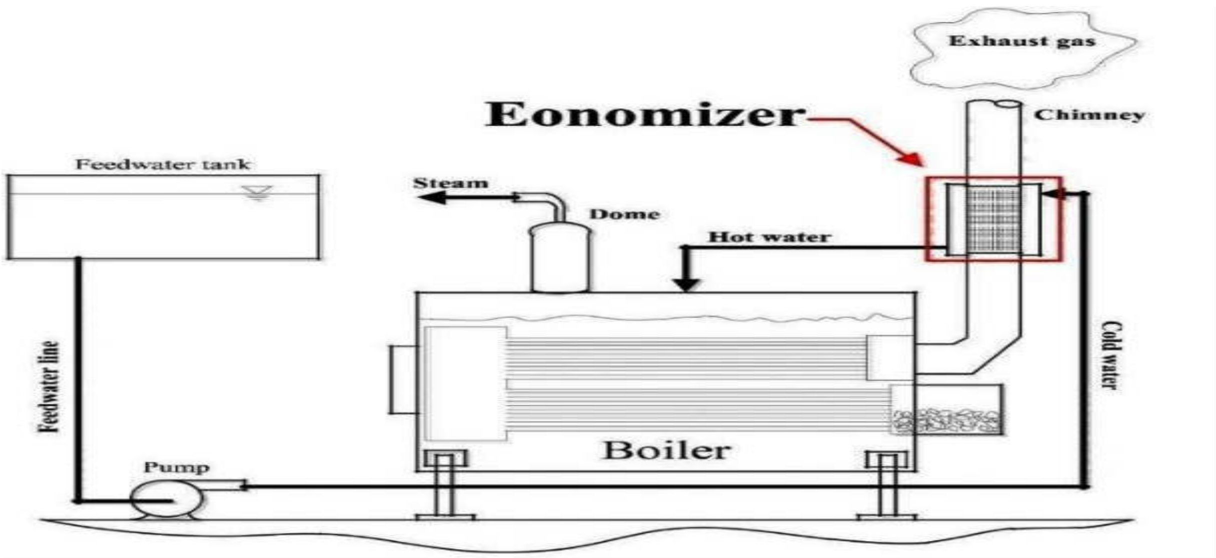

Figure 3.1 Economizer

2. Feed pump

A boiler feed water pump is a specific type of pump used to pump feed water into a steam boiler. The water may be freshly supplied or returning condensate produced as a result of the condensation of the steam produced by the boiler. These pumps are normally high pressure units that take suction from a condensate return system and can be of the centrifugal pump type or positive displacement type.

Figure 3.2 Feed Pump

The boiler mountings are fittings which are mounted on the boiler for its proper functioning. Mountings are water level indicator, safety valve, pressure gauge, etc. It may be noted that a boiler cannot function safely without the mountings.

1. Water level indicator
2. Pressure gauge
3. Safety valve
4. Stop valve
5. Blow off
6. Feed check valve

1. Water level Indicator

It is a main fitting in the boiler, Water level indicator indicates the water level inside the boiler. It is a safety device upon which safe working of the boiler depends.

Figure 3.3 Water Level Indicator

2. Pressure gauge

Pressure gauges are used to measure the pressure of steam inside a steam boiler. The pressure gauge is fixed in front of a steam boiler.

Figure 3.4 Pressure Guage

3. Safety Valve

These are the devices attached in the steam boiler for preventing explosions due to excessive internal pressure of steam. The safety valve is an instrument which prevents the boiler pressure from rising above its normal working pressure by automatically opening when the boiler pressure exceeds the normal working pressure, Thus allowing excess steam to escape into the atmosphere until the pressure comes down to its normal valve. Thus, a safety valve ensures safety to a boiler from being damaged due to excessive steam pressure.

Figure 3.5 Safety Valve

4.Stop Valve

The function of a stop valve is to control the flow of the steam from within the boiler and to stop it completely when required. A stop valve or junction valve is used to regulate the flow of steam from the boiler.The valves mounted on the boilers, which change the direction of flow of steam by 90° are called junction valves, while valves fitted in pipelines which allowing the steam in the same direction are called stop value.

Figure 3.6 Stop Valve

5.Blow off

The function of a blow-off valve is to remove periodically the sediments deposited at the bottom of the boiler while the boiler is in operation and to empty the boiler while it is being cleaned or inspected.When the blow-off valve is opened the water which is under the pressure of steam, rushes out with tremendous velocity thus carrying out the sediments along with it.

Figure 3.7 Blow Off

6.Feed check valve

When the level of water in the boiler falls, it is brought back to the specified level by supplying the additional water called feed water. The pressure inside the boiler will be high therefore the pressure of the feed water has to be raised by a pump before it is fed into the boiler. The feed water under high pressure is fed into the boiler through the feed check valve. The function of a feed check valve is to control the flow of water from the feed pump to the boiler and to prevent the back flow of water from the boiler to the pump when the pump pressure is less than the pressure or when the feed pump ceases to work. Evidently the feed check valve is placed at the boiler end of the delivery pipe of the feed pump.

Figure 3.8 Feed Check Valve

- **Boiler Cycle**

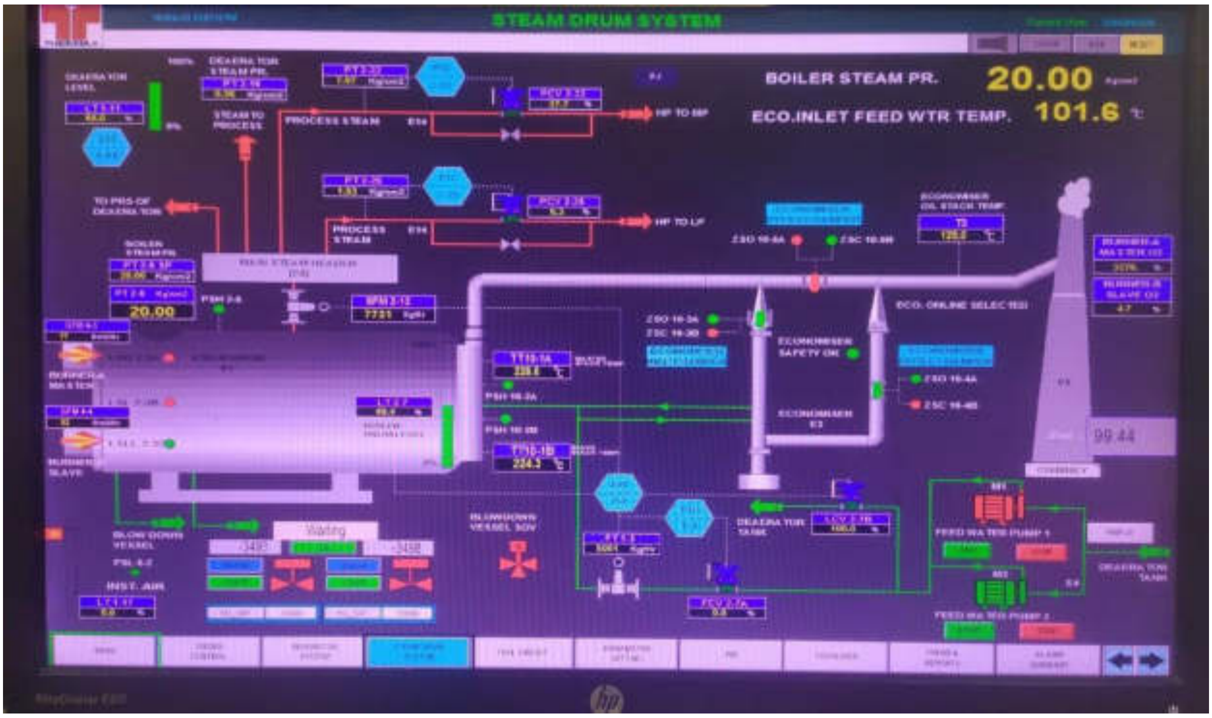

Figure 3.9 Boiler cycle

As shown in the figure this is a complete boiler cycle. first the surface water is purified in the ro then that ro water goes to the deaerator. in deaerator it control the water hardness, pH, odor etc. then it goes to the feed pump. there is a feed pump in that one is for use and another one is used when the first one is stopped. the feed pump is used to pass the water to the boiler very forcefully.

Then from the feed pump the water goes to the economizer in it there was very high temperature flue gas which came out from the boiler. so for more efficiency water is already heated before going to the boiler. ex like if flue gas temperature on coming out from boiler is 250 degree then when it come out from economizer its temperature is like 120 degree . because of this we save more gas which was used in the boiler.

Then in the boiler the water converts into steam and its pressure is like 20kg. and from header it is divided as per machine. ex like peeler and fryer needed accumulator in it the steam stored and then goes to the machine. the used steam is called condensate, it goes to the deaerator and again the cycle is started. this boiler works on closed cycle. in this i learn all the system of boiler how it is works. and i also learn how to take parameters of blow down, feed water, condensate water, deaerator water. and i also how watch the automation of the boiler.

Figure 3.10 Line 1&2 Boiler Room

Figure 3.11 Line 3 Boiler Room

3.1.2 BOILER PARAMETERS

Table 3.1 Boiler Feed Water

Boiler Feed Water				
PH	TDS	TH	PAIK	MALK
8.2-9.2	<50	0	<20	<50

Table 3.2 Boiler Blowdown Water

BOILER BLOWDOWN WATER						
PH	TDS	TH	PALK	MALK	SULFITE	PO4
10.5-11.5	3500	0	<450	<600	20-50	20-40

Table 3.3 Dearator Feed Water

DEARATOR FEED WATER { RO WATER }			
PH	TDS	TH	MALK
7.0-8.0	50	0	50

Table 3.4 Condensate Return Water

CONDENSATE RETURN WATER	
PH	TDS
8-9	<5

3.2 Refrigeration

In this plant water is cooled using refrigeration which uses ammonia as refrigerant and operates on VCR Cycle.In which the cooing goes to cold store, tote room, packaging room, weighing room, anti room, freezer, loading dock. It contains components are given below.

1. High pressure receiver
2. Low pressure receiver
3. Refrigeration Compressor
4. Condensor
5. Economiser

1. High pressure receiver

The high-pressure receiver also called liquid receiver is generally needed in a refrigeration system when operating less than its full nominal capacity. Liquid receivers are generally installed close to the condenser outlet. High pressure liquid receivers permit also to maintain a sufficient head pressure during low ambient temperature.

The high-pressure receiver permits to hold excess refrigerant which is not in circulation due to lower capacity needs. It's a storage pressure vessel which is generally sized for 80 % to 100 % of the full refrigeration system charge.The Local liquid receiver tank is designed for a huge variety of refrigerants used in industrial refrigeration systems such as R717 ammonia, R744 carbonic dioxide CO_2, R290 propane, etc.

Docal custom made high pressure receivers are designed for vertical or horizontal orientation depending on your specifications. Docal liquid receivers are ASME certified (U stamp our UM stamp) and can also bear Canadian registered number (CRN) from CSA

B51 for Canada or with National Board for USA. Our liquid receiver can be made of a variety of materials such as carbon steel, 304 or 316 stainless steel or other exotic materials. Post-weld Heat treatment, corrosion allowance and liquid level indicators are available as options.

Figure 3.12 High Pressure Receiver

2. Low pressure receiver

Low Pressure Receiver (LPR) technology was first developed and applied by Star Refrigeration in the UK in 1975. “LPR” as discussed here refers to a system arrangement whereby evaporators are flooded with an overfeed of liquid, which is driven thermodynamic ally (with the LPR) instead of mechanically (with a liquid pump).

This type of LPR should not be confused with a simple suction line accumulator typically used in pumped liquid re-circulation systems. The original LPR systems were used with R-502, however the phase-out of this ozone-depleting refrigerant (along with others, like R-22) quickly resulted in a transition to the natural refrigerant, R717--ammonia.

One key benefit to the LPR architecture is that it allows for very low overfeed rates, increasing efficiency and reducing refrigerant charge; however, operating with very low overfeed rates introduced new challenges in the shift to ammonia.

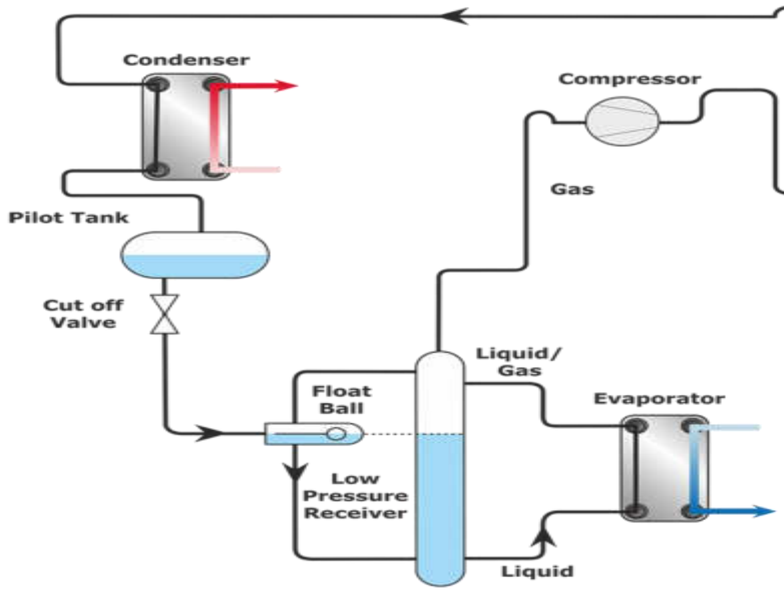

Figure 3.13 Low Pressure Receiver

3. Refrigeration Compressor

A Refrigeration Compressor draws refrigerant from the evaporator at a relatively low pressure, compresses it and then discharges it to the condenser where it is cooled. The refrigerant then moves to the expansion valve and the evaporator before being compressed again.

This compressor type is screw type compressor. These compressors have a pair of meshing screws in between them where the refrigerant gets compressed. They can produce high pressure for a small quantity of gas. They pass refrigerant vapour through screw spindles which compress the gas.

Figure 3.14 Refrigeration Compressor

4. Condensor

A condenser's function is to allow high pressure and temperature refrigerant vapor to condense and eject heat. There are three main types: air-cooled, evaporative, and water-cooled condensers. An evaporative condenser is used to remove excess heat from a cooling system when the heat cannot be utilized for other purposes. The excess heat is removed by evaporating water.

The evaporative condenser has a cabinet with a water-sprayed condenser, and it usually has one or more fans. The excess heat is removed by evaporating water. In an evaporative condenser the primary coolant of the cooling system is cooled, which is the opposite of a cooling tower. Evaporator condensers are more expensive than dry coolers and are primarily used in large cooling systems or systems where the outdoor temperature is high. In many locations around the world, regulations limit the physical size of a cooling system and this in turn limits the use of evaporative condensers.

Figure 3.15 Condensor

5. Economiser

An economizer is a type of sub-cooler that uses part of the total refrigerant flow from the condenser to cool the rest of the refrigerant flow. The evaporated refrigerant then enters the compressor at an intermediate pressure level. The cold gas from the economizer can also be used to provide extra cooling for the compressor.

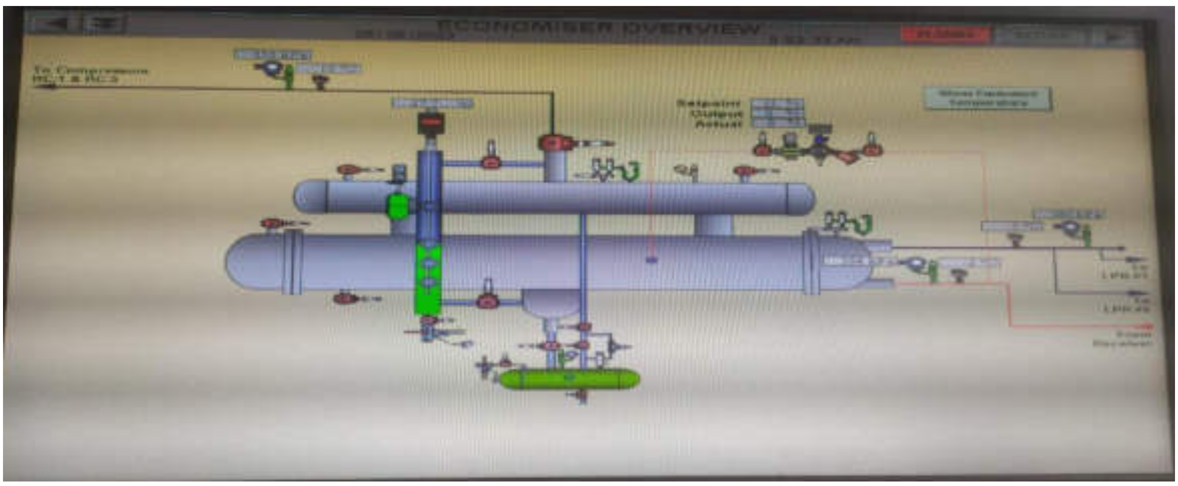

Figure 3.16 Economizer

The refrigeration cycle of three plants are given below.

- **LINE 1 REFRIGERATION LINE**

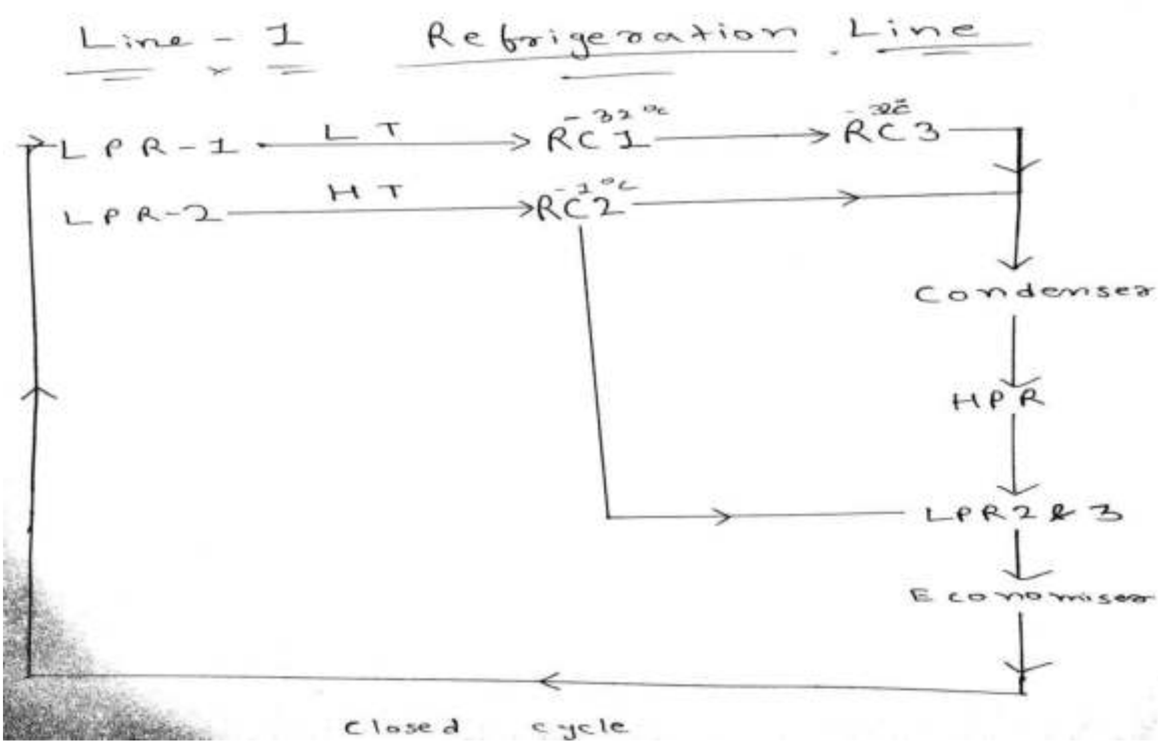

Figure 3.17 RL1

- **LINE 2 REFRIGERATION LINE**

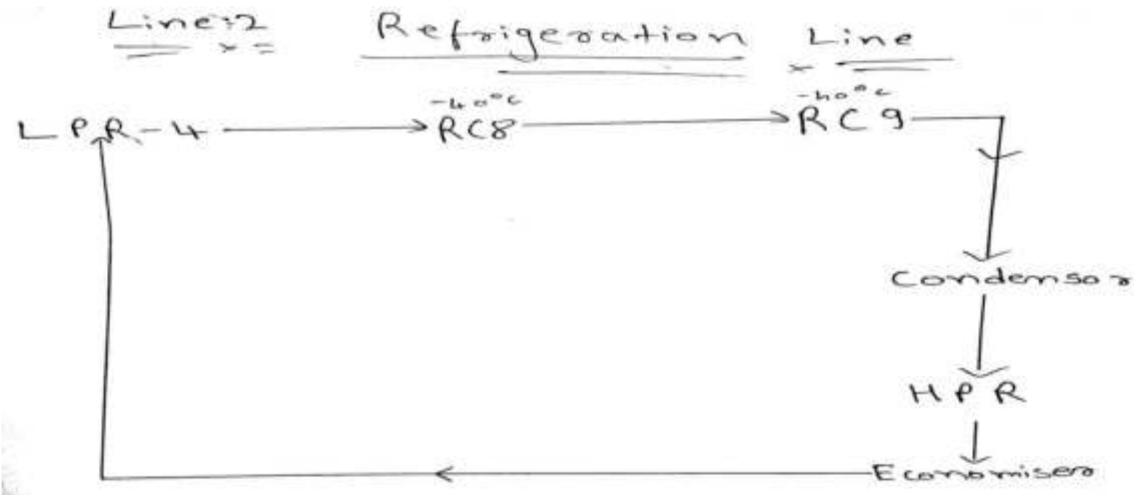

Figure 3.18 RL2

- **LINE 3 REFRIGERATION LINE**

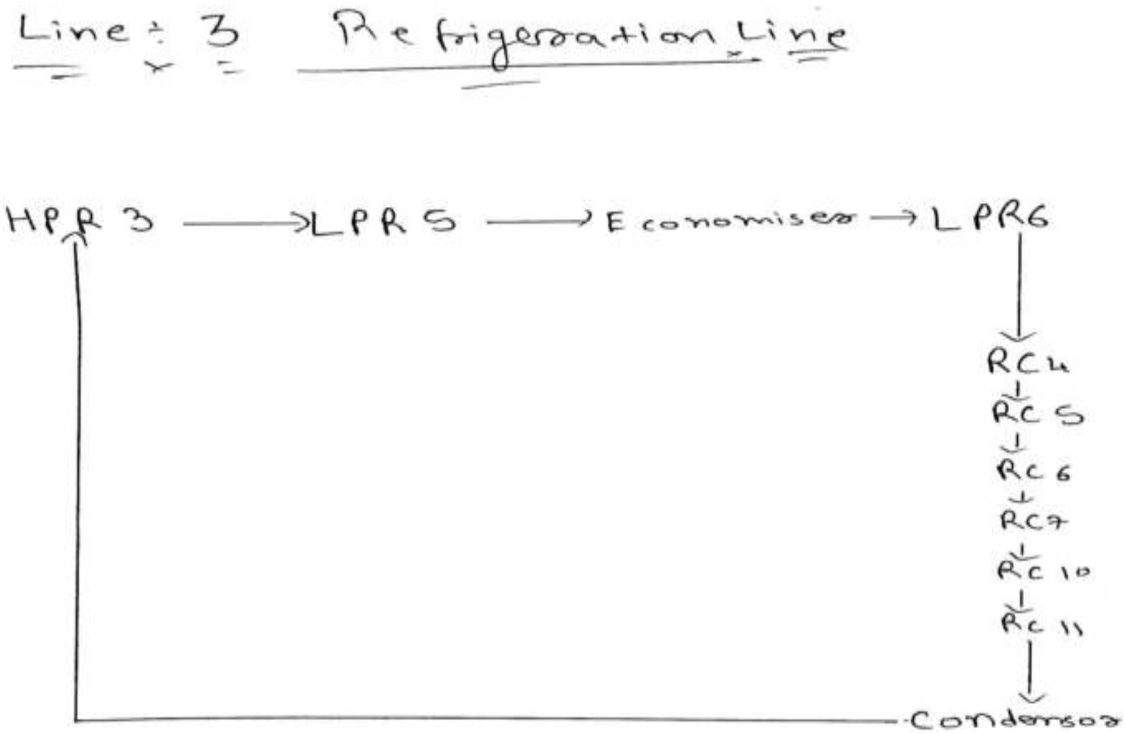

Figure 3.19 RL3

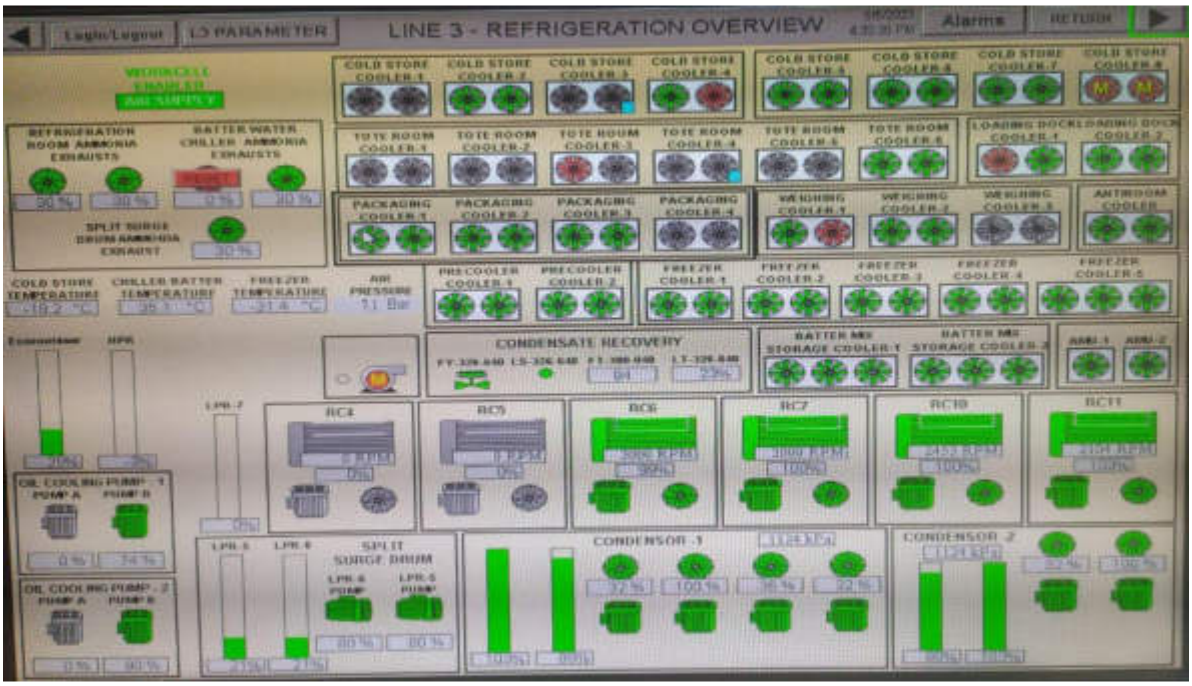

Figure 3.20 Line 3 Refrigeration Overview

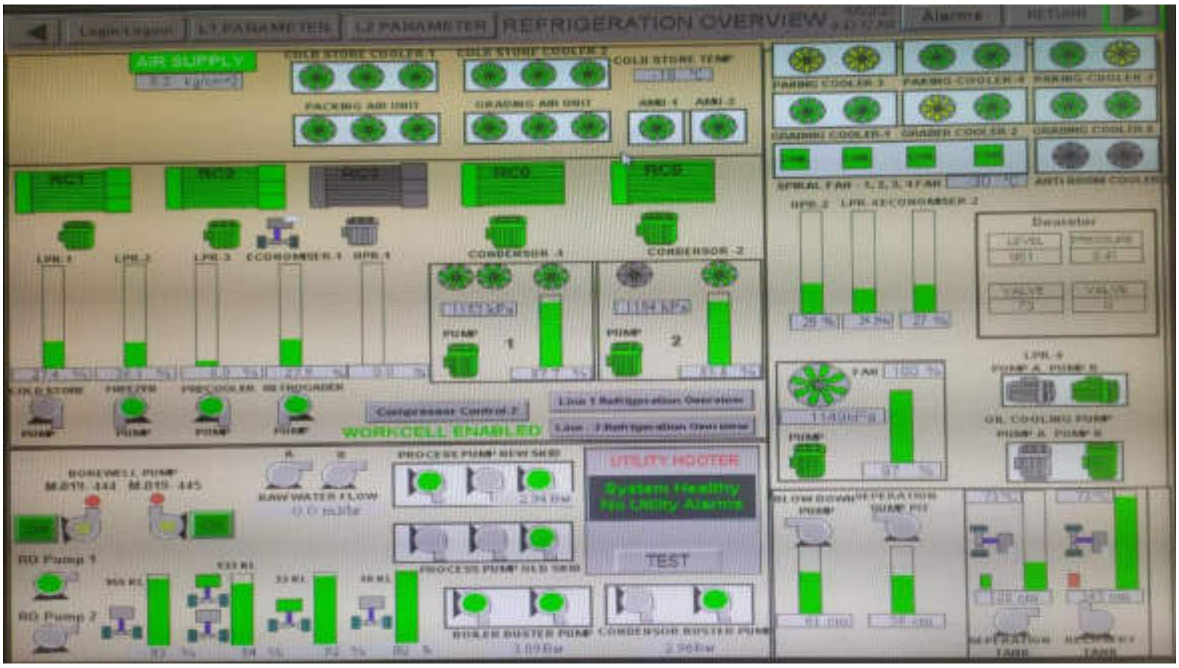

Figure 3.21 Line 1&2 Refrigeration Overview

3.2.1 REFRIGERATION PARAMETERS.

Table 3.5 Condensor

CONDENSOR					
PH	TH	MALK	CHLORIDE	COND	PO4
7.0-8.6	<700	<100	<250	<2400	6-9

Table 3.6 Make Water For Condensor

MAKE WATER FOR CONDENSOR				
PH	TH	MALK	CLORIDE	TDS
7.0-8.0	<100	<100	<100	<250

3.3 Oil Separation

Edible oils are used for cooking, as ingredients in other products or consumed directly, and are extracted from various parts of plants, like seeds, nuts, fruit, leaves, flowers, bark and roots. These oils coat presses and equipment, can spill or leak in the extraction process, and end up mixing with process water and wastewater. Our customers in the oil extraction business use oil skimmers and oil water separators to recover the oil from the water before the water can be treated further on site, reused or discharged to the municipality.

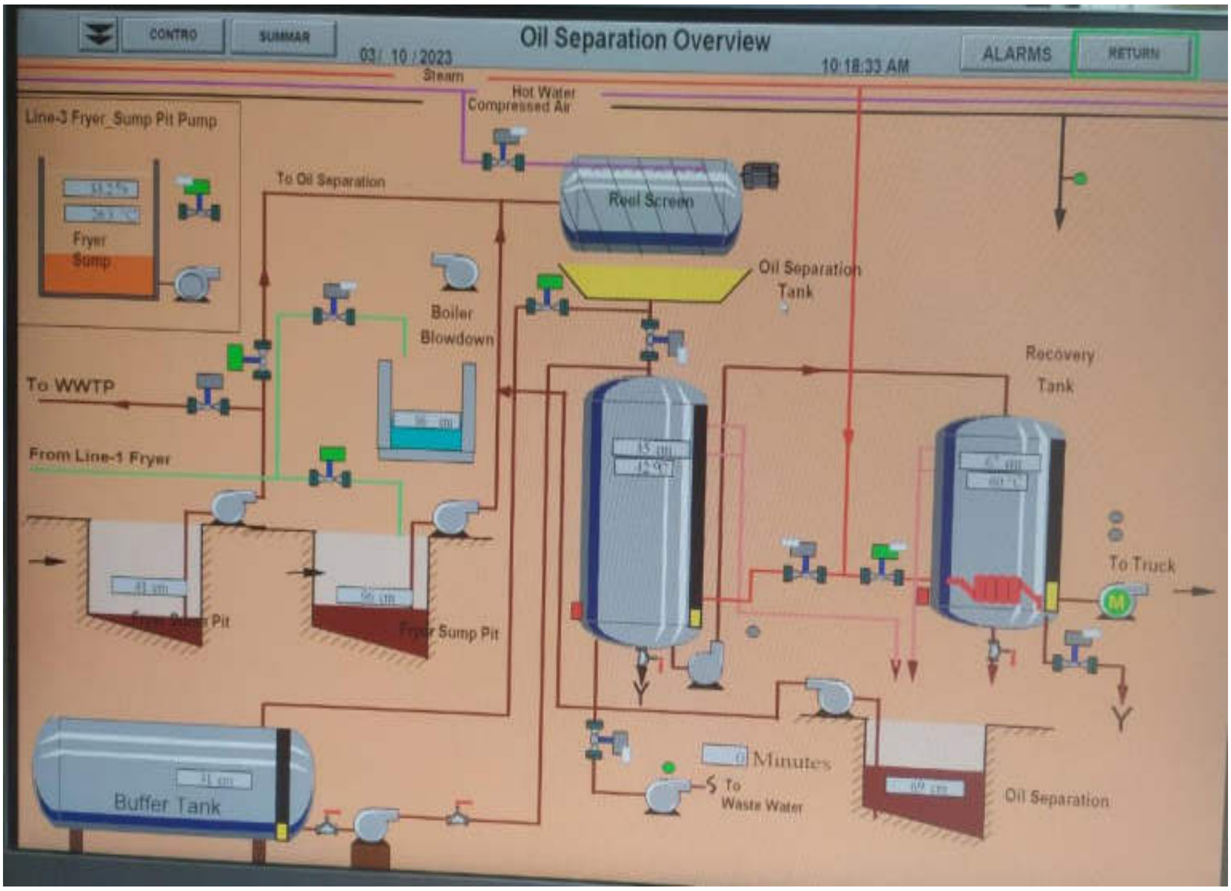

Figure 3.22 Oil Separation

Chapter 4
SAFETY DEPARTMENT

Figure 4.1 Safety

McCain manufacturing food production team members targeting zero incident at work, because we believe everyone should get home safe every day.

McCain`s provides all types of safety instruments like safety shoes, safety goggles, safety helmet, safety ear guard, hair net because it is food company, apron for go in the plant.

McCain`s approach`s

Our approach to achieving zero incidents, and our entire Health & Safety (H&S) System, are based on our Health & Safety principles and objectives.

Our Health & Safety principles:

1. • Nothing we do is worth getting hurt for.
2. • Safety can and must be managed.
3. • Every injury could and should be prevented.
4. • We owe ourselves and each other a safe place to work.

Our Health & Safety objectives:

1. Create a culture where we work safely because we want to – so that we can go home safely to our family and friends.
2. Ensure McCain employees are 100% engaged with their own safety and that of others, inside and outside the organization.
3. Embed H&S concepts in all employees regarding their day-to-day activities.
4. Develop self-sufficient teams with strong H&S capabilities at every level.

These objectives are supported by a robust H&S training approach. This approach includes safety awareness and expectations as part of employee orientation and annual training requirements. Tailored training is also provided for specific roles, for example among our operations staff.

Figure 4.2 Safety Clothing

Chapter 5
SUSTAINABILITY REPORT OF COMPANY

Figure 5.1 Sustainability

As shown figure that there was a four Sustainability pillars which are Smart & Sustainable Farming, Resource efficient operations, Good food, Thriving.

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Figure 5.2 F22 Sustainability Progress

This Figure shown who company achieve in her goal in last year 2022. So, There was good progress in the smart & sustainable farming, resource efficient operations, good food, thriving communities.

Chapter 6
CONCLUSION

During my three-month internship at McCain's Foods Pvt Ltd in the utility department, I gained valuable insights and experiences that have greatly enhanced my understanding of the company's operations. Working closely with the team, I witnessed firsthand the crucial role played by the utility department in ensuring the smooth functioning of various processes within the organization. Through my involvement in maintenance and troubleshooting tasks, I developed a strong sense of responsibility and attention to detail, while also improving my technical skills. Moreover, I had the opportunity to collaborate with professionals from different departments, enabling me to appreciate the importance of effective cross-functional communication and teamwork. Overall, my internship at McCain's Foods Pvt Ltd has been an enriching experience that has not only contributed to my professional growth but also reinforced my passion for the food industry and its intricate operations.

Chapter 7
REFFERANCE

1. https://www.nationalboard.org/

2. https://www.boilerguide.co.uk/

3. https://www.mccain.com/

4. https://www.mccainindia.com/

5. https://www.bigbasket.com/pb/mccain/

6. https://m.indiamart.com/mccainfoodsindia/profile.html

7. https://www.araner.com/blog/vapor-compression-refrigeration-cycle

APPENDIX :-1

ANNEXURE-1 (WEEK-1)

GUJARAT TECHNOLOGICAL UNIVERSITY
(Established under Gujarat Act No. 20 of 2007)
ગુજરાતટેકનોલોજીકલ યુનિવર્સિટી
(ગુજરાત અધિનિયમ ક્રમાંક: ૨૦/૨૦૦૭ દ્વારા સ્થાપિત)

Annexure 1
Enrollment no: 190390119004

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: Harshitsinh Bhupendrasinh Chauhan
DIARY OF THE WEEK: Dt: 6/2/23 TO 10/2/23
DEPARTMENT: utility, project SEM: 8th
NAME OF THE ORGANISATION: McCain's Foods, PVT LTD
NAME OF THE PLANT/SECTION/DEPARTMENT: Project, Utility
NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT: Ajitsinh Rathod

DESCRIPTION OF THE WORK DONE IN BRIEF

=> In this week all the Registration work are done I fill up the form then submitted my documents, Then I enroll myself for attendence and Gate entry

=> Then I also enroll myself at admin

=> In this week my sittplace is also done

=> I have to sit at safety department bunk

=> This is all about one week

1

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(ગુજરાત અધિનિયમ ક્રમાંક: ૨૦/૨૦૦૭ દ્વારા સ્થાપિત)

TOTAL HOURS: 40hr

SIGNATURE OF STUDENT

The above entries are correct and the grading of work done by Trainee is
EXCELLENT / VERY GOOD / GOOD / FAIR / BELOW AVERAGE / POOR

Signature of Faculty Mentor

Signature of officer-in-charge
of Dept. / Section / Plant

Date: 18/3/23

Date: 23/02/'23.

Grading of Work, for trainee may be given depending upon your judgement about his Punctuality, Regularity, Sincerity, Interest taken, Work done etc.

ANNEXURE-1 (WEEK-2)

GUJARAT TECHNOLOGICAL UNIVERSITY
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Annexure 1
Enrollment no: 190390119004

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: Harshitsinh Bhupendrasinh chauhan
DIARY OF THE WEEK: Dt: 13/2/23 **TO** 17/2/23
DEPARTMENT: Utility, Project **SEM:** 8th
NAME OF THE ORGANISATION: McCain's Foods PVT LTD
NAME OF THE PLANT/SECTION/DEPARTMENT: Project, utility
NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT: Ajitsinh Rathod

DESCRIPTION OF THE WORK DONE IN BRIEF

=> In this week I see the safety induction video
=> I also get my safety Accessories like safety shoes, helmet, earbuds etc
=> Then my safety induction of Three plants are done in Two dayes
=> Then my company site visit is done
=> Then I take visit of Refrigeration department, maintanence department.
=> This is all about this week

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(ગુજરાત અધિનિયમ ક્રમાંક: ૨૦/૨૦૦૭ દ્વારા સ્થાપિત)

TOTAL HOURS: 4042

SIGNATURE OF STUDENT

The above entries are correct and the grading of work done by Trainee is
EXCELLENT / VERY GOOD / GOOD / FAIR / BELOW AVERAGE / POOR

Signature of Faculty Mentor

Signature of officer-in-charge of Dept. / Section / Plant

Date: 18/3/23

Date: 23/02/'23

Grading of Work, for trainee may be given depending upon your judgement about his Punctuality, Regularity, Sincerity, Interest taken, Work done etc.

ANNEXURE-1 (WEEK-3)

GUJARAT TECHNOLOGICAL UNIVERSITY
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Annexure I

Enrollment no: 190390119004

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: Harshitsinh h. Bhupendrasinh Chouhan

DIARY OF THE WEEK: Dt: 20/2/23 TO 24/2/23

DEPARTMENT: Utility, ~~[illegible]~~, Project SEM:

NAME OF THE ORGANISATION: McCain's Foods, PVT, LTD

NAME OF THE PLANT/SECTION/DEPARTMENT: Project, Utility

NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT: Ajitsinh h. Rathod

DESCRIPTION OF THE WORK DONE IN BRIEF

=> In this I take the visit of Production department

=> In first day I take the visit of Line 1 & 2 Production department

=> & In second day I take the visit of Lin 3 Production department.

=> I learn how all the production Process is done

=> In this they make 12 tons french fries in one hour.

=> They also have big coldstorage which is 18°c.

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(ગુજરાત અધિનિયમ ક્રમાંક: ૨૦/૨૦૦૭ દ્વારા સ્થાપિત)

TOTAL HOURS: 40 hrs

SIGNATURE OF STUDENT

The above entries are correct and the grading of work done by Trainee is EXCELLENT / VERY GOOD / GOOD / FAIR / BELOW AVERAGE / POOR

Signature of Faculty Mentor

Signature of officer-in-charge of Dept. / Section / Plant

Date: 18/3/23

Date: 9/3/23

Grading of Work, for trainee may be given depending upon your judgement about his Punctuality, Regularity, Sincerity, Interest taken, Work done etc.

ANNEXURE-1 (WEEK-4)

GUJARAT TECHNOLOGICAL UNIVERSITY
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Annexure I

Enrollment no: 210910119004

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: Harshitsinh. Bhupendrasinh. Chauhan

DIARY OF THE WEEK: Dt: 27/2/23 TO 3/3/23

DEPARTMENT: Utility, Project SEM:

NAME OF THE ORGANISATION: McCain's Foods, PVT, LTD

NAME OF THE PLANT/SECTION/DEPARTMENT: Project, Utility

NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT: Ajitsinh Rathod.

DESCRIPTION OF THE WORK DONE IN BRIEF

=> From today I started to go Utility department

=> But in Utility department have 7 days training

=> So, they give their time to me from 6 Date

=> For this day I do some work with Safety department

=> I learn some there works and also their computer works

=> I see them and try to learn it.

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TOTAL HOURS: 40hrs

SIGNATURE OF STUDENT

The above entries are correct and the grading of work done by Trainee is
EXCELLENT / VERY GOOD / GOOD / FAIR / BELOW AVERAGE / POOR

Signature of Faculty Mentor

Signature of officer-in-charge of Dept. / Section / Plant

Date: 18/3/22

Date: 7/3/22

Grading of Work, for trainee may be given depending upon your judgement about his Punctuality, Regularity, Sincerity, Interest taken, Work done etc.

ANNEXURE-1 (WEEK-5)

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Annexure I

Enrollment no: 190390119004

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: Harshitsinh B. Chauhan

DIARY OF THE WEEK: Dt: 6/3/23 TO 10/3/23

DEPARTMENT: Utility Department SEM: 8th

NAME OF THE ORGANISATION: McCain's Foods PVT LTD

NAME OF THE PLANT/SECTION/DEPARTMENT: Utility

NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT: Ajitsinh Rathod

DESCRIPTION OF THE WORK DONE IN BRIEF

=> From Monday My training start in Utility Department

=> In The Utility Department work's on company Resources

=> In McCain's company the Utility Department works on Boiler, compressor, Refrigeration.

=> They Resources are steam, water, cold steam, etc.

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TOTAL HOURS: 40hrs

SIGNATURE OF STUDENT

The above entries are correct and the grading of work done by Trainee is
EXCELLENT / VERY GOOD / GOOD / FAIR / BELOW AVERAGE / POOR

Signature of Faculty Mentor

Signature of officer-in-charge
of Dept. / Section / Plant

Date: 18/3/22

Date:

Grading of Work, for trainee may be given depending upon your judgement about his Punctuality, Regularity, Sincerity, Interest taken, Work done etc.

ANNEXURE-1 (WEEK-6)

GUJARAT TECHNOLOGICAL UNIVERSITY
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Annexure I
Enrollment no: 190390119004

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: Harshitsinh . B Chauhan
DIARY OF THE WEEK: Dt: 13/3/23 TO 17/3/23
DEPARTMENT: Utility Department SEM: 8th
NAME OF THE ORGANISATION: McCaint Foods PVT. LTD.
NAME OF THE PLANT/SECTION/DEPARTMENT: Utility
NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT: Ajitsingh Rathod

DESCRIPTION OF THE WORK DONE IN BRIEF

=> In utility Department i start training in Boiler.

=> In Boiler there was three lines, steam, Gas line, water lines

=> There was 3 plants ~~the~~ & in one & two plant there was one Boiler of 70 TPH

=> And in 3 Plants has Boiler of 16 TPH

=> I also start learning of every parts of the Boiler like Accessories & moulding

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TOTAL HOURS: 32 hrs

SIGNATURE OF STUDENT

The above entries are correct and the grading of work done by Trainee is
EXCELLENT / VERY GOOD / GOOD / FAIR / BELOW AVERAGE / POOR

Signature of Faculty Mentor

Signature of officer-in-charge of Dept. / Section / Plant

Date: 18/3/23

Date: 17/3/23

Grading of Work, for trainee may be given depending upon your judgement about his Punctuality, Regularity, Sincerity, Interest taken, Work done etc.

ANNEXURE-1 (WEEK-7)

GUJARAT TECHNOLOGICAL UNIVERSITY
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(ગુજરાત અધિનિયમ ક્રમાંક: ૨૦/૨૦૦૭ દ્વારા સ્થાપિત)

Annexure 1
Enrollment no: 190390119004

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: Harshitsinh B. Chauhan
DIARY OF THE WEEK: DI: 20/3/23 TO 24/3/23
DEPARTMENT: Utility SEM: 8th
NAME OF THE ORGANISATION: McCain's Foods PVT. LTD
NAME OF THE PLANT/SECTION/DEPARTMENT: Utility
NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT: Ajitsinh Rathod

DESCRIPTION OF THE WORK DONE IN BRIEF

In this week i learn about boiler Gas line
In this Gas is PNG (Pressurized Natural Gas).
which supplied by Sabarmati Gas PVT. LTD.

In company there was complete Portion ~~station~~ for Gas Station.

first Gas come there then it was supplied to the all places of Plant were Gas is needed.

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(ગુજરાત અધિનિયમ ક્રમાંક: ૨૦/૨૦૦૭ દ્વારા સ્થાપિત)

TOTAL HOURS: 25hrs

SIGNATURE OF STUDENT

The above entries are correct and the grading of work done by Trainee is
EXCELLENT / VERY GOOD / GOOD / FAIR / BELOW AVERAGE / POOR

Signature of Faculty Mentor

Signature of officer-in-charge of Dept. / Section / Plant

Date: 25/05/23

Date: 24/3/23

Grading of Work, for trainee may be given depending upon your judgement about his Punctuality, Regularity, Sincerity, Interest taken, Work done etc.

ANNEXURE-1 (WEEK-8)

GUJARAT TECHNOLOGICAL UNIVERSITY
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(ગુજરાત અધિનિયમ ક્રમાંક: ૨૦/૨૦૦૭ દ્વારા સ્થાપિત)

Annexure 1
Enrollment no: 190390119004

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: Harshitsinh B. Chauhan
DIARY OF THE WEEK: Dt: 27/3/23 TO 31/3/23
DEPARTMENT: Utility SEM: 8th
NAME OF THE ORGANISATION: Mc Cain's Foods PVT. LTd
NAME OF THE PLANT/SECTION/DEPARTMENT: Utility
NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT: Ajitsinh Rathod

DESCRIPTION OF THE WORK DONE IN BRIEF

So, In this week i learned more about Gas line and boiler burner

when PNG is supplied to the plant before it it goes in big vessel and from there it goes to the all filter Pressuired valve then from ther it goes to the differed areas its ~~[illegible]~~ supplied on given quantity more of Gas is used in Boiler

I also make Drawing of this Gas line.

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(ગુજરાત અધિનિયમ ક્રમાંક: ૨૦/૨૦૦૭ દ્વારા સ્થાપિત)

TOTAL HOURS: 25 hrs

SIGNATURE OF STUDENT

The above entries are correct and the grading of work done by Trainee is
EXCELLENT / VERY GOOD / GOOD / FAIR / BELOW AVERAGE / POOR

Signature of Faculty Mentor

Signature of officer-in-charge of Dept. / Section / Plant

Date: 11/5/23

Date: 31/3/23

Grading of Work, for trainee may be given depending upon your judgement about his Punctuality, Regularity, Sincerity, Interest taken, Work done etc.

ANNEXURE-1 (WEEK-9)

GUJARAT TECHNOLOGICAL UNIVERSITY
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Annexure 1
Enrollment no: 190390119006

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: Harshitsinh. B. Chauhan
DIARY OF THE WEEK: Dt: 3/4/23 TO 7/4/23
DEPARTMENT: Utility SEM: 8th
NAME OF THE ORGANISATION: McCain's Foods PVT. LTD
NAME OF THE PLANT/SECTION/DEPARTMENT: Utility
NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT: Ajitsinh Rathod

DESCRIPTION OF THE WORK DONE IN BRIEF

So, In this week i learned about boiler burner working

In this company ~~there~~ the burner company is Oilon

=> In Plant there was two boiler In this one boiler for Plant 1 & 2

=> ~~and~~ and it only need one burner because of low capacity

=> But in ~~3 the~~ third plant the capacity is high then it have two burner for one boiler

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(ગુજરાત અધિનિયમ ક્રમાંક: ૨૦/૨૦૦૭ દ્વારા સ્થાપિત)

TOTAL HOURS: 25 hrs

SIGNATURE OF STUDENT

○ The above entries are correct and the grading of work done by Trainee is
EXCELLENT / VERY GOOD / GOOD / FAIR / BELOW AVERAGE / POOR

Signature of Faculty Mentor

Signature of officer-in-charge
of Dept. / Section / Plant

Date: 11/5/23

Date: 7/4/23

○ Grading of Work, for trainee may be given depending upon your judgement about his Punctuality, Regularity, Sincerity, Interest taken, Work done etc.

ANNEXURE-1 (WEEK-10)

GUJARAT TECHNOLOGICAL UNIVERSITY
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(ગુજરાત અધિનિયમ ક્રમાંક: ૨૦/૨૦૦૭ દ્વારા સ્થાપિત)

Annexure I
Enrollment no: 190390119004

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: Harshitsinh B. Chauhan
DIARY OF THE WEEK: Dt: 10/4/23 TO 14/4/23
DEPARTMENT: Utility SEM: 8th
NAME OF THE ORGANISATION: McCain's Foods PVT LTD
NAME OF THE PLANT/SECTION/DEPARTMENT: Utility
NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT: Ajitsinh Rathod

DESCRIPTION OF THE WORK DONE IN BRIEF

=> In this week i learn about Refrigeration In this Company Product is Frozen Food then Refrigeration is have most important place

=> In this company Refrigeration cycle is VCR

=> which works on Ammonia

=> Because of Ammonia is used Refrigeration there was so much safety preparation are there.

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(ગુજરાત અધિનિયમ ક્રમાંક: ૨૦/૨૦૦૭ દ્વારા સ્થાપિત)

TOTAL HOURS: 25 hrs

SIGNATURE OF STUDENT

The above entries are correct and the grading of work done by Trainee is
EXCELLENT / VERY GOOD / GOOD / FAIR / BELOW AVERAGE / POOR

Signature of Faculty Mentor

Signature of officer-in-charge of Dept. / Section / Plant

Date: 11/5/23

Date: 24/4/23

Grading of Work, for trainee may be given depending upon your judgement about his Punctuality, Regularity, Sincerity, Interest taken, Work done etc.

ANNEXURE-1 (WEEK-11)

GUJARAT TECHNOLOGICAL UNIVERSITY
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Annexure I
Enrollment no: 190390119004

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: Harshitsinh B. Chauhan
DIARY OF THE WEEK: Dt: 17/4/23 TO 21/4/23
DEPARTMENT: Utility SEM: 8th
NAME OF THE ORGANISATION: McCain's Foods PVT. LTD
NAME OF THE PLANT/SECTION/DEPARTMENT: Utility
NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT: Ajitsinh Rathod.

DESCRIPTION OF THE WORK DONE IN BRIEF

In this week i learn that was how Machine are there in Refrigeration and also who it works ex- compressor, condensor, Evaporator etc

=> which place are there wher cooling is need

=> in who much quantity it need i learn about this perfectly

=> the complete cycle is shown in computer

=> there perfect Automation for this.

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(ગુજરાત અધિનિયમ ક્રમાંક: ૨૦/૨૦૦૭ દ્વારા સ્થાપિત)

TOTAL HOURS: 25 hrs

SIGNATURE OF STUDENT

The above entries are correct and the grading of work done by Trainee is
EXCELLENT / VERY GOOD / GOOD / FAIR / BELOW AVERAGE / POOR

Signature of Faculty Mentor

Signature of officer-in-charge of Dept. / Section / Plant

Date: 11/5/23

Date: 21/4/23

Grading of Work, for trainee may be given depending upon your judgement about his Punctuality, Regularity, Sincerity, Interest taken, Work done etc.

ANNEXURE-1 (WEEK-12)

GUJARAT TECHNOLOGICAL UNIVERSITY
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Annexure I
Enrollment no: 190390119006

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: Harshitsinh B. Chauhan
DIARY OF THE WEEK: DE: 24/4/23 TO 28/4/23
DEPARTMENT: Utility SEM: 8th
NAME OF THE ORGANISATION: McCain's Foods PVT. LTd
NAME OF THE PLANT/SECTION/DEPARTMENT: Utility
NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT: Ajitsinh Rathod.

DESCRIPTION OF THE WORK DONE IN BRIEF

In this week i learn more about Refrigeration and seen all Machine of it like LPR, HPR etc

In Refrigeration the Ammonia is used so Safety is so much needed in this so There was so many safety measure are taken

=> I also learn about Air compressor & Oil separation system have also Automation in computer.

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(ગુજરાત અધિનિયમ ક્રમાંક: ૨૦/૨૦૦૭ દ્વારા સ્થાપિત)

TOTAL HOURS: 25 hrs

SIGNATURE OF STUDENT

The above entries are correct and the grading of work done by Trainee is EXCELLENT / VERY GOOD / GOOD / FAIR / BELOW AVERAGE / POOR

Signature of Faculty Mentor

Signature of officer-in-charge of Dept. / Section / Plant

Date: 11/5/23

Date: 25/5/23

Grading of Work, for trainee may be given depending upon your judgement about his Punctuality, Regularity, Sincerity, Interest taken, Work done etc.

ANNEXURE-1 (WEEK-13)

GUJARAT TECHNOLOGICAL UNIVERSITY
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Annexure I
Enrollment no: 190390119004

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: Harshitsinh Chauhan
DIARY OF THE WEEK: DT: 1/5/23 TO 5/5/23
DEPARTMENT: Utility SEM: 8th
NAME OF THE ORGANISATION: McCain's foods PVT LTD
NAME OF THE PLANT/SECTION/DEPARTMENT: Utility
NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT: Ajitsinh Rathod

DESCRIPTION OF THE WORK DONE IN BRIEF

=> In this week I learn ~~ab~~ more about oil separation that who many parts are there.

=> who its cycle is works

=> ~~also~~ as same for Air compressor

=> I also learn there Automationic in computer

=> So, it is my last week of Intern ship

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(ગુજરાત અધિનિયમ ક્રમાંક ૨૦/૨૦૦૭ દ્વારા સ્થાપિત)

TOTAL HOURS: 24

SIGNATURE OF STUDENT

- The above entries are correct and the grading of work done by Trainee is EXCELLENT / VERY GOOD / GOOD / FAIR / BELOW AVERAGE / POOR

Signature of Faculty Mentor

Signature of officer-in-charge of Dept. / Section / Plant
Project

Date: 6/5/23

Date: 5/5/23

- Grading of Work, for trainee may be given depending upon your judgement about his Punctuality, Regularity, Sincerity, Interest taken, Work done etc.

APPENDIX:-2

ANNEXURE-2 (FEEDBACK FORM)

GUJARAT TECHNOLOGICAL UNIVERSITY
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Annexure 2

Feedback Form by Industry expert

Student Name: Harshitsinh. B.Chauhan Date: 05/05/2023

Work Supervisor: Ajitsinh Rathod Title:

Company/Organization: McCain Foods PVT LTD

Enrollment No: 190390119004

Internship Address: SH-41, Milestone #54, Survey No. 165, P.O. Baliyasan Dist Mehsana, Gujarat - 384455 India

Dates of Internship: From 06/02/2023 to 05/05/2023

Please evaluate your intern by indicating the frequency with which you observed the following behaviors:

Parameters	Needs improvement	Satisfactory	Good	Excellent
Shows interest in work and his/her initiatives			✓	
Produces high quality work and accepts responsibility			✓	
Uses technical knowledge and expertise				✓
Analyzes problems effectively			✓	
Communicates well and writes effectively			✓	

Overall performance of student intern: (Needs improvement/ Satisfactory/Good/Excellent): Good.

Additional comments, if any:

AJITSINH RATHOD

Signature of Industry person with name and Stamp:

(Ashutosh Gohel).

Signature of the Faculty Mentor

INTERNSHIP AT NPCIL

AN INTERNSHIP REPORT

Submitted by

HARIKRUSHNA PRAKASHCHANDRA KANSARA

190390119007

In partial fulfillment for the award of the degree of

Bachelor of Engineering

In

Mechanical Engineering

S.P.B. Patel Engineering College, Mehsana

Gujarat Technological University, Ahmedabad

May, 2023

Team id- 323630

S.P.B. Patel Engineering College

Near Shanku's Water Park, Ahmedabad – Mehsana Highway, Linch, Gujarat

CERTIFICATE

This is to certify that the project report submitted along with the project entitled **Internship at NUCLEAR POWER CORPORATION OF INDIA LIMITED** has been carried out by **Harikrushna Prakashchandra Kansara** under my guidance in partial fulfillment for the degree of Bachelor of Engineering in Mechanical Engineering, 8th Semester of Gujarat Technological University, Ahmedabad during the academic year 2022-23.

Sign	Sign
Internal Guide,	HOD,
Prof. Aashutosh Gohel Mechanical Engineering Department SIT, Mehsana	Prof. Kunalsinh Kathia Mechanical Engineering Department SIT, Mehsana

Team id- 323630

PMMS Certificate

GUJARAT TECHNOLOGICAL UNIVERSITY

CERTIFICATE FOR COMPLETION OF ALL ACTIVITIES AT ONLINE PROJECT PORTAL

B.E. SEMESTER VIII, ACADEMIC YEAR 2022-2023

Date of certificate generation : 14 May 2023 (20:38:09)

This is to certify that, ***Kansara Harikrushna Prakashchandra*** (Enrolment Number - 190390119007) working on project entitled with ***Internship at Nuclear power corporation of India limited*** from ***Mechanical Engineering*** department of ***S. P. B. PATEL ENGINEERING COLLEGE, MEHSANA*** had submitted following details at online project portal.

Internship Project Report	**Completed**

Name of Student : Kansara Harikrushna Prakashchandra

Name of Guide : Mr. Ashutosh Gohel

Signature of Student : ____________

*Signature of Guide : ____________

Disclaimer :
This is a computer generated copy and does not indicate that your data has been evaluated. This is the receipt that GTU has received a copy of the data that you have uploaded and submitted as your project work.

*Guide has to sign the certificate, Only if all above activities has been Completed.

Company Certificate

न्यूक्लियर पॉवर कॉर्पोरेशन ऑफ इंडिया लिमिटेड
NUCLEAR POWER CORPORATION OF INDIA LIMITED
(भारत सरकार का उद्यम A Government of India Enterprise)
काकरापार गुजरात स्थल KAKRAPAR GUJARAT SITE
अणुमाला-394651, ता. व्यारा, जिला तापी, गुजरात Anumala-394651, Ta. Vyara, Dist. Tapi, Gujarat

सीआईएन CIN : U40104MH1987GOI149458 — वेबसाइट Website : www.npcil.nic.in

संख्या: कागुजस्थल/मासं/मासंप्र/पका/2023/201 — मई 09, 2023

प्रमाणपत्र CERTIFICATE

यह प्रमाणित किया जाता है कि **श्री हरिकृष्ण कंसारा पुत्र श्री प्रकाशचन्द्र कंसारा** जो '**सफ्रोनी इंस्टीट्यूट ऑफ टेक्नोलॉजी, मेहेसाणा**' से "**बीई-मेकेनिकल(सेमेस्टर-8)**" कोर्स का अध्ययन कर रहे है, ने **अवधि 10/02/2023 से 09/05/2023** के दौरान इस संगठन से अपना परियोजना कार्य/औद्योगिक प्रशिक्षण सफलतापूर्वक पूर्ण किया है। This is to certify that **Shri Harikrushna Kansara son of Shri Prakashchandra Kansara** , who is pursuing "**BE-Mechanical(Sem-8)**" course from '**Saffrony Institute of Technology, Mehesana**', has successfully completed his Project Work/Industrial Training in this organization **from 10/02/2023 to 09/05/2023**.

इस अवधि के दौरान, विद्यार्थी ने न्यूक्लियर पॉवर कॉर्पोरेशन ऑफ इंडिया लिमिटेड, काकरापार गुजरात स्थल में '**मेकेनिकल सिस्टम्स एवं कंपोनेन्ट्स एट केएपीपी 3 एवं 4**' पर परियोजना कार्य/औद्योगिक प्रशिक्षण पूर्ण किया है। During this period, the student did Project Work/Industrial Training on '**Mechanical Systems & Components at KAPP 3&4**' at Nuclear Power Corporation of India Limited, Kakrapar Gujarat Site.

यह भी प्रमाणित किया जाता है कि प्रशिक्षण अवधि के दौरान विद्यार्थी निष्ठावान और इनका आचरण संतोषजनक रहा। It is further certified that during the period the student has been sincere and his conduct has been satisfactory.

ऋचा 9/5/23
ऋचा यादव Richa Yadav,
उप-प्रबंधक(मासं) Dy. Manager(HR),
एनपीसीआईएल, काकरापार गुजरात स्थल
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S.P.B. Patel Engineering College, Mehsana

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DECLARATION

We hereby declare that the Internship / Project report submitted along with the Internship / Project entitled **Internship at Nuclear Power Corporation of India limited** submitted in partial fulfillment for the degree of Bachelor of Engineering in **Mechanical Engineering** to Gujarat Technological University, Ahmedabad, is a bonafide record of original project work carried out by me under the supervision of **Prof. Aashutosh Gohel** & **Shri. Pawan Kumar Kashyap (External Guide)** and that no part of this report has been directly copied from any students' reports or taken from any other source, without providing due reference.

Name of the Student	Sign of Student
Harikrushna P. Kansara	______________________

ACKNOWLEDGMENT

In the current era of technological advancement, vocational training has become very important. Vocational training helps individuals to have a firsthand experience of the concepts taught in books. Thus, it forms a bridge connecting theory and practical. Also, it helps an individual to get exposed to the work culture in industries and corporate life. To gain the opportunity for vocational training in Nuclear Power Plant is like feather on cap. I would like to thank KAPS (Kakrapar Atomic Power Station) for giving me the opportunity to do my 3 months internship at the plant site.

I would like to thank Shri. Pawan Kumar Kashyap (SO/F, Mechanical Maintenance Unit), Shri. Deepak Dubey (Senior Maintenance Engineer, Mechanical Maintenance Unit), Shri. Hemant Trivedi (SO/E, MMU) for providing all the resources and support for training. I would like to extend my sincere thanks to Prof. Kunalsinh Kathia, Head of Department(Mechanical Engineering Department), Prof. Ashutosh Gohel(Internal Guide) whose close monitoring of the programme with continuous feedback from us are indispensable in successful completion of this training.

ABSTRACT

This report contains the work done by the me during my internship at Nuclear Power Corporation of India Limited. It shows the work I did in the company during my internship period. This internship report provides an overview of my experience as an intern at Kakrapar Atomic Power Station(KAPS). The internship program lasted for a period of three months and provided me with an opportunity to gain practical knowledge in the field of nuclear power generation. During my internship, I was assigned to the Maintenance department. Turbine group was allotted to me during my internship. I was involved in various activities related to the plant's maintenance.

The report includes a brief introduction to KAPS and its history, followed by a detailed description of the activities I undertook during my internship. These activities included maintenance of the plant's equipment, conducting safety drills and emergency respond procedures, and participating in various training sessions on nuclear power generation.

Throughout my internship, I gained valuable insights into the of the operations of a nuclear power plant and the importance of safety in the industry. I also developed skills in problem-solving, communication, and teamwork, which are essential for a successful career in this field.

Overall, my internship at KAPS was an enriching experience that provided me with a unique opportunity to learn from experienced professionals in the nuclear power industry. This report summarizes my experience and provinces insights into the valuable lessons I learned during my time at KAPS.

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Abbreviations

NPCIL	Nuclear Power Corporation of India Limited
DAE	Department of Atomic Energy
PHWR	Pressurized Heavy Water Reactor
DM Plant	Demineralized Plant
PHT System	Primary Heat Transport System
DR	Deficiency Report
ACW	Active Cooling Water
ASW	Auxiliary Service Water
HX	Heat Exchanger

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CHAPTER 1. INTRODUCTION Of NPCIL

1.1 Company Profile:

Nuclear Power Corporation of India Limited (NPCIL) is a Public Sector Enterprise under the administrative control of the **Department of Atomic Energy (DAE)**, Government of India. The Company was registered as a Public Limited Company under the Companies Act, 1956 in September 1987 with the objectives of operating atomic power plants and implementing atomic power projects for generation of electricity in pursuance of the schemes and programmes of the Government of India under the Atomic Energy Act, 1962. NPCIL also has equity participation in BHAVINI, another PSU of Department of Atomic Energy (DAE) which implements Fast Breeder Reactors programme in the country.

NPCIL is responsible for design, construction, commissioning and operation of nuclear power reactors. NPCIL is a MoU signing, profit making and dividend paying company with the highest level of credit rating (AAA rating by CRISIL and CARE). NPCIL is presently operating 22 commercial nuclear power reactors with an installed capacity of 6780 MW.

The reactor fleet comprises two Boiling Water Reactors (BWRs), 18 Pressurised Heavy Water Reactors (PHWRs) including one 100 MW PHWR at Rajasthan which is owned by DAE, Government of India and two VVER reactors of 1000 MW capacity each. Kakrapar Atomic Power Project (KAPP) Unit – 3 was synchronized to the grid on January 10, 2021 and is expected to be in commercial operation soon. Apart from KAPP Unit-3 of 700 MW capacity, NPCIL has 9 more reactors under construction with a total capacity of 7500 MW.

1.1.1 Objectives:

- To maximise the power generation and profitability from nuclear power stations with the motto 'safety first and production next'.
- To increase nuclear power generation capacity in the country, consistent with the available resources in a safe, economical and rapid manner, in keeping with the growth of energy demand in the country.
- To continue and strengthen QA activities relating to nuclear power programme within the organization and those associated with it.
- To develop personnel at all levels through an appropriate Human Resource Development (HRD) programme in the organisation with a view to further improve their skills and performance consistent with the high technology.
- To continue and strengthen the environmental protection measures relating to nuclear power generation.
- To continue and strengthen the neighbourhood welfare programme/CSR activities for achieving inclusive growth of the surrounding population.
- To share appropriate technological skills and expertise at national and international levels.
- To bring about modernisation and technological innovation in activities.
- To coordinate and endeavour to keep the sustained association with the other units of DAE.

1.1.2 Operating Units and Units under Construction:

- Operating Units:

- Tarapur Atomic Power Station Units-1&2 (2x160 MW BWRs),
- Tarapur Atomic Power Station Units-3&4 (2x540 MW PHWRs),
- Rajasthan Atomic Power Station Units 1to6 (RAPS-1 100 MW, RAPS-2 200 MW and RAPS-3to6,4x220 MW PHWRs),
- Madras Atomic Power Station Units-1&2 (2x220 MW PHWRs),
- Narora Atomic Power Station Units-1&2 (2x220 MW PHWRs),
- Kakrapar Atomic Power Station Units-1&2 (2x220 MW PHWRs),
- Kaiga Generating Station Unit-1 to 4 (4x220 MW PHWRs) and
- Kudankulam Nuclear Power Station Unit-1&2 (2x1000 MW VVER)

- The units under construction are:

- Kakrapar Atomic Power Project Unit-3&4 (2x700 MW PHWRs)
- Rajasthan Atomic Power Project Units-7&8 (2x700 MW PHWRs)
- Gorakhpur Haryana AnuVidhyutPariyojna Units-1&2 (2x700 MW PHWRs)
- Kudankulam Nuclear Power Project Unit-3&4 (2x1000 MW VVER)
- Kudankulam Nuclear Power Project Unit-5&6 (2x1000 MW VVER)

1.2 Mission and Vision of the company:

1.2.1 Mission:

- The Mission of the Company is ‘To develop nuclear power technology and to produce nuclear power as a safe, environmentally benign and economically viable source of electrical energy to meet the increasing electricity needs of the country'.

1.2.2 Vision:

- “To be globally proficient in nuclear power technology, contributing towards long term energy security of the country.”

1.3 About Kakrapar atomic Power Project Unit 3&4:

- KAPP-3&4 is India’s first pair of indigenously designed Pressurized Heavy Water Reactors (PHWRs) of 700 MW unit size located at Kakrapar in Gujarat, where two units of 220 MW PHWRs are already in operation. The first unit (Unit-3) has been commissioned with successful achievement of major milestone “First Criticality” (controlled self-sustaining nuclear fission chain reaction for the first time) on July 22, 2020 after receipt of regulatory clearance. The unit is synchronized with grid and generating infirm power.

➢ Table 1.3.1 Technical data of Reactor

Type of reactor	CANDU, Pressurized Heavy Water Reactor (PHWR)
Gross electric generation	2 x 700 MWe at 400kV
Type of fuel	Natural uranium in oxide form (UO2)
Number of coolant channels	392 channels
Number of fuel bundles	4704 bundles
Primary coolant	Heavy water (>99% isotropic purity)
Primary coolant temperature	310 ^{0}C at outlet header
Primary coolant flow	26 kg/s
Moderator	Heavy water (>99.97% isotropic purity)
Reactor vessel	Calandria integral with end shield
Calandria and end shield material	Stainless steel 304-L
Coolant tube material	Zircalloy + Niobium (2.5%)
Calandria tube material	Zircalloy-4
Steam generator	4 nos. Tube steel material –low alloy Tube material –incolloy-800
Steam condition	Saturated steam at 256.2^{0}C, 44 kg/cm^2, 0.25% moisture
Turbine	Horizontal tandem compounded. One high pressure and three double flow low pressure turbine.
Generator	Rating 250 MVA, terminal voltage 16.5 KV
Quantity of steam	1076 kg/s
Type of governing	Throttle governing

Fig.1.3.1 Plant Layout

CHAPTER 2. INTRODUCTION OF VARIOUS SYSTEM

2.1 Principle of Nuclear Reactor

- When a heavy nucleus is split up into smaller nuclei, a small amount of mass is converted into energy. The amount of energy produced is given by Einstein's mass-energy reaction $E=mc^2$. This breaking up of a nucleus into two or more smaller nuclei fission.
- In Natural Uranium two types of isotopes U-238 and U-235 are available in the ratio of 139:1. It is the less abundant U-235 isotope that fissions and produces energy which is the fuel for this reactor. When a U-235 atom is struck by a slow (or thermal) neutron, it will split into two or more fragments.
- Splitting is accompanied by release of tremendous amount of energy in the form of heat, kinetic energy of fission products and two or three fast neutrons. These fast neutrons, which eject out of the split atom at high speed, are made to slow down(thermalize) so that they have high probability to hit other U-235 atoms which in turn releases more energy and further sets of neutrons.
- The slowing down of neutrons is achieved by moderator which is Heavy Water. Attainment of self sustained splitting of Uranium Atoms is called "Chain Reaction".

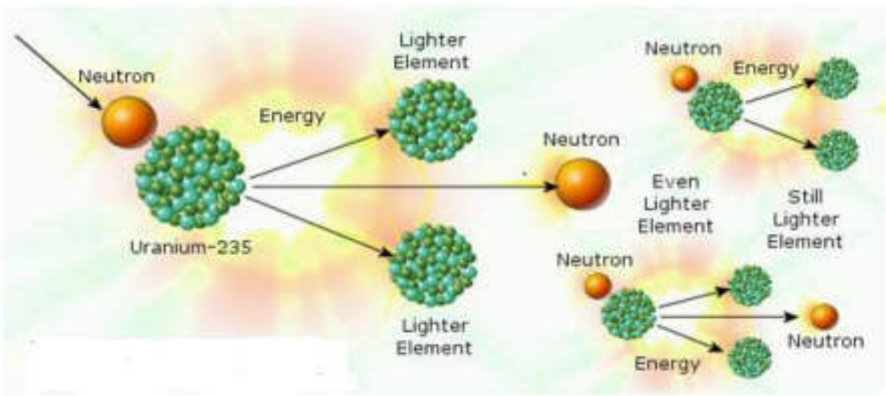


Fig.2.1.1 Fission process

2.1.1 Criticality:

- There is a particular size of fissile material for which is the neutron production by fission is exactly balanced by neutron leakage and absorption. This is called the **CRITICAL SIZE** – that at which the chain-reaction will be self-sustaining. Thus size of the reactor is determined by considerations of critical size. When the chain reaction has been made self-sustaining, it is said that the reactor has gone CRITICAL.

2.2 About PHWR

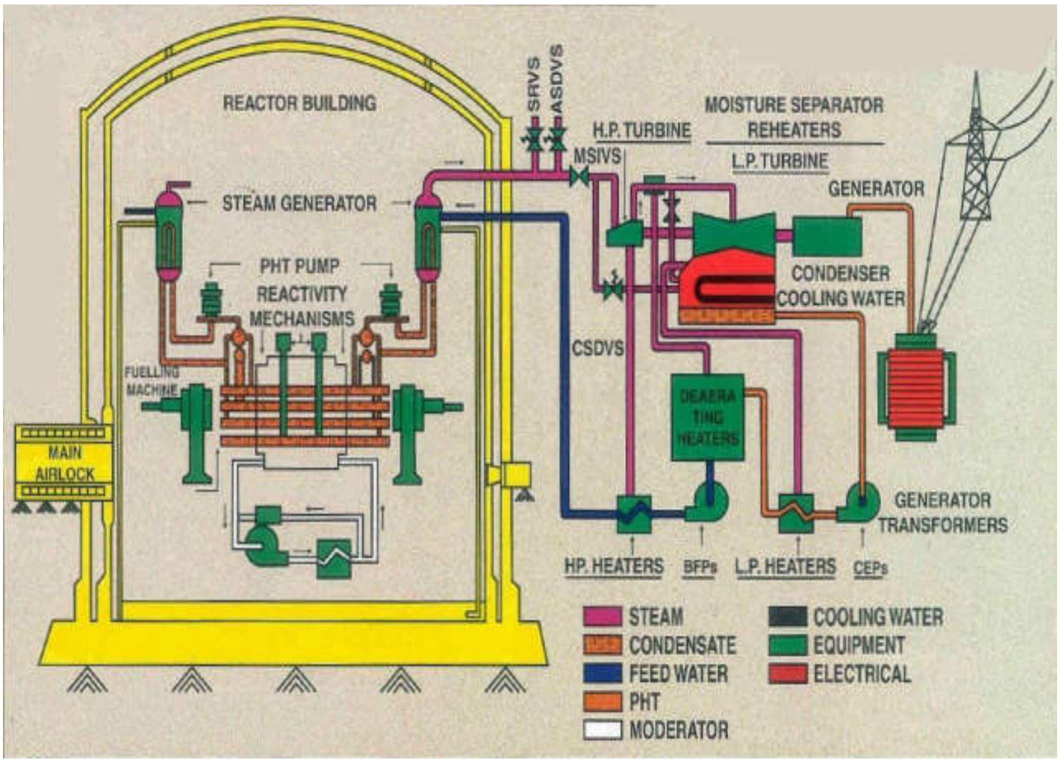


Fig 2.2.1 PHWR Layout

- PHWR is called the Pressurized Heavy Water Reactor. The above figure shows the schematic diagram of Pressurized Heavy Water Reactor. Reactor is made up of two inner and outer walls and they are known as inner containment wall and outer containment wall respectively.
- The reactor core is enclosed in a horizontal cylindrical stainless steel vessel consisting of a large central shell and relatively smaller cylindrical shell at both ends. This cylindrical vessel is called Calandria.
- The moderator and reflector(Heavy Water) are contained in this calandria. Reactor is of horizontal pressure-tube type, using natural Uranium oxide fuel in the form of 37 element cluster.
- There are 392 fuel channels each having 12 fuel bundles. Heavy water is used as moderator in a low temperature, low pressure system(moderator system). The coolant channel with 12 fuel bundles all located in the active core region.
- To refuel the channel with above configuration, ball screw based Fuelling Machine has been designed accordingly for 700 MWe Pressurized Heavy Water Reactor.

2.3 PHT System

- The primary heat transport system transfers the heat generated in the core during normal operation to the steam generators, which produce saturated steam from secondary feed water for driving the turbine-generator.
- The primary heat transport system is in direct contact in fuel and acts as a thermodynamic coupling between the fuel and heat sink. The heat transfer capability of this system also covers different operational states from initial phase of reactor start-up to reactor cool-down.
- The main function of PHT main circuit is to remove heat generated in the fuel bundles and transfer it to different heat sinks in all possible operational states; thereby maintaining integrity of the fuel cladding under all conceivable state of reactor operation. This allows for the production of electric power in a safe and reliable manner.
- The heat transport medium (primary coolant) is pressurized heavy water, and is circulated through and around the fuel bundles in the coolant channel assemblies, by the primary coolant pumps via reactor headers, feeder pipes and associated piping.

- Table 2.1.1 Design Parameters of PHT System

Sr. No.	Parameter Description	Value
1.	Reactor Thermal Power (to coolant)	2166 MW
2.	Total D2O in PHT main system with pressurizer	206 m^3
3.	PHT Pressurizer Volume	45 m^3
4.	PHT main Circuit Design Pressure (Kg/ cm^2)	126
5.	PHT main Circuit Design Temperature, ^0C	326
6.	Total design flow rate, kg/hr.	28.9 x 10^6
7.	Reactor Inlet Header(RIH) Temperature, ^0C	266
8.	Reactor Outlet Header (ROH) Temperature, ^0C	310
9.	Mean D2O Temperature at 100% FP with pressurizer, ^0C	295
10.	Mean D2O density with pressurizer, kg/ m^3:	712
11.	Mean D2O Temperature at 0% FP, ^0C	256
12.	Nominal coolant quality at channel exit %	1.08 to 2.04
13.	Steam pressure (secondary) kg/c cm^2 (g)	44

2.4 Description of PHT System

- PHT main circuit is arranged in two independent and identical loops with two reactor outlet headers of both the loops interconnected to nullify the two phase flow instability effects.

- The Reactor core consists of 392 coolant channels. The two loops are uniformly distributed in the core by adopting interleaving of feeders to limit void co-efficient of reactivity in case of LOCA. This adopted core configuration has channels connected to the headers in such a fashion that:-

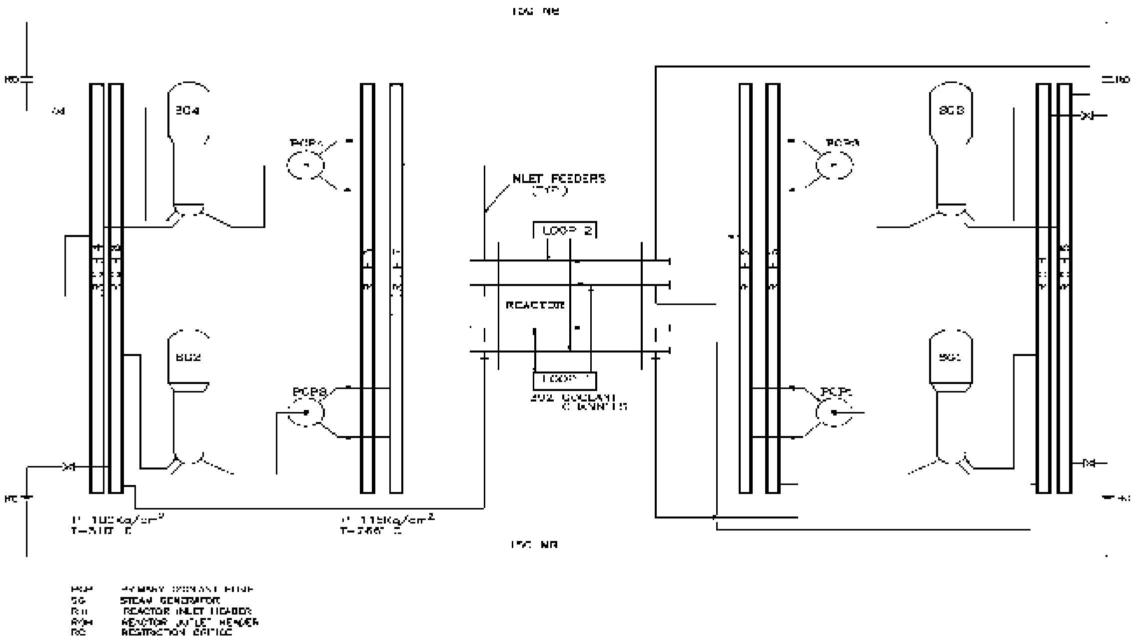


Fig 2.4.1 PHT System Layout

(1)Flow in adjacent channel is in opposite direction.
(2) Each header has 98 feeder connections.
(3) The feeders of channels which are equidistant from centre line of the core are identical, i.e. they have same centre line layout and sizes.
(4) Channels of Loop 1 and 2 are distributed uniformly throughout the core. Each loop consists of two reactor outlet headers (ROHs), two steam generators (SGs), two primary coolant pumps (PCPs) and two reactor inlet headers (RIHs) and a set of 196 no. each of inlet and outlet feeders connecting coolant channel assemblies to the reactor headers at both ends.

- The fuel bundles inside the coolant pressure tube are held in place by downstream shield plug through fuel locators with shielding and sealing being provided by shield plug and seal plug respectively. Feeders are connected to pressure tubes through end fittings. The feeders and headers at each end of the reactor are housed in insulating cabinets in the fuelling machine vaults which is called as feeder cabinet.

2.5 Primary Coolant Pumps

- Primary coolant pumps (PCPs) circulate coolant through the reactor core. PHT main circuit has four PCPs with two pumps in each loop. PCP is a single stage, double volute, vertically mounted, single suction double discharge centrifugal pump. Each PCP is provided with three mechanical seals. Each of these mechanical seals can withstand full system pressure and thus provide a reliable pressure boundary sealing. The three mechanical seals are further backed up by a vapor seal to prevent leakage of D_2O vapor past the shaft. Besides this, a stationary backup seal is provided which can be energized after the shaft is made stationary, to prevent any escape of heavy water to reactor building (RB) atmosphere in case of gross seal failure.

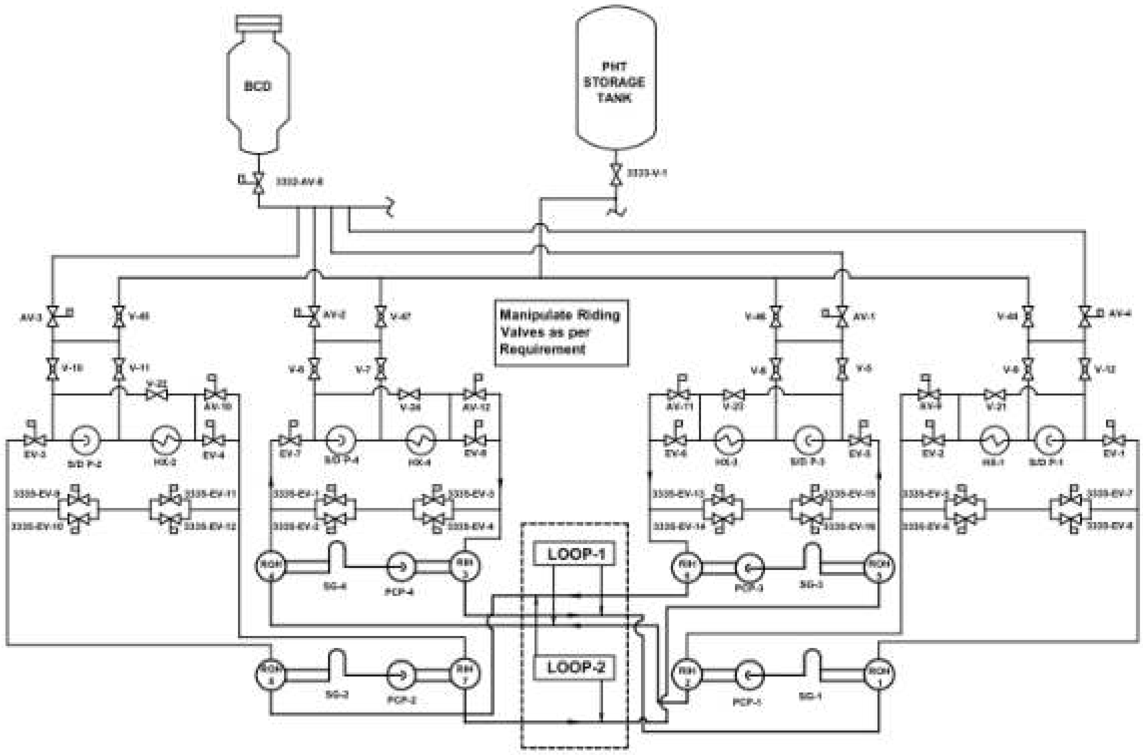


fig 2.5.1 PCP Loop

- PCP motors are connected to 6.6 kV class-IV electric power supply. The motors are provided with air brakes to prevent slow forward turning of the tripped pump in 1-0 mode of reactor operation. The brakes are energized at a shaft speed of 400 rpm in this mode as continued operation at low speeds can damage the bearings. Motor is equipped with a flywheel for increasing pump run down time, in case of loss of electric supply to PCP-motor.

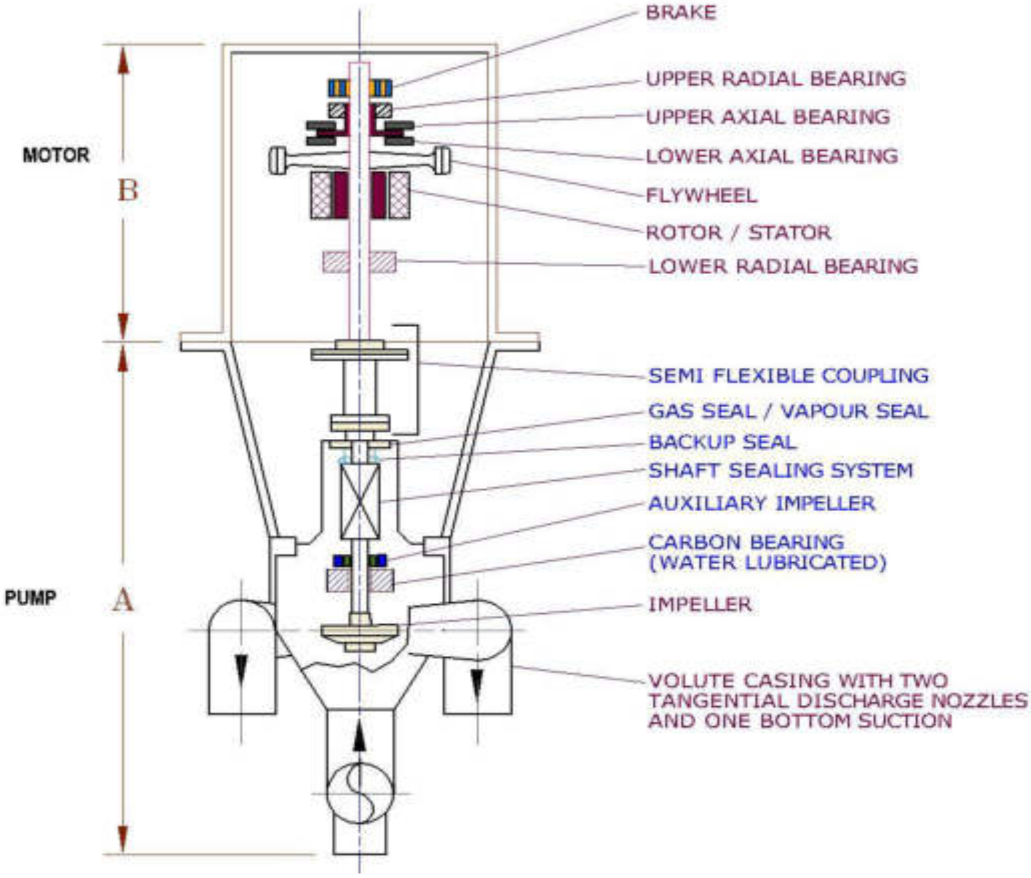


Fig 2.5.2 PCP Pump

Design Parameters

Arrangement : Two pumps in each loop, total four pumps

Pump rated flow : 8785 m^3/hr.

Operating head : 221.7 m

Design Pressure : 126 kg/cm^2(g)

Design Temperature : 326^0C

Electrical Load Details

PCP motor : 6000 KW, Class-IV, 6.6 KV AC, 3 Phase

Rated power : 5.1 MWe (at duty point)

2.6 Steam Generators

- Steam Generators transfer heat from primary system to secondary system. Two SGs are provided in each of primary loop. The Steam Generators are vertical mushroom type design without integral pre-heater. They are recirculation type heat exchangers, having inverted U tubes for primary flow. The shell side is designed for a natural recirculation.
- Hot primary coolant from the reactor outlet header enters the inlet chamber of the SG, passes through the tube bundle and enters the primary coolant. The nominal inlet quality to the steam generator is to be kept below about 4.0% at the end of life (i.e. considering tube plugging and fouling effect) corresponding to 100% FP conditions of 310°C and 100 kg/ cm^2 (g) at ROH.
- The feed water at 180°C enters the steam generator through two feed water nozzles provided diametrically opposite in the steam drum at an elevation of 14.5 m (approx.) above the tube sheet.

2.6.1 SG Design Parameters

Type: Mushroom without preheater
Arrangement: Two Steam Generators in each loop, (total four Steam Generators)
Tube material: Incoloy-800
Total evaporation rate : 3844 Te/hr.
Feed water inlet temperature : 180^0C
Steam temperature &pressure : 256^0C, 44 kg/cm^2(g)
Steam quality at steam generator outlet : 0.26% moisture (max.)

2.6.2 Design Pressure

Shell Side : 55 kg/cm^2(g)
Tube Side : 126 kg/cm^2(g)
Design Temperature
Shell Side: 326^0C
Tube Side: 326^0C
Primary side flow : 2005 kg/sec.
Feed water flow / Steam flow : 267 kg/sec.

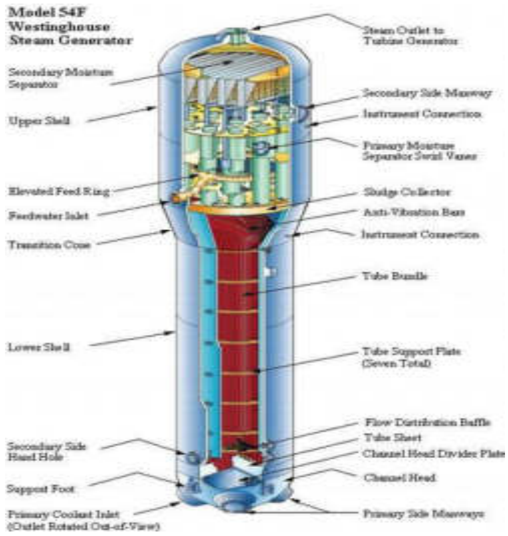


Fig 2.6.1 Steam Generator Layout

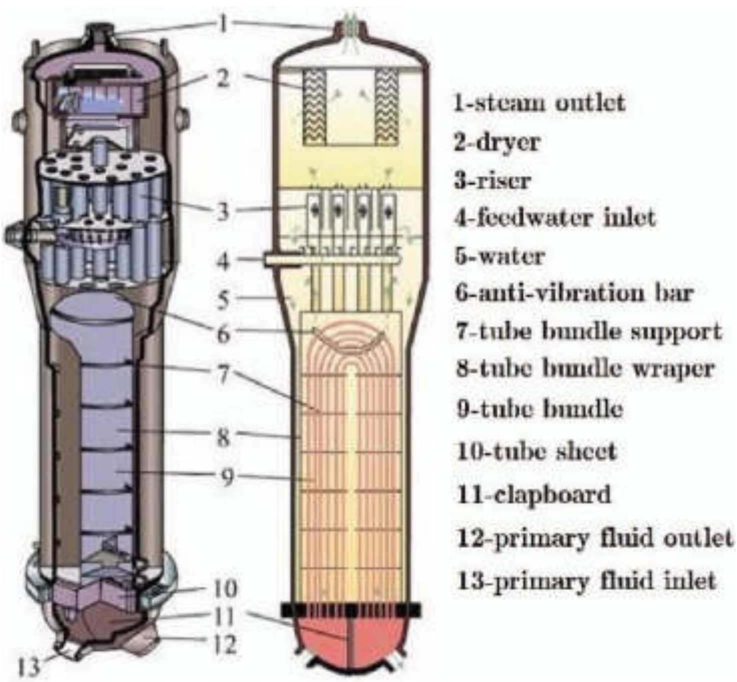


Fig 2.6.2 Schematic Diagram of Steam Generator

2.7 PHT Feed & Bleed system

- PHT Feed & Bleed System Systems is designed to carry out following functions:
  1) PHT purification flow for controlling chemistry of primary coolant.
  2) To control dissolved gases in primary coolant.
  3) To provide sufficient space for storing coolant swells and to store sufficient Inventory to meet shrinkage demands in all operational transients and small leak events.
  4) Requisite inventory control of heavy water within PHT main circuit to preclude voids.
  5) Pressure control in PHT main circuit under all operational states.

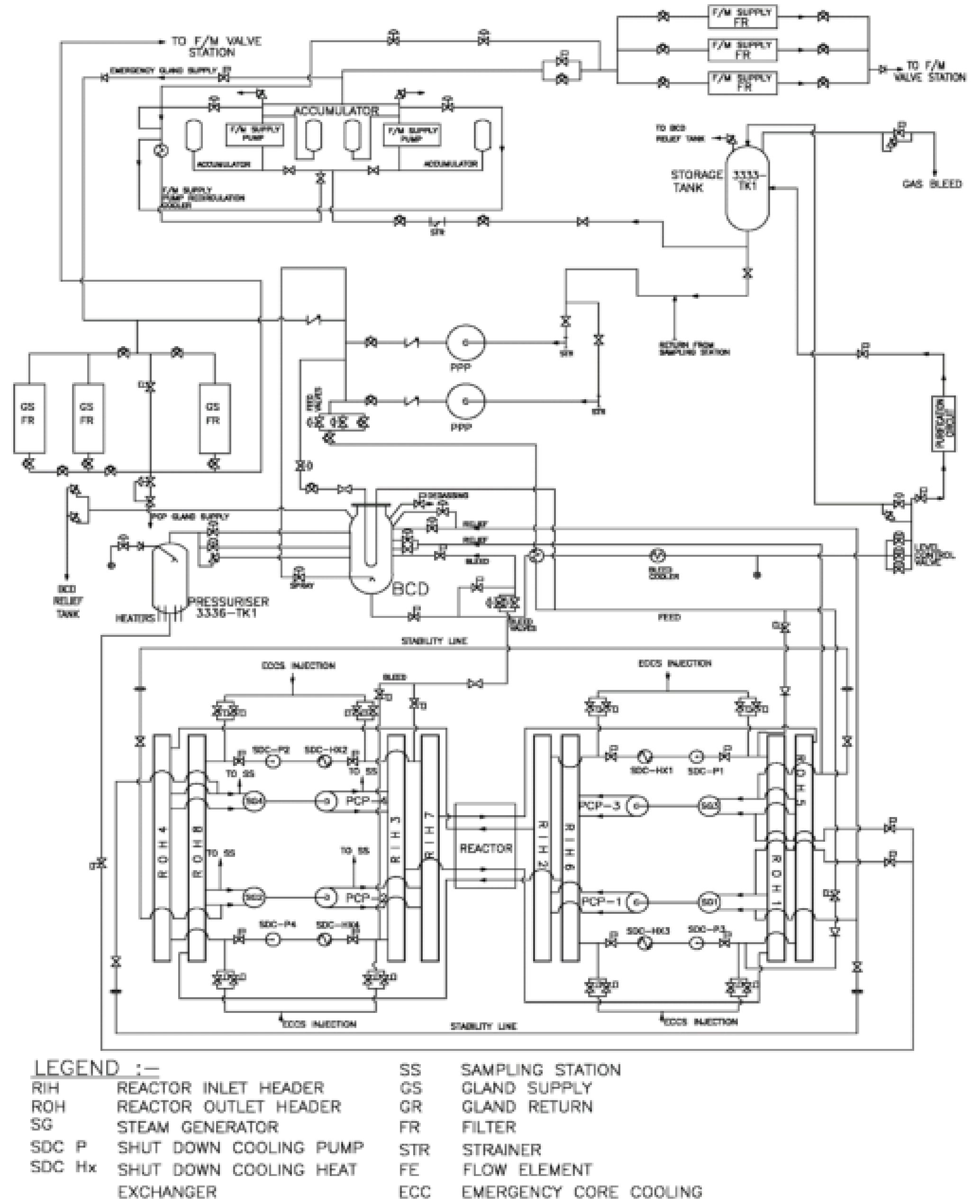


Fig 2.7.1 PHT Feed & Bleed System

2.7.1 PHT Storage System

- The heavy water storage system consists of a main storage tank of about 70 m^3 capacity, located in Pump Room at 115.5 M Fl. El. Primary pressurizing pumps (PPPs) and F/M supply pumps normally draw water from this main storage tank. The bleed from main circuit is returned to the storage tank after purification.
- The storage tank is provided with nitrogen cover gas which is maintained at positive pressure above 3.0 kg/cm^2 (g) by gas feed valve & bleed valve during normal operation. It is protected from over pressurization by two relief valves.

Design Parameters of Storage Tank

Design Pressure : 5.0 kg/cm^2(g) (Internal) 1.6 kg/ cm^2 (g) (External)
Design Temperature : 125oC
Operating Pressure range : 3 to 3.5 kg/ cm^2 (g)
Vessel capacity total : 70 m^3

2.7.2 Primary feed system

- Primary feed system provides a feeding (make-up) and pressurizing source for PHT main circuit to required pressures. The system consists of 2 x 100% pressurizing pumps and 2x100% capacity feed control valves for controlling feed flows, located in RB at 104.5 elevation.
- During steady state operation, 1000 lpm of coolant at 266 ^{0} C is bleed off from PHT main circuit for purification. Equivalent amount of feed, 800 lpm at 40 ^{0} C is fed into the main circuit through the following modes:

    1) Direct feed through feed control valves via regenerative cooler
    2) Reflux cooling flow supplied to Bleed Condenser (BCD).
    3) Gland injection through PCP seals. The gland cooling supply to 4 primary coolant pumps is 100 lpm out of which 54 lpm returns to purification via Gland return system. Thus 46 lpm goes back into the PHT system. Reflux cooling flow required for 1000 lpm bleed at 260 ^{0} C is 200 lpm. Hence the direct feed during normal operation through feed control valves via regenerative cooler will be 554 lpm (800 lpm-200 lpm-46 lpm).

2.7.3 Primary pressurizing pumps

- PPPs (i.e. PHT Feed pumps) are multistage centrifugal pumps with single suction and single discharge. 2 x 100% capacity pumps are provided for redundancy. These are connected on class-III supply, located in RB at 104.5 M Fl. El.
- Both pumps draw coolant from the storage tank through suction strainers and discharge it at high pressure to a common header which supplies to various demands as given below:
    1) Direct feed to system through feed control valves.
    2) Reflux cooling supply to BCD.
    3) PCP GLAND INJECTION.
    4) Low pressure supply to F/M valve station for fuel transfer operations

2.7.4 Primary feed circuit

- Primary feed circuit comprises a pair of feed control valves which control coolant feed into main circuit and an indirect feed in the form of reflux cooling flow to which joins main feed line.

- Main feed line supplies coolant to one Reactor Outlet Header in each of the two loops of main circuit independently. 2x100% capacity feed control valves are provided for redundancy.
- When pressurizer is connected to PHT main circuit for PHT pressure control, feed control valves are on “Inventory control” mode. (Viz. pressurizer level control).
- When pressurizer gets disconnected from main circuit loops for any reason pressure control of main circuit loops is transferred to feed & bleed control valves and they operate in “Pressure Control” mode. Reflux control valve is always for pressure control of BCD only.

2.7.5 Primary bleed system

- Primary bleed system comprises 2 x 100% capacity bleed control valve -which bleed coolant from lowest temperature point in main circuit viz. Reactor Inlet Header. The hot coolant bleeds from main circuit flashes in Bleed Condenser as liquid-vapour mixture.
- It is condensed in Bleed Condenser and subsequently cooled in stages in Regenerative cooler and Bleed cooler to a near ambient temperature for low temperature purification.
- The bleed is condensed by Reflux cooler in Bleed condenser and further cooled by feed flow in Regenerative cooler thereby recovering some of the heat for heating the feed.
- Bleed Cooler is designed to cool the bleed from Bleed Condenser outlet condition to near ambient even if Regenerative cooler is ineffective. 2 x 100% capacity bleed control valves are provided for redundancy.

2.7.6 Bleed condenser

- Bleed Condenser (BCD) is a cylindrical pressure vessel of 12 m^3 volume, located in pump room at 115.5 M Fl. El. It contains heavy water in equilibrium with heavy water vapour at 34.0 kg/ cm^2 (g) pressure (saturated temperature 240^0C) controlled normally by reflux control valve & backed up by spray control valve during normal operation.
- Primary function of BCD is to condense coolant bleed from main circuit and/or relieved from pressurizer. The bleed or relieved coolant from main circuit / pressurizer is condensed in Bleed Condenser to a saturated liquid at 240^0C. Reflux cooling heat exchanger in Bleed Condenser provides cooling in normal case. BCD also accepts coolant relief in case of PHT system overpressure through IRV opening / pressurizer RV opening.
- Additional/ reserve cooling capacity is provided in the form of spray arrangement in BCD. Reflux cooler is a tube bundle in BCD vapour space, normally cooling BCD by condensing heat transfer on tube bundle (Vessel side).
- A provision for spraying cold heavy water exists, which takes supply from PPP discharge. Spray cooling, even though more effective, acts only as a back-up to reflux cooling mode.
- The sources of dissolved gases can be:
    1) Radiologists of coolant.

2) Fission products released to coolant due to fuel failure.
3) Decomposition of chemical additives, etc

2.7.7 Regenerative cooler

- Bleed or relieved coolant from PHT main circuit/pressurizer is condensed in Bleed Condenser to saturated liquid state of 240^{0}C approx. Further cooling is done in two stages, first in Regenerative Cooler and second in Bleed Cooled (BCL). Regenerative Cooler is a shell and tube D2O to D2O heat exchanger.
- Hot bleed from BCD is cooled by cold feed flow, in the process heating up feed going to PHT main circuit. This scheme enables to recover system heat which otherwise would have been lost in Bleed Cooler & also minimizes thermal stresses at feed line-main circuit junction.

2.7.8 Bleed cooler

- Bleed Cooler is designed to cool bleed from Bleed Condenser outlet condition to near ambient temperature (without giving credit to cooling in regenerative). Bleed cooler is also a shell and tube heat exchanger, located in pump room at 115.5 M Fl. El. Hot bleed (Tube side) is cooled by active process water system (shell side).
- In addition, inlet motorized valve to purification system closes automatically when bleed cooler outlet temperature exceeds 50^{0}C. A control valve , and a relief valve in purification bypass line, inside RB provides protection to PHT purification circuit on coolant pressure high. In case of such action, cooled heavy water from bleed cooler is directly fed to PHT heavy water storage tank.

2.7.9 Pressurizer

- Pressurizer is a pressure vessel (Surge tank) of a total capacity of 45 m^3 with heavy water inventory of 36 m^3 during full power operation. It reduces demand of pressure and inventory control on feed and bleed system. Pressurizer provides the necessary vapour cushion for PHT main circuit to reduce pressure variations due to transients involving swell and shrinkage in main circuit.
- The need for incorporating pressurizer arises due to large swell and shrinkage in the coolant volume resulting from the operational transients. *{In KAPS-1&2 of 220 MWe, only 70 Ton heavy water is used in Primary Heat Transport System but in KAPS-3&4 of 700 MWe, about 250 Ton heavy water is used in Primary Heat Transport System }.*

2.8 Reactor Shutdown System

2.8.1 Introduction

- When certain plant parameters exceed operating limits and conditions, the shutdown systems trip the reactor by fast insertion of a large amount of negative reactivity into the core.

- Two independent and fast acting system SDS 1 and SDS 2 capable of independently shutting down the reactor and maintaining it sub-critical are provided. Each system is designed to perform the intended function assuming single failure criteria.

- SDS 1 consists of 28 vertical shut-off rods(SRs) consisting of cadmium absorber sandwiched between stainless steel tubes, which fall into the reactor under gravity upon its actuation.

- Design objectives of the shut-off rods are that upon trip, to provide an initial negative reactivity insertion rate high enough to counteract all credible reactivity excursions.

- Upon full insertion, to provide enough negative reactivity depth to ensure that the reactor remains subcritical following shutdown.

- SDS 2 consists of 6 horizontal tubes through which liquid poison in the form of Gadolinium nitrate, (Gd(NO3)3. $6H_2O$) is injected directly into the moderator.

CHAPTER 3. INTRODUCTION OF VARIOUS EQUIPMENT

3.1 Introduction

- In any power plant, for generation of electricity, turbine is an essential part, as it is the prime mover for the generator rotor. The heat produced in the reactor is taken away by heavy water in PHT system & transfers it to the feed water into steam generator for steam production.
- The generated steam is then transferred to turbine to convert the thermal energy into mechanical energy to rotate the generator rotor.

- Table 3.1.1 Steam Turbine Parameters

Sr. No.	Parameters	HP admission steam
1	Pressure (bar)	42.9
2	Temperature (	254.5
3	Enthalpy (KJ/Kg)	2794.5
4	Mass flow rate (Kg/s)	1075.95
5	Speed of rotation (RPM)	3000
6	Direction of rotation	Clockwise
7	Rating (MWe)	700
8	Admission pressure at HP stop valve	44
9	Admission temperature at HP stop valve	256
10	Admission pressure at LP stop valve	6
11	Admission temperature at LP stop valve	236

- The turbine is made up of one HP dual flow turbine and three LP dual flow turbines. These turbine and generator and exciter all are mounted on a same shaft. This is known as Tandem Compounding.

- The turbine is a pressure tandem compounded horizontal impulse reaction type with HP and three LP cylinders. The individual turbine rotors and the generator rotor are connected by rigid coupling. There are total five rotors which are connected to each other and forms turbine shaft.

- The steam expands successively in the HP turbine and then in parallel, in the three LP turbines. The expansion goes from 42.9 bar abs upstream the HP admission valves down to 0.090 bar abs in the main condenser.

- Between the HP exhaust and the LP admission, the steam goes through the MSR. In the MSR, the steam is separated from the water before being re-heated successively by HP extraction steam and main steam.

- Part of the steam is diverted through five additional extractions that supply the 5 HP and LP heaters with hot steam at appropriate enthalpy and re-heat the extraction water and feed water.

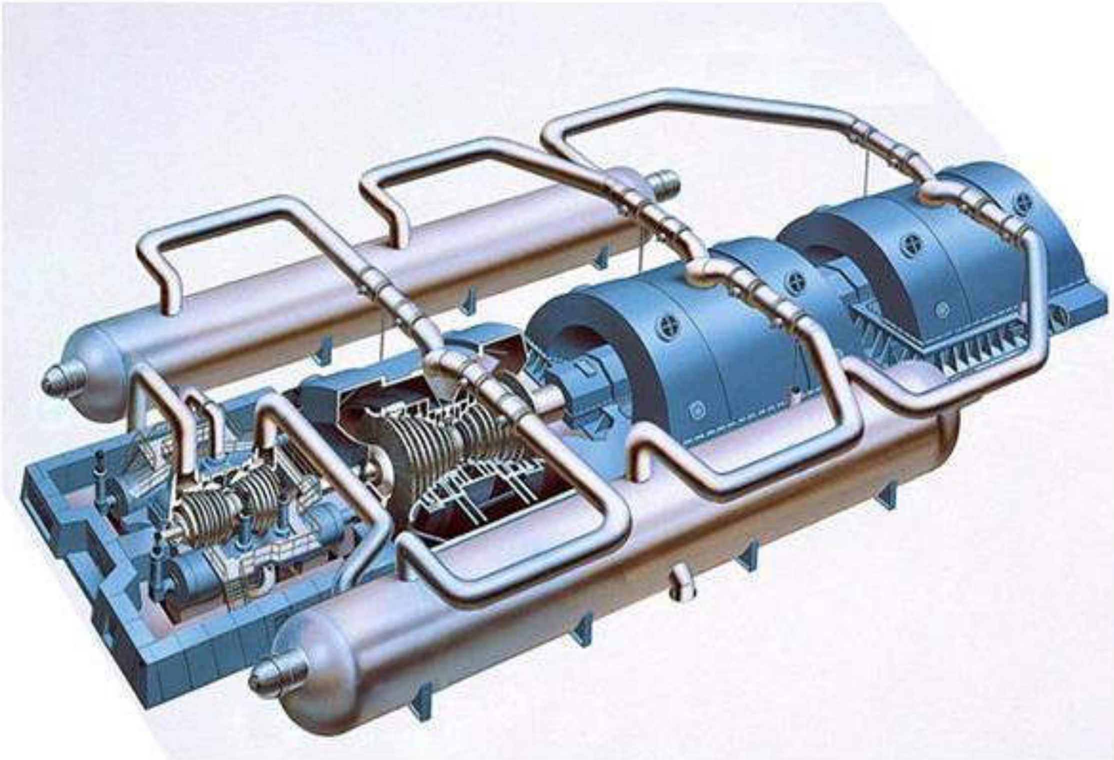


Fig 3.1.1 Steam Turbine

3.2 Brief Overview of Turbine Generator Train

- Turbine generator (TG) system contains:
  1) 1 HP turbine, 3 LP turbine, Generator and Exciter
  2) 2 HP inlet valves and 2 HP outlet valves, 6 LP inlet valves and 6 LP outlet valves
  3) 2 MSRs with Cold Re-Heat (CRH) piping and Hot Re-Heat (HRH) piping.

- Complete TG train is supported on 11 journal bearings. One thrust bearing is provided at HP rear pedestal to absorb thrust load. All turbines are rigidly coupled. Turning gear and Main oil pump are provided at HP front pedestal.
- Critical speed below 3000rpm are- HP: 1741 rpm, LP1: 1684 rpm, LP2: 1701 rpm, LP3: 1692 rpm, Gen: 736 rpm and 2130 rpm, Exciter: 1296 rpm

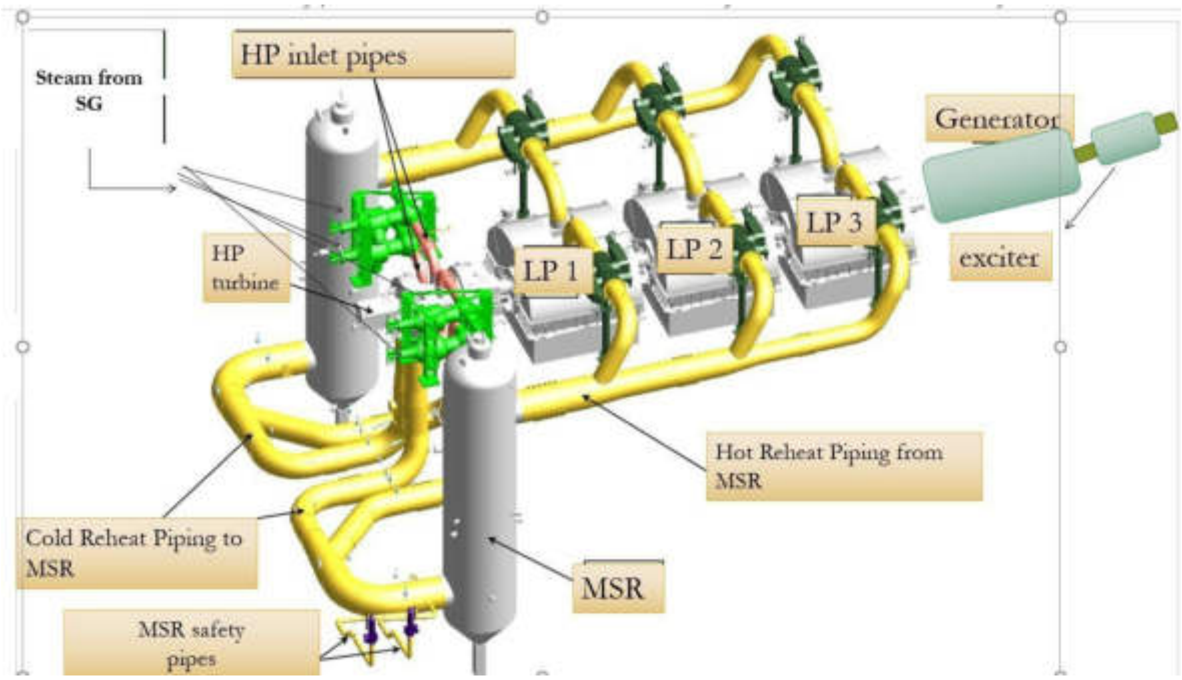


Fig 3.2.1 Turbine Generator Train

3.3 Constructional Features of 700 MW Turbine

3.3.1 HP Turbine

- 6 stages, double flow, single cylinder HP turbine with impulse-reaction type blades.
  - Casing:
    - Casted alloy steel casing (Cr~11.7%, Ni~1.01%, Mo~0.27%, Si~0.29%, C~0.08%) with internally machined for diaphragm seating.
    - It is supported on front and rear pedestals and fixed at rear pedestal.
    - Casing has four inlets and 4 exhausts for steam.
  - Bearings:
    - HP rotor is supported on one Journal bearing at front and one journal bearing at rearend.
    - Thrust bearing is provided at rear end to absorb axial thrust.
    - Thrust bearing also acts as rotor fixed point.
  - Other features:
    - Extraction after 2nd stage (rear side) and 4th stages (front side) are provided to MSR 1st stage reheater heater and HP heater respectively.
    - After erection, HP turbine is fully insulated to minimize radiation and conduction losses.

- Rotor shaft end glands are provided to prevent any leakage of steam to outside.

3.3.2 LP Turbine

➢ 5stage, double flow, Double cylinder LP turbine with impulse-reaction type blades.

- Casing**:**
  - Inner casing is fabricated with SA 516 Gr-70 plate and internally machined for diaphragm seating.
  - Inner casing is supported on 4 supports provided on outer casing.
  - Inner casing has 2 inlets for steam and exhaust is from exhaust hood directly into condenser.
  - Inner casing is fixed on outer casing at middle on both sides.
  - Outer casing is welded to condenser neck and also secured by anchoring bolts with foundation.
  - Outer casing has 2 rupture disc each.
- Rotor**:**
  - Forged monoblock rotor (0.26% C, 0.21%Mn, 1.63%Cr, 3.51% Ni, 0.41%Mo, 0.09% V) with integral discs and blade roots machine done it.
  - Rotor rest on bearing pedestals, which are inbuilt in outer casing.
  - Rotors are designed to be interchangeable in duplicate units.

Fig 3.3.2 LP Turbine

- Blades:
  - Moving blades are obtained from machining of forged 12% Chromium steel bars.
  - 1-4 stages moving blades are integrally shrouded and fixed with fork- pin arrangements with rotor.
  - Last stage moving blade is provided with integral stubbing and are edge hardened.
  - Last stage moving blades are fixed by fir-tree arrangement.
  - Fixed blades obtained in similar fashion as moving blades and welded with inner and outer rings.
- Bearings:

- Each LP rotor is supported by its own set of journal bearing a tends.
- These bearings are fixed in built-in pedestals provided in outer casing.

- Other features:
  - Thermal screens are provided on inner casing to reduce heat losses.
  - Extractions are provided after 2nd 3rd and 4th stage of turbine toLPH-3, LPH-2 and LPH-1respectively.
  - Rotor shaft end glands are provided to prevent air ingress to turbine.

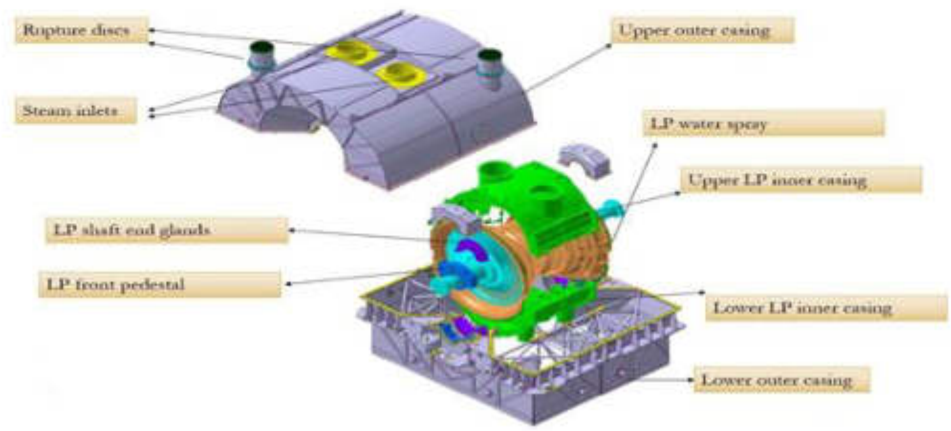


Fig 3.3.3 LP Turbine Assembly

3.4 Steam Turbine Losses

- Internal losses
  - Frictional losses in fixed and moving blades
  - Clearance losses
  - Losses due to wetness of steam
  - Carry over losses
  - Leaving velocity losses
  - Radiation and conduction losses
- External losses
  - Mechanical losses
  - Leakage losses from end seals

3.5 Various Turbine Auxiliary System

1) Lube oil system:- This system is provided to ensure supply of lube oil to turbine generator bearings and cooling of oil in all conditions.

2) Jacking oil system: This system is provided to lift up rotor during start up and smoothly placing on bearings after shut down of turbine.

3) Gland sealing system: This system is provided to ensure gland sealing of LP and HP turbines, HP inlet valves and LP inlet valves, etc.

3.6 Pumps

- Pump is a mechanical device which is used to transfer liquid from one place to another. In other words, a pump is a mechanical device which converts the mechanical energy into hydraulic energy. It is used for various purposes to lift water from wells, to deliver water to different parts of the power plant, etc.
- Classification of Pumps are as follows:

1) Dynamic pressure pumps
   a. Centrifugal
   b. propeller
   c. Turbine
2) Positive Displacement Pump
   a. Reciprocating
      I. Piston
      II. Diaphragm
   b. Rotary
      I. Gear
      II. Lobe
      III. Screw
      IV. Vane
      V. Rotary Plunger

3.7 Reciprocating Pump

- Reciprocating pump is a positive displacement type of pump. In this pump, all the amount of liquid sucked in first half of cycle of operation is completely displaced to discharge side in the next half of the cycle.

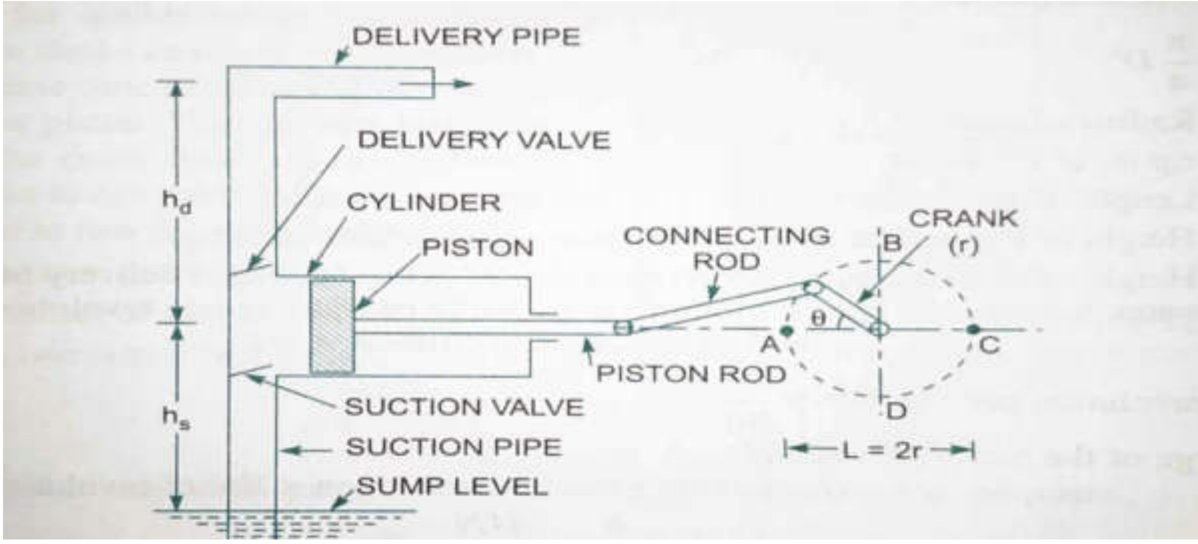


Fig 3.7.1 Single Acting Reciprocating Pump

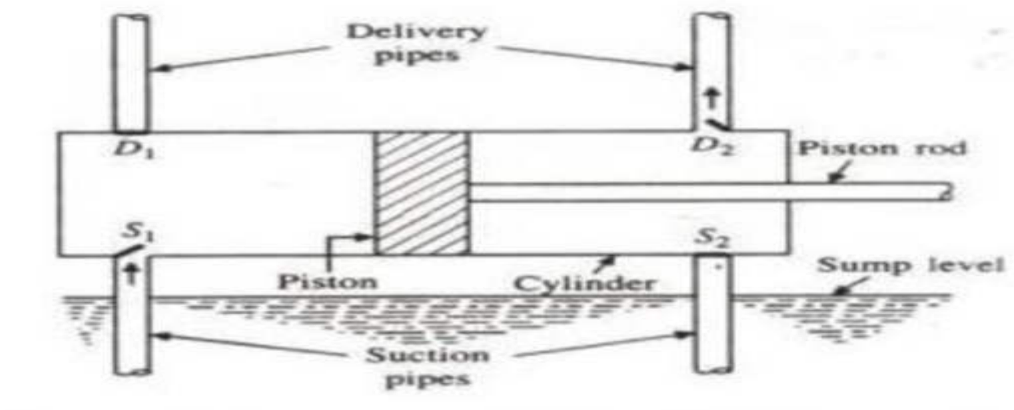


Fig 3.7.2 Double Acting Reciprocating Pump

3.8 Centrifugal Pump

- It converts mechanical energy into hydraulic energy (pressure energy) by virtue of centrifugal force. Flow is in radial outward direction. Common uses include water, Sewage, Petroleum and petrochemical pumping.
- Components of Centrifugal pump are as follows:

1) Impeller: It is a wheel or rotor which is provided with a series of backward curved blades or vanes. It is mounted on the shaft which is coupled to an external source of energy which imparts the liquid energy to the impeller there by making it to rotate.

➢ Types of Impellers:
   I. Open
   II. Semi-open
   III. Enclosed

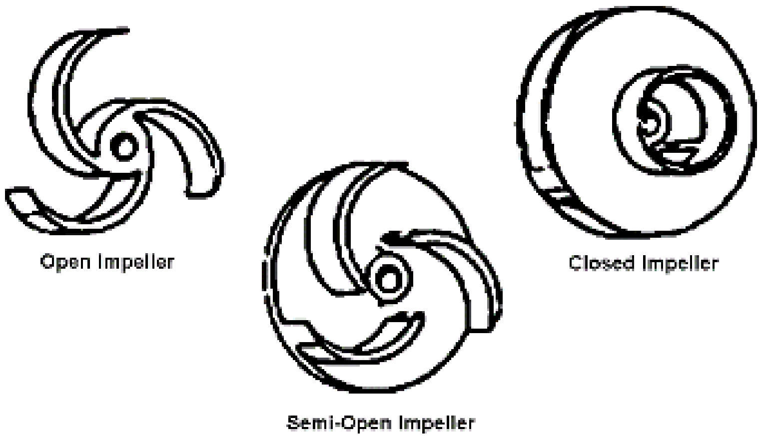


Fig 3.8.1 Types of Impellers

2) Casing: It is a pipe which is connected at the upper end to the inlet of the pump to the center of impeller which is commonly known as eye. The double end reaction pump consists of two suction pipe connected to the eye from both sides. The lower end dips into liquid in to lift. The lower end is fitted into foot valve and strainer.

➢ Commonly three types of casing are used in centrifugal pump:
   I. Volute casing
   II. Vortex casing
   III. Casing with guide vanes

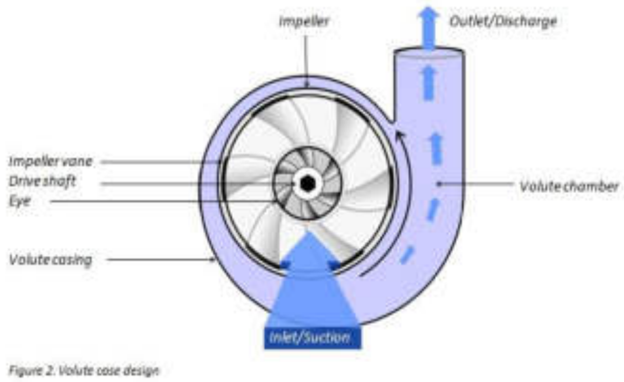


Fig 3.8.2 Volute casing

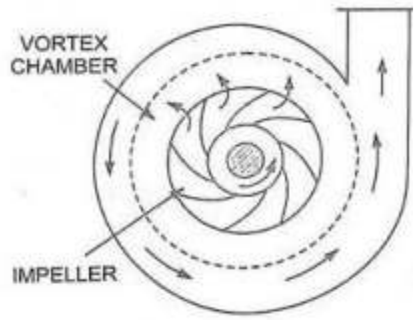


Fig 3.8.3 Vortex casing

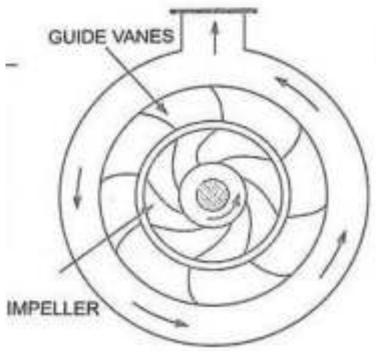


Fig 3.8.4 Casing with guide vanes

3) Delivery pipe: It is a pipe which is connected at its lower end to the outlet of the pump and it delivers the liquid to the required height. Near the outlet of the pump on the delivery pipe, a valve is provided which controls the flow from the pump into delivery pipe, etc.

3.9 Rotary Pump

- Rotary pump is a positive displacement pump. It consists of a fixed casing with a motor which may be in the form of gears, vanes, lobes, etc. Suitable to handle viscous liquids like, Vegetable oil, Lubricating oil, Alcohol, etc. It is used in carbonators for coffee machines and cold drink dispensers.
- It is self-priming so they can pump gases as well as liquids. The rotary type pumps are as follows:
  - I. Gear pump
  - II. Vane pump

III. Screw pump
IV. Lobe pump

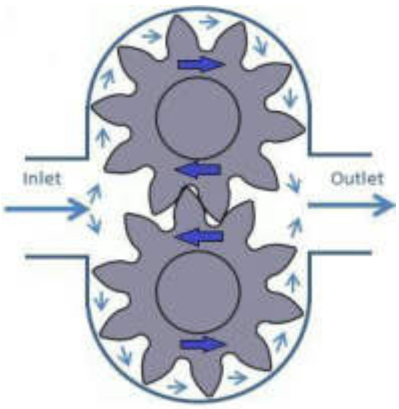


Fig 3.9.1 Gear pump

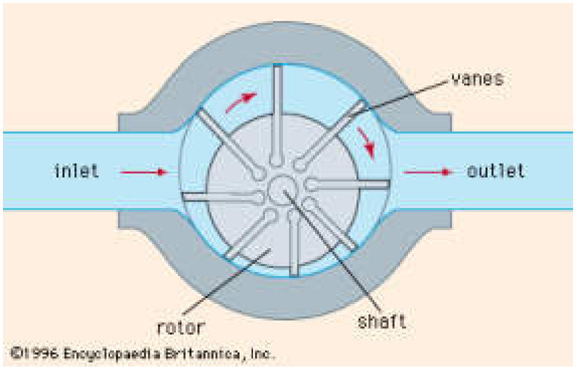


Fig 3.9.2 vane pump

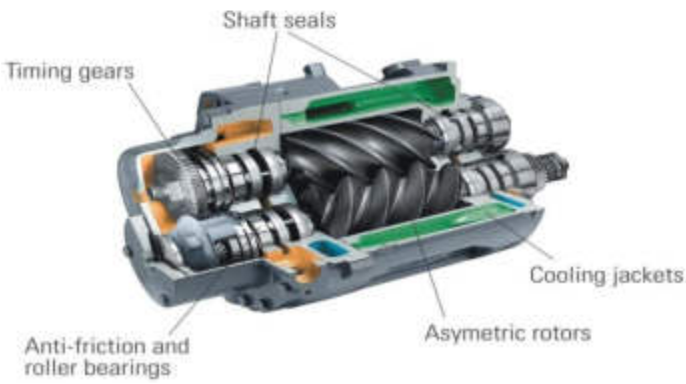


Fig 3.9.3 Screw pump

3.10 Valves

- Valves are basically a mechanical device which are used in piping system for the purpose of controlling, regulating and directing the flow within the system of process. There are many application of valves like, Pressure regulation, Flow control, etc.

- Functions of valves:
  I. Start or stop the flow
  II. Regulation of flow

III. Back flow prevention
IV. Pressure regulation
V. Pressure relief

- Types of Valves:
  I. Isolating valve
  II. Regulating Valve
  III. Non-return Valve
  IV. Safety or Relief Valve

I. Isolating Valve: An isolating valve is a valve in a fluid handling system that stops the flow. It is fully closed or fully opened. Generally, it is used for maintenance or safety purpose.

- Examples: Ball Valve, Butterfly Valve, Globe Valve, Bellow sealed Valve, etc.

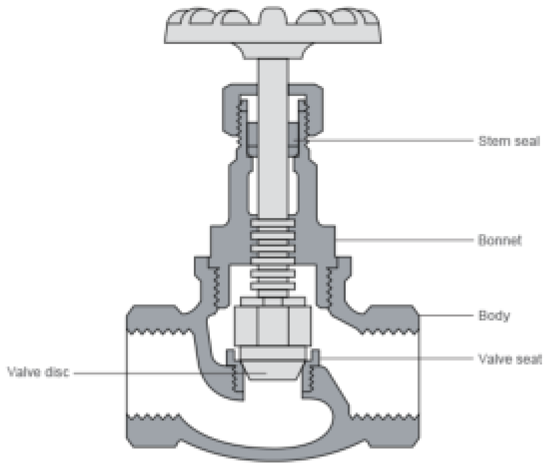


Fig 3.10.1 Isolating Valve

II. Regulating Valve: Our regulating valves are used for adjusting or monitoring flow volumes and flow directions. Regulating valves may be used in the closed circuits of heating and cooling systems, to control low rate(two way valves) and to control temperature by mixing the primary circuit medium with the system return medium(three way valves) in order to obtain the desired flow temperature to the utility.

- Examples: Plug Valve, Diaphragm Valve, Gate Valve, etc.

Fig 3.10.2 Regulating Valve

III. Non-return Valve: A non-return valve is a single way valve that allows the fluid to flow only in one direction. The main importance of non-return valves is their working of allowing flow in the downstream direction and preventing the flow in the upstream direction. Non-return valves use the mechanism to allow the medium only in the right direction. It has two openings; one inlet and the other outlet. A closing member separates the inlet and outlet staying in between. When the fluid enters the non-return valve through the valve inlet, the fluid pressure keeps the closing member open. On the other hand, when the fluid attempts to flow in the backward direction from the outlet side to the inlet side, the closing member closes the entrance which prevents the flow. Non-return valves work automatically without the need for control of any external element.

- Examples: Swing check NRVs, Stop check NRVs, Ball NRVs, etc.

Fig 3.10.3 Non-return Valve

IV. Safety or Relief Valve: A safety valve protects a system against overpressure. Overpressure occurs when the system's pressure exceeds the maximum Allowable Working Pressure(MWAP) or the pressure for which the system is designed. Safety valves can open very quickly compared to relief valves. A safety valve opens from a set pressure; the valve first opens a little, then opens fully so that the unwanted pressure is removed from the system as quickly as possible. Safety valves prevent pressure increases that lead to malfunctions, fire hazards, or explosions. The system's media fully actuates a safety valve, keeping it working in a power failure. Safety valves only have mechanical parts, which operate when electronic or pneumatic safety devices fail.

- Examples: Valves with a spring-load mechanism, Valves with balanced bellows, and pilot-operated safety valves.

CHAPTER 4. INTRODUCTION OF VARIOUS PLANTS

4.1 Introduction

- Steam after expansion in Low Pressure (L.P.) Turbine is led to condenser where the steam is condensed by the condenser cooling water flowing through the tubes and steam condensate is led to condenser hot-wells. That condensate is pump to the cooling towers.
- There are two cooling towers:

i. NDCT(Natural Draft Cooling System)
ii. IDCT(Induced Draft Cooling System)

4.2 NDCT

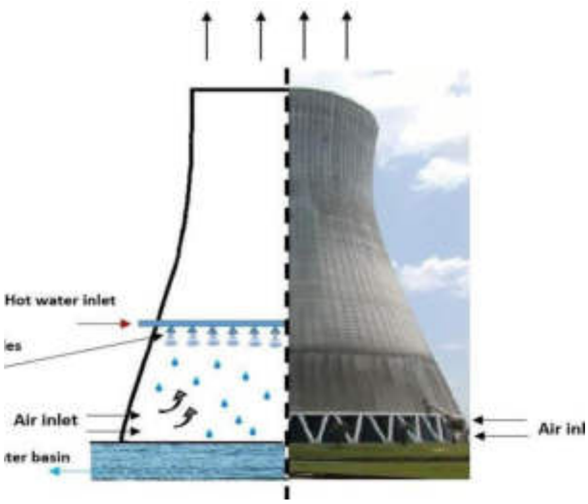


Fig 4.2.1 NDTC

- The condensate water in the secondary cycle is sprayed in the cooling tower and from the bottom of the cooling tower cold air comes and absorbs the heat and discharge from the top of the cooling tower duet pressure difference.
- NDCTs are used to dissipate the heat load of CCW system (1545 MW) and ASW system (45 MW approx.). The total expected heat load is about 1590 MW. Considering the indigenous capability on construction of NDCTs, two numbers of NDCTs per unit to dissipate the above heat load are considered.
- Efficiency of NDCT is about 66% and Efficiency of IDCT is about 76% due to less amount of approach in IDCT.

➢ Table 4.2.1 NDCT Parameters

NDCT Flow	127000 m^3/hr [120000 m^3/hr (CCW) + 7000 m^3/hr (ASW)]
NDCT Heat Load	1590 MW [1545MW (CCW)+45MW (ASW)]
Design Wet Bulb Temperature (DWBT)	26.9 ºC
Design Dry Bulb Temperature (DDBT)	31.5 ºC
Approach to DWBT (Mean Coincident dry bulb temperature)	6 ºC
NDCT temperature range	10.75 ºC

4.3 IDCT

- Here the cooling water in the primary cycle is cooled down by the axial fans placed at the top of the cooling tower and creating low pressure which would reject the heat to the atmosphere. Design basis wet bulb temperature and approach of IDCT are selected as 270C and 3°C respectively ensuring recooled water temperature at 300C at 95% confidence level throughout the year.
- Overall temperature rise in SW system of loop I & II works out to be 8.870C & 9.260C. Hence the range of IDCT is selected as 9.30C. Separate IDCT is proposed for each loop. Each IDCT is provided with six cells and the cooling capacity of each IDCT will be 84 .

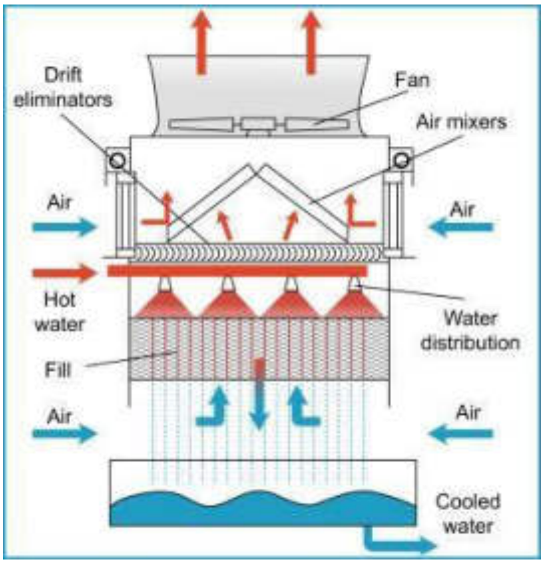


Fig 4.3.1 IDCT Tower

4.4 Introduction of DM Plant

- The demineralized water system is common for both units of Kakrapar Atomic Power Project units 3&4. DM water system is provided to cater the following requirements:

    1) Make-up to turbine feed water circuit.
    2) Make-up to closed loop system like, Active process water system, End shield cooling system, Calandria vault cooling system, Auxiliary cooling water system, Chilled water system, Turbine generator stator water cooling system and Cooling loops of DG sets.

- This system is designed to produce water of demineralized quality in adequate quantity and to supply the same to various consumption points indicated above.

- Water is one of the most important of all chemical substances. Water is found everywhere in nature.

- It is a major constituent of living matter and the environment in which we live. About 70% of the earth's crust is covered up by water in the form of rivers, oceans, lakes, etc. It is an essential constituent of animal and vegetable matters. 70% of the human body is made up of water. In the form of moisture, it is present in air.

- Water contains many impurities such as clay, silt, minerals, etc. Which are broadly classified as insoluble impurities e.g. clay, silt, etc. and soluble impurities e.g. minerals, etc.

- The methods used for the removal of insoluble impurities are usually termed as pretreatment techniques in which different sequences of filtration by screens, coagulation, flocculation and sedimentation are involved.

4.5 Demineralization Methods

- Various demineralization method are listed below:

    1) Distillation process
    2) Softening process
    3) Ion exchange or de-ionization process

- For the production of DM water ion exchange process is used. Ion exchange or de-ionization process, which converts mineral rich water into mineral free water or makes demineralized water is the most popular and widely used one due to the following advantages:

1) Instantaneous start up
2) No heating / cooling involved
3) Low energy consumption
4) Simple operation
5) No sludge formation
6) Most economical

- Ion exchange is a process, which removes unwanted ions.

Cation resin : $R\_H + M^+ \leftrightarrow RM + H^+$
Anion resin : $R\text{-}OH + X^- \leftrightarrow RX + OH^-$

4.6 System Equipment Details

- DM plant consists of three streams (2 working + 1 stand by) of capacity normal 35 m^3/hr (continuous duty) to max 70 m^3/hr per stream. It consists of:

1) Sand filter
2) Activated carbon filter
3) Strong acid cation exchanger (3 streams)
4) Degasser system (consists of two Nos. of degasifying towers, Air blowers 4 Nos. (2w+2s))
5) Degasified water storage tank (2 Nos.)
6) Degassified water transfer pump 4 Nos. (2w+ 2s)
7) Strong base anion exchanger (3 streams)
8) Mixed bed polishing units (3 streams)
9) DM water storage tank (2 Nos.) with N_2 blanketing
10) Acid caustic measuring & injection system
11) Effluent neutralization system (neutralizing pit with necessary dosing system)

- DM plant is designed for semi-automatic mode of operation i.e. manually initiated and the operation sequence control in auto mode.

- DM water PH is 7±0.3 and specific conductivity is <0.2 μs/cm.

4.7 Introduction of Heavy Water Upgrading Plant

- Hydrogen and oxygen combine to form light water. In heavy water, though same chemical combination holds good but combining hydrogen is in a heavier form called deuterium or heavy hydrogen.
- Deuterium is a naturally occurring stable isotope of hydrogen and is disturbed in all the water on the earth in a proportion of approximately one part to seven

thousands. Heavy water is about one-tenth more heavier than natural water. However, no human, fish, plants can survive on heavy water.

- Chemical properties of heavy water and light water are same. The limited differences in chemical and physical properties have to be exploited for the separation of these two isotopes. Because of the small separation factors, a lot of difficulties is experienced to separate the two isotopes and involves a large numbers of separation stages. Thus, production of heavy water is difficult, expensive and technologically complicated process.
- Heavy water (deuterium oxide) is used in India as a "Moderator" in PHWR. Heavy water slows or "Moderates". The speed of the neutrons released during fission of uranium_235 atoms so that the probability of fission is increased. The neutrons maintain a self-perpetuating chain reaction, generating continuous heat to produce steam for operating steam turbine and generate electricity.
- Moderating materials that can be used in nuclear reactors include ordinary water, graphite, beryllium. A good moderator should be relatively stable and a poor neutron absorber. The merits of materials used as moderator is expressed by their "Moderating Ratio". Larger the ratio better the material.

- Table 4.7.1 Moderating Ratio Of Different Moderators

Sr. No.	Moderator Material	Moderating Ratio
1	Ordinary Water	72
2	Beryllium	130
3	Graphite	200
4	Heavy Water	21000

- Table 4.7.2 Properties of Different Compounds Of Water

Sr. No.	Properties	H_2O	D_2O	T_2O
1	Molecular Weight	18.015	20.028	22.032
2	Specific Gravity	0.99701	1.1044	1.2138
3	Refractive Index	1.33300	1.32844	-
4	Freezing Point	0	3.82	10.1
5	Boiling Point	100	101.42	101.52
6	Neutron C/S absorption	0.66	0.001	-
7	Neutron C/S Scattering	10.3	13.6	-
8	Moderating Ratio	72	21000	-

- Table 4.7.3 Various Heavy Water Producing Plants

Sr. No.	Plants	Capacity (T/year)
1	Nangal (Punjab)	12
2	Kota (Rajasthan)	100
3	Hazira (Gujarat)	67
4	Tuticorin (Tamil Nadu)	71
5	Talchor (Orissa)	62.5
6	Manuguru (Andhra Pradesh)	185
7	ThalVaishet (Maharashtra)	110
		Total: 607.5 T/year

4.8 Most Common Type of Impurities Found In Downgraded Heavy Water

1) Corrosion and erosion products
2) Products from radiolytic action
3) Organic material from ion exchanger resins used in deuterium and purification system.
4) Oil and greases from leaking equipment seals.
5) Dirt and particulate matter from collection system and spillage areas.

4.9 Methods of Up gradation

- Table 4.9.1 Comparison Between Electrolysis and Distillation

Electrolysis	Distillation
High separation factor	Low separation factor
Low capital investment	High capital investment
Low plant life	High plant life
No startup/reflux time required	It takes long time after shutdown for coming in equilibrium
Batch process	Continuous process
Cumbersome operation	Neat & clean operation
High operation cost	Low operation cost
High maintenance cost	Low maintenance cost
Presence of explosive gases	No presence of explosive gases

CHAPTER 5. INTRODUCTION OF INTERNSHIP

5.1 Introduction

- As we know that there are 22 nuclear power plants are operates in all over India. I got opportunity to do my 3 months internship at Kakrapar Gujarat Site which is located in Tapi district. This site is 80 km away from the Surat.

- In Kakrapar Nuclear Power Plant, there are four units; Unit 1&2 and Unit 3&4. Unit 1&2 are 220MW plant and Unit 3&4 are new and 700MW plant. In which Unit 3 is operates now and unit 4 is under construction.

- I got an opportunity to do my internship in Unit 3&4 and I was allotted Turbine Group during my internship. There are various groups works together in plant like, Feed water group, Reactor building group, Diesel generator group, etc. these all groups are working together and when any fault or maintenance is required at some place respective group will do their job.

5.2 Maintenance Procedure

- I was in Turbine group hence any fault or any problems occurs in some equipment the turbine group is responsible to solve that problem or fault. KAPS team is very serious about accident free atmosphere in plant during operation and maintenance. That's why a specific procedure has to be followed by maintenance section. That procedure is as follows as:

1) Fault is checked manually by visiting on site.

2) If any fault is there then a DR is filed and then sent it to the respective section main control room. As same EMU and CMU both filed their DR.

3) Then a meeting is organized on daily basis that which task is to be performed first and which at last.

4) After take permission from the main control room, they cut down the source to that equipment same Electrical section cut their power supply and control section cut their logics.

5) After this process, MMU finally perform their task and complete it within time which is given by main control room.

6) After completion of task MMU again filed a DR and tell that job has been done and the Electrical and control section start their power supply and logic and then finally main control room start that equipment.

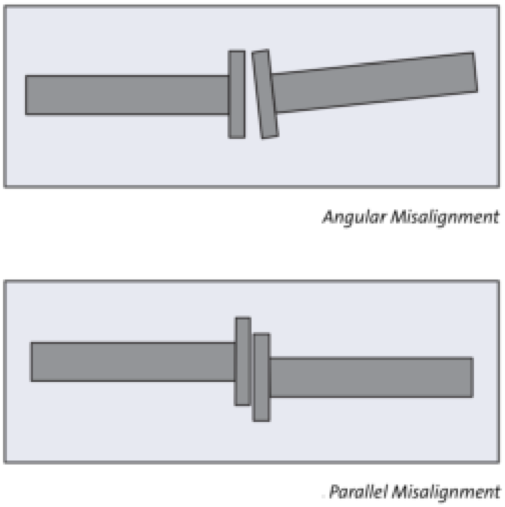
- That's how an accident free procedure is followed by step by step and they avoid any accident during their work.

- My role in the turbine group is to observe the problem and do help of the technician team whenever they need. Below I mention some of maintenance work that occurred during my internship:

1) Pre-commissioning checks of ACW Pump: I was involved in pre commissioning checks of ACW pump in Unit 4. Here, alignment was done with the help of dial gauge. There are two ways to do alignment; first one is by manually with the help of dial gauge and second one automatically with the help of laser equipped machine.

    - Here, alignment was done by manually with the help of dial gauge. In this dial gauge has to be fixed at some place and then dial first set on 0 and the slightly rotate the shaft at 90,180,270,360 angle and measured the all readings. And then based on readings, person done the alignment process.

    - This process is time consuming process because the person has experience of dial gauge and if he hasn't experience then he took so much time to do this task. But a person with experience done this job faster.



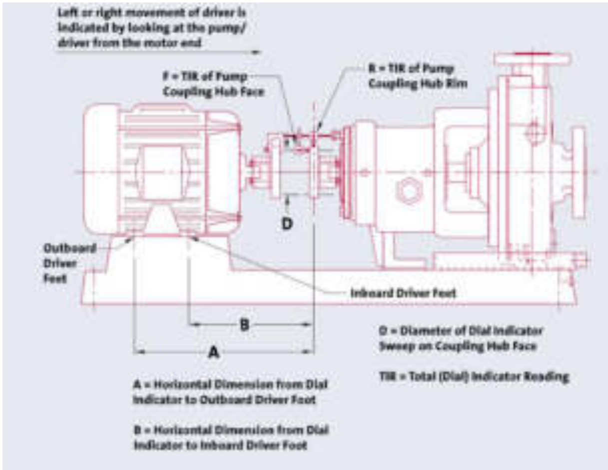


Fig 5.2.1 Pump Misalignment

Fig 5.2.2 Schematic Diagram of Pump

2) Cleaning of Plate type heat exchanger:

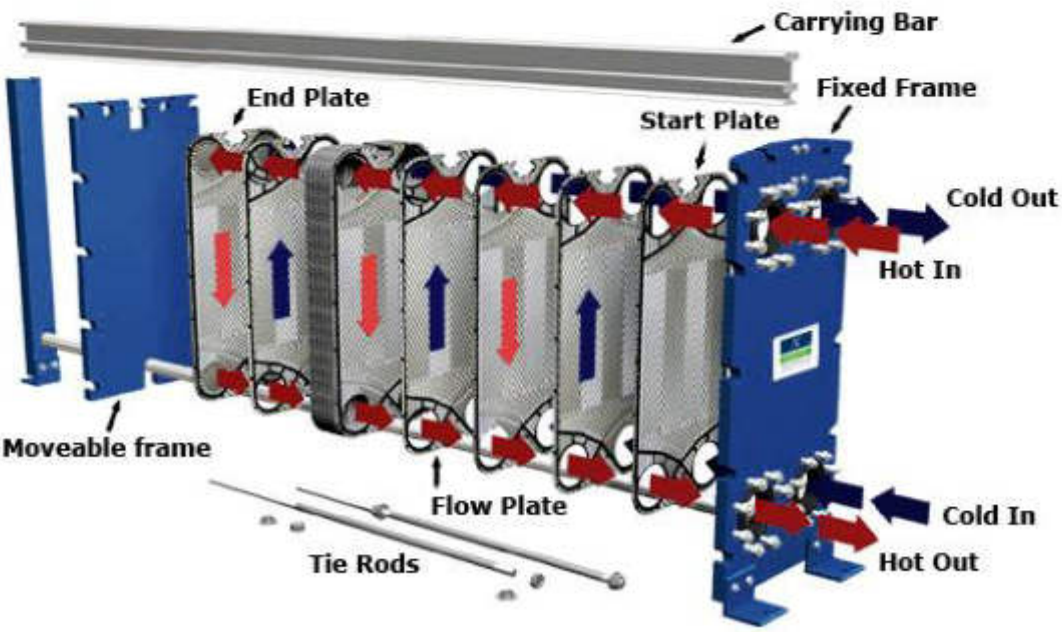


Fig 5.2.3 Plate type heat exchanger

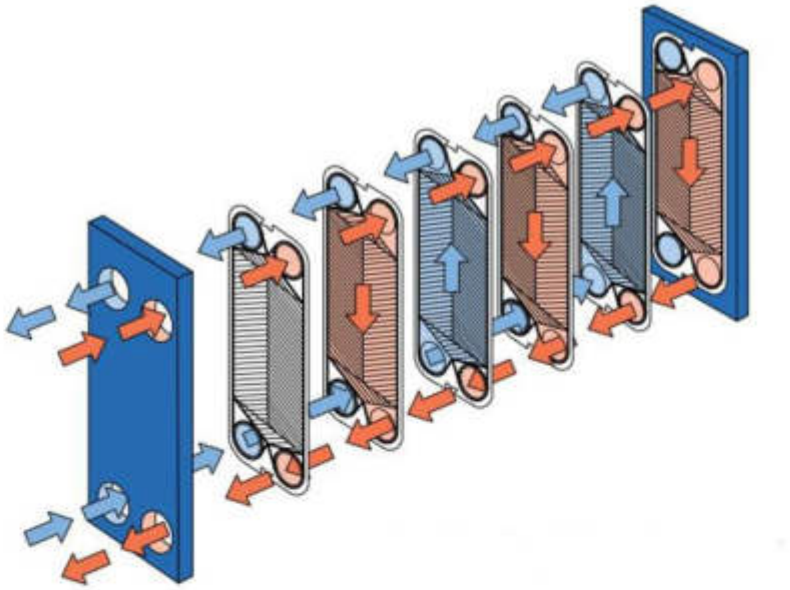


Fig 5.2.4 Flow Principle of a Plate Type HX

- Inspection and Cleaning of Plate type HX was performed during my internship and I was involved in it. Plate type HX is located at the bottom of the turbine building.

- Function of Plate type HX is to cool down the ACW By ASW. ACW is Active Cooling Water which is circulated in whole turbine building and takes the heat load of systems located in turbine building like, Lube oil, Seal Oil, etc. and comes in HX and ASW is an Auxiliary Service Water comes from the NDCT and takes off all the heat load of ACW and cools it.

- In this HX, flow is counter flow which is shown in above figures. When TG group inspected this HX then they come to conclusion that cleaning of HX is necessary. For cleaning, they carefully removed all the studs and nuts and found that there is an objectionable amount of mud is stucked in the in the HX and that’s why flow was restricted. Then cleaning was done carefully and mud was removed from the HX.

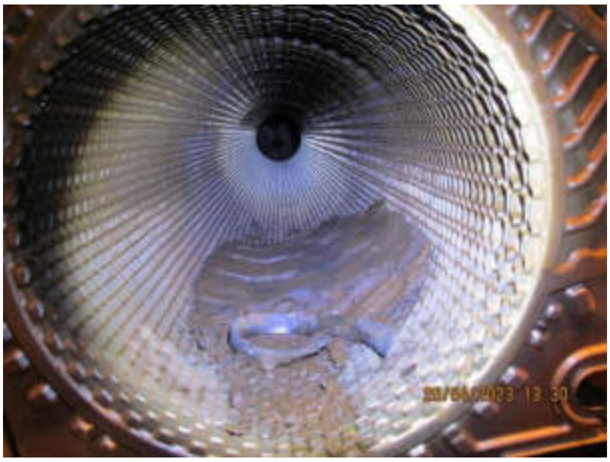


Fig 5.2.5 Plate type HX

Fig 5.2.6 cleaned

CHAPTER 6. CONCLUSION

During my three month internship at Kakrapar Atomic Power Station, I have gained Valuable knowledge, practical experience, and personal growth. The internship has been an exceptional opportunity for me to immerse myself in the world of nuclear power and witness firsthand the intricate workings of a highly sophisticated atomic power station.

Over the course of my internship, I have had the privilege to work alongside a team of dedicated professionals who have generously shared their expertise and guided me through various tasks and projects. Through their mentorship, I have not only honed my technical skills but also developed a deeper understanding of the complexities and safety protocols associated with nuclear power generation.

One of the highlights of my internship was being able to contribute to real world projects. I witness the importance of precision, attention to detail, and adherence to stringent safety standards in a nuclear facility. Beyond the technical aspects, this internship has provided me with numerous opportunities foe personal growth. Working in a professional environment has enhanced my communication, teamwork, and problem-solving skills. Collaborating with fellow interns from diverse backgrounds has broadened my perspective and enriched my ability to adapt to different working styles.

In conclusion, my three-month internship at Kakrapar Atomic Power Station has been an unforgettable and transformative experience. It has deepened my knowledge of nuclear power, fueled my passion for sustainable energy, and equipped me with valuable skills for future endeavors. I am incredibly grateful for the guidance and support I received during my time at kakrapar, and I am confident that the lessons learned and connections made during this internship will have a lasting impact on my personal and professional development.

References

1) https://tameson.com/pages/safety-valve
2) https://www.ayvaz.com/Isolation-Valves/
3) https://instrumentationtools.com/types-of-control-valves/
4) https://www.npcil.nic.in/index.aspx
5) Training Manuals of KAPP 3&4

APPENDIX

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Annexure 1
Enrollment no: 190390119007

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: Harikrushna P. Kamsara
DIARY OF THE WEEK: Dt: 13/02/23 TO 19/02/23
DEPARTMENT: Mechanical SEM: 8th
NAME OF THE ORGANISATION: Nuclear Power Corporation of India Limited
NAME OF THE PLANT/SECTION/DEPARTMENT: MMU
NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT: PAWAN KUMAR KASHYAP

DESCRIPTION OF THE WORK DONE IN BRIEF

→ Had an introductory session at NTC (Nuclear Training Centre)

→ our training instructor gave us information about various working nuclear power plant in india and gave us detailed information about kakrapar Atomic power station 1&2 and 3&4.

→ Sir talked about basic principle of nuclear power plant; chain reaction, about different systems, different components used in nuclear power plant, about moderator, demineralised water, etc.

→ After that, we visited a mechanical workshop which is located near NTC & saw many components which are used in power plant like, different valves, Reciprocating compressor, shell and Tube heat exchanger, identification of pipes, etc.

→ Sir took us to the information centre and explained a 3D model of KAPS 1&2 and 3&4.

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TOTAL HOURS: 42

H.P.Kansara
SIGNATURE OF STUDENT

The above entries are correct and the grading of work done by Trainee is
EXCELLENT / ~~VERY GOOD / GOOD / FAIR~~ / BELOW AVERAGE / POOR

Signature of Faculty Mentor

Pawan
Signature of officer-in-charge of Dept. / Section / Plant

Date:

Date: 28/02/23

Grading of Work, for trainee may be given depending upon your judgement about his Punctuality, Regularity, Sincerity, Interest taken, Work done etc.

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Annexure 1

Enrollment no: 190390119007

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: Harikrushna P. kansara

DIARY OF THE WEEK: Dt: 20/02/23 **TO** 26/02/23

DEPARTMENT: Mechanical **SEM:** 8 th

NAME OF THE ORGANISATION: Nuclear Power Corporation of India limited

NAME OF THE PLANT/SECTION/DEPARTMENT: MMU

NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT: PAWAN KUMAR KASHYAP

DESCRIPTION OF THE WORK DONE IN BRIEF

→ I got alloted to in the Mechanical Maintenance unit. I Rereported to Mechanical Maintenance Unit (MMU) head of Unit 3&4.

→ I was told to be with turbine group in my internship. There are various groups which working in unit 3&4 like, Turbine group, Feed water group, demineralised water plant group, Reactor control Building group, etc.

→ I observed and discussed the types of turbine and how power is produced. when steam comes from the reactor building HP turbine rotates then LP turbines rotates and from the generator electricity generates. All are mounted on the same shaft. This is called Tandem mounting.

→

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TOTAL HOURS: 42

H.P. Kansara
SIGNATURE OF STUDENT

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EXCELLENT / ~~VERY GOOD / GOOD / FAIR / BELOW AVERAGE~~ / POOR

Signature of Faculty Mentor

Signature of officer-in-charge of Dept. / Section / Plant

Date:

Date: 25-2-23

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SUPPLEMENTRY NOTES
(add additional sheets if required)

→ Various Auxiliary systems of Turbine were discussed like,

i) Turbine lube oil system
ii) condensor vaccum system
iii) Generator seal oil system
iv) Stator water cooling system

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Annexure I

Enrollment no: 190390119007

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: Harikrushna P. Kamsara

DIARY OF THE WEEK: Dt: 27/02/23 TO 05/03/23

DEPARTMENT: Mechanical SEM: 8th

NAME OF THE ORGANISATION: Nuclear Power Corporation of India Limited

NAME OF THE PLANT/SECTION/DEPARTMENT: MMU

NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT: PAWAN KUMAR KASHYAP

DESCRIPTION OF THE WORK DONE IN BRIEF

→ Sir Discussed about the types of maintenance of equipments in turbine building like, preventive maintenance, breakdown maintenance.

→ Sir gave use the information about the importance of condition monitoring and preventive maintenance in the life of equipments.

→ components are used in power plant day and night so that sometime their inner or outer surface got damaged and they can be failed. So at that time condition monitoring become important and from that P we can take preventive maintenance.

→ Discussed about various components used in unit 3 & 4 like, MSR (Moisture separator Reheater, De-aerator, condenser, HP turbine, LP turbine, HP & LP heater, etc.

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TOTAL HOURS: 42

H.P.Kamsaray
SIGNATURE OF STUDENT

The above entries are correct and the grading of work done by Trainee is
EXCELLENT / VERY GOOD / GOOD / FAIR / BELOW AVERAGE / POOR

Signature of Faculty Mentor

Signature of officer-in-charge
of Dept. / Section / Plant

Date:

Date: 04/03/23

Grading of Work, for trainee may be given depending upon your judgement about his Punctuality, Regularity, Sincerity, Interest taken, Work done etc.

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Annexure 1
Enrollment no: 190370119007

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: Harikrushna P. Kansara
DIARY OF THE WEEK: Dt: 06/03/23 TO 12/03/23
DEPARTMENT: Mechanical SEM: 8th
NAME OF THE ORGANISATION: Nuclear Power Corporation Of India Limited
NAME OF THE PLANT/SECTION/DEPARTMENT: MMU
NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT: Pawan Kashyap

DESCRIPTION OF THE WORK DONE IN BRIEF

→ I was involved in precommissioning check of pumps and motor.

→ Pre commissioning check of Auxiliary cooling water motor for No load test was carried out.

→ Following checks for motor Noload was performed:

(i) Equipment cleanliness:- Before taking it in the use, motor equipment needs to be cleaned first by clothes just to remove dust from it.

(ii) Motor fan cleanliness:- Motor is stored in a store from very long time since it was made and taking it in use so motor fan might be freezed so it is needs to be cleaned with acetone.

(iii) Greasing NDE & DE Bearing:- Greasing must be done before taking it into use at the Non driving end & driving end

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TOTAL HOURS: 42

H.P. kamsary
SIGNATURE OF STUDENT

The above entries are correct and the grading of work done by Trainee is
EXCELLENT / VERY GOOD / GOOD / FAIR / BELOW AVERAGE / POOR

Signature of Faculty Mentor

pawan
Signature of officer-in-charge of Dept. / Section / Plant

Date:

Date: 10/03/23

Grading of Work, for trainee may be given depending upon your judgement about his Punctuality, Regularity, Sincerity, Interest taken, Work done etc.

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SUPPLEMENTRY NOTES
(add additional sheets if required)

(iv) Motor Base bolt tightness

(v) Marking on motor for DOR(Direction of rotation)

(vi) Marking of Driving end & Non driving end side of motor for vibration measurement with the help of vibration meter. It can be done from the Horizontal, Vertical and Axial Side.

(vii) Reflector Sticking on rotor for RPm measurement with the help of tachometer.

(viii) free rotation of motor rotor.

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Annexure I
Enrollment no: 190390119007

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: Harikrushna P. kamsara
DIARY OF THE WEEK: Dt: 13/03/23 **TO** 19/03/23
DEPARTMENT: Mechanical **SEM:** 8th
NAME OF THE ORGANISATION: Nuclear Power corporation of India limited
NAME OF THE PLANT/SECTION/DEPARTMENT: MMU
NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT: PAWAN KASHYAP

DESCRIPTION OF THE WORK DONE IN BRIEF

→ I was involved in precommissioning checks of Auxiliary cooling water pump-1 load test.
→ Following activities were carried out:
a) cleaning of pump.motor and its pedestal
b) Tightness check of Suction & discharge pipe-line of pump.
c) Base bolt tightness checks.
d) Alignment of pump-motor is carried out by dialgauge. Here, TIR (Total indicative Reading) should be less than 0.05 mm.
e) Marking of vibration points on pump at both NDE & DE in Horizontal, vertical & Axial direction.

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TOTAL HOURS: 42

H.P.Kamdarg
SIGNATURE OF STUDENT

- The above entries are correct and the grading of work done by Trainee is EXCELLENT / VERY GOOD / GOOD / FAIR / BELOW AVERAGE / POOR

Signature of Faculty Mentor

Pawan
Signature of officer-in-charge of Dept. / Section / Plant

Date:

Date: 18/03/23

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SUPPLEMENTRY NOTES
(add additional sheets if required)

f) Free rotation checks of pump motor rotor.

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Annexure 1
Enrollment no: 190390119007

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: Harikrushna P. Kamsara
DIARY OF THE WEEK: Dt: 20/03/23 **TO** 26/03/23
DEPARTMENT: Mechanical **SEM:** 8th
NAME OF THE ORGANISATION: Nuclear Power Corporation of India Limited
NAME OF THE PLANT/SECTION/DEPARTMENT: MMU
NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT: Pawan Kashyap

DESCRIPTION OF THE WORK DONE IN BRIEF

→ I was involved in load test of Auxiliary cooling water pump-1.
→ Following activities were carried out:
① During pump start-up DOR (Direction of Rotation) was checked.
② Vibration reading in Horizontal, vertical & Axial direction and temperature reading on pump Driving End, pump Non driving end, Motor Driving End, Motor Non driving End, Pump base, Motor base were taken at an interval of 15 min, 30 min, 1 hrs., 2 hrs., 4 hrs.
③ Flow rate and pump discharge pressure was also monitored and compared it with its designed value.

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TOTAL HOURS: 42

M.R.Kamsaray
SIGNATURE OF STUDENT

The above entries are correct and the grading of work done by Trainee is EXCELLENT / VERY GOOD / GOOD / FAIR / BELOW AVERAGE / POOR

Signature of Faculty Mentor

Pawan
Signature of officer-in-charge of Dept. / Section / Plant

Date:

Date: 25/03/23

Grading of Work, for trainee may be given depending upon your judgement about his Punctuality, Regularity, Sincerity, Interest taken, Work done etc.

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SUPPLEMENTRY NOTES
(add additional sheets if required)

(4) Leak search in the pipeline during pump running was also carried out. No leak was found

(5) All the test parameters were found within limit

Vibration < 2.8 mm/s
Temperature < 75°C

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Annexure 1
Enrollment no: 190390119007

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: Harikrushna P. Kansara

DIARY OF THE WEEK: Dt: 27/03/23 **TO** 02/04/23

DEPARTMENT: Mechanical **SEM:** 8th

NAME OF THE ORGANISATION: Nuclear Power corporation of India Limited

NAME OF THE PLANT/SECTION/DEPARTMENT: MMU

NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT: Hemant Trivedi SO/F, MMU

DESCRIPTION OF THE WORK DONE IN BRIEF

→ In main steam line system one of the control valve was passing.

→ To attend the problem, maintenance section decided to carryout overhauling of valve. so. I was involved in the job.

→ various Activities for valve maintenance is listed below.

1) work permit was taken.

2) Pneumatic connection to valve was disconnected & removed.

3) Body bonet bolts were loosened and removed

4) Upper Actuator unit along with stem and Plug was removed

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TOTAL HOURS: 42

H.P. Kumsara
SIGNATURE OF STUDENT

The above entries are correct and the grading of work done by Trainee is
EXCELLENT / VERY GOOD / GOOD / FAIR / BELOW AVERAGE / POOR

Signature of Faculty Mentor

Signature of officer-in-charge
of Dept. / Section / Plant
Hemant Trivedi
SO(E), MMU-34

Date:

Date: 03/04/23

Grading of Work, for trainee may be given depending upon your judgement about his Punctuality, Regularity, Sincerity, Interest taken, Work done etc.

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SUPPLEMENTRY NOTES
(add additional sheets if required)

5) plug and cage way inspected visually.
6) on visual inspection wire-drawing way observed on cage body.
7) spare new cage way installed.
8) Blue check of plug & seat way performed, 100% contact way found.
9) valve way boxed up.
10) All connection to valve way normalized.
11) valve way taken into service and found performing well.

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Annexure 1
Enrollment no: 190390119007

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: Harikrushna P. Kansara
DIARY OF THE WEEK: Dt: 03/04/23 **TO** 09/04/23
DEPARTMENT: Mechanical **SEM:** 8th
NAME OF THE ORGANISATION: Nuclear Power Corporation of India Limited
NAME OF THE PLANT/SECTION/DEPARTMENT: MMU
NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT: Hemant Trivedi
SO/E, MMU

DESCRIPTION OF THE WORK DONE IN BRIEF

→ I was involved in Replacement & Installation of new rubber expansion joint (Bellow) on the Pump discharge of cooling water system.

→ Following activities were performed:

1) Worn out existing bellow was removed by loosening and removal of Tie rod bolts and flange bolt.

2) Alignment and gap between Pump discharge flange and pipe flange was ensured as per bellow installation requirement. Alignment was maintained as below:
- Lateral ±12 mm
- Angular ±2°
- Torsional ±1°

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TOTAL HOURS: 42

H. P. Kuvadiya
SIGNATURE OF STUDENT

The above entries are correct and the grading of work done by Trainee is EXCELLENT / VERY GOOD / GOOD / FAIR / BELOW AVERAGE / POOR

Signature of Faculty Mentor

Signature of officer-in-charge of Dept. / Section / Plant
Hemant Trivedi
S/E, MMW-34

Date:

Date: 10/04/23

Grading of Work, for trainee may be given depending upon your judgement about his Punctuality, Regularity, Sincerity, Interest taken, Work done etc.

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SUPPLEMENTRY NOTES
(add additional sheets if required)

3) New bellow was put in position and first tightened on pump flange side, keeping tie rods free.

4) cross check the alignments on pipe flange end.

5) If ok, then tightened the bellow on pipe end also.

6) Tie rod to be positioned equally on both side pipe & pump end.

7) Tightened the tie rod with a gap of minimum 1 mm and secure it with lock nut on both side.

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Annexure 1
Enrollment no: 190390119007

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: Harikrushna P. kamsara

DIARY OF THE WEEK: Dt: 10/04/23 **TO** 16/04/23

DEPARTMENT: Mechanical **SEM:** 8th

NAME OF THE ORGANISATION: Nuclear Power Corporation of India Limited

NAME OF THE PLANT/SECTION/DEPARTMENT: MMU

NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT: Pawan Kumar Kashyap SO/F, O&M, KAPP-3&4.

DESCRIPTION OF THE WORK DONE IN BRIEF

→ I was involved in inspection and cleaning of plate type heat exchanger of Auxiliary water system in Turbine building.

→ Auxiliary cooling water system takes out all the heat loads of turbine auxiliary system like, lube oil cooler, seal oil cooler, hydrogen, etc.

→ one of the four plate type Hx was planned to be opened after operating for 2 years.

→ Main control room work permits were taken before starting of job.

→ Following activities were carried out:

1) Isolation and draining of equipment was ensured before start of job.

2) Initial compression of plate was measured as per drawing and actual in site.

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TOTAL HOURS: 92

H.P.Kangary
SIGNATURE OF STUDENT

The above entries are correct and the grading of work done by Trainee is
EXCELLENT / VERY GOOD / GOOD / FAIR / BELOW AVERAGE / POOR

Signature of Faculty Mentor

Signature of officer-in-charge of Dept. / Section / Plant

Date:

Date: 17/04/23

Grading of Work, for trainee may be given depending upon your judgement about his Punctuality, Regularity, Sincerity, Interest taken, Work done etc.

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SUPPLEMENTRY NOTES
(add additional sheets if required)

3) Single diagonal paint marking line on side ~~AA~~ on compressed plate was done for identification and to prevent intermixing of plates position during cleaning
4) Proper tools and spanners was used for slowly opening of studs/nuts
5) After releasing of nuts from studs, plates was inspected.
6) large amount of muddy deposit was found on plates.
7) plates was cleaned using water jets.
8) Final inspection after cleaning of plates was done.
9) Box-up of plates was done and tightened upto measured initial value as per drawing.

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Annexure 1

Enrollment no: 190390119007

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: Harikrushna P. Kamsara

DIARY OF THE WEEK: Dt: 17/04/23 **TO** 23/04/23

DEPARTMENT: Mechanical **SEM:** 8th

NAME OF THE ORGANISATION: Nuclear Power corporation of India Limited

NAME OF THE PLANT/SECTION/DEPARTMENT: MMU

NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT: Pawan Kumar Kashyap SO/F, O&M, KAPP-3&4

DESCRIPTION OF THE WORK DONE IN BRIEF

→ I was involved in yearly preventive maintenance of IDCT (Induced Draft cooling tower) fan.

→ In total there are two IDCT for each unit, And each IDCT consists of 6 numbers of fan.

→ one fan was identified for job.

→ Permit was taken from main control room.

→ Following things were performed:

1) Any abnormal sound during hand rotation.
2) Angle checking of fan blades.
3) cleaning of scales deposits on fan blades
4) Alignment checks of Motor and connecting shaft.
5) oil replacement in gear box.
6) Greasing of Motor bearings.
7) Overall cleaning of area

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TOTAL HOURS: 42

H.P. Kumsara
SIGNATURE OF STUDENT

The above entries are correct and the grading of work done by Trainee is
EXCELLENT / VERY GOOD / GOOD / FAIR / BELOW AVERAGE / POOR

Signature of Faculty Mentor

Pawan
Signature of officer-in-charge of Dept. / Section / Plant

Date:

Date: 24/04/23

Grading of Work, for trainee may be given depending upon your judgement about his Punctuality, Regularity, Sincerity, Interest taken, Work done etc.

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Annexure 1
Enrollment no: 190390119007

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: Harikrushna Kansara
DIARY OF THE WEEK: DI: 24/04/23 **TO** 30/04/23
DEPARTMENT: Mechanical **SEM:** 8th
NAME OF THE ORGANISATION: Nuclear Power corporation of India Limited
NAME OF THE PLANT/SECTION/DEPARTMENT: MMU
NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT: Hemant Trivedi SO/E, MMU

DESCRIPTION OF THE WORK DONE IN BRIEF

→ I was involved in the maintenance of supports on the various places of the Turbine building.

→ Following checks was carried out:

1) check for Deterioration of support member.
2) check for tightness of fixing bolt.
3) Availability of SHIMS (If applicable)
4) Free movement of sliding surface
5) Check for tightness of Hanger rod/verticality
6) check for travel indicator is on Hot Position.
7) visual examination of weld
8) Check for Hydraulic fluid for hydraulic type of supporting device

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TOTAL HOURS: 42

H.P.Kumsary
SIGNATURE OF STUDENT

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Signature of Faculty Mentor

Signature of officer-in-charge
of Dept. / Section / Plant
Hemant trivedi
SO/E, MMU-34

Date:

Date: 01/05/23

Grading of Work, for trainee may be given depending upon your judgement about his Punctuality, Regularity, Sincerity, Interest taken, Work done etc.

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SUPPLEMENTRY NOTES
(add additional sheets if required)

9) check for lubricating fluid, etc.

10) check for surface protection (painting, galvanizing is proper ~~on~~ or not)

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Annexure 1
Enrollment no: 190390119007

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: Harikrushna Kansara
DIARY OF THE WEEK: Dt: 01/05/23 **TO** 07/05/23
DEPARTMENT: Mechanical **SEM:** 8th
NAME OF THE ORGANISATION: Nuclear power corporation of India limited
NAME OF THE PLANT/SECTION/DEPARTMENT: MMU
NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT: Hemant Trivedi SO/E, MMU

DESCRIPTION OF THE WORK DONE IN BRIEF

→ I was involved in the checks of ASDV (Atmospheric steam dump valve).

→ Foot following activities were carried out.

1) permit was taken from main control room.
2) Shut off the steam supply to the valve and allow it to cool down.
3) visually inspect the valve body, bonnet and internal parts for any signs of corrosion, erosion or damage.
4) Contact between stem and cage was not found 100%. Then (stem is) cage is replaced and again checked. found contact 100%.
5) After that, valve seat and disc is checked for wear and damage

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TOTAL HOURS: 42

H.P.Kumsara
SIGNATURE OF STUDENT

The above entries are correct and the grading of work done by Trainee is
EXCELLENT / VERY GOOD / GOOD / FAIR / BELOW AVERAGE / POOR

Signature of Faculty Mentor

Signature of officer-in-charge
of Dept. / Section / Plant
Hemant Trivedi
SO/E, MMU.

Date:

Date: 08/05/23

Grading of Work, for trainee may be given depending upon your judgement about his Punctuality, Regularity, Sincerity, Interest taken, Work done etc.

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SUPPLEMENTRY NOTES
(add additional sheets if required)

6) check the Packing gland for proper tightness. The packing should be tight enough to prevent steam leaks but loose enough to allow smooth operation of the valve stem

7) Lubricate the valve stem ~~and~~ and all moving Parts

8) Reassemble the valve and check for Proper alignment and operation.

9) Finally, perform a leak test to ensure that valve is operating properly.

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Annexure 2

Feedback Form by Industry expert

Student Name: Harikrushna kansara Date:

Work Supervisor: Hemant Trivedi Title:

Company/Organization: NPCIL

Enrollment No: 190390119007

Internship Address:

Dates of Internship: From 10/02/23 to 09/05/23

Please evaluate your intern by indicating the frequency with which you observed the following behaviors:

Parameters	Needs improvement	Satisfactory	Good	Excellent
Shows interest in work and his/her initiatives				✓
Produces high quality work and accepts responsibility				✓
Uses technical knowledge and expertise				✓
Analyzes problems effectively				✓
Communicates well and writes effectively				✓

Overall performance of student intern: (Needs improvement/ Satisfactory/Good/Excellent):

Performance is Good.

Additional comments, if any:

Signature of Industry person with name and Stamp: 09/05/2023 हेमंत त्रिवेदी Hemant Trivedi

Signature of the Faculty Mentor Ashutosh Gohel.

Team ID: 286492

INTERNSHIP AT

WINDSOR MACHINES LIMITED

AN INTERNSHIP REPORT

Submitted by

Nima Anilbhai Patel

190390119010

In partial fulfillment for the award of the degree of

BACHELOR OF ENGINEERING

In

Mechanical Engineering

S.P.B. Patel Engineering College, Mehsana

Gujarat Technological University, Ahmadabad

May 2023

Team ID: 286492

S.P.B. PATEL
ENGINEERING COLLEGE
SAFFRONY INSTITUTE OF TECHNOLOGY

S.P.B. Patel Engineering College

Near Shanku's Water Park, Ahmadabad – Meshing Highway, Lynch, Gujarat

CERTIFICATE

This is to certify that the project report submitted along with the project entitled **Internship at Windsor Machines Limited** has been carried out by **Nima Anilbhai Patel** under my guidance in partial fulfillment for the degree of Bachelor of Engineering in Mechanical Engineering, 8th Semester of Gujarat Technological University, Ahmadabad during the academic year 2022-23.

Internal Guide	**Head of Department**
Prof. Ashutosh Gohel	Prof. Kunalsinh Kathia
Mechanical Engineering Department, S.P.B. Patel Engineering College, Mehsana	Mechanical Engineering Department, S.P.B. Patel Engineering College, Mehsana

Team ID: 286492

COMPANY CERTIFICATE

Email : contact@windsormachines.com
Website : www.windsormachines.com
CIN : L99999MH1963PLC012642

WINDSOR
Partner in progress

WINDSOR MACHINES LIMITED
Injection Moulding Machinery Division
Plot No. 6 & 7, GIDC, Chhatral, Ta. Kalol,
Dist. Gandhinagar-382729, Gujarat, INDIA
Phone : +91 2764 352700
Fax : +91 2764 233643

15th April 2023

CERTIFICATE

This is to certify that **Ms. Nima Anilbhai Patel Enrollment No. *190390119010*,** a student of S. P. B. Patel Engineering Collage - Linch (Mechanical Engineering Department), Linch 8th Semester, has undergone Industrial Training in our Company from 23.01.2023 to 15.04.2023. We have found her very sincere, keen and co-operative.

We wish him ***EVERY SUCCESS*** in his future endeavors.

For Windsor Machines Limited,

Steven Christian
Senior Manager & Head HR

Registered Office : 102/103, Dev Milan Co. Op. Housing Society, Next to Tip Top Plaza, L B S Road, Thane(w) - 400 604. **Ph.** : +91 22 25836592, **Fax** : +91 22 25836285
Corporate Office : Plot 5402-5405, Phase IV, GIDC, Vatva, Ahmedabad-382 445.

Team ID: 286492

S.P.B. PATEL
ENGINEERING COLLEGE
SAFFRONY INSTITUTE OF TECHNOLOGY

S.P.B. Patel Engineering College, Mehsana

Near Shanku's Water Park, Ahmedabad – Mehsana Highway, Linch, Gujarat

DECLARATION

We hereby declare that the Internship / Project report submitted along with the Internship / Project entitled Internship at **Windsor Machines Limited** submitted in partial fulfillment for the degree of Bachelor of Engineering in **Mechanical Engineering** to Gujarat Technological University, Ahmedabad, is a bonafide record of original project work carried out by me under the supervision of **Mr. Sanjay Patel (External Guide)** and that no part of this report has been directly copied from any students' reports or taken from any other source, without providing due reference.

Name of the Student	Sign of Student
Nima Anilbhai Patel	__________________

Team ID: 286492

ABSTRACT

Injection molding has been a challenging process for many manufacturers and researchers to produce products meeting requirements at the lowest cost. Faced with global competition in injection molding industry, using the trial and error approach to determine the process parameters for injection molding is no longer good enough. Factors that affect the quality of a molded part can be classified into four categories: part design, mold design, machine performance and processing conditions. The part and mold design are assumed as established and fixed. During production, quality characteristics may deviate due to drifting or shifting of processing conditions caused by machine wear, environmental change or operator fatigue.

Injection molding is a molding technology that melts the material with the aid of a screw and an external heating device and then injects it into a mold to form the corresponding product as the mold cools. At present, many types of materials can be used to mold products by injection molding.

ACKNOWLEDGEMENT

Training is the most important and essential part of the study of engineering. An engineering student is incomplete without the Industrial training.

Special Thanks to our HOD **Prof.Kunalsinh Kathia** and Internal Guide **Prof. Ashutosh Gohel.**

We were very fortunate that got training at **WINDSOR MACHINES LTD**, At Chhatral and for which we sincerely thank **Mr. Steven Christian** who gave us the chance to undergo training in this company.

We are also thankful to our training supervisor and also the manager of the testing department **Asst.Manager Mr.SanjayPatel.**

We are also thankful to all Engineers and staff members for the testing department, who gave us the knowledge and helped me in the industry. We also thank full to the fitter of testing department and many other people assembly department, who gave us the practical knowledge of assembling various machines.

List of Figures

List of Tables

Team ID: 286492

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Team ID: 286492

Windsor machines Limited, Chhatral

Figure 1: Windsor Chhatral

Figure 2: Windsor Vatva

CHAPTER 1

INTRODUCTION TO THE COMPANY

1.1 Vision of company

"We are committed to serve the community by empowering it to achieve its aspirations and improving its overall quality of life."

1.2 Mission of company

To undertake CSR (Corporate Social Responsibility) activities in chosen areas through partnerships, particularly for the communities around us and weaker sections of the society by supporting need based initiatives.

1.3 Introduction of company

WINDSOR is global plastic processing machinery manufacturer based in India and one of the few domestic companies engaged in manufacturing of injection moulding, pipe extrusion and blown film machineries, all under one roof. With cutting edge product designs and latest technologies in its portfolio, Windsor continues to serve and support the varied needs of plastic processing industry across 65 countries, by harnessing in experience spanning over 30,000 manyear.

Today, Windsor Machines Limited runs three state-of-art manufacturing facilities at **Italy, Chhatral** and **Vatva**.

Figure 3: Company plant

Windsor Machines Limited has grown to become the largest manufacturer of Plastic Processing Machinery in India with 1200 employees and three state-of-the-art production centers. At all these centers, a wide range of Plastic Processing Machinery including Injection Moldings, Blow Molding and Extrusion Lines are built, striking the right balance between the requirements of the market as well as the customer – maintaining the highest standards of accuracy all along the way.

1.4 Department of the company

- Machine shop
- Assembly shop
- Maintenance Department
- Research & Development Department
- Stores & Inspection Department
- Testing Department
- Purchase & Administrative Department
- Company Sales Department
- Electronics Department
- Electric Department
- Production, Planning and Control Department
- Industrial Engineering Department
- Machine shop

In machine shop they made screw, barrel, Mold platen, Pistons, Tie bars etc. there are many machines in this shop like drilling, pillar drilling, lathe, and horizontal machining center. They have CNC base machines for the precision manufacturing work.

Assembly shop

Machines are assembled in assembly shop. There are many assembly operations are done for one machine.

Testing shop

Machines are tested in the department after completion of assembly, All the specification of machine are checked here and long trial dry run of machines is performed to ensure all the parts and circuits are functioning as per standard specification.

1.5 Products Profile

Range and variety of injection moulding machines, describe as under.

Table 1: Machine series with tonnage range and machine name

Machine Series	Machine Name	Tonnage Range
KL series	KL	350 TO 8000T
	KL-2C	350 TO 1300
	KL-RPVC	350 TO 1300
	KL-CPVC	350 TO 1300
EXCEL series	EXCEL	75 TO 350T
	EXCEL-2C	150 TO 350T
	WINFIT-RPVC	75 TO 350T
	WINFIT-CPVC	75 TO 350T
	WINPET	16 TO 72 CAVITY MOULDS
ARMOUR series	ARMOUR	450 TO 900T
	WINFIT-RPVC	450 TO 950T
	WINFIT-CPVC	450 TO 950T
	ARMOUR-2C	450 TO 900T
SPRINT series	SPRINT	100 TO 800T
	SPRINT SPET-BT	2 TO 8 CAVITY MOULDS
	SPRINT-2C	100 TO 800T
	SPRINT-3C	250 TO 650T
WINPACK series	WINPACK	150 TO 350T
WINX	WINX	350 TO 900T

<u>BAY WISE ASSEMBLY LINE</u>

UNIT 1. 75 TO 250 TONS (4 BAY)

- Assembly (bay-1)
- Testing (bay-2)
- Machining shop(bay-3,4)

UNIT 2. 250 TO 800 TONS (2 BAYS)

- Assembly (bay-1)
- Testing (bay-2)

UNIT 3. 850 TO 1600 TONS (1 BAY)

- Assembly
- Testing
- First floor (electrical department)

- **KL SERIES**

Figure 4: KL Series

- **EXCEL SERIES**

Figure 5: Excel Series

❖ **ARMOUR SERIES**

Figure 6: Armour Series

❖ **SPRINT SERIES**

Figure 7: Sprint Series

❖ **WINPACK SERIES**

Figure 8: Winpack Series

❖ **WINX SERIES**

Figure 9: Winx Series

CHAPTER 2

INJECTION MOLDING MACHINE

2.1 INTRODUCTION OF INJECTION MOLDING MACHINES

One of the most common methods of converting plastics from the raw material form to an article of use is the process of injection molding. This process is most typically used for thermoplastic materials, which may be successively melted, reshaped and cooled. Injection molded components are a feature of almost every functional manufactured article in the modern world, from automotive products through to food packaging

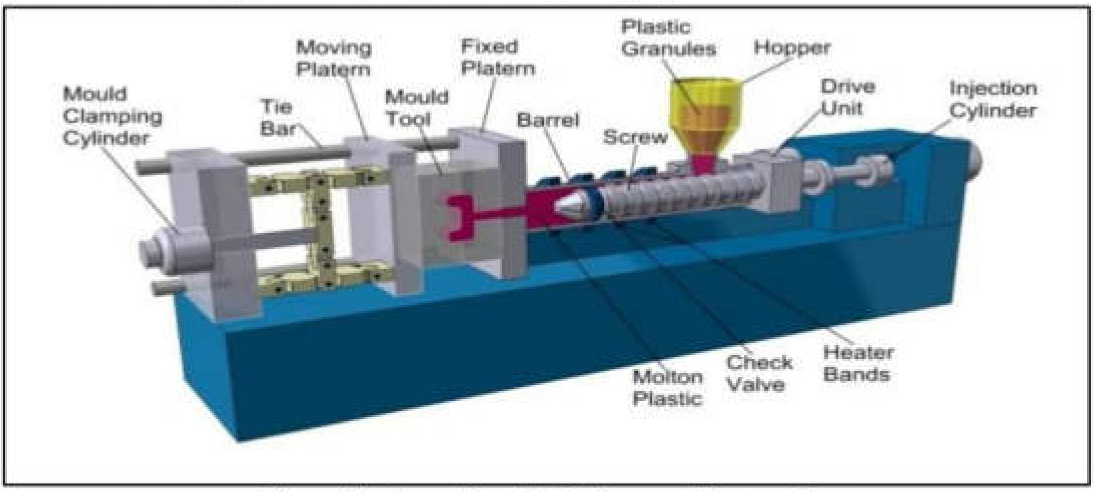

Figure 10: the outline of injection moulding machine

2.2 THE INJECTION MOLDING CYCLE

Thermoplastic injection molding requires the transfer of the polymeric material in powder or granule form from a feed hopper to a heated barrel. In the barrel, the thermoplastic is melted and then injected into a mould with some form of plunger arrangement. The mould is clamped shut under pressure within a platen arrangement and is held at a temperature well below the thermoplastic melt point. The molten thermoplastic solidifies quickly within the mould, allowing ejection of the component after a pre-determined period of cooling time. The basic injection molding process steps with reciprocating screw machine areas follows.

Mould Close and Clamping

The mould is closed within the platen arrangement and clamped using necessary force to hold the mould shut during the plastic injection cycle, thus preventing plastic leakage over the face of the mould. Present day molding machines range from around 15 to 4,000 metric tons available clamping force(150to 4000KN).

Many systems are available for opening/closing and clamping of mould tools, although usually they are of two general types. Direct Hydraulic Lock is a system where the moving machine platen is driven by a hydraulic piston arrangement, which also generates the required force to keep the mould shut during the injection operation.

The second type of general clamping arrangement is referred to as the Toggle Lock. In this case a mechanical toggle device, which is connected to the rear of the moving platen, is actuated by a relatively small hydraulic cylinder, this provides platen movement and also clamping force when the toggle joint is finally locked over rather like a knuckle arrangement.

Injection

At this stage in the machine cycle the helical form injection screw is in a 'screwed back' position with a charge of molten thermoplastic material in front of the screw tip roughly equivalent to or slightly larger than that amount of molten material required to fill the mould cavity. Injection molding screws are generally designed with length to diameter ratios in the region of 15:1 to 20:1.

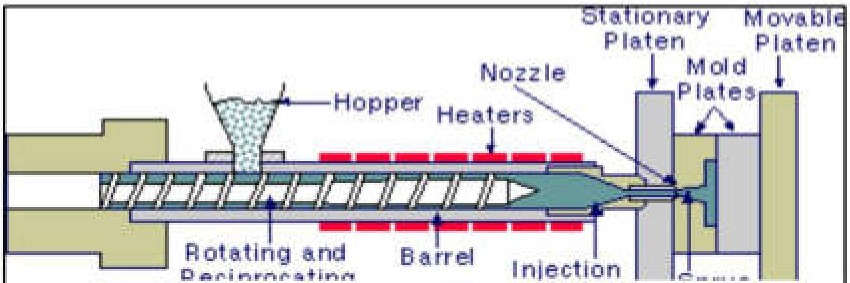

Figure 11: Injection unit assembly diagram

Normally, ceramic resistance heaters are fitted around the barrel wall, these are used to primarily heat the thermo plastic material in the barrel to the required processing temperature and make up for heat loss through the barrel wall, and due to the fact that, during processing most of the heat required for processing is generated through shear imparted by the screw.

Holding Pressure and Cooling

The screw is held in the forward position for a set period of time, usually with a molten 'cushion' of thermo plastic material in front of the screw tip such that a 'holding' pressure may be maintained on the solidifying material within the mould, thus allowing compensating material to enter the mould as the molded part solidifies and shrinks. Holding pressure may be initiated by one of three methods: by a set time in seconds from the start of the injection fill phase; by the position of the screw in millimeters from the end of injection stroke; or by the rise in hydraulic pressure as measured by a pressure transducer in the mould itself or in the injection hydraulic system.

Mould temperature control is in corporate into the tool usually via channels for pressurized water flow. The mould may be connected to a cooling unit or water heater depending on the material being processed, type of component and production rate required.

Screw are filling or Metering

During the cooling phase, the barrel is recharged with material for the next molding cycle. The injection screw rotates and, due to its helical nature, material in granule or powder form is drawn into the rear end of the barrel from a hopper feed. The throat connecting the hopper to the injection barrel is usually water cooled to prevent early melting and subsequent material bridging giving a disruption of feed. The screw rotation speed is usually set in rpm which is measured using a proximity switch at the rear of the screw. Screw rotation may be set as one constant speed throughout metering several speed stages.

The material is gradually transferred forward over the screw flights and progressively melted such that when it arrives in front of the screw tip it should be fully molten and homogenized. The molten material transferred in front of the tip progressively pushes the screw back until the required shot size is reached. Increased shear is imparted to the material by restricting the backward movement of the screw; this is done by restricting the flow of hydraulic fluid leaving the injection cylinder. This is referred to as `back pressure and it helps to homogenize the material and reduce the possibility of un melted material transferring to the front of the screw.

Mould Open and Part Ejection

When the cooling phase is complete the mould is opened and the molding is ejected. This is usually carried out with ejector pins in the tool, which are coupled via an ejector plate to a hydraulic actuator, or by an air operated ejector valve on the face of the mould tool. The molding may free fall into a collection box or onto a transfer conveyer, or may be removed by an automatic robot.

2.3 ASSEMBLY OF INJECTION MOULDING MACHINE

- Injection molding machine is divided into 5 cells.
  1. Injection cell
  2. Clamping cell
  3. Hydraulic cell
  4. Electric cell
  5. Line cell

2.3.1 Injection cell:

The injection unit melts the polymer resin and injects the polymer melt into the mold. It consists of a barrel that is fed from one end by a hopper containing a supply of plastic pellets. The unit may be ram fed or screw fed. The injection unit consists of a granulate hopper, cylinder, screw, nozzle, heating bands and hydraulic drives and serves the purpose of melting and injecting the molding material.

➢ **Barrel and screw assembly:**

Barrel: It is a hollow cylindrical chamber in which plastic material is heated by heating element and move forward through screw.

• Material: high-grade nitrated steel

• Types of barrels:

1. Nitriding barrel
2. Bimetallic barrel
3. Vented barrel
4. Grooved barrel

1. Nozzle: Nozzle is the front part of the screw and barrel of injection molding machine; it is the necessary and important of injection machine.

2. Screw: Screw is one of shaft which has flight on the body and functioning like to provide contact with mode, producing homogeneous melt and transporting or injecting the melt into the mold.

Screw is heart of injection molding machine.

Material: EN41B

The screw is divided into three zones:

i. Feed zone
ii. Compression zone
iii. Metering zone

3. Tip seat valve: Tip seat valve is fitted on screw and prevents back flow of material which is passing through it.

4. Barrel adapter: Barrel adapter is fitted on the one side of the barrel.

5. Heaters: Insulated heaters are mounted on the body of barrel.

Ceramic heaters are fixed on the barrel at stationary side.

It helps to melt the plastic material.

6. Thermocouple: It measures the temperature of heaters.

7. Hydraulic cylinders: Hydraulic cylinders are mounted on the stationary traverse to give movement of the screw.

8. Hopper: The hopper holds the raw material that is used in the molding process. This can be in the form of virgin granules, regrind, master batches or in some applications powder.

➢ **Injection thrust assembly:**

- This is used to provide movement to the barrel screw and to hold the driveshaft.
- Components of traverse assembly
  - Thrust casting
  - Drive shaft
  - Tapper roller bearing
  - Blind end cap
  - O-ring
  - Piston rings
  - Glide alignments
  - Oil seal
  - Lock key washer
  - Lock nut

- **LM Guide assembly:**
  - This is used to provide movement to injection unit.
  - Components
    - Riser
    - Frame & LM guide

- **Bracket assembly:**
  - Components:
    - Junction box - It consist of wiring of heater and thermocouple.
    - Transducer - It measures movement of piston.
    - Limit switch - It limits motion of machines.
    - Water connection - For cooling of stationary platen.

- **Alignment assembly:**
  - Here the alignment of traverse and stationary platen is done.
  - First of all, the injection thrust is fixed then the alignment of thrust platen and stationary platen is done through fixture for proper alignment of screw then stationary platen is fixed.

- **Working of injection unit:**
  - Hydro motor rotates drive shaft which is coupled with the screw.
  - The material is entered through hopper in the screw.
  - Plasticizing of material takes place inside the barrel and through tip seat valve it gets transferred to the nozzle and thus to mold

2.3.2 Clamp Cell:

- The clamping unit is that portion of an injection-molding machine in which the mold is mounted. It provides both the motion and force to open and close the mold and hold the mold closed with force during injection.

- Thus, the clamping unit has two basic functions to perform.
  - ✓ To provide the force required to hold the mold closed.
  - ✓ To perform mold closing movement and in addition to perform the tasks of mold opening and ejector operation.

- Thus, injection unit and the ejector unit are linked with one another mechanically, hydraulically and electrically. An injection-molding machine is classified according to the type of clamp that it possesses and also according to the force that the clamping system can apply to the mold.

- Clamp cell cab be classified as: i. Toggle clamp
- Hydraulic clamp
- Toggle clamp

❖ Toggle clamp:

- This type of closing and clamping system consists of a system of levers which are moved by means of a small hydraulic cylinder. The hydraulic actuation cylinder causes the movement of the toggle assembly arms and linkages by means of collapsing the assembly to open the moving platen and erection of assembly to close and lock the platen mould.
- This concept uses the mechanical advantage of the linkage to develop the force used to hold the mould closed during the plastic injection portion of the cycle. The linkages are designed in such a way that slowdowns are built in automatically. The mechanical advantage of the linkage is extremely high, so a relatively small closing cylinder can develop high tonnage.
- In this type of toggle clamp five point twin toggle locking mechanism used.
- Excel series and Armour series machines uses toggle type clamp.

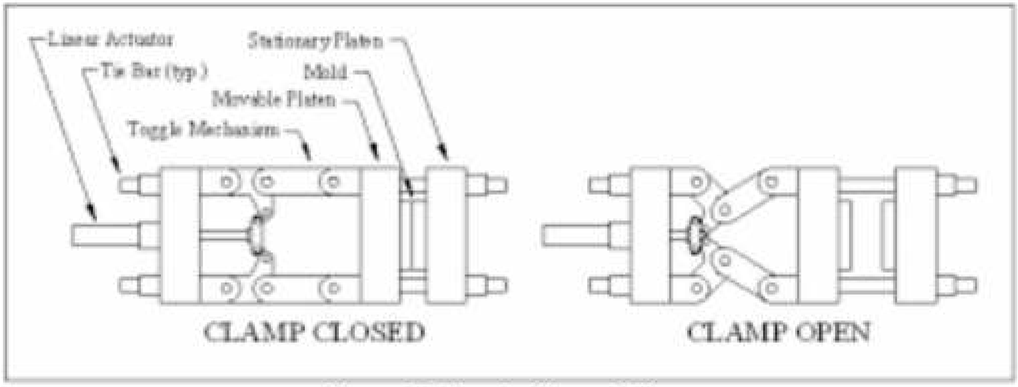

Figure 12: Toggle Clamp Cell

❖ Hydraulic clamp:

- The direct hydraulic locking system is one in which the locking force is applied by means of a hydraulic ram and without using a mechanical mechanism to achieve mould closing.
- The simplest power operated locking system is one in which hydraulic ram is attached to the moving platen and the hydraulic ram or cylinder is fed with a single high-pressure supply. These

are simple units having less moving parts. However, it is seldom used on injection machines, as the power utilization is very poor.

- Hydro and omega series machines uses hydraulic clamp.
- The main features of this mechanism can be described as below.

  1. The clamping force applied to the back of the moving platen by the ram is directly in-line with the load. The clamp tonnage is consistent and doesn't vary due to temperature variations (assuming pressure is carefully closed loop controlled) or mould height differences.
  2. Setting up the clamp for different mould heights or tonnage is very simple and fast.

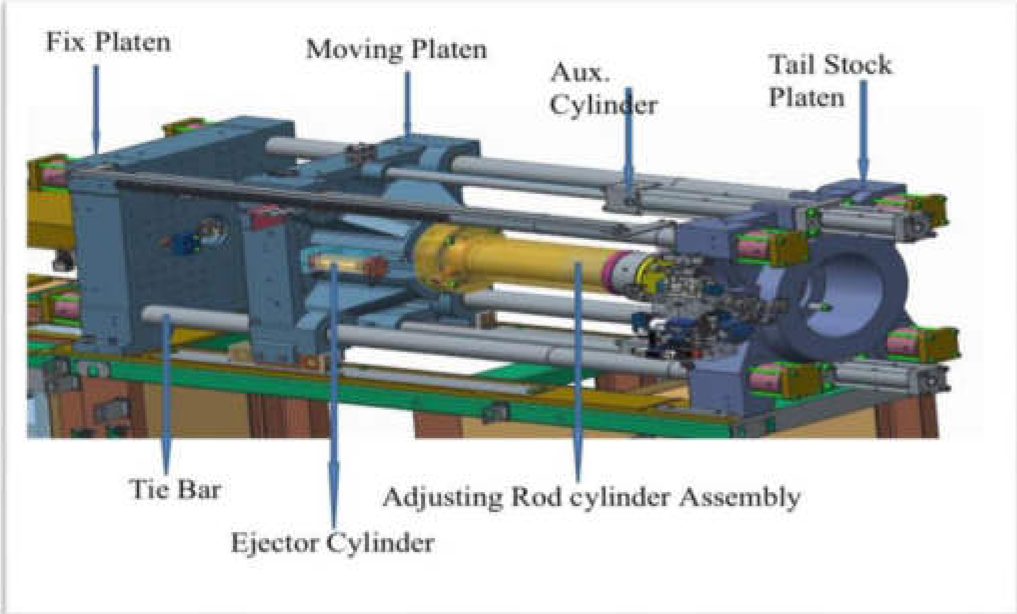

Figure 13: Hydraulic Clamp Cell

❖ Components of clamp cell:

- **Stationary platen:** The stationery platen provides an area for mounting one half of the mould. It also acts as a stationary object against which the moving platen will build tonnage.
- **Moving platen:** It provides an area of mounting the other half of the mould. It is the platen, which moves back and forth to open and closed the mould. It also consists the ejector cylinders for the purpose of eject the product.
- **Die height platen:** This platen is used to adjust the clamp assembly to accommodate varying die heights (mould thickness). It can also be used to adjust the amount of tonnage that is applied to the mould.
- **Traverse cylinder:** These cylinders are mounted on the stationery platen. The cylinder rod extended, through the stationary platen and is attached to the moving platen. These cylinders are used to move the moving platen for the closing and opening of the mould.
- **Ram:** The ram is bolted to the moving platen. It moves back of forth inside the ram housing as the moving platen moves back and forth.
- **Ram housing:** The cylinder is used to provide the tonnage necessary for the process; the oil in the cylinder behind the ram is pressurized to supply the necessary clamping force.
- **Tie bar [Strain rod]:** There are four Tie Bar given in Injection Molding Machine which provides way to move moving platen. Tie Bar is fixed with Stationary Platen and it has thread at end portion which provide way to Forward and Retract Die Height.
- **Mold:** Most important component of injection molding machine. Mould is made from two halves core and cavity, which provides shape to plastic material.
- **Locating ring:** It mounts at stationary platen and provides concentric between nozzle and sprue.
- **Ejector plate:** This plate is used to mount ejector pin. It is operated by hydraulic actuators.
- **Ejector pin:** Ejector pin is used to eject product from mould.
- **Sun gear and planet gears:** This assembly is used to forward retract die-height.

2.3.3 Hydraulic Cell:

➢ The hydraulic cell consists of three sub cells:

1. Power pack assembly
2. Tank assembly
3. Manifold assembly

1. Power pack assembly:

❖ A hydraulic power pack is a self-contained unit that consists mainly of a motor, a tank / reservoir hydraulic pump, valves, gauges. Using fluid to transmit power from one location to another, hydraulic power packs can generate massive amounts of flow and pressurized oil to drive hydraulic machinery.

❖ The basic components of power pack assembly.

a. A manifold block with cavities for various types of valves
b. A very quiet, high-efficiency gear pump
c. An electric motor (DC or AC)
d. A reservoir (plastic or steel)
e. Several optional accessories

2. Tank assembly:

❖ Tank assembly for a hydraulic system including a hydraulic load device and a transmission. The tank assembly comprises a tank, a weir mounted on the bottom wall of the tank, which weir functions as a partition wall for dividing the inside of the tank into a first and a second reservoirs and allows fluid to over flow from the first reservoir to the second reservoir, the first reservoir being adapted to receive fluid from both the hydraulic load device and the transmission, a dust collect or mat disposed on the bottom wall of the tank for collecting dust from drained fluid, and a strainer mounted in board on one of the side walls of the tank and extending within the second reservoir.

3. Manifold block:

❖ A hydraulic manifold is a component that regulates fluid flow between pumps and actuators and other components in a hydraulic system. It could be compared to a switch board in an electrical circuit, because it lets the operator control how much fluid flows between components of hydraulic machinery. For example, in a backhoe loader, a manifold turns on or shuts off or diverts flow to the telescopic arms of the front bucket and the back bucket. The manifold is connected to the levers in the operator's cabin, which the operator uses to achieve the desired behavior.

2.3.4 Electric Cell:

- Electric cell consists of three panels:
- Control panel
- Heating and power panel
- Drive section panel

- Components of electric cell:
- SMPS (Switch Mode Power Supply)
- CT (Current Transducer)
- UPS
- Fuse
- Relays
- SSR (Solid Straight Relay)
- MCB
- Contactor
- VFD
- Chock
- Servo drive
- Sur suppressor
- MMCB
- Energy meter
- Cooling fan

2.4 Injection Moulding Machine Advantages & Disadvantages

Advantages:-

- Parts can be produced at high production rates.
- Large volume production is possible
- Relatively low labor cost per units is obtainable.
- Process is highly susceptible to automation.
- Parts require little or no finishing.
- Many different surfaces, color & finishes are available.
- Wood decoration is possible.
- For many shapes this process is the most economical way to fabricate.
- Process permits the manufacture of very small parts which the almost impossible to fabricate in quantities by other methods.
- Minimum scrap loss produces.
- Same parts can be produced with different material without changing mold.
- Close dimension to clearance can be molded.
- Parts can be molded with metallic & non-metallic inserts.

Disadvantages:-

- Intense industry competition often results in low profit margins.
- Three shifts operation are often necessary to compete.
- Molds costs are very high.
- Molding machinery& auxiliary equipment cost are high.
- Process control may be poor.
- Machinery that is no consistent in operation & whose controls are directly related to the end product.
- Susceptibility to poor work man ship.
- Quality is often difficult to determine immediately.

CHAPTER 3
TESTING PROCEDURE

3.1 Significance of Machine Testing

- It confirms sound the working of all component and assemblies.
- Defects improper electrical connection, if any. Thus can be rectified immediately.
- Improper hydraulic connections can be noticed and can be connect before machine leaves factory premises.
- Proper fixing of high and low pressure oil pipes is carried out during flushing.
- Ensure no shortage or short fallings of various components.
- Strict vigilance over the functioning makes the system more efficient.
- It incorporates free movement to moving parts.
- A minimum 10 hours dry run given to the machine reduces problems while installation and start up at the customer factory.
- Confirms sound operation of various parameters by companies the required valves.
- Basic pump pressure is set only during testing.
- Ensures the nozzle in center of the O_3 plate to prevent leakage during molding.
- Helps in manufacturing machine to Windsor quality standards and specifications.

3.1.1 Leveling

First of all as the machine complete assembled for testing leveling is done. This is done lengthwise and across. This is done by level bottle is put on barrel.

3.1.2 Preliminary preparation

1. Clean the base and fill the oil
2. Fit the filter in the base.
3. Fill up the base with the correct grade oil (HLP68) an up to level indicator.
4. This step containing cleaning of oil tank & refill tank with air pressure & put magnet in tank.
5. Fill the cradle oil up to particular level.(220)
6. Check all fuses and their values check it with the circuit.
7. Ensure all the bulb son the control panel is fitted.
8. Connect the water connection to the heat exchanger and hopper.

3.1.3 Lubrication

Oil is filled in the lubrication pump then main lubrication pipe and bleeds are open. Oil should be reaching the all parts particularly at tie bars and slide bad. Some machines greasing is also done by grease gun. Greasing of injection unit should be completed.

3.1.4 Visual inspection

Visual inspection is very necessary step before starting machine. This contains inspection of hydraulic valve proper mounting is done or not. Pipes, filter fitment are connected or not.

3.1.5 Starting the machine

Supply is connected to the main isolator switch of the machine. Set the amperes on the over load relay and adjust the time setting of star to delta (over load setting is 0.6 times full load current of motor. Relay timer setting is 6 seconds for machine 30 to 180 and 9 seconds for more than180 machines.)

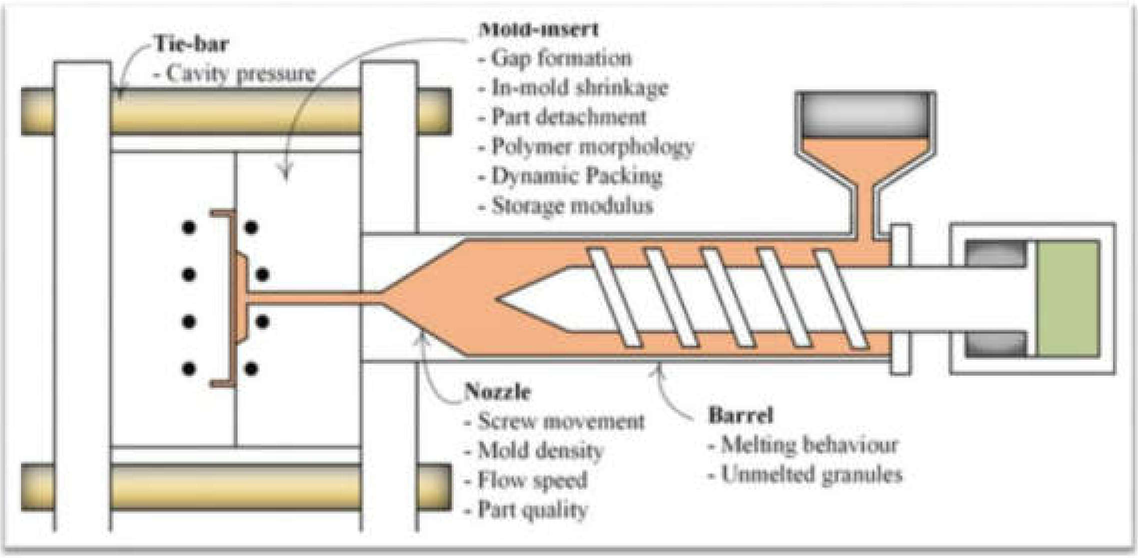

Figure 14: Testing

3.1.6 Flushing

Flushing is done to remove metal chips and other unwanted particles from the hydraulic systems. Following pipes are removed.

- Close and open side pipes.
- Intensifier 1st and 2nd stage pipes.
- Injection and refilling and suck back pipes
- Nozzle shut off pipes
- Core pulling pipes

1. Then open the relief valve for initial start up. Start the motor and jog 2-3 times. Start the motor and look for any cavitations noise or pump noise.

2. Set the pressure of P1, P2, P3 and P4 as per hydraulic circuit.

3. Set the switch to hand operation carries out the flushing by operation and proves the function of flow control valves, directional control valves, throttle valves and remote relief valves. Each flushing action should be realizing the flow through hoses by operating throttle valve son hose pipes.

4. Flush the in injection cylinders pipes with boost ON/OFF.

5. Reconnect the pipes, which are removed for flushing.

6. After flushing connects the portal filter unit with base reservoir and filter the oil initial dry run of 8 hours is over.

3.1.7 Heating test

1. Check the heaters are fitted incorrect or derand thermo couples are fitted correctly.

2. Check all heaters as per the heating circuits and note down readings.

3.1.8 Centering of the machines

1. Remove the clamping strip and wiper felt/center support of guide rod.
2. Adjust the jib strip with the bolt in such a manner that forward and retraction movement is smoothly and steady.

3. Lock the strip and lock strip screws.
4. Fit the wiper felt and clamping strips.
5. Tighten the rear nut when injection unit is fully back position and with full pressure. Then tighten the rear nut again when injection unit is fully forward and retract movement without pressure. It should be smooth a steady.
6. Check Hooper cooling in proper
7. Ensure that barrel is soaked at 250^0C for two hours.
8. Ensure the screw in fully forward condition.
9. Ensure the torque is given to the injection unit.
10. Work out the size of shim required to center the injection unit to O_3 plate bore. Take center of nozzle as a reference.
11. Fit the correct size of shimas per requirement and note the size of shim used.
12. Drill and do we lead with the base.
13. Check and set nozzle protrusion as per the requirement.
14. Ensure adequate clearance on the nozzle shut off valve and mould plate.

3.1.9 Fit the dummy mould

Then dummy mould is set on the machine. The mold is mounted on the O3 plate.

Mould safety

Adjust the mould safety pressure and check min closing pressure with 02 Plate connected to the ram.

3.1.10 Cycle test

(A) Hand operation set selector switch in hand position

- Move opening and closing on hand check.
- Opening without locking pressure.
- Opening with intensifier.
- Closing with different setting of pressure switch.
- Check slowdown operation.
- Check mould safety operation.
- Check injection with RIP and boost.
- Check refill and back.

(B) Semi auto mode

- Check the single cycle. Ti should follow the sequence operation. Semi cycle starts from closing the front safety gate or mould close.
- Check all timers" function correctly.
- Check the stroke advance function.

(C) Fully auto mode

- Set a selector in fully auto mode. It should follow the sequence continually.
- Check and record the pressure required to move the ram.
- Check the all timers operation.
- Check leakages of pipe fittings after 1-hour dry run.
- Check ram surface for scoring get it rectified.
- Keep the machine dry run for at least 8 hours.

Noise is check by db meter. These readings are taken out from the major six positions of the machines. Leakage is check by visual inspection, whether oil drips from the fittings, valves mounting blocks. Oil temperature is measured after running machine for some time. In this test measured that in particular time how much the oil temp increases.

3.1.11 Tie bar Stretching

After completion of "AUTO" cycle testing finally tie bar starching is measured at the end of tie bar back plate by dial-gauge at the time of locking. Check that the stretching equal side or not. If not then tight or lose the nut as per requirement and hold the back plate.

1. Dowelling is done all in four plates to fix the position of the nut.
2. After completion of this stretching keep the tonnage at maximum a check for addition features like high mould safe flow mould safety. Note that using low mould safety mould is not shucked with fixed platen, sp by putting restriction in directional control valve or by providing throttle valve it be eliminated.
3. Check the types of ejector stroke like multiple stroke stay forward strike. Check ejector pressure by pressure reducing valve.

4. Remedy for any fault comes during can be removed by faultfinding chart.

When the mould closes, Mould is being compressed. This compression is reacts as stretching of tie bars. So it is necessary to measure the stretching of tie bars in ideal conditions when demy mould is loaded. This is measure by dial. As especially in toggle machines gears are tighten according to the tie bar stretching.
If the stretching is find uneven then the tie bar nut is loose it for relies the stretching. If the starching found very high, then during process tie bar may be brake. And flash may be occurs during molding.

3.1.12 Molding & Ring Plunger Test

- Average shot weight
- Maximum injection stroke
- Time
- pressure

Fill mould shut off the nozzle, refill and injection on filled mould. Injection stroke should be approximately 10mm due to compression of material. On release of injection piston should be jump back.

3.1.13 Important Formula

1. L/ D Ratio:-

L/D = Effective length of the Screw or Flighted length of the Screw / Overall diameter of the Screw

2. Compression Ratio:-

Compression Ratio = Channel Depth in the first flight of the Feed Zone / Channel Depth in the Last flight of the Metering Zone

3. Maximum Day Light: -

For Toggle Machines,

Maximum Day Light = Maximum Mold Height + Maximum Opening Stroke

For Hydraulic Machines,

Maximum Day Light = Minimum Mold Height + Maximum Opening Stroke

4. Pitch:-

The Distance between the centre of two adjacent flight in a screw and it equals to the diameter of the screw.

5. Helix Angle:-

The angle between the flights of traverse plane to the screw axis. Normally the angle lies 17.66.

6. Melt Pressure (Bar):-

Melt Pressure = Injection Pressure * (Diameter of Injection Piston ^2/
(Hydraulic Pressure) Diameter of Injection Screw ^2)

7. Clamping Force (in tons):-

Clamping Force = (Projected Area * Cavity Pressure) / 1000

8. Injection Power (Kw):-

Injection Power (Kw) = Max Melt Pressure * Max Injection Rate

9. Cooling Time:-

Cooling Time= (Heaviest wall thickness^2)/Thermal diffusivity of the melt

10. Plasticizing Capacity (in Kg/ hr):-

Plasticizing Rate of Melt B" = Plasticizing Rate of Melt „A" * (Q1 / Q2)
(Kg/hr) (Kg/hr)

Where,
A = Poly Styrene
B= material to be used
Q1= Thermal Capacity (Heat Content) of PS (Cal/gm)
Q2= Thermal Capacity (Heat Content) of the material to be used (Cal/gm)

Plasticizing Rate (Kg/hr) = Weight of the molding (Gm) * Number of moldings (1/hr)

11. Shot Capacity:-

Shot Capacity of = Shot Capacity of Material A"* (Density of B"/Density of A") Material B"* (Bulk Factor of A"/Bulk Factor of B")

Where, A = GPPS (Rated by Machine manufacturers)
B= Plastic material actually used

Shot Capacity (Gms) = Swept Volume (CC) *Density (Gms/CC) * C

Where,
C=0.85 for Crystalline Material
0.93 for Amorphous Material

12. Screw Speed:-

$$V=3.14 * D * N$$

Where,
V = Screw Speed (m/sec)
D = Diameter of the Screw
N= RPM of the Screw

CHAPTER 4

MAINTENANCE AND SAFETY

4.1 MAINTENANCE

As we know "Prevention is the best cure". Machines are also to be looked after and maintained properly. This will reduce wear and tear and increase production along with machines life.

A system of frequent inspection should be established to prevent breakdowns and wearing parts under observation. The following planned preventive maintenance program will be quite helpful in obtaining reliable performance from the machine.

DAILY

1. Clean the machine externally.
2. Clean panels of safety gate.
3. Lubricate tie rod at the start of every shift and the regularly at 178 hours. Intervals by means of a hand pump provided.
4. Grease all parts where grease nipples are provided.
5. Check the oil level of the tank and top up if necessary.
6. Check oil level of thrust unit and top up if necessary.
7. Check oil temperature. Temperature should not exceed 50*C.
8. Check a meter for working of heaters.

WEEKLY

1. Check for oil leakage and rectify wherever necessary.
2. Check lubrication system for fracture of pipes or leakage through fittings.
3. Clean guide rods of injection unit a lubricate wall.
4. All oil tank covers should be firmly fixed in position. Check the gaskets for damage. Repair if necessary.
5. Check for any loose connections on machine elements and tightened if required.
6. Check water-cooling system for leaks.

FORTNIGHTLY

1. Check bolts fixed under head stock mold place.
2. Check main valve and injection relief valve setting.
3. Check that all the return lines are valves below the oil level to prevent aeration.
4. Check the machine for the incorrect functioning.
5. Check all safety features provided.
6. Check pressure filter, provided for hydro motor.

MONTHLY

1. Contact points of contractors should be checked. If found dirty, clean with carbon tetra chloride.
2. Check heat circuit checking each zone individually.
3. Check temp. Controllers for correct functioning. Correct if necessary. Set the zero error.
4. Check function of limits witches.
5. Check main electrical cabinet and the machine.
6. Check earthling of main electrical cabinet and the machine.
7. Check tightness of solenoid cover screw.
8. Check tightness for controllers mounting screw.

QUARTERLY

1. Check hydraulic coil for,
   - Loss in oil level.
   - Take oil sample from oil tank for analysis.

SIX MONTHLY

1. Clean oil cooler internally on the water side and refit.

2. Check all tie bar nuts for tightness.
3. Remove oil from the oil tank. Clean the tank and fill it after filtering the oil. Also clean the pre-fill tank.

4.2 SAFETY & HAZARDOUS

- In considering the cause of the simple machine, it is important not to overlook the hazards of both the injection moulding process and the various m/c functions. The secan range from the simple matter like the accidental trapping of finger in moving parts much more serious accident resulting in severe burning or of such bad trapping.
- These safety precaution sare to be used as a guide to supplement the following.
- All other information pertaining to them/c.
- Local, plant a shop safety rules and codes.
- Federal land state safety laws and regulation.

Personal Safety Attitudes and Action

- A person has to work with good physical condition and is fresh mind. Every day and every time inspect for noise and unusual sound coming from the m/c and tell to authorize person.
- That is good practice to do not put any tools on the m/c that creates an injury problem. Before starting work on to the m/c remove all watches rings and chain any metal jewelry that may cause problem. Do not smokes around the m/c because of hydraulic oil threat create fire? Keep them/c neat and clean.

Industrial Safety

- Following safety factors are carried out to prevent accident in the company.
- Frequently checking of the entire machines safety factorisd one to prevent accident.
- Firefighting equipment is placed at fixed distance for easy and fast handling of it, in the case of fire.
- Training is given to labors about safety measures.
- Workers and staff are trained for firefighting at regular intervals.

CHAPTER 5

CONCLUSION

Windsor Machine Ltd. is a very good Industry for taking practical knowledge & training. I got golden chance to undergo training in the well being named established organization, which will be proved as sound base for career of an engineer.

During this training period I had been observed modern machinery of machine manufacturing and also seen latest designing technique of injection molding machine which I have never studied in my study curriculum.

This industry is generally related to the plastic engineering. Though I have learn lots more or almost new things.

To develop industrial relationship is the base of all engineers. I develop their how to create industrial relationship between workers and managers. I also studied about company's management, market and economics.

REFERENCES

- Company Testing Manual Book
- Company Engineers and Workers
- https://windsormachines.com/
- www.windsor-imm.com

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Annexure 1

Enrollment no: 190390119010

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: Patel Nimu Anilbhai

DIARY OF THE WEEK: Dt: 23/01/2023 **TO** 27/01/2023

DEPARTMENT: Mechanical Engineering **SEM:** 8th

NAME OF THE ORGANISATION: Windsor Machines Limited Chatral

NAME OF THE PLANT/SECTION/DEPARTMENT: Injection Moulding

NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT: Sanjay Patel Sir

DESCRIPTION OF THE WORK DONE IN BRIEF

Here in first week i am working an intern in a assembly area. During this days i visited assembly department of injection moulding. Here major two things are included: i) injection unit assembly. ii) locking unit. In injection unit assembly major machines are based on hydraulic. The components included such as manifold, gears (tapper & thong), cylinder, piston rod, barrel, coupling, heater, screw, blower, hydro motor etc. and in locking unit operated include two type plate, towel type plate and hand operated type of plats. As per requirement it is used in the injection moulding also its design may vary as per requirements. Major three platten are used. stationary, moving and toggel. all the needed -casting material loaded from outside source.

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TOTAL HOURS: ~~20~~ 28 hours

SIGNATURE OF STUDENT

- The above entries are correct and the grading of work done by Trainee is EXCELLENT / VERY GOOD / GOOD / FAIR / BELOW AVERAGE / POOR

Signature of Faculty Mentor

Date:

Signature of officer-in-charge of Dept. / Section / Plant

Date: 07/02/23

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Annexure I

Enrollment no: 190390119010

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: Patel Nimel Anilbhai

DIARY OF THE WEEK: Dt: 30/01/2023 TO 03/01/2023

DEPARTMENT: Mechanical Engineering SEM: 8th

NAME OF THE ORGANISATION: Windsor Machines limited chatral

NAME OF THE PLANT/SECTION/DEPARTMENT: Injection Moulding

NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT: Sanjay Patel sir

DESCRIPTION OF THE WORK DONE IN BRIEF

Machining processes to be performed:
for cylinder → Juraystic machine (cutting, marking)
drill machine (drill) acc. to requirements speed & diameter will change.
material - SS → screw and head will be fitted into the cylinder.
thread milling machine → screw will made.
boring & deburring process of cylinder.
34 number oil, bush & screw → SS material
outside hardening of bush.
as per requirements.
size, pitch, thread, diameter, everything will be different of screw as per requirements.
thread milling machine → gears, chuck, oil (34 number & 55 number), screw (diff. APR), thread milling governer, Motor, Vernier caliperse is used to check accuracy of the screw thread.

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TOTAL HOURS: 23 hours

SIGNATURE OF STUDENT

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EXCELLENT / VERY GOOD / GOOD / FAIR / BELOW AVERAGE / POOR

Signature of Faculty Mentor

Signature of officer-in-charge
of Dept. / Section / Plant

Date:

Date:

✪ Grading of Work, for trainee may be given depending upon your judgement about his Punctuality, Regularity, Sincerity, Interest taken, Work done etc.

Annexure I

Enrollment no: 190390119010

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: Patel Nimel Anilbhai

DIARY OF THE WEEK: DT: 06/02/2023 TO 10/02/2023

DEPARTMENT: Mechanical Engineering SEM: 8th

NAME OF THE ORGANISATION: Windsor Machines Limited, Chhatral

NAME OF THE PLANT/SECTION/DEPARTMENT: Injection Moulding (Assembly & testing)

NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT: Sanjay Patel Sir

DESCRIPTION OF THE WORK DONE IN BRIEF

Machine Series:
- ARMOUR series
- EXCEL series
- WINFIT series
- WINPET series

} toggle mechanism

- Sprint series - hydromechanical
- KL series - 2 platten only hydraulic

2 Types of Motor are used in Injection Moulding machine:
Servo Motor & Induction Motor
↓ fix pump ↓ (3000 RPM) drive to control
↓ variable pump ↓ (1440 RPM) direction to control anti & clockwise

Injection Moulding has two units:
(i) Injection unit
↓
screw, barrel, nozzle, head, ring plunger, heater, thermocouple, barrel support, retraction cylinder, coupling, guide bar, hopper, hopper slider, barrel mixer, head mixer, injection blocks, gauge, pressure selector, hydromotor, transducer, oil tank, pump, oil cooler

(ii) locking/clamping unit
↓
- toggle mechanism
3 platten
- tie bar
- suite
- toggle mechanism (pins, line...)
- pan cover
- Ejector assembly
- sun & planet gears
- Clamp cylinder
- lubrication unit
- Safety gate
- ejector block
- transducer
- core block
- proxy

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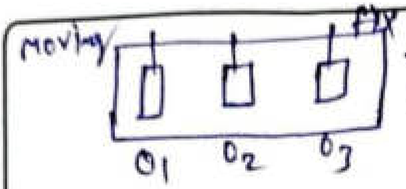
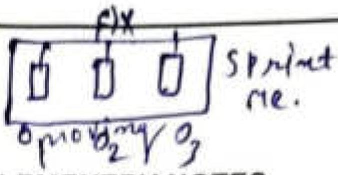
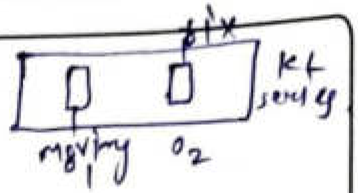






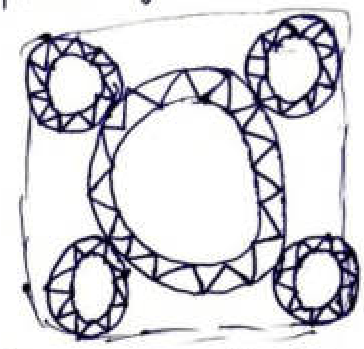
SUPPLEMENTRY NOTES
(add additional sheets if required)

- Sprint Mechanism:
  3 platten
  tie bar (fix)
  auxillary cylinder
  Shutter Mechanism
  dummy ram
  clamping cylinder
  oil tank
- KL series:
  hydraulic type
  2 platten
  4 tie bar
  Split nut
  cylinder & piston (for tonnage)
  auxillary cylinder
  oil tank.

MMI – B&R → Armom, Sprint, (touchscreen) KL, wimpet

KEBA → Excel, wimfit.

Sun & planet gear Mechanism:



to give movement to the Moving plate.
it in case we need to change the size of mould then it adjust die height to give support proper movement space to the Moving plate.

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TOTAL HOURS: 26 hours

SIGNATURE OF STUDENT

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Signature of Faculty Mentor

Signature of officer-in-charge of Dept. / Section / Plant

Date:

Date:

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Annexure I

Enrollment no: 190390119010

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: Patel Nima Anilbhai

DIARY OF THE WEEK: Dt: 13/02/2023 TO 17/02/2023

DEPARTMENT: Mechanical Engineering SEM: 8 th

NAME OF THE ORGANISATION: Windsor Machines Limited, Chhatral

NAME OF THE PLANT/SECTION/DEPARTMENT: Injection Moulding (Assembly & testing)

NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT: Sanjay patel sir

DESCRIPTION OF THE WORK DONE IN BRIEF

Machine specifications:
Injection capacity (maximum volume of material that can be injected each time in screw)
screw stroke (maximum linear movement)
Injection pressure (during mould filling it's required force)
Maximum mould height
clamping force
L/D ratio (length/diameter ratio of screw) approximately 1:10

Hydraulic control valve types:
(i) flow control (F)
(ii) pressure control (P)
(iii) direction control (D)

Electric cell:
P.S.U. - Power supply unit
M.C.B. - Miniature circuit breaker
S.S.R. - Solid state relay
N.O.N.C. relay - Normally open normally close relay

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SUPPLEMENTRY NOTES
(add additional sheets if required)

transformer
Scanner card
T.B. - terminal block.
S.M.P.S. - Switch Mode power supply
C.T. - current transformer
fuse
connector
V.F.D. - variable frequency drive
B.R. - breake register
chock
drive
UV relay - under voltage relay.
OV relay - over voltage relay.
power supply unit :
convert the power of 400 watt to 24 watt.
MCB → for switching
3 types ↔ B curve, C curve, D curve.
SMPS → Switch Mode power supply
415 V → 24 V DC.
AC to DC convert
UPS → for continue work
for sometime even it after power out off
cycle completition)

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TOTAL HOURS: 25 hours

SIGNATURE OF STUDENT

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Signature of Faculty Mentor

Signature of officer-in-charge of Dept. / Section / Plant

Date:

Date:

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Annexure I

Enrollment no: 193390119010

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: Patel Nimy Anilbhai

DIARY OF THE WEEK: Dt: 20/02/2023 TO 24/02/2023

DEPARTMENT: Mechanical Engineering SEM: 8th

NAME OF THE ORGANISATION: Windsor Machines Limited, Chhatral.

NAME OF THE PLANT/SECTION/DEPARTMENT: Injection Moulding (Assembly & Testing)

NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT: Sanjay Patel Sir

DESCRIPTION OF THE WORK DONE IN BRIEF

injector cylinder
Injector thrust

Injection unit assembly :
(detailed process)

- fitting of LM guide on the riser frame. Skate or bearing block would be fitted on LM guide and the function of bearing block is to move the injection in forward and backward directions. After this fitting process check the parality of LM guide using by parality checker machine (guage type). After fitting of skate, fix the stopper at end of the LM guide. The function or working of stopper is to stop the skate at the end of the LM guide. It means stopping the skate to donot go outside to end of the LM guide. Now, on next day we are continue with assembly of 250 tons machine. filling of the piston gap by using guide ring and O ring. guide ring help to avoid friction between metals, also it stop the oil leakage. If in case the guide ring will allongate, then rap the salotap all over the guide ring. This allogation of guide ring create problem of

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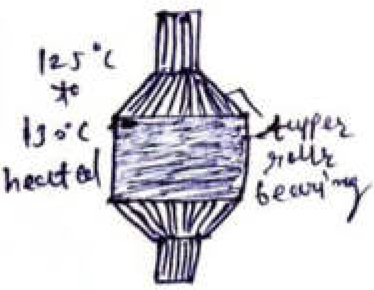
SUPPLEMENTRY NOTES
(add additional sheets if required)

oil leakage in machine. After 1 or 2 hours the ring get back to its original position.
piston guide type : stop the oil, help to move the piston and prevent the metal to metal contact. now, fitting of the viper ring on the piston. It prevent the piston from the dust and helps to stay remain clean.
Thrust coupling assembly : coupling or coupler join the hydromotor and injector. Now, taper roller bearing heat at 125c to 130°c.
after the elegation bearing is easily fitted on the thrust coupler. There are two thrust bearing is fitted one upper and one is at lower. now leave bearing to cool down at room temperature.



The plug is fitted onto the extra hole of injection cylinder housing so the oil doesnot leake. guide ring is fixed on to the piston. Taper fixer is used to fix the piston into the injection cylinder. after the fixing of piston into the cylinder the injection cylinder End cap fit on to the cylinder end bar fixing the piston.
Thread locker used for thread lock → locatite 262 at light strength
for retaining compound → locatite 698.

SUPPLEMENTRY NOTES
(add additional sheets if required)

Now, fitted of injection cylinder on the LM guide. Hopper slider fitted on the injection cylinder. Grueket is used for lubrication for lubrication thin pipe is used just like straw. lubrication happened on the skate injection thrust: put lubrication happened on the skate. Thrust bearing → caller then thrust coupling on upper roller thrust bearing. one caller fitted to cover upper roller thrust bearing. one upper and one lower → thrust bearing position then fitted of seal housing to using bolts. using seal housing → fitting of caller donot move freely (upper roller thrust bearing). After removing seal housing fit oring and oil seal. So that oil will not be go outside then fix the seal housing. 0.5 mm filler → to check the gap. then put injection thrust on the skate. Now, fitting of hydrometer on thrust. at the end fit the nozzle, screw, barrel and heater. barrel clamping ring fitted onto injection cylinder to check lock the barrel. barrel lock ring is used to lock the barrel with the barrel clamping ring. Split ring is fitted onto the piston rod at the place lock the piston cylinder and donot move from the place. Injection piston nut used lock the nut. ceramic heater is used in the injection machine. heater is fitted onto barrel rotometer fits near the side of barrel.
Extension rod is for future extension.
Screw clamping ring → lock the screw.

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TOTAL HOURS: 24 hours

SIGNATURE OF STUDENT

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Signature of Faculty Mentor

Signature of officer-in-charge of Dept. / Section / Plant

Date:

Date:

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Annexure I

Enrollment no: 190390119070

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: Patel Nima Anilbhai

DIARY OF THE WEEK: Dt: 27/02/2023 TO 03/03/2023

DEPARTMENT: Mechanical Engineering SEM: 8th

NAME OF THE ORGANISATION: Windsor Machines Limited, Chatral

NAME OF THE PLANT/SECTION/DEPARTMENT: Injection Moulding (assembly & testing)

NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT: Sanjay Patel Sir.

DESCRIPTION OF THE WORK DONE IN BRIEF

Locking unit:

preparing of dieheight plate → casting (outside readymade)

↓

cleaning and hole drilling; grinding with accuracy and using Emery paper.

↓

oilling and greaseing

↓

brass bush → put into the nitrogen container for cooling at -150°C.

↓

after cooling fitted on plate (brass bush at -150°C).

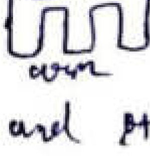
↓

brass bush (inside black hole of graphite) to hold and stick grease, so that for long time it can be used.

↓

fitting of links, lever and arm.


link


arm

fitting of crosshead die, tie with links in die-height platten.

- stationary plate fitted on the stand.

↓

casting and other accuracy checking of stationary & moving plate.

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SUPPLEMENTRY NOTES
(add additional sheets if required)

oiling and greesing
↓
brass bush fitting at -150°c (nitroding) ?
piping fitting
↓
cross side direction fitting of tie bar into hole.
↓
fitting of moving plate in stationary plate using tie bars.
↓
on tie bar → nut fitting → alignment checking using filler
↓
fitting of nut pad lock so that stationary fixed with it.
↓
Now, fitting of arms between the moving plate and dieheight plate using arm fixer one at lower side of the arm.
↓
connecting of arm with links. Putting plates and fitted using proper parts like nuts and bolts.
↓
remaining two tie bar fitting also locked using nut pad locks.
↓
Parality checking → sun and planete gear fixed at last.
Cutting of all parts. Machine name: BENDSAW machine.
as per company grade and color code of raw material or parts; parts such as cylinder, barrel, tie bar, piston, rod, screw.
for example chart has following thing:
color code: pink, Material grade: MS, Material description: Mild steel

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TOTAL HOURS: 23 hours

SIGNATURE OF STUDENT

The above entries are correct and the grading of work done by Trainee is
EXCELLENT / VERY GOOD / GOOD / FAIR / BELOW AVERAGE / POOR

Signature of Faculty Mentor

Date:

Signature of officer-in-charge
of Dept. / Section / Plant

Date:

Grading of Work, for trainee may be given depending upon your judgement about his Punctuality, Regularity, Sincerity, Interest taken, Work done etc.

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Annexure I

Enrollment no: 190390119010

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: Patel Nimel Anilbhai

DIARY OF THE WEEK: Dt: 09/03/2023 TO 10/03/2023

DEPARTMENT: Mechanical Engineering SEM: 8th

NAME OF THE ORGANISATION: Windsor Machines Limited Chatral

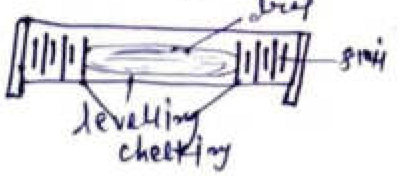
NAME OF THE PLANT/SECTION/DEPARTMENT: Injection Moulding

NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT: Sanjay Patel Sir

DESCRIPTION OF THE WORK DONE IN BRIEF

Working of 100 tons Excel type machine
- toggel type
- 8 seconds timing of cycle (cycle time)
- household applications

autonode + semi + manual
currently testing is continue at auto mode.
levelling checking of base (used to load injection & locking unit)



Injection unit assembly (150 tons Excel)
- fitting of L.M. guide
- scale or bearing block fitting
- parallity checking
- fix the stopper at end of L.M. guide

- filling the piston gap by using guide ring and using guide ring
- thrust coupling assembly upper roller bearing at 125°C heated
- elongation should be done
- two thrust bearing upper & lower

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TOTAL HOURS: 7 hours

SIGNATURE OF STUDENT

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Signature of Faculty Mentor

Signature of officer-in-charge of Dept. / Section / Plant

Date:

Date:

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Annexure I

Enrollment no: 190390119010

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: Patel Nimy Anilbhai

DIARY OF THE WEEK: Dt: 13/03/2023 TO 17/03/2023

DEPARTMENT: Mechanical Engineering SEM: 8th

NAME OF THE ORGANISATION: Windsor Machines Limited Chatral

NAME OF THE PLANT/SECTION/DEPARTMENT: Injection Moulding

NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT: Sanjay Patel sir

DESCRIPTION OF THE WORK DONE IN BRIEF

Materials that are used in injection moulding:

- Ethylene
- polymer
- polyvenyle chloride
- thermoplastic polymer
- thermosetting polymer
- acrylic
- nylon
- polycarbonate
- polyethylene
- polypropylene
- polystyrene.

Material testing:

- firstly start the machine.
- check all the conditions and positions of parts.
- fit the hopper and put magnet plate inside the hopper. which will stick the other material like metal, iron. So only plastic material will go. kind of filtering.
- check the material by testing it or showing the details like color, grade, strength of material by looking into manual description.

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SUPPLEMENTRY NOTES
(add additional sheets if required)

- now start the cycle and firstly before that purge it. Purge which remove the unwanted resin or dust from the barrel.
- proper heat to the barrel and also check the cooling.
- now run cycle and every after completing cycle note down temperature, pressure and remove that material, leave it for the cooling then after completing every test, take all the melted material and do their weight. This is based on cycle and its time, this shows that how our requirements will fulfill.

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TOTAL HOURS: 24 hours

SIGNATURE OF STUDENT

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Signature of Faculty Mentor

Signature of officer-in-charge of Dept. / Section / Plant

Date:

Date:

Grading of Work, for trainee may be given depending upon your judgement about his Punctuality, Regularity, Sincerity, Interest taken, Work done etc.

Annexure I

Enrollment no: 190390119010

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: Patel Nimel A.

DIARY OF THE WEEK: Dt: 20/03/2023 TO 24/03/2023

DEPARTMENT: Mechanical Engineering SEM: 8th

NAME OF THE ORGANISATION: Windsor Machines Limited, chatral

NAME OF THE PLANT/SECTION/DEPARTMENT: Injection Moulding

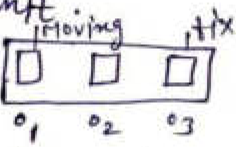
NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT: Sanjay Patel sir

DESCRIPTION OF THE WORK DONE IN BRIEF

barrel assembly: barrel screw, tip seat valve, nozzle tip, heater, blower, adapter barrel, nozzle body, thermo-couple to measure heat.

this are the parts that are used in the barrel assembly into the injection unit.

toggle Mechanism



3 platten
tie bar
ejector assembly
} locking/clamping unit

Test: Machine dry duty, check the loose wiring and piping, skate setting, pump venting, all input & output check, oil test, all pressure setting also temperature, heating detail check, Machine centering & bottoming, levelling, calibration checking, shuttle setting, screw rpm proxi, parallety checking, tie bar strenting.

Injection unit assembly:

LM guide fitting on the riser frame. Skate would be fitted on the LM guide. parallity checking, fixing the stopper at end of the LM guide.

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SUPPLEMENTRY NOTES
(add additional sheets if required)

filling of the piston gap by using guide ring 9 o-ring. It stop the leakage.
piston guide tape:
Stopping the oil, help to move the piston and preventing metal-to-metal contact. fitting of viper ring into the piston. It is prevent the dust all this are fitted into injection and all. At last motor fitted on the last.

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TOTAL HOURS: 20 hours

SIGNATURE OF STUDENT

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EXCELLENT / VERY GOOD / GOOD / FAIR / BELOW AVERAGE / POOR

Signature of Faculty Mentor

Signature of officer-in-charge
of Dept. / Section / Plant

Date:

Date:

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Annexure I

Enrollment no: 190390119070

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: Patel Nimy A.

DIARY OF THE WEEK: Dt: 27/03/2023 TO 31/03/2023

DEPARTMENT: Mechanical Engineering SEM: 8th

NAME OF THE ORGANISATION: Windsor Machines Limited, chhatral.

NAME OF THE PLANT/SECTION/DEPARTMENT: Injection Moulding

NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT: Sanjay Patel sir.

DESCRIPTION OF THE WORK DONE IN BRIEF

locking unit:
first preparing of die height plate. casting → outside readymade.
↓
cleaning a hole drilling with grinding accuracy, using emery paper.
↓
oiling and greeceing → brass bush put into the nitrogen
↓
container for cooling at -80°C. → after cooling fitted on plate (brass bush at -80°C)
↓
brass bush → Inside black hole of graphite.
To hold and stick greece so that for long time it can be used.
↓
fitting of link, lever and arm.
working: (shows before testing)
100 tonnes machine
excel type machine.
- toggle type
- 8 seconds timing of cycle (cycle time)
- household applications (uses)

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TOTAL HOURS: 21 hours

SIGNATURE OF STUDENT

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Signature of Faculty Mentor

Signature of officer-in-charge of Dept. / Section / Plant

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Date:

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Annexure I

Enrollment no: 190390119010

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: Patel Nima A.

DIARY OF THE WEEK: Dt: 03/04/2023 TO 07/04/2023

DEPARTMENT: Mechanical Engineering **SEM:** 8th

NAME OF THE ORGANISATION: Windsor Machines Limited, Chatral

NAME OF THE PLANT/SECTION/DEPARTMENT: Injection Moulding

NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT: Sanjay Patel sir

DESCRIPTION OF THE WORK DONE IN BRIEF

Material testing → fit hopper and put magnet plate. now add material in the plastic form. It is poly-ethylene and cycle time is 24 seconds of sprint150. It's ram type or shuttle type. Provide tonnage through oil cylinder.

Machining processes :

Screw → 3 to 4 operations, turning, milling, drilling, finishing, fluting, grinding, boring processes are to be performed.

- Screw, barrel, nozzle, manifold, injection ~~mo~~ housing, tip seat valve - components that are machined.

Some are manual and some of them are CNC automatic.

Injection thrust → put collar then thrust coupling or taper roller thrust bearing → called fitted. To cover taper roller thrust bearing one upper and one lower → thrust bearing position. then fitted of seal housing to using bolts. using seal housing → fitted o-ring and oil seal. So that oil will not be go outside. then fix the seal housing.

SUPPLEMENTRY NOTES
(add additional sheets if required)

0.5 MM filler → to check the gap then put injection thrust on the skate. fitting of Injection process : barrel clamping ring fitted onto Injection cylinder to lock the barrel. barrel lock ring is used to lock the barrel with the barrel clamping ring. split ring is fitted onto the piston rod at the place lock the piston rod cylinder and do not move from the place. Injection heater is fitted onto barrel retractor fits near the side of barrel. Extention rod → for future extention screw clamping.
ring → lock the screw.

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TOTAL HOURS: 20 hours

SIGNATURE OF STUDENT

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EXCELLENT / VERY GOOD / GOOD / FAIR / BELOW AVERAGE / POOR

Signature of Faculty Mentor

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Annexure I

Enrollment no: 190390119010

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: Patel Nima A.

DIARY OF THE WEEK: Dt: 10/04/2023 **TO** 14/04/2023

DEPARTMENT: Mechanical Engineering **SEM:** 8th

NAME OF THE ORGANISATION: Windsor Machines Limited, Chatral.

NAME OF THE PLANT/SECTION/DEPARTMENT: Injection Moulding

NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT: Sanjay Patel sir

DESCRIPTION OF THE WORK DONE IN BRIEF

cutting of parts, Machine - BENDSAW. parts such as Piston rod, screw, cylinder, barrel, tie bar etc... but now cutting of Piston rod with of alloy steel heat treated of yellow color with EN-19 Material grade then second is of tie bar color blue with EN-408 Material of Nitro alloy steel heat treated. locking unit assembly → preparing of dieheight plate. → brass bush casting to be ready → oiling and greasing → brass bush put into the nitrogen container for cooling at -80°C. after that it will further fitted on plate (brass bush at -80°C) → brass bush has black hole of graphite too. after fitting of bushes → using tie bars → on tie bar nut fitting → alignment checking using filler rod → fitting of nut pad lock. fitting of nut pad lock and fitting of rotary between the moving plate and dieheight plate using arm fixer rods.

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TOTAL HOURS: 21 hours

SIGNATURE OF STUDENT

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Signature of Faculty Mentor

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Annexure 2

Feedback Form by Industry expert

Student Name: Patel Nimay Anilbhai

Date: 15/04/2023

Work Supervisor: Sanjay Patel sir

Title: Injection Moulding

Company/Organization: Windsor Machines Limited

Enrollment No: 190390119010

Internship Address: Plot No. 697, GIDC Chhatral, Kalol

Dates of Internship: From 23/01/2023 to 15/04/2023

Please evaluate your intern by indicating the frequency with which you observed the following behaviors:

Parameters	Needs improvement	Satisfactory	Good	Excellent
Shows interest in work and his/her initiatives			✓	
Produces high quality work and accepts responsibility			✓	
Uses technical knowledge and expertise			✓	
Analyzes problems effectively			✓	
Communicates well and writes effectively			✓	

Overall performance of student intern: (Needs improvement/ Satisfactory/Good/Excellent):

Additional comments, if any:

For, WINDSOR MACHINES LIMITED

Authorised Signatory

Signature of Industry person with name and Stamp:

Signature of the Faculty Mentor Ashutosh Gohel

INTERNSHIP AT NATIONAL ENGINEERING CO.

INTERNSHIP REPORT

Submitted by

Harshit Dhanjibhai Prajapati

190390119011

In partial fulfilment for the award of the degree of

BACHELOR OF ENGINEERING

In

Mechanical Engineering

S.P.B. Patel Engineering College, Mehsana

S.P.B. PATEL
ENGINEERING COLLEGE
SAFFRONY INSTITUTE OF TECHNOLOGY

GUJARAT TECHNOLOGICAL UNIVERSITY

Gujarat Technological University, Ahmedabad

May, 2023

S.P.B. PATEL
ENGINEERING COLLEGE
SAFFRONY INSTITUTE OF TECHNOLOGY

GUJARAT TECHNOLOGICAL UNIVERSITY

S.P.B. Patel Engineering College

Near Shanku's Water Park, Ahmedabad – Mehsana Highway, Linch, Gujarat

CERTIFICATE

This is to certify that the project report submitted along with the project entitled **Internship at National Engineering Company** has been carried out by **Harshit Dhanjibhai Prajapati** under my guidance in partial fulfilment for the degree of Bachelor of Engineering in Mechanical Engineering, 8th Semester of Gujarat Technological University, Ahmedabad during the academic year 2022-23.

Sign	Sign
Prof. Monil Shah	Prof. Kunalsinh Kathia
Internal Guide	Head of Department

COMPANY CERTIFICATE

NATIONAL ENGINEERING COMPANY

+91 90990 20397, +91 94265 56535 national_thrasher@yahoo.com
1, Rajendra Industrial Estate, Kheralu Road, Visnagar - 384315
GST IN :- 24AKJPP2055P1ZQ

Date: 3rd May 2023

TO WHOM IT MAY CONCERN

This is to certify that **HARSHIT DHANJIBHAI PRAJAPATI, ENROLLMENT No. 190390119011,** a student of **S.P.B. PATEL ENGINEERING COLLEG, MAHESANA (SAFFRONY INSTITUTE OF TECHNOLOGY)** has successfully completed his internship in the field of **MECHANICAL DEPARTMENT** from **3rd FEBRUARY 2023** to **3rd MAY 2023** (Total number of Days: **90**) under the guidance of **PANCHAL KETANKUMAR BHIKHABHAI.**

During the period of his internship program with us, he had been exposed to different processes and was found diligent, hardworking and inquisitive.

We wish him every success in his life and career.

For,

NATIONAL ENGINEERING COMPANY

NATIONAL ENGINEERING CO.

PROPRIETOR

Authorised Signature with Industry Stamp

S.P.B. Patel Engineering College, Mehsana

Near Shanku's Water Park, Ahmedabad – Mehsana Highway, Linch, Gujarat

DECLARATION

We hereby declare that the Internship / Project report submitted along with the Internship / Project entitled **Internship at National Engineering Company** submitted in partial fulfilment for the degree of Bachelor of Engineering in **Mechanical Engineering** to Gujarat Technological University, Ahmedabad, is a bonafide record of original project work carried out by me under the supervision of **Prof. Monil Shah (Internal Guide)** & **Ketan Panchal (External Guide)** and that no part of this report has been directly copied from any students' reports or taken from any other source, without providing due reference.

Name of the Student	Sign of Student
Harshit Dhanjibhai Prajapati	_______________

ACKNOWLEDGMENT

I wish to express my heartfelt appreciation to all those who have contributed guidance, encouragement and cooperation of intellectuals, both explicitly and implicitly, without the co-operation of whom, it would not have been possible to complete My Internship.

I would like to thank our H.O.D Prof. Kunalsinh Kathia as well as Prof. Monil Shah (Internal Guide) for constantly guiding and showing us the correct path to reach towards our desired goal. Also, I thank them for sharing their experience, knowledge and valuable time with me and showing their concern to do this wonderful internship in Thresher Company and make it better.

I also thanks to National Engineering Company and Mr. Ketan Panchal, who gave me the golden opportunity to do this wonderful internship by sharing their ideas and knowledge.

Harshit Dhanjibhai Prajapati

190390119011

ABSTRACT

This report provides an overview of my internship experience at National Engineering Company. National Engineering Company is a leading organization in the agricultural machinery industry, specializing in the production and distribution of advanced farming equipment. Throughout my internship, I had the opportunity to work closely with the company's skilled professionals and gain valuable hands-on experience in various departments.

The report begins with an introduction to Thresher Company, including its history, mission, and core business areas. It highlights the significance of the agricultural machinery sector and Thresher Company's position within it. The objectives of the internship program are outlined, focusing on personal and professional growth, knowledge acquisition, and practical skill development.

Next, the report describes the specific tasks and responsibilities I undertook during the internship. These included assisting the research and development team in testing and improving machinery prototypes, analyzing market trends and customer feedback, and participating in the production process. The report also details the various departments I had the opportunity to work in, such as sales, marketing, and customer support, highlighting the valuable insights gained from each experience.

Furthermore, the report reflects on the skills and knowledge acquired throughout the internship. It discusses the importance of teamwork, communication, and problem-solving skills in a professional environment. It also addresses the significance of adaptability and flexibility when working in a dynamic industry like agricultural machinery.

LIST OF FIGURES

ABBREVIATIONS

QC	Quality Control
CNC	Computerized Numerical Control
MCU	Machine Control Unit
MIG	Metal Inert Gas
CAD	Computer Aided Design
PPE	Personal Protective Equipment

TABLE OF CONTENTS

1. INTRODUCTION

1.1 COMPANY PROFILE

National Engineering Company is one of the India’s leading manufacturers of Agriculture Implements started it journey in 1980, with experience in the same field catering Farmers demands for Threshing machines. We at National have latest Machinery like CNC Plasma Cutting, CNC Punching, CNC Bending, Hydraulic Pressing etc. to produce unmatched quality and reliability with professionally trained staff. Our upward approach to provide cost effective and maintenance free machines lead us to become leaders in Indian Agriculture Implement manufactures. It is specialized in exclusive Optimum Quality Tractor Driven Agricultural Implements to ensure that top quality is met at reasonable prices. Over.

Fig 1.1.1 National Engineering Company

1.2 MISSION AND VISION OF THE COMPANY

National Engineering Co. has always believed in 100% customer satisfaction by excellence in all areas of operation through products of high quality and performance and strength lies in responding to the customers' needs and strived to bring the best possible technologies proper selection, dealers' network, service after sales, methodologies and equipment to enhance customer satisfaction.

Mission of Company is Keeping Farmers requirement in the center design & manufacture better, safer and maintance free machines which helps farmer achieving progress & prosperity.

1.3 DEPARTMENT OF THE COMPANY

- Management Department
- Storage And Purchase Department
- Cutting Department
- Welding Department
- Assembly Department
- Painting Department
- Testing And Delivery Department

1.4 COMPANY OWNERSHIP AND LOCATION

OWNER

The director of this company is Himanshukumar A. Panchal

LOCATION

01, Rajendra Industrial Estate. Near Kheralu road Visnagar,384315

1.5 TYPE OF MANUFACTURING PRODUCTS

FIG 1.5.1 SINGLE SHAFT THRESHER

FIG 1.5.2 JUMBO MULTICROP THRESHER

FIG 1.5.3 CASTER THRESHER WITH DOUBLE ELAVATOR

FIG 1.5.4 GROUNDNUTT THRESHER

FIG 1.5.5 CASTER THRESHER

FIG 1.5.6 DOUBLE SHAFT MULTICROP AUTOMATIC THRESHER

1.6 COMPANY COMPETITORS

- Khodiyar Thresher Visnagar.
- Param Thresher Visnagar.
- Maruti Thresher Visnagar.
- Samrat Thresher Unjha.
- Visvas Thresher Visnagar.
- Nataraj Thresher Visnagar.
- Shaktiman Thresher Visnagar

2. INTRODUCTION TO THRESHER

2.1. HISTORY OF THRESHER

1956-57 the famous Ludhiana thresher was Frist introduced in India. The thresher was tractor operated type and used mainly for wheat . It was a very good machine, which threshed, cleared and bagged the grain at the same time it made the quality straw (bhusa).

1970 spick tooth cylinder thresher was commercially marketed in the country. This simple design has been able to maintain the cost of machine low as the total weight of machine was greatly reduced the output capacity also improved.

1995 further development work took place for low horsepower threshers.

2.2. WORKING PRINCIPAL

The grains are separated by combining as well as by hammering action of threshing teeth. Paddy is threshed due to impact and rubbing action between threshing drawn loops and concave screen. The grains are cleaned with the help of a fan and cleaned grain goes down through the grain outlet at the bottom of the thresher.

2.3. CONSTRUCTIONAL DETAILS, FEATURES AND ADJUSTMENTS

The operation of detaching the grains from the ear head, cob or pod is called threshing. It is basically the removal of grains from the plant by striking, treading or rupturing. The traditional method of threshing using manual labours requires 150-230 man-h/ha. Threshing is normally done after the grain moisture content is reduced to 15 to 17%. In various parts of world, threshing is accomplished by treading the grains under the feet of animals or under the tractor tyres, striking the grains with sticks, pegs or loops and removing the grains by rubbing between stone or wooden rollers on a threshing floor or between the rasp bar and a concave of combine. The threshing can be achieved by three methods: Rubbing action, Impact and Stripping.

Threshers are the most important component of farm mechanization. If threshing is not done timely, all efforts made by farmers and inputs given to crop goes wasted. Traditional method of threshing by animal is very slow. It gives low output. Due to low output, the cost of operation is high and there is a huge loss of grains because of rodents, birds, insects, wind, and untimely rain and fire hazards. Wheat threshers overcome these difficulties to a great extent. Wheat threshers are of two type viz. animal-drawn and power threshers. In animal-drawn threshers, olpad thresher is a common machine used in different parts of the country. Power wheat thresher is a machine, which thresh the wheat crop and performs several other functions such as:

- Feed the harvest crop to the threshing cylinder.
- Thresh the grain out of the ear head.
- Separate the grain from the straw.
- Clean the grain.
- Make 'bhusa' suitable of animal feeding.

During the last two decades in the country, power threshers have become quite popular. The famous Ludhiana thresher was first introduced in India during 1956-57. The thresher was tractor operated type and used mainly for wheat. It was a very good machine, which threshed, cleared and bagged the grain, at the same time it made the quality straw (bhusa). Further development work took place during the period from 1965 onwards for low horsepower threshers. The most widely used design, spike tooth cylinder thresher was commercially marketed in the country around 1970. This simple design has been able to maintain the cost of machine low as the total weight of machine was greatly reduced. The output capacity also improved. These threshers are available in various sizes operated by 3-40 hp power sources. The grain output is 20-25 kg/hp-h. Beater type threshers take comparatively more power than spike tooth threshers.

Spike tooth/peg tooth type thresher has cylindrical drum having five to six rows of spikes or pegs mounted on periphery of drum. Threaded mild steel bolts or spikes of same material are used. Thresher with spike is better than bolts as former takes less energy as compared to later. Threshing is accomplished due to impact and rubbing action. The separation is affected through aspiration of material falling through concave. Cleaning is done on a set of oscillating sieves provided in the machine. The fan and cylinder are mounted on the same shaft that makes construction simpler as compared to beater type threshers. The drive to the oscillating sieves is provided from main shaft with the help of crossed belt.

Main Components of Thresher

- Drive pulley
- Fan/blower
- Feeding chute
- Spikes
- Cylinder
- Concave
- Flywheel
- Frame
- Towing hook
- Upper sieve
- Lower sieve
- Transport wheel
- Suspension lever
- Can pulley
- Shutter plate

According to functional components

- Drummy
- Regular (Through-put)
- Axial flow
- According to types of threshing cylinder
- Syndicator
- Hammer Mill or Beater type
- Spike tooth type
- Rasp bar type

Types of Power Threshers

- According to crops being threshed
    1. Crop

2. Multi-crop Single

Principles of threshing: The threshing mechanism, which separates the grain from the stalks, consists mainly of a revolving cylinder and the concaves. A feeder beater is usually located in front of the cylinder and at the upper end of the elevator-feeder to assist the elevator-feeder in feeding the grain to the threshing mechanism. Most threshers are provided with the rasp-bar type cylinder and concaves. The grain is rubbed from the stems without materially cutting the straw. Tooth-type cylinder and concaves are available on some combines. Adjustments are provided for varying the speed of the cylinder to suit the kind of crop being harvested. V belt variable-speed drives are used on most combines. The straw is thrown back onto the separating mechanism, while the grain falls through the concaves onto a grain pan or grain carrier and is conveyed to the cleaning mechanism.

Axial Flow Thresher: The crop in this thresher is fed into the cylinder through a feeding chute located at one end of the threshing drum. In a multi-crop thresher, threshed wheat crop passing through concave is cleaned by a set of sieves and a blower or aspirator. Axial flow of paddy crop is facilitated by the use of louvers provided on the upper concave. The straw is thrown out of the threshing unit by paddles. The cleaning and separation of grain is accomplished by a set of sieves and a blower or aspirator.

Functional components of threshing unit: A power thresher essentially consists of feeding unit, threshing unit, cleaning unit, power transmission unit, main frame and transport unit (Fig. 1). The operation of conveying the cut crop into threshing unit is known has feeding. Normally, one of the two types of feeding units 'throw-in-type' or 'hold-on-type' is used in power threshers (Fig. 2). In 'throw-in-type' feeding unit, the cut crop is pushed into threshing cylinder, where as in 'hold-on-type' the heads is only pushed into the cylinder and straw is manually or mechanically held. Throw-in-type feeding device is quite common in the threshers, which may be a feeding hopper or feeding chute.

Feeding Hopper: In this type of feeding device there is a hopper, placed on the top of the threshing cylinder. Generally hopper type of feeding units have a rotating star wheel mechanism between the hopper and threshing drum to facilitate the uniform feeding of crop to the drum. The initial cost of this system is high, hence is mostly used on a large thresher e.g. axial flow thresher of large capacity.

Threshing Unit: The threshing is accomplished by the impact of the rotating pegs mounted on the cylinder, over to the ear heads, which force out the grain from the sheath holding it. In the threshing of wheat crop, the straw is also bruised and broken up by the impact, thus converting it into 'bhusa' (straw). Threshing unit is mainly consisting of a cylinder and concave.

There are different types of threshing cylinders such as:

- Spike tooth/peg type cylinder
- Rasp bar type cylinder
- Angled bar type cylinder
- Wire loop type cylinder
- Cutter blade or syndicator type cylinder
- Hammer mill type cylinder

Spike tooth type cylinder: In this type of threshing drum, there is a hollow cylinder, made out of MS flat. Over to its entire periphery, a number of spikes/pegs of square /round bars or flat iron pieces are welded or bolted. Now days, in most of threshers, round peg with adjustable length are used. These spikes are staggered on the periphery of the drum for uniform threshing. The crop is fed along with the direction of motion of the rotating drum. The spike tooth cylinders are available in various sizes. A spike tooth cylinder with spikes of flat front and streamlined back has lower energy consumption.

Rasp bar type cylinder: In this type of cylinder, there are slotted plates, which are fitted over to the cylinder rings, in such a way that the direction of slot of one plate is opposite to another plate. This type of cylinder is commonly used in threshers. It gives better quality of bhusa and it can be used for a wide variety of crops viz.-wheat, paddy, maize, soybean etc.

Wire loop type cylinder: In this type of threshing drum, there is hallow cylinder, over which a number of wooden or MS plates are fitted. On these plates, number of wire loops is fixed for threshing purposes. This type of cylinder is common in the manually operated paddy threshers. Holding the bundle against the loops of revolving cylinder does threshing of paddy crop.

Chaff cutter/Syndicator type thresher: This is essentially an adoption of chaff cutter for threshing. The crop is fed as is done in case of chaff cutters. After passing through a set of rollers, crop is cut into pieces. Varying the set of gears can vary the size. Three to four serrated blades are fastened on the radial arm of the flywheel. Threshing is done mainly due to cutting helped by rubbing and impact. The main advantage of syndicator thresher is that it can handle crop with higher moisture content. However, chopping knives need to be sharpened every 3-5 hours of operation. The machine is more prone to accidents due to positive feed rollers.

Hammer mill type cylinder: it uses beaters to do the required job of threshing. The shape of this type of cylinder is different from the above-discussed cylinder. The beaters are made of flat iron pieces and are fixed radically on the rotor shaft. Generally feeding chutes are used with hammer mill type threshing cylinder. The cut crop is fed perpendicular to the direction of motion of rotating beaters. This type of thresher requires more power as compared to spike tooth type of thresher.

Concave: Cylinder and concave together makes the threshing unit. It separates the grain from the crop and removes grain from the straw. Concave is provided in the thresher to hold the fed crop inside the threshing chamber and allows only grain and small amount of chaff to pass through it. The threshing takes place only in this space. It is a curved unit, made of iron steel or iron bar, fitted near the threshing cylinder. The clearance between cylinder and concave is adjustable, depending upon the size and type of grain. The concave clearance for wheat is 5 to 13 mm and for paddy is 5 to 10 mm. As the concave clearance is reduced, the threshing efficiency increases but losses increase and vice versa. The concave clearance at the inlet is less as compared to outlet. There are different types of concave, which are used in thresher.

Screen type concave: It is made of MS rod. It is semicircular in shape and sometimes made with wire also. The screen allows the material after threshing to pass through its perforation.

Perforated concave: In this, perforations are made in a mild steel sheet. The concave is closed from both the ends by iron sheet. The size of perforation is made as per the size of grain of a crop.

Cleaning unit: This unit is provided to separate the grain from chaff. It further uses sub units, like aspirators or blowers, sieves and sieve shaking mechanisms to separate out grains from chaff. The thresher that is provided with aspirator unit is usually called aspirator type thresher. Those threshers fitted with blower which blows air in horizontal direction is called drummy threshers.

Blower or Aspirator: After threshing unit carries out threshing, the cleaning and separation of straw from grain is required. The fan is generally installed on the main shaft over which cylinders, flywheel and driven pulley are mounted. Fan lifts/sucks the lighter material chaff and other plant portion and throw away from the out let. Rest of the separation-cum-cleaning is done by screen with its oscillating motion.

Screens: Most of the power threshers are equipped with two screens. Top screen is provided so as to pass the grain to second screen and chaff etc is taken out from it. Other screen sieves out the smaller grain or weeds seeds and delivers the cleaned grain towards outlet. The size of screen hole is selected on the basis of grain size. These screens are effective when kept under oscillation.

Shaking mechanism: The screens are oscillated or shaken with a crank attached to the screen. This crank is powered from main axle either by belt or by rod. The circular motion of the main shaft is converted into oscillating motion of screen, which shakes it and separates the grain from other foreign material and chaff. The separating effectiveness depends on the frequency of strokes of crank, which is adjustable.

Power transmission unit: Threshers are usually powered with tractors and sometimes with electric motors or diesel engine also. After installing the thresher into the threshing floor in the field, tractor PTO shaft is coupled with a flat pulley. A corresponding matching pulley of appropriate size is provided over to the thresher main shaft. These pulleys are connected with a proper rating of flat belt and thresher is operated. Blower fan is provided into the main shaft of the thresher, which rotates and does the required job. The screens are oscillated with the help of a v-belt and a crank wheel, powered with main shaft of thresher. A heavy flywheel is also provided on the main axle of the thresher. It is very important part of any thresher. It is provided to store the energy to supply continuously and equally to the entire threshing cylinder. It is made up of cost iron, and fitted on one end of the main shaft of thresher.

Main frame: A very strong frame is provided in the thresher on which all the functional parts are attached. The frame is made usually of heavy angle iron sections. It should be strong enough to sustain vibrations of machine, during its operation in the field.

Transport wheels: Thresher is provided with wheels at its legs, so that transportation can be done easily. These wheels are made mostly with cost iron but new and large capacity threshers are equipped with pneumatic wheels for better performance during transportation.

Thresher adjustments: The following adjustments can be done on a stationary power thresher:

Cylinder and concave clearance: In order to get cleaned grains and proper threshing, it is very important to set the proper clearance between tip of cylinder and concave. On an average, concave clearance is kept about 25 mm at the mouth, 10 mm at the middle and 15 mm at the rear end. Start operating the thresher, by keeping proper recommended speed, and check if any grain is left in the ears. If it is so, reduce the concave clearance gradually, until drum is threshing cleanly. Too close concave setting is likely to crack some of the grains.

Cylinder speed: The drum of the thresher should be rotated at proper speed for better threshing and cleaning efficiency. Normally, manufacturers specify the cylinder speed for different crops. The cylinder speed can be checked using tachometer. Operator should check the speed occasionally under load for proper functioning of thresher. The cylinder peripheral speed for wheat is kept between 1520 to 1830 m/min and for paddy between 370 to 920 m/min.

Fan adjustment: Fan(s) fitted on thresher must provide the proper amount of blast. The shutter(s) at each end of fan should be adjusted properly so that it could provide blast sufficient enough to remove chaff and light materials without grain. Watching the sample and adjusting the blast can help in getting the desired results.

Drummy Thresher: These threshers were very popular in the beginning when threshers were introduced because of its simplicity and low cost. The radially arranged arms known as beaters are mounted on the shaft. These are made of mild steel square section with mild steel flat welded or bolted at the top. The beaters revolve inside an enclosed casing. Ribs are provided inside of upper half of the cover in order to have better threshing. The lower half (known as concave) has rectangular openings made out from square bars. The crop is fed through feeding chute. Crop receives impacts from the rotating beaters till size is reduced to pass through concave. The clearance between beater and concave is kept about 18-20 mm. The crop should be well dried before feeding in the thresher. A wet crop raps around the beater shaft and machine becomes overloaded. These threshers do not have provision for separation and cleaning of grains. The threshed material is later separated and cleaned by small pedal type blower.

Olpad thresher: 'Olpad' threshers are also used for threshing wheat crop. A pair of bullocks pulls it around over the dried crop spread in a circular form on the threshing ground. Threshing is continued till the entire material becomes a homogeneous mixture of grain and 'bhusa' (chaff). It consists of about 20 circular grooved discs each of 45-cm diameter and 3-mm thickness placed 15 cm apart in three rows. An operator's seat is provided on the frame to control the movement of animals. All discs are mounted staggered to give more effective cutting of the straw. It has 3 or 4 wheels to facilitate its movement from one place to other. Threshing by this thresher is fairly efficient and cheap but is quite slow with low output capacity. This machine can be used for threshing wheat, barley, gram etc.

Paddy Threshers: Paddy thresher of pedal operated type consists of mainly a well-balanced cylinder with a series of wire loops fixed on wooden slates. It has got gear drive mechanism to transmit power. While cylinder is kept in rotary motion at high speed, the paddy bundles of suitable sizes are applied to the teeth. The grains are separated by combining as well as by hammering action of threshing teeth. Paddy is threshed due to impact and rubbing action between threshing drawn loops and concave screen. The grains are cleaned with the help of a fan and cleaned grain goes down through the grain outlet at the bottom of the thresher. They are available in different horse power range

Multi-crop Threshers: Since, the Indian farmers raise variety of crops as per the suitability of particular region, climate and soil conditions, there was need to thresh all these crops for timelines of operation. Developing a multi crop thresher has solved this problem. It can thresh crops like wheat, moong, paddy, grain, soybean etc. For these crop requirements are different, as in the case of wheat bruised straw (bhusa) is the main requirement. For paddy, farmers need long straw. For pulses, seed damage should be minimal; as damaged seeds lower the quality and causes spoilage in storage. The crop factors such as moisture content, grain size, grain-straw ratio, condition of straw etc influence the design consideration of main components of threshers. The farmer is primarily interested in end product, low cost, durable and reliable machine. The suitable multi crop threshers for cereals and pulses are commercially available in the country.

A multi-crop thresher attains the axial movement of the crop while handling paddy and all crop material is made to move through the concave in case of wheat. The main components of multi-crop threshers are: feeding chute, threshing cylinder, aspirator blower, paddy chaff outlet, wheat straw outlet, hopper, and cam for oscillating sieves, oscillating sieves, transport wheel, frame, main pulley and louvers. The axial flow of material can be accomplished by providing seven louvers with spacing of 150 mm in the hexagonal casing. The clearance between louvers and tip of cylinder spikes is 20 mm. For wheat threshing, the first three louvers are placed with ribbed casing and side plates are fixed with top casing and concave to prevent material flow in the second portion. The direction of rotation of threshing cylinder is opposite for wheat than paddy. That is why; straw outlet of aspirator blower is repositioned. The top sieve has holes of 9-mm diameter for wheat and 5 mm for paddy grains. The lower sieve has holes of 1.5-mm diameter common for both the crops. The upper sieve can be changed easily depending upon crop to be threshed. The cylinder-concave clearance in the first section of threshing system (i.e. facing the feeding chute) has to be more while handling paddy than wheat. The machine output is 500 kg/h for wheat and 700 kg/h for paddy.

High capacity (Harambha) threshers: It is a basically a chaff-cutter type thresher. It consists of a threshing cylinder, concave, two aspirator blowers, reciprocating sieves, feeding chute, feeding conveyor, feed rollers, safety lever in the feeding chute and flywheel. A platform is attached to the main frame of thresher, on which a person stands and feeds the crop into thresher. All the crop materials are fed through the conveyor of feeding chute and feed rollers move the crop into threshing cylinder. A safety lever provided in feeding chute prevents the entrapping of hands by the feed rollers. Threshing cylinder has two chaff-cutter type blades and beaters. Chaff-cutter blades cut the crop into pieces and beater helps to detach grain from crop. All the threshed materials pass through the concave where it is subjected to aspiration action of blower. Light materials like chopped straw are blown away and grain etc. fall on a set of reciprocating sieves. The clean grain is collected in trolley through auger elevator. It can be used to thresh the crop having high moisture content also. The machine is operated by PTO of a 35-hp tractor and is mounted on two pneumatic tyres for easy transportation. It can thresh 1.5-2.0 tonnes/h.

Sunflower thresher: It consists of a threshing cylinder, concave, casing fitted with louvers, cleaning system, feeding hopper and frame. The cylinder concave clearance is 40 mm and is uniform throughout its length. The diameter of cylinder is 65 cm and length 150 cm. The first part of cylinder of length 133 cm has flat bars for crop threshing and the 2nd portion of length 17-cm has straw throwing blades. The cylinder casing is of hexagonal shape and is fitted with 7 louvers. The louvers help the crop to move axially and the crop is rotated three and half times for complete separation of grains. The cleaning system has a blower and two sieves. The opening of top sieve is 16 mm and of lower sieve 6 mm. Recommended cylinder and blower speeds are 300-350 rpm and 1200-1400 rpm respectively. A tractor or 7.5 hp motor can operate machine. The machine has a capacity of 600-900 kg/h of clean grain.

3. SAFETY, ADJUSTMENT AND PERFORMANCE

3.1 SAFE USE OF THRESHER

Introduction of power wheat threshers has greatly reduced the time required for threshing as well as physical burden and drudgery of work for human beings. However, these machines have lead to the problem of involvement of the operators in accidents while using the thresher. The threshers are generally of spike-tooth cylinder type, chaff-cutter type and hammer mill or beater type. The crop is fed manually into these machines through a feeding chute. It has been observed that human factors such as inattentiveness, un-skilfulness, overwork, and physical incapability, wearing of loose clothes, hand-wears and use of intoxicants are mainly responsible for about 73% of accidents. The machine factors such as improper design of feeding systems, substandard material and defective design contribute to about 13% of accidents. Crop factors such as feeding of ear-heads, short crop stalks and wet crop contributed about 9% of accidents whereas inadequate light, crowded surroundings and slipping on the threshing yard contributed to about 5% of accidents.

The threshing accidents can be minimized provided the farmers adopt the following measures:

- The farmer should buy only those threshers, which are fitted with safe feeding chute as per B.I.S. standards. For safety, the minimum length of feeding chute should be kept 90 cm, covered up to a minimum of 45 cm and inclined to the horizontal at an angle of 5-10 degrees. The angle of covered portion with the base length of feeding chute should be kept equal to 5 degrees.
- Employ only skilled and trained workers for feeding the crop to the thresher.
- Avoid feeding ear-heads without stalks as it may lead to serious hand injuries. Similarly, feeding of wet crop should also be avoided which otherwise might lead to fire accidents.
- Avoid talking while working on the thresher. Do not work on thresher under the influence of alcohol or any other intoxicants. Do not work on thresher for more than 8 hours or when feel tired. Do not wear loose clothes, wristwatch, and bangles while working on the thresher.
- Ensure proper lighting in case the machine is to be operated at night, other poor visibility may lead to accidents.
- Keep the work place and surroundings of thresher free of all kinds of obstructions.

- Do not smoke or light a fire near the threshing yard.
- Do not cross over the flat belt or moves near it.
- Keep a first aid box handy for use in the event of need.

3.2 ADJUSTMENT IN THRESHER

Adjustments involved in the threshers are:

Cylinder speed: A thresher is operated at a recommended speed for belt performance. The speed is changed by changing diameter of pulleys using the following relationship.

$$N = (Np\ X\ Dp) / d$$

Where,

- N = Speed of thresher pulley in rpm
- d = Diameter of thresher pulley in cm
- Np = Speed of primary pulley in rpm
- Dp = Diameter of prime mover pulley in cm

Cylinder-concave clearance: It is adjusted by following methods:

- Raising or lowering the cylinder
- Adjusting height of concave assembly
- Adjusting length of spikes

The clearance is measured at five points and an average is taken.

Blower speed: The speed of blower or aspirator is changed by using pulleys of different diameters in accordance with above equation.

Air flow: A thresher may be provided with a sliding gate for air flow adjustment at the same speed of blower or aspirator.

Sieve slope: The slope of cleaning and grading sieves is changed with the help of I-bolts of the units.

Speed and strokes of sieves: The frequency and stroke length of reciprocating sieves which govern the cleaning efficiency can be adjusted by changing the length of connecting rod or eccentricity of crankshaft or both in accordance with the available provisions.

Factors affecting performance: Parameters that are important for threshing which effect the separating and cleaning units are percent of seed separated through concave grate (separating efficiency) and the degree of the breakup of the straw. Most of the seed damage caused occurs in the threshing unit because of impact blows received during the threshing process. Seed damage may be visible or it may be internal which is determined only by germination tests.

Effects of feeding pattern upon cylinder and concave performance: When the material enters, a cross-flow cylinder has considerable effect upon cylinder and concave performance. Based on the tests performed on wheat and barley in the laboratory it was found that cylinder losses is twice as when fed heads first with the stalks parallel and the heads on top of the layer. The percentage of the grains that failed to pass through the concave grate was also twice as high. Tangled pattern, simulating the effect of header gave about the same cylinder losses as the head first feeding. Feeding heads first with the heads on the bottom of the layer was better than with the heads on top.

Effects of cylinder and concave design factors upon performance: With the increase in concave length the separation efficiency also gets increased but at the diminishing rate. Also, increased concave length increases the straw breakup and tends to increase the seed damage, especially with low moisture contents and high cylinder speeds.

Effects of operating conditions upon cylinder loss and seed damage: Threshing effectiveness is related to:

- Peripheral speed of the cylinder: Increasing the cylinder speed reduces the cylinder loss and but may substantially increase damage. Seeds of dicotyledonous plants, such as beans may be damaged excessively at peripheral speeds as low as 7.6 m/s.
- Cylinder concave clearance: Reducing the cylinder concave clearance tends to reduces the cylinder losses but it increases the seed damage. But the effects are generally small in comparison with the effects of increasing cylinder peed.
- Number of times the material passes through concave
- Number of rows of concave teeth used with a spike tooth cylinder
- Type of crop
- Moisture content of the crop: Seed damage increases as the seed moisture content is reduced. Several investigators found that germination of wheat was reduced when threshed at seed moisture content above or below the optimum range of about 17 to 22%.

- Rate of material feeding: Increasing the non-grain feed rate increases the cylinder losses. Increased feed rate tends to reduce seed damage, but the effect is very small.

Effect of operating conditions upon straw breakup and seed separation through concave grate: Harvesting of cereal grains with combines having rasp-bar cylinders and open-grate concaves, 60 to 90% of the seed is usually separated through the concave grate. Increasing the cylinder speed or decreasing the clearance causes more seed to be forced through the grate, thereby reducing the amount of seed that must be handled by the walkers. Increasing the cylinder speed makes the layer of material between the cylinder and concave less dense, and decreasing the clearance makes it thinner. Increasing feed rate makes the layer denser and reduces the amount of seed separation.

3.3 COST OF OPERATION MACHINERY FOR OPTIMUM USE

One of the most important items influencing the profitability of farming operations is the cost of owning and operating the farm machines. Accurate cost estimates play an important role in every machinery management decision, namely, when to trade, which size to buy, how much to buy, etc. There are two types of machinery costs viz. fixed and variable costs. Fixed costs depend on how long a machine is owned rather than how much it is used. It includes depreciation, interest, taxes, shelter and insurance. Variable costs also called operational costs vary in proportion to the amount of machine used. It includes repair and maintenance, fuel, oil or lubrication and labour costs.

FIXED COSTS

Depreciation: Depreciation costs mean a loss in the value of a machine due to time and use. Often, it is the largest of all costs. Machine depreciate, or have a loss of value, for several reasons such as age, wear and tear of machine and obsolescence. There are several methods to calculate the depreciation. These methods are estimated value, straight-line, declining-balance, sum-of-the year's digits, and sinking-fund methods.

VARIABLE COSTS

Repair and Maintenance Costs: Repair and maintenance costs are considered as an essential and significant part of machinery ownership. Occasional repairs and periodic maintenance are required to maintain a machine in good working order and ensure a high degree of reliability. The more a machine is used, the greater is its need for repair. The factors necessitate the repairs in a machine are routine wear, accidental breakage or damage, operator's negligence and periodic overhauls. Repair costs consists of the expenditures incurred for the spare parts and the labour for repairs made in a shop or on the farm. Repair costs vary from one geographical region to another because of the differences in machinery use, labour wages and prices of spares. Repair costs increases with the age of a machine but tends to level off, as a machine becomes older.

Fuel and Oil Cost: With tractors and other powered farm equipment, the cost of fuel and oil must be included in the total machine charge.

Labour Charge: The cost of operator and labour is calculated from the actual operator and labour charges paid in Rupees per day at the prevailing rates in that region.

3.4 PERFORMANCE OF THRESHING SYSTEM

The performance of a threshing system is crucial in determining its efficiency and effectiveness in separating grain or seeds from the crop stalks or husks. Several factors contribute to the performance of a threshing system, including the design of the machine, the type of crop being threshed, and the operating conditions. Here are some key performance aspects to consider:

Threshing Efficiency: Threshing efficiency refers to the ability of the system to effectively separate the grain or seeds from the crop material. A high threshing efficiency means that a greater proportion of the desired product is successfully separated, resulting in minimal loss or damage to the grain or seeds.

Cleaning Efficiency: Along with threshing, cleaning efficiency is essential in removing impurities such as chaff, dust, and debris from the separated grain or seeds. Effective cleaning ensures a high-quality final product and reduces the likelihood of spoilage or contamination.

Capacity and Throughput: The capacity of a threshing system refers to the amount of crop it can process within a given time frame. Higher capacity allows for faster and more efficient harvesting operations, particularly in large-scale farming. Throughput, on the other hand, refers to the rate at which the threshing system can process the crop. Both capacity and throughput are important considerations for commercial farming operations.

Power Requirements: The power required to operate the threshing system is another important performance factor. Efficient utilization of power ensures optimal energy consumption, minimizing fuel or electricity costs and reducing the environmental impact. It is essential to match the power source, such as engines or motors, with the specific requirements of the threshing system.

Versatility: The ability of a threshing system to handle different types of crops and varying conditions is crucial. A versatile system can adapt to different crop varieties, moisture levels, and plant conditions, ensuring consistent performance across various agricultural settings.

Maintenance and Reliability: The reliability and ease of maintenance of the threshing system are critical for smooth and uninterrupted operation. A well-designed system will have easily accessible components, robust construction, and minimal downtime for maintenance and repairs.

Grain Loss and Damage: Minimizing grain loss and damage during the threshing process is essential for maximizing overall yield and profitability. A good threshing system will effectively separate the grain without causing excessive damage or loss, resulting in a higher-quality final product.

Operator Comfort and Safety: The design of the threshing system should prioritize operator comfort and safety. Ergonomic controls, clear visibility, and safety features contribute to a better working environment and reduce the risk of accidents or injuries.

It's important to note that the performance of a threshing system can vary depending on the specific design, adjustments, and maintenance practices. Manufacturers often provide guidelines and recommendations for optimizing performance based on the intended crop and operating conditions. Regular monitoring, adjustment, and adherence to best practices can help maximize the performance of a threshing system.

4. MANUFACTURING PROCESS FLOW

4.1 DESIGN

Design process is a way of figuring out what you need to do, then doing it. Along the way you might solve one or more problems, try to achieve a goal, and/or create something specific. The first critical step to understanding the design process is that it's not about working the “right way” or “wrong way”.

The design process for a thresher typically involves several key steps to ensure the development of an efficient and effective machine. While the specifics may vary depending on the manufacturer and the type of thresher being designed, here is a general overview of the design process:

Requirement Analysis: The design process starts with a thorough analysis of the requirements and objectives of the thresher. This includes understanding the specific crops or materials it will be used for, the desired output capacity, fuel or power source, and any special features or functionalities required.

Research and Conceptualization: Once the requirements are established, research is conducted to gather information about existing threshers, market trends, and technological advancements. Based on this research, various conceptual designs are developed to explore different ideas and approaches to meet the requirements.

Preliminary Design: From the conceptual designs, a preliminary design is selected. This involves creating detailed drawings, specifications, and calculations to determine the overall dimensions, mechanical components, power requirements, and operational parameters of the thresher. Computer-aided design (CAD) software is often used during this stage to create 3D models and simulations.

Component Selection and Integration: The preliminary design is further refined by selecting specific components such as the engine, cutting mechanisms, separating systems, conveyor belts, and control systems. The chosen components must be compatible, efficient, and reliable. Integration of these components into the overall design is carefully considered to ensure smooth operation and optimal performance.

Prototype Development: Once the design is finalized on paper, a prototype is built. This involves fabricating the various components and assembling them into a functional thresher. The prototype allows for testing and validation of the design, identifying any potential flaws or areas for improvement.

Testing and Iteration: The prototype is rigorously tested under various operating conditions to evaluate its performance, efficiency, durability, and safety. Test results are analyzed, and any necessary design modifications are made to address shortcomings or enhance performance. This iterative process may involve multiple rounds of testing and refinement.

Production Design: Once the design has been thoroughly tested and refined, a production-ready design is developed. This involves finalizing all the specifications, drawings, and manufacturing instructions necessary for mass production. Considerations such as cost optimization, ease of assembly, and maintenance are taken into account during this phase.

Manufacturing and Quality Control: The final design is handed over to the manufacturing team for production. Quality control measures are implemented to ensure that each thresher manufactured meets the design specifications and required standards. This may involve inspections, testing of individual components, and overall performance evaluation.

Post-production Support: After the thresher is manufactured and deployed, the design team may continue to provide support by addressing any customer feedback, resolving issues, and implementing design improvements for future iterations.

It's important to note that the design process may vary depending on the specific requirements, complexity, and resources of the company involved. Additionally, adherence to relevant safety standards, regulations, and environmental considerations is crucial throughout the design process.

4.2 PLASMA ARC CUTTING PROCESS

Plasma cutting is a widely used process in metal fabrication and can be applied to the manufacturing of certain components in a thresher. While the specific implementation may vary based on the design and requirements of the thresher, here is a general overview of the plasma cutting process:

Design and CAD Modelling: The first step in the plasma cutting process is to create a detailed design of the components or parts that require cutting. This is typically done using computer-aided design (CAD) software, where the desired shapes and dimensions are modelled.

Material Selection and Preparation: The appropriate material for the thresher components is selected based on factors such as strength, durability, and cost. Common materials used in thresher construction include steel or stainless steel. The selected material is prepared by cleaning it to remove any contaminants or oxidation that could affect the cutting process.

Plasma Cutting Machine Setup: A plasma cutting machine, equipped with a power supply, plasma torch, and CNC (Computer Numerical Control) system, is used for the cutting process. The machine is set up and calibrated according to the specifications of the thresher components being cut. This includes adjusting the gas flow rates, plasma torch height, cutting speed, and other parameters.

Marking and Positioning: The CAD model of the thresher component is loaded into the CNC system, which controls the plasma cutting machine. The position and orientation of the component on the cutting table are determined, and markings or reference points may be added to ensure accurate cutting.

Plasma Arc Initiation: The plasma cutting process begins with the initiation of an electrical arc. A high-frequency spark or pilot arc is created between the electrode and the nozzle of the plasma torch. Once the pilot arc is established, a high-velocity plasma jet is produced by introducing compressed air or another suitable gas through the torch.

Cutting Process: The plasma torch is maneuverer along the designated cutting path, following the contours of the thresher component as per the CAD model. The intense heat of the plasma arc melts and vaporizes the material, while the high-velocity gas blows away the molten metal, creating a clean and precise cut.

Piercing and Kerf Control: In some cases, piercing holes may be required to start the cutting process. The plasma torch is momentarily paused to create a small hole in the material, after which the torch is moved along the desired cutting path. Kerf control, which refers to the width of the cut, can be adjusted by modifying the cutting speed, gas flow, and other parameters.

Post-Cutting Operations: Once the cutting is complete, the thresher components may undergo additional processes such as edge cleaning, deburring, or grinding to ensure smooth edges and remove any sharp or uneven surfaces.

It's important to note that plasma cutting should be performed by trained operators with proper safety measures in place, including the use of personal protective equipment (PPE) and adherence to safety guidelines. The specific details and intricacies of plasma cutting for thresher components may vary depending on the design, material, and manufacturing requirements.

FIG 4.2.1 CNC MACHINE

FIG 4.2.2 CNC MACHINE OPERATING

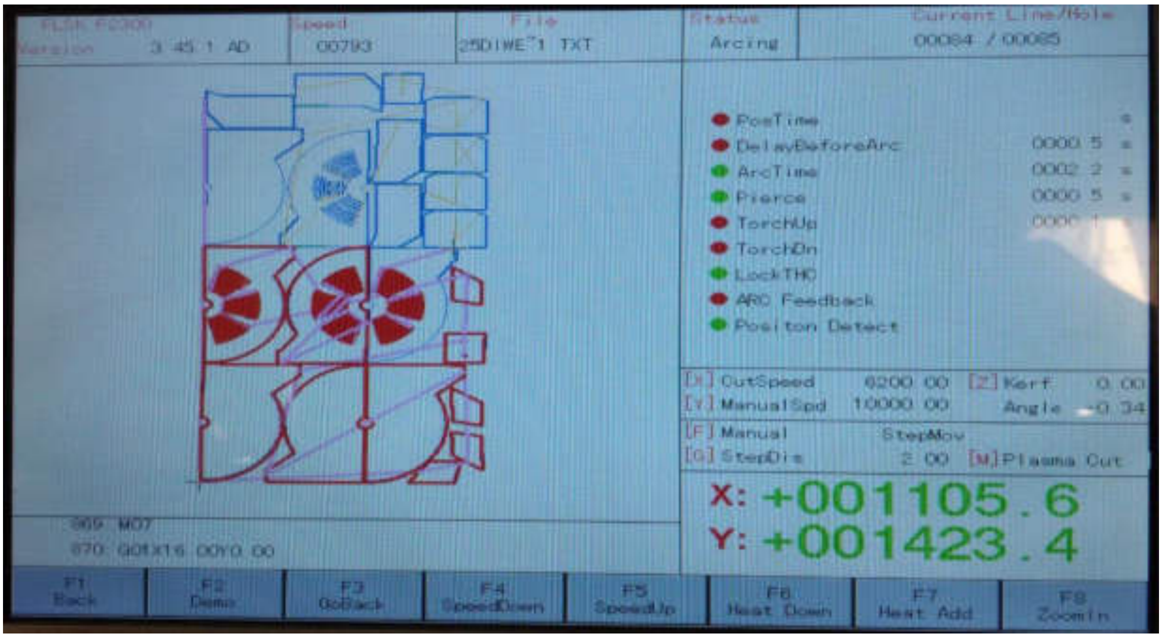

FIG 4.2.3 CNC MACHINE SCREEN

4.3 WELDING PROCESS

The welding process for a thresher typically involves joining various metal components together to create a sturdy and functional machine. While the specific welding techniques and procedures may vary depending on the design, materials used, and manufacturing processes, here is a general overview of the welding process for a thresher:

Welding Method Selection:

Determine the appropriate welding method based on factors such as the type of materials, joint design, weld quality requirements, and available equipment. Common welding methods used for thresher construction include MIG (Metal Inert Gas) welding, TIG (Tungsten Inert Gas) welding, and Stick welding (Shielded Metal Arc Welding).

Preparation:

Clean the metal surfaces to be welded, ensuring they are free from dirt, rust, grease, and other contaminants that could negatively impact the quality of the weld.

Prepare the joint by chamfering, beveling, or otherwise shaping the edges of the metal components to provide proper fit-up and welding access.

Welding Equipment Setup:

Select the appropriate welding machine based on the chosen welding method.

Prepare the welding equipment by setting the correct voltage, current, and wire speed (for MIG welding) or electrode type and amperage (for Stick welding) based on the material thickness and welding requirements.

Shielding Gas and Consumables:

For MIG or TIG welding, select the appropriate shielding gas and welding wire or filler rod based on the materials being welded. The choice of shielding gas and consumables depends on factors such as the type of metal, joint configuration, and desired weld characteristics.

Welding Technique:

Follow the specific welding technique for the chosen welding method. This may include the position of the welding torch or electrode, arc initiation, travel speed, and bead formation.

For MIG or TIG welding, maintain the appropriate torch angle, distance, and travel speed to ensure proper heat input and fusion between the base metals.

Weld Quality and Inspection:

Ensure proper penetration, fusion, and bead appearance during the welding process.

Conduct regular visual inspections and, if necessary, non-destructive testing (NDT) to verify the quality and integrity of the welds. NDT methods may include visual inspection, radiographic testing, ultrasonic testing, or magnetic particle testing, depending on the requirements and standards.

Post-Welding Operations:

After completing the welding process, remove any welding slag, clean the weld area, and perform necessary post-weld operations such as grinding, polishing, or surface treatment to achieve the desired finish or specifications.

It's important to note that welding operations should be performed by trained and qualified welders who follow safety guidelines and proper welding procedures. Additionally, adherence to welding codes and standards, as well as thorough inspections, is crucial to ensure the strength, durability, and reliability of the welded components in the thresher.

4.4 WELDING METHOD USED BY COMPANY

There are two types of welding is used :

1. MIG WELDING
2. IRON WELDING

Welding is a fabrication process that joins materials by using high heat to melt the parts together and allowing them to cool, causing fusion.

MIG Welding is an arc welding process in which a continuous solid wire electrode is fed through a welding gun and into the weld pool, joining the two base materials together. A shielding gas is also sent through the welding gun and protects the weld pool from contamination. In fact, MIG stands for metal inert gas.

Iron Welding is a special process by which two homogeneous or non-homogeneous metals are linked locally and permanently joined together using without the consumable metal and with or without melting.

In this company there is reverse polarity is used in both types of welding process. When workpiece is negative and tool is positive, this type of polarity is commonly known as reversed polarity.

FIG 4.4.1 IRON WELDING

FIG 4.4.2 MIG WELDING

4.5 ASSEMBLY

The assembly process for a thresher involves the systematic joining and integration of various components to create a functional and operational machine. While the specific assembly steps may vary depending on the thresher design and manufacturer, here is a general overview of the assembly process:

Component Preparation:

Ensure that all the individual components required for the thresher assembly are available and organized.

Inspect and verify the quality and condition of each component, addressing any issues or defects before proceeding with the assembly.

Sub-Assembly:

Start by assembling smaller sub-components or subsystems of the thresher. This could include the assembly of the cutting mechanism, grain separation system, power transmission components, control systems, and other subsystems.

Follow the manufacturer's instructions or assembly guidelines to ensure proper alignment, fitting, and connection of the sub-components.

Conduct necessary tests or inspections at each stage to verify the functionality and quality of the sub-assemblies.

Frame Assembly:

Once the sub-assemblies are completed, begin assembling the thresher frame or chassis.

Position and attach the main structural components, such as the frame beams, supports, and brackets, following the assembly instructions or design specifications.

Use appropriate fasteners, such as bolts, nuts, and screws, to secure the components in place.

Ensure proper alignment and levelness of the frame to ensure the smooth operation of the thresher.

Integration of Sub-Assemblies:

Once the frame is assembled, integrate the previously assembled sub-components and subsystems into the main thresher structure.

Connect power transmission components, such as belts, pulleys, or gears, to drive the cutting and threshing mechanisms.

Attach the control systems, electrical wiring, sensors, and actuators as required, ensuring proper routing and connection.

Verify the alignment and positioning of the sub-assemblies, making any necessary adjustments for optimal functionality and performance.

Final Assembly and Testing:

Complete the remaining assembly tasks, such as attaching safety guards, covers, and access panels.

Perform a comprehensive inspection of the entire thresher assembly to ensure proper fit, alignment, and functionality.

Conduct functional tests to verify the operation of all subsystems and components, including the cutting, threshing, and grain separation mechanisms.

Test the control systems, safety features, and any other integrated systems to ensure proper operation.

Address any issues or malfunctions detected during testing and make necessary adjustments or repairs.

Quality Assurance and Finishing:

Once the thresher assembly passes all tests and inspections, conduct a final quality check to ensure compliance with design specifications and manufacturing standards.

Apply any necessary finishing touches, such as painting, surface treatment, or branding.

Prepare the thresher for shipment or delivery by ensuring proper packaging, documentation, and labelling.

The assembly process may involve a combination of manual labor, the use of specialized tools or equipment, and adherence to safety guidelines and assembly instructions provided by the manufacturer. Thorough documentation and quality control measures are essential to ensure the reliability, functionality, and performance of the assembled thresher.

FIG 4.5.2 ASSEMBLY DEPARTMENT

FIG 4.5.2 ASSEMBLY OF THRESHER

4.6 PAINTING PROCESS

Painting plays a crucial role in the thresher manufacturing process as it provides protection, aesthetic appeal, and identification for the machine. Here is an overview of the painting process for a thresher:

Surface Preparation:

Thoroughly clean the thresher surface to remove any dirt, dust, grease, or other contaminants. This ensures proper adhesion of the paint and a smooth finish.

Use appropriate cleaning agents, such as degreasers or solvents, and cleaning tools like brushes or pressure washers, depending on the extent of the surface preparation required.

Surface Treatment:

Conduct surface treatments, if necessary, to improve paint adhesion and prevent corrosion. This step may involve processes like sanding, sandblasting, or applying a primer or anti-corrosion coating to the thresher surface.

The specific surface treatment method will depend on the material used for the thresher and the desired level of surface preparation.

Paint Selection:

Choose paint that is suitable for the thresher's operating conditions, environment, and desired finish. Consider factors such as durability, weather resistance, chemical resistance, and colour stability.

Consult paint manufacturers or suppliers for recommendations on the most appropriate type of paint for the thresher application.

Painting Application:

Use appropriate painting equipment, such as spray guns, brushes, or rollers, based on the size, complexity, and accessibility of the thresher components. Follow the manufacturer's instructions for mixing the paint, adjusting spray patterns, and ensuring the correct paint thickness. Apply an even and uniform coat of paint on the thresher surfaces, taking care to cover all areas and achieve the desired level of coverage. Allow the paint to dry according to the manufacturer's recommended drying time before applying additional coats, if necessary.

Multiple Coats and Finishing:

Apply multiple coats of paint as needed to achieve the desired color, finish, and level of protection.

Allow sufficient drying time between each coat to ensure proper adhesion and avoid surface defects.

Conduct inspections during the painting process to detect any imperfections, such as drips, runs, or uneven coverage, and address them promptly.

Once the final coat is applied, inspect the thresher for any touch-ups or additional finishing required to ensure a high-quality paint finish.

Curing and Quality Assurance:

After the painting process, allow the thresher to fully cure according to the paint manufacturer's instructions. Conduct a thorough quality check to ensure that the paint has adhered properly, there are no visible defects, and the desired color and finish are achieved. Conduct any necessary touch-ups or corrections to address any paint imperfections or areas that require attention. Painting in the thresher manufacturing process should be conducted in a controlled environment to minimize dust, contaminants, and potential safety hazards. Additionally, proper safety measures, such as the use of personal protective equipment (PPE) and adherence to safety guidelines, should be followed during the painting process.

FIG 4.6.1 PAINTING OF THRESHER

4.7 TESTING

The testing process for a thresher involves evaluating its performance, functionality, and safety to ensure that it meets the required standards and specifications. Here is an overview of the testing process for a thresher:

Functional Testing:

Conduct functional tests to verify the operation of different components and systems of the thresher. Test the power transmission system, such as belts, pulleys, or gears, to ensure smooth and efficient power transfer. Test the cutting mechanism, threshing system, and grain separation system to ensure proper functionality and effectiveness.Verify the operation of control systems, electrical circuits, sensors, and actuators to ensure accurate and responsive control of the thresher.

Performance Testing:

Test the thresher under different operating conditions to assess its performance capabilities. Evaluate the cutting performance by testing the thresher on various crop types and sizes, assessing the quality and consistency of the cut. Test the threshing and grain separation system to ensure efficient separation of grain from straw or other debris, evaluating the quality and purity of the harvested grain. Assess the thresher's productivity, throughput, and fuel efficiency to determine its performance in real-world applications.

Safety Testing:

Ensure that the thresher complies with safety standards and regulations. Test safety features such as emergency stop buttons, safety guards, and interlock systems to verify their functionality and effectiveness. Conduct tests to assess the thresher's stability, balance, and manoeuvrability, especially on uneven or inclined terrain. Evaluate the machine's noise levels and vibration to ensure they meet acceptable limits and do not pose a risk to operators or bystanders.

Durability and Reliability Testing:

Subject the thresher to durability tests to assess its ability to withstand the expected operating conditions and maintain performance over time. Test the thresher under simulated or actual field conditions to evaluate its resistance to wear, fatigue, and mechanical stress. Monitor and evaluate the reliability of critical components and systems through long-term testing or accelerated life cycle tests. Assess the thresher's maintenance requirements and conduct tests to determine the ease of servicing, access to components, and overall reliability of the machine.

Documentation and Compliance:

Document the testing process, including test procedures, results, and any issues or observations encountered during testing. Ensure that the thresher meets all applicable regulatory and industry standards, both in terms of performance and safety. Compile all relevant testing documentation, including test reports, certificates, and compliance statements, to demonstrate that the thresher has undergone rigorous testing and meets the required standards.

The testing process should be conducted by trained personnel using appropriate testing equipment, tools, and methodologies. It is essential to adhere to safety protocols and guidelines during the testing phase to mitigate any risks or hazards associated with operating the thresher. Regular testing and quality assurance procedures help ensure that the thresher functions optimally, delivers reliable performance, and meets customer expectations.

4.8 DELIVERY

Packaging and Preparation:

Ensure that the thresher is properly prepared for transportation. This includes securely fastening any loose components, removing detachable parts, and protecting delicate or vulnerable areas to prevent damage during transit. Clean the thresher and remove any debris or foreign objects to present a professional appearance upon delivery.

Transportation Arrangements:

Determine the most suitable mode of transportation based on factors such as the distance to the delivery location, the size and weight of the thresher, and any specific requirements or constraints. Arrange for transportation services, whether it is through a logistics company, freight carrier, or in-house delivery team. Consider factors such as delivery timelines, costs, and insurance coverage.

Documentation and Compliance:

Ensure that all necessary documentation, such as shipping invoices, customs forms (if applicable), and delivery receipts, are prepared and in order. Verify compliance with any local, national, or international regulations, permits, or certifications required for the transportation and delivery of the thresher.

Loading and Securing:

Safely load the thresher onto the transportation vehicle, taking precautions to prevent damage during the loading process. Secure the thresher using appropriate restraints, such as straps or brackets, to ensure stability and minimize movement during transportation.

Tracking and Communication:

Establish a communication channel between the manufacturing facility, transportation team, and the customer to provide updates on the delivery progress. Utilize tracking systems, if available, to monitor the location and status of the thresher during transit and inform the customer accordingly.

Delivery Confirmation and Inspection:

Upon arrival at the delivery location, confirm the delivery with the customer or recipient, ensuring that the thresher is received in good condition. Conduct a visual inspection of the thresher in the presence of the customer to address any concerns or issues promptly. Obtain the customer's signature or acknowledgment of receipt to confirm the successful delivery.

Installation and Training (if applicable):

If required, provide installation services to set up the thresher at the customer's location. This may involve assembling certain components, calibrating settings, or connecting power sources. Offer training sessions or guidance to familiarize the customer with the operation, maintenance, and safety features of the thresher.

Post-Delivery Support:

Provide post-delivery support and assistance to address any questions, concerns, or issues that the customer may have. Establish a channel for customer feedback and follow-up to ensure their satisfaction with the delivered thresher.

Effective coordination, communication, and attention to detail are essential during the delivery process to ensure that the thresher reaches its destination safely and in optimal condition. Adhering to transportation regulations, maintaining appropriate documentation, and prioritizing customer satisfaction contribute to a successful thresher delivery experience.

5. TRAINING DETAILS

5.1 TRAINING DESCRIPTION

The 12 weeks industrial training program is conducted by Gujarat Technological University for each student who is 08th Sem in bachelor's degree in respective institute. The industrial training should be completed by student in their 08th Sem B.E. It is done by the student in order to improve their hard skills and to gain some technical and practical knowledge.

5.2 TERAINING OBJECTIVES

I started the industrial training on the 03rd of February, 2023 and will be finishing on the 03rd of May, 2023. During this training, I observed how employees work in companies and how they communicate with each other and lots of other things. The industrial training contributed to an understanding that in industries how the work is done and how the professionals work and how the machines are useful in manufacturing processes. And finally, I must set up personal targets to develop and improve my skills.

5.3 PROCESS (FORMAL PERMISSION FOR TRAINIG)

On 01st of February 2023, I went to National engineering Company. to meet to HR department of the industry to get permission to complete my training in the premises of the industry. Wherever I met Mr. Ketan Panchal, who is the Supervisor at the company . he told me to meet Company Owner Mr. Himanshu Kumar Panchal who issued and grant me a permission letter for industrial training for the duration from 03rd February 2023 to 03rd May 2023. He is very helpful person. He gave me all the information related to this training which seems very helpful to me, and he told me about rules and regulations which I should have to follow during this training.

TASK

Task 1

I observe the machine work

Know About which machining process are required for any particular part.

Task 2

General introduction with employee of purchase department.

Introduction with of parts are given to me & asked for go to store & collect it be familiar with those parts Know about working atmosphere in our company as well as in our purchase department.

Task 3

I work in storage department.

In this task some time important part is missing

By this task we know that how unnecessary items create problem in store area and also create impact on expenses.

Task 4

Helping the workers to shift assembly parts.

Observe and Understand How to work with an employee in the company.

How to get material from the store with document process.

Task 5

I work in purchase department.

Know about document process for take material from any particular store I talk to the workers and then I know time management

I found that the value of punctuality, discipline, consciousness, time management in industry.

I communicate the workers and owner.During this 90 Day I found out how to make urgent parts within time with supplier.

6. CONCLUSION

In conclusion, my internship experience at the thresher making company has been invaluable in terms of gaining practical knowledge, skills, and insights into the thresher manufacturing industry. Throughout the internship, I was able to actively engage in various aspects of thresher production, including design, manufacturing, testing, and quality control. The following key points summarize the highlights of my internship:

The internship provided me with a comprehensive understanding of the thresher making industry. I gained exposure to the manufacturing processes, technologies, and best practices involved in producing high-quality threshers. This experience helped me develop a deep appreciation for the complexities and challenges of the industry. Through hands-on training and guidance from experienced professionals, I acquired valuable technical skills related to thresher design, engineering principles, manufacturing techniques, and quality control. I learned how to use various tools, machinery, and software to contribute effectively to the manufacturing process. I actively participated in the testing and quality assurance procedures of the threshers. This involved conducting performance tests, inspecting components, and ensuring compliance with safety standards. I gained insights into the importance of rigorous testing and quality control measures in delivering reliable and efficient threshers to customers. During the internship

I encountered various challenges throughout the internship, such as troubleshooting technical issues, optimizing manufacturing processes, and meeting production deadlines. These challenges allowed me to develop problem-solving skills and adaptability in a fast-paced and dynamic work environment. The internship provided me with valuable networking opportunities within the industry.

Overall, my internship at the thresher making company was a transformative experience that deepened my understanding of the industry and provided me with practical skills and knowledge. I am grateful for the opportunity to learn from experienced professionals, work with cutting-edge technologies, and contribute to the manufacturing of high-quality threshers. This internship has not only enriched my academic and professional journey but also reinforced my passion for the industry and sparked a desire to pursue a career in this field.

Appendix

Annexure I

GUJARAT TECHNOLOGICAL UNIVERSITY
(Established under Gujarat Act No. 20 of 2007)
ગુજરાતટેકનોલોજીકલ યુનિવર્સિટી
(ગુજરાત અધિનિયમ ક્રમાંક ૨૦/૨૦૦૭ દ્વારા સ્થાપિત)

Annexure I
Enrollment no: 190390119011

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: Harshit D. Prajapati
DIARY OF THE WEEK: Dt: 03rd Feb 2023 TO 05th Feb 2023
DEPARTMENT: Be. Mech. SEM: 08th
NAME OF THE ORGANISATION: National Engineering Company.
NAME OF THE PLANT/SECTION/DEPARTMENT: Cutting Department.
NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT: Himanshu Panchal.

DESCRIPTION OF THE WORK DONE IN BRIEF

This is the first week of joining of 12 weeks industrial internship training programme. During this week i worked in cutting department of the company. In the cutting department a Plasma Arc CNC cutting machine and a shearing machine is used to cutting process. Also a roller bending machine and Automated bending machine are there. During this time period i learned and understand about plasma Arc CNC machine. I also learn how to operate a Plasma Arc CNC machine. Mr. Valjibhai given me guidence.

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(ગુજરાત અધિનિયમ ક્રમાંક ૨૦/૨૦૦૭ દ્વારા સ્થાપિત)

TOTAL HOURS: 24 Hours

SIGNATURE OF STUDENT

The above entries are correct and the grading of work done by Trainee is
EXCELLENT / VERY GOOD / GOOD / FAIR / BELOW AVERAGE / POOR

Signature of Faculty Mentor

Date:

Signature of officer-in-charge of Dept. / Section / Plant
NATIONAL ENGINEERING CO.
PROPRIETOR
Date: 07th Feb 2023

Grading of Work, for trainee may be given depending upon your judgement about his Punctuality, Regularity, Sincerity, Interest taken, Work done etc.

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(ગુજરાત અધિનિયમ ક્રમાંક ૨૦/૨૦૦૭ દ્વારા સ્થાપિત)

Annexure I

Enrollment no: 190370119011

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: Harshit D. Prajapati

DIARY OF THE WEEK: Dt: 06th Feb 2023 TO 12th Feb 2023

DEPARTMENT: B.E. Mech. SEM: 08th

NAME OF THE ORGANISATION: National Engineering Company

NAME OF THE PLANT/SECTION/DEPARTMENT: Cutting Department.

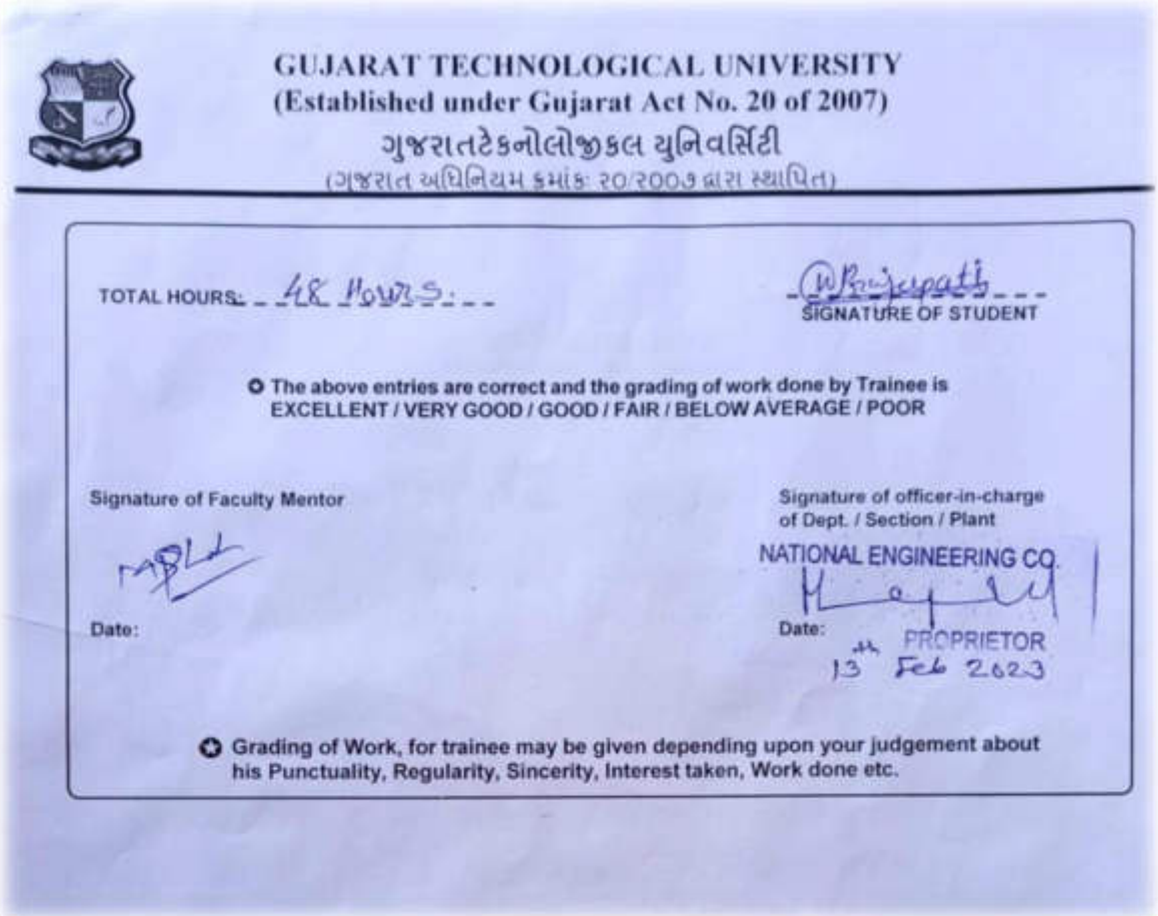
NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT: Himanshu Panchal.

DESCRIPTION OF THE WORK DONE IN BRIEF

During this week i worked in cutting department of the company. During this time period i operated a plasma Arc CNC cutting machine And also know and understand its different function.

There are three different parts of plasma accessories like, i) Plasma electrode ii) plasma nozzle and iii) Plasma shield.

Last one day of the week i went to welding department of the company.



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TOTAL HOURS: 48 Hours

SIGNATURE OF STUDENT

The above entries are correct and the grading of work done by Trainee is
EXCELLENT / VERY GOOD / GOOD / FAIR / BELOW AVERAGE / POOR

Signature of Faculty Mentor

Date:

Signature of officer-in-charge
of Dept. / Section / Plant

NATIONAL ENGINEERING CO.
PROPRIETOR

Date: 13th Feb 2023

Grading of Work, for trainee may be given depending upon your judgement about his Punctuality, Regularity, Sincerity, Interest taken, Work done etc.

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Annexure I

Enrollment no: 190390119011

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: Harshit D. Prajapati

DIARY OF THE WEEK: Dt: 13th Feb 2023 TO 19th Feb 2023

DEPARTMENT: BE. mech. SEM: 08th

NAME OF THE ORGANISATION: National Engineering Company.

NAME OF THE PLANT/SECTION/DEPARTMENT: Welding Department

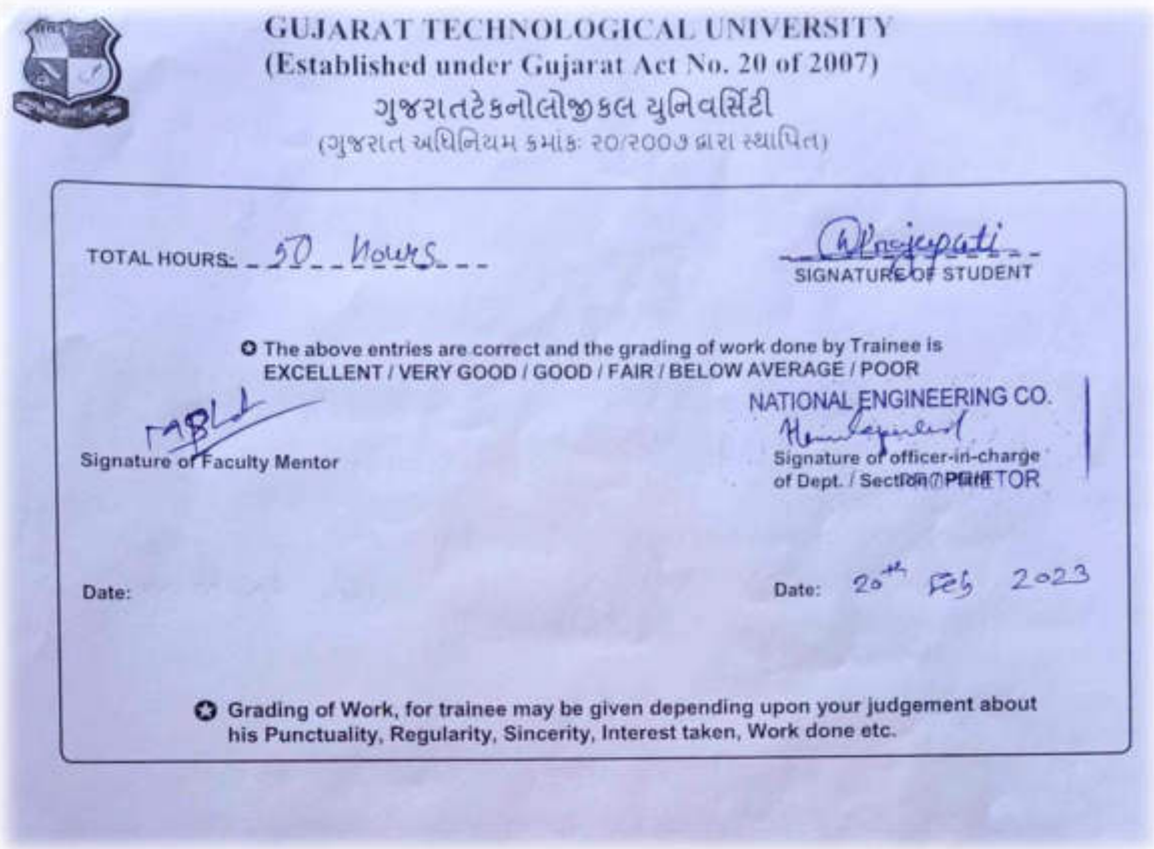
NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT: Himanshu Panchal.

DESCRIPTION OF THE WORK DONE IN BRIEF

This is the third week of joining of 12 weeks industrial training programme. During this week i worked in welding department of the company. In the welding department there are two types of process are used. 1) MIG welding and 2) Iron welding.

During this week i learned about welding process. and also understand how it occurs and then after i practiced on it.

Mr. ArvindKumar Panchal and Arjunbhai gives me knowledge aswell as guidence about it.



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TOTAL HOURS: 50 hours

SIGNATURE OF STUDENT

The above entries are correct and the grading of work done by Trainee is
EXCELLENT / VERY GOOD / GOOD / FAIR / BELOW AVERAGE / POOR

Signature of Faculty Mentor

NATIONAL ENGINEERING CO.
Signature of officer-in-charge of Dept. / Section / Plant
PROPRIETOR

Date:

Date: 20th Feb 2023

Grading of Work, for trainee may be given depending upon your judgement about his Punctuality, Regularity, Sincerity, Interest taken, Work done etc.

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Annexure I
Enrollment no: 190390119011

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: Harshit D Prajapati
DIARY OF THE WEEK: Dt: 20th Feb 2023 TO 26th Feb 2023
DEPARTMENT: BE. Mech. SEM: 08th
NAME OF THE ORGANISATION: National Engineering Company.
NAME OF THE PLANT/SECTION/DEPARTMENT: Assembly Department.
NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT: Himanshu Panchal.

DESCRIPTION OF THE WORK DONE IN BRIEF

This is the Fourth week of joining of 12 weeks industrial training Programme. During this week I worked in Assembly Department of the company.

In this department during this time period i learned about different Assembly parts and their uses. I also learned about working principle of the threshar.

Mr. Vipulbhai and Mr. Dashrathbhai gives me guidence about releted works.

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TOTAL HOURS: 48 Hours.

SIGNATURE OF STUDENT

The above entries are correct and the grading of work done by Trainee is
EXCELLENT / VERY GOOD / GOOD / FAIR / BELOW AVERAGE / POOR

NATIONAL ENGINEERING CO.

Signature of Faculty Mentor

Signature of officer-in-charge
of Dept. / Section PROPRIETOR

Date:

Date: 27th Feb 2023

Grading of Work, for trainee may be given depending upon your judgement about his Punctuality, Regularity, Sincerity, Interest taken, Work done etc.

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Annexure I
Enrollment no: 190390119011

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: Harshit D. Prajapati
DIARY OF THE WEEK: Dt: 27th Feb 2023 TO 05th March 2023
DEPARTMENT: BE. Mech. SEM: 08th
NAME OF THE ORGANISATION: National Engineering Company.
NAME OF THE PLANT/SECTION/DEPARTMENT: Assembly Department.
NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT: Himanshu Panchal.

DESCRIPTION OF THE WORK DONE IN BRIEF

This is the fifth week of joining 12 weeks industrial internship programme. During this week i worked in Assembly Department of the company.

The thresher consists of frame, threshing cylinder, cylinder casing, concave, oscilating sieves, pulley, belts, fly wheels, aspirator blower, cleaning and winnowing attachment, Housing, gearbox, universal joint, etc.----

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TOTAL HOURS: 55 Hours

SIGNATURE OF STUDENT

The above entries are correct and the grading of work done by Trainee is
EXCELLENT / VERY GOOD / GOOD / FAIR / BELOW AVERAGE / POOR

Signature of Faculty Mentor

Date:

Signature of officer-in-charge of Dept. / Section / Plant

NATIONAL ENGINEERING CO.
PROPRIETOR

Date: 06th March 2023

Grading of Work, for trainee may be given depending upon your judgement about his Punctuality, Regularity, Sincerity, Interest taken, Work done etc.

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Annexure I

Enrollment no: 190390119011

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: Harshit D. Prajapati

DIARY OF THE WEEK: Dt: 06th March 2023 TO 12th March 2023

DEPARTMENT: B.E. Mech. SEM: 08th

NAME OF THE ORGANISATION: National Engineering Company.

NAME OF THE PLANT/SECTION/DEPARTMENT: Delivery Department.

NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT: Himanshu Panchal.

DESCRIPTION OF THE WORK DONE IN BRIEF

This is the sixth week of joining of 12 weeks industrial internship training programme. During this week i worked in Delivery Department of the Company. During this time period i played my role as a helper. because in this week delivery orders were higher as compared to other week. bnz time is no more to reached to completed work.

Mr. Rameshbhai and Mr. Jagdishabhai guided me about releted work.

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TOTAL HOURS: 48 Hours

SIGNATURE OF STUDENT

○ The above entries are correct and the grading of work done by Trainee is
EXCELLENT / VERY GOOD / GOOD / FAIR / BELOW AVERAGE / POOR

Signature of Faculty Mentor

Date:

Signature of officer-in-charge
of Dept. / Section / Plant

ENGINEERING CO.
PROPRIETOR

Date: 13th March 2023

○ Grading of Work, for trainee may be given depending upon your judgement about his Punctuality, Regularity, Sincerity, Interest taken, Work done etc.

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Annexure I
Enrollment no: 190390119011

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: Harshit D. Prajapati
DIARY OF THE WEEK: Dt: 13th March 2023 TO 19 March 2023
DEPARTMENT: BE - Mech. SEM: 08th
NAME OF THE ORGANISATION: National Engineering company
NAME OF THE PLANT/SECTION/DEPARTMENT: Service & management Department
NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT: Himanshu Panchal.

DESCRIPTION OF THE WORK DONE IN BRIEF

This is the seventh week of 12 week industrial training programme. During this week i workes in service & management department of the company

In this time period i take on orders of service and carrier. in between i also workes in cutting department and operated a plasma Arc arc cutting machine.

Mr. Keertan Panchal guides me about detailed work.

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TOTAL HOURS: 50 Hours

SIGNATURE OF STUDENT

The above entries are correct and the grading of work done by Trainee is
EXCELLENT / VERY GOOD / GOOD / FAIR / BELOW AVERAGE / POOR

Signature of Faculty Mentor

Date:

NATIONAL ENGINE... CO.
Signature of Officer-in-charge of Dept. / Section / Plant
PROPRIETOR

Date: 20 March 2023

Grading of Work, for trainee may be given depending upon your judgement about his Punctuality, Regularity, Sincerity, Interest taken, Work done etc.

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Annexure I
Enrollment no: 190390119011

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: Harshit D. Prajapati

DIARY OF THE WEEK: Dt: 20 March 2023 TO 26 march 2023

DEPARTMENT: BE. Mech. SEM: 08th

NAME OF THE ORGANISATION: National Engineering Company.

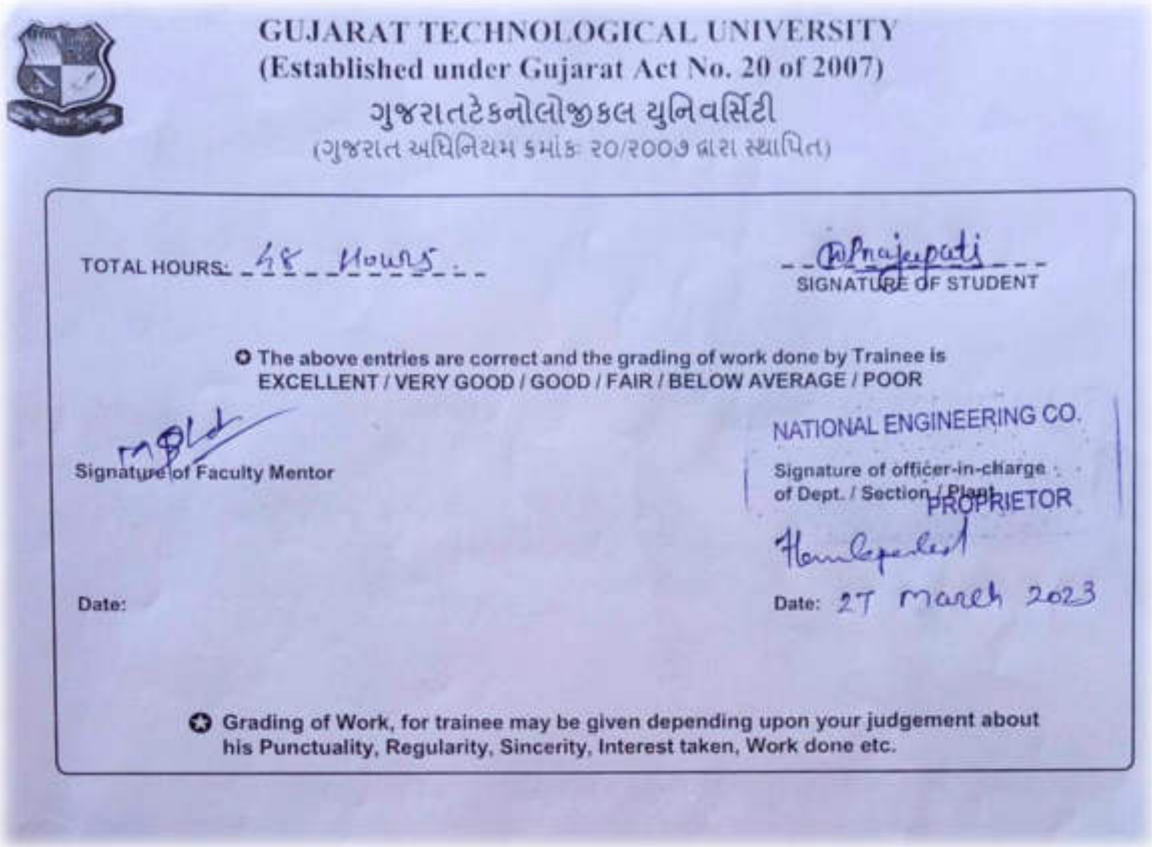
NAME OF THE PLANT/SECTION/DEPARTMENT:

NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT: Himanshu Panchal.

DESCRIPTION OF THE WORK DONE IN BRIEF

This is the eithght week of joining of 12 weeks industrial internship training programme During this time period i worked in service and management deparment as well as cutting and welding department.

In management department i created sheet about product available in store room. i worked under a mr. Jetam panchal. in other department i played my role as a helper.



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TOTAL HOURS: 48 Hours

SIGNATURE OF STUDENT

- The above entries are correct and the grading of work done by Trainee is EXCELLENT / VERY GOOD / GOOD / FAIR / BELOW AVERAGE / POOR

Signature of Faculty Mentor

NATIONAL ENGINEERING CO.

Signature of officer-in-charge of Dept. / Section / Plant

PROPRIETOR

Date:

Date: 27 March 2023

- Grading of Work, for trainee may be given depending upon your judgement about his Punctuality, Regularity, Sincerity, Interest taken, Work done etc.

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Annexure I
Enrollment no: 190390119011

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: Harshit D. Prajapati
DIARY OF THE WEEK: Dt: 27 March 2023 TO 02 April 2023
DEPARTMENT: BE - Mech. SEM: 08th
NAME OF THE ORGANISATION: National Engineering Company.
NAME OF THE PLANT/SECTION/DEPARTMENT: Repairing department.
NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT: Himanshu Panchal.

DESCRIPTION OF THE WORK DONE IN BRIEF

This is the nineth week of joining of 12 weeks industrial internship training programme. During this week i worked in repairing department of the company.

In repairing department i communicate with customers and department's employee to find problems and their solution and i also find how to problems occurs.

Mr. Mukeshbhai and Mr. Popatbhai guides me about related work.

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TOTAL HOURS: 48 Hours

SIGNATURE OF STUDENT

The above entries are correct and the grading of work done by Trainee is
EXCELLENT / VERY GOOD / GOOD / FAIR / BELOW AVERAGE / POOR

Signature of Faculty Mentor

Date:

Signature of officer-in-charge of Dept. / Section / Plant

NATIONAL ENGINEERING CO

PROPRIETOR

Date: 03 April 2023

Grading of Work, for trainee may be given depending upon your judgement about his Punctuality, Regularity, Sincerity, Interest taken, Work done etc.

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Annexure I
Enrollment no: 190390119011

STUDENT'S WEEKLY RECORD OF INTERNSHIP

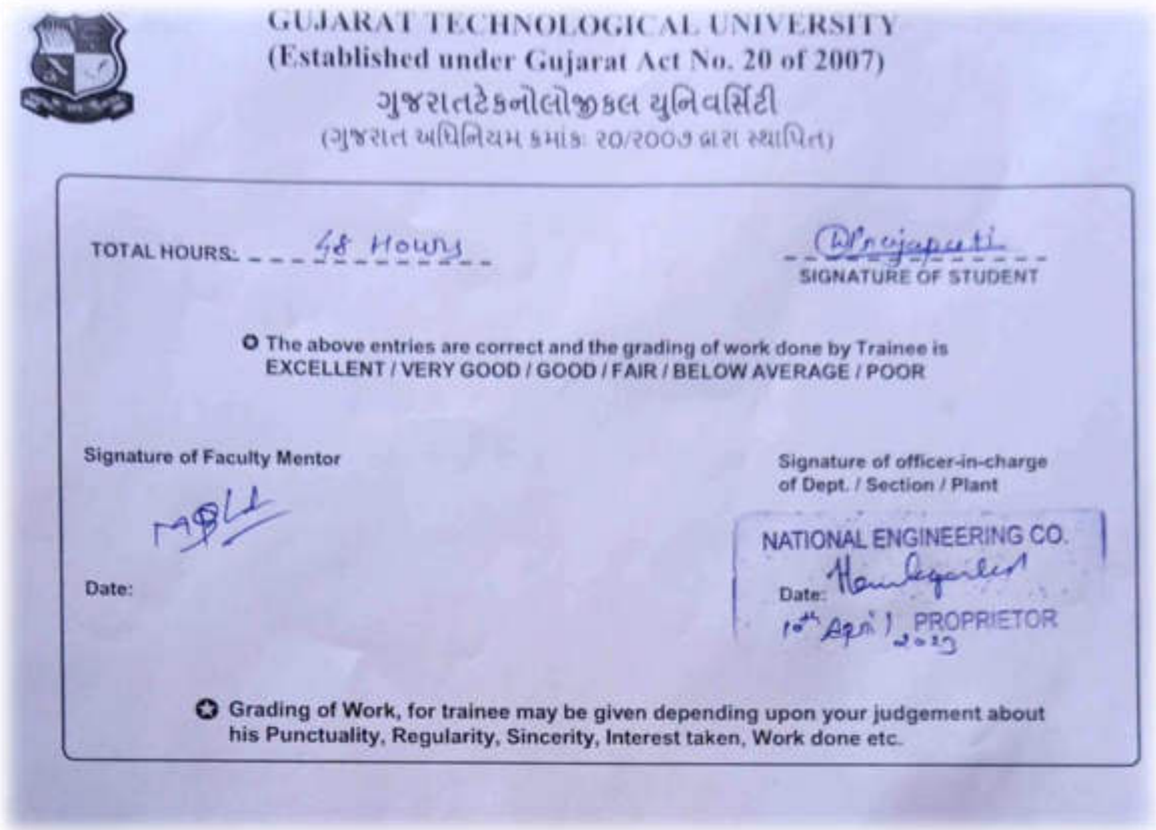
NAME OF STUDENT: Harshit D. Prajapati
DIARY OF THE WEEK: Dt: 03rd April 2023 TO 09th April 2023
DEPARTMENT: mech. SEM: 08th
NAME OF THE ORGANISATION: National Engineering Company
NAME OF THE PLANT/SECTION/DEPARTMENT:
NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT: Himanshu Panchal.

DESCRIPTION OF THE WORK DONE IN BRIEF

- This is the tenth week of joining of 12 week industrial internship training programme.

In this week i learned & understand about :-

i) Powder Coating Process for painting.
ii) Making assembly of thresher in the assembly department.
iii) Finding Problems and Solutions in the repairing departments.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TOTAL HOURS: 48 Hours

SIGNATURE OF STUDENT

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EXCELLENT / VERY GOOD / GOOD / FAIR / BELOW AVERAGE / POOR

Signature of Faculty Mentor

Date:

Signature of officer-in-charge
of Dept. / Section / Plant

NATIONAL ENGINEERING CO.
Date: 10th April, 2023
PROPRIETOR

Grading of Work, for trainee may be given depending upon your judgement about his Punctuality, Regularity, Sincerity, Interest taken, Work done etc.

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Annexure I
Enrollment no: 190390119011

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: Harshit D. Prajapati
DIARY OF THE WEEK: Dt: 10th April 2023 TO 16th April 2023
DEPARTMENT: Mechanical SEM: 08th
NAME OF THE ORGANISATION: National Engineering Company
NAME OF THE PLANT/SECTION/DEPARTMENT:
NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT: Himanshu Panchal.

DESCRIPTION OF THE WORK DONE IN BRIEF

This is the eleventh week of joining of 12 weeks industrial training programme.

During this week i played my role as a helper in the different departments of the company. such as:

i) In cutting department i played my role as a machine operator.

ii) In welding department i played my role as a helper and welder.

iii) In management department i played my role as a ingineer.

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(ગુજરાત અધિનિયમ ક્રમાંક: ૨૦/૨૦૦૭ દ્વારા સ્થાપિત)

TOTAL HOURS: 48 Hours

SIGNATURE OF STUDENT

The above entries are correct and the grading of work done by Trainee is
EXCELLENT / VERY GOOD / GOOD / FAIR / BELOW AVERAGE / POOR

Signature of Faculty Mentor

Date:

Signature of officer-in-charge
of Dept. / Section / Plant

NATIONAL ENGINEERING CO.
PROPRIETOR

Date: 17 April 2023

Grading of Work, for trainee may be given depending upon your judgement about his Punctuality, Regularity, Sincerity, Interest taken, Work done etc.

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Annesure I
Enrollment no: 190390119011

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: Harshit D. Prajapati
DIARY OF THE WEEK: Dt: 17th April 2023 TO 23rd April 2023
DEPARTMENT: BE - Mech. SEM: 08th
NAME OF THE ORGANISATION: National Engineering Company.
NAME OF THE PLANT/SECTION/DEPARTMENT: Cutting & Assembly Department
NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT: Himanshu Panchal.

DESCRIPTION OF THE WORK DONE IN BRIEF

This is the final and last week of the 12 weeks industrial training programme.

During this week i played my role as a helper in assembly department and machine operater in cutting department.

In this week i learned and understand about Groundnut Threshar machine's Assembly. Mr. Mukeshbhai guides me about related work.

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TOTAL HOURS: 50 Hours

SIGNATURE OF STUDENT

• The above entries are correct and the grading of work done by Trainee is
EXCELLENT / VERY GOOD / GOOD / FAIR / BELOW AVERAGE / POOR

Signature of Faculty Mentor

NATIONAL ENGINEERING CO.

Signature of officer-in-charge of Dept. / Section / Plant

PROPRIETOR

Date:

Date: 24th April 2023

• Grading of Work, for trainee may be given depending upon your judgement about his Punctuality, Regularity, Sincerity, Interest taken, Work done etc.

Annexure II

GUJARAT TECHNOLOGICAL UNIVERSITY
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Annexure 2

Feedback Form by Industry expert

Student Name: Harshit D. Prajapati Date:

Work Supervisor: Ketankumar B. Panchal. Title:

Company/Organization: National Engineering Company.

Enrollment No: 190390119011

Internship Address: 01, Rajendra Industrial Estate

Dates of Internship: From 03rd Feb 2023 to 03rd May 2023

Please evaluate your intern by indicating the frequency with which you observed the following behaviors:

Parameters	Needs improvement	Satisfactory	Good	Excellent
Shows interest in work and his/her initiatives				✓
Produces high quality work and accepts responsibility				✓
Uses technical knowledge and expertise			✓	
Analyzes problems effectively			✓	
Communicates well and writes effectively				✓

Overall performance of student intern: (Needs improvement/ Satisfactory/Good/Excellent):

Additional comments, if any:

NATIONAL ENGINEERING CO.
PROPRIETOR

Signature of Industry person with name and Stamp:

Signature of the Faculty Mentor

INTERNSHIP AT INDO GERMAN TOOL ROOM

INTERNSHIP REPORT

Submitted by

SENGAL BHAUMIKKUMAR RAMESHBHAI

190390119012

In partial fulfillment for the award of the degree of

BACHELOR OF ENGINEERING

in

Mechanical Engineering

S.P.B. Patel Engineering Collage, Mehsana

S.P.B. PATEL
ENGINEERING COLLEGE
SAFFRONY INSTITUTE OF TECHNOLOGY

Gujarat Technological University, Ahmedabad

May, 2023

S.P.B. PATEL
ENGINEERING COLLEGE
SAFFRONY INSTITUTE OF TECHNOLOGY

S.P.B. Patel Engineering Collage

Near Shanku's water park, Ahmedabad – Mehsana Highway, Linch Gujarat

CERTIFICATE

This is to certify that the project report submitted along with the project entitled **INDO GERMAN TOOL ROOM** has been carried out by **Sengal Bhaumikkumar Rameshbhai** under my guidance in partial for the degree of Bachelor of engineering in mechanical engineering, 8^{th} Semester of Gujarat technological university, Ahmedabad during the academic year 2022-23.

Prof. Monil Shah	Prof. Kunalsinh Kathiya
Internal Guide	Head of the department

INDO GERMAN TOOL ROOM, AHMEDABAD
(Ministry of MSME, Govt. of India Society)
An ISO 9001 : 2015 Tool Room & Training Centre

Date: April 25, 2023

TO WHOM IT MAY CONCERN

This is to certify that Sengal Bhaumikkumar Rameshbhai, a student of S P B Patel Engineering College, Mehsana has successfully completed his internship in the field of Production/Manufacturing from 23rd January 2023 to 17th April 2023 (total number of weeks: 12) under the guidance of Mr. Rahul Shekokar.

His internship activities include work in AutoCAD, Solidworks, CNC Milling, CNC Turning, Press Tool and Plastic Mold.

During the period of his internship program with us, he has been exposed to different processes and was found diligent, hardworking and inquisitive.

We wish him every success in his life and career.

INDO GERMAN TOOL ROOM AHMEDABAD A Govt. of India Society

For, Indo German Tool Room, Ahmedabad
Authorized Signatory

Plot No. 5003, Phase: IV, GIDC, Mehmedabad Road, Vatva, Ahmedabad - 382445, Gujarat
Mobile: 9099041986 Email ID: info@igtrahd.com Website: www.igtrahd.com

GUJARAT TECHNOLOGICAL UNIVERSITY

CERTIFICATE FOR COMPLETION OF ALL ACTIVITIES AT ONLINE PROJECT PORTAL

B.E. SEMESTER VIII, ACADEMIC YEAR 2022-2023

Date of certificate generation : 12 May 2023 (23:32:12)

This is to certify that, ***Sengal Bhaumikkumar Rameshbhai*** (Enrolment Number - 190390119012) working on project entitled with ***Internship at Indo German Tool Room*** from ***Mechanical Engineering*** department of ***S. P. B. PATEL ENGINEERING COLLEGE, MEHSANA*** had submitted following details at online project portal.

Internship Project Report	**Completed**

Name of Student : Sengal Bhaumikkumar Rameshbhai

Name of Guide : Mr. Monil Shah

Signature of Student : ____________

*Signature of Guide : ____________

Disclaimer :
This is a computer generated copy and does not indicate that your data has been evaluated. This is the receipt that GTU has received a copy of the data that you have uploaded and submitted as your project work.

*Guide has to sign the certificate, Only if all above activities has been Completed.

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SAFFRONY INSTITUTE OF TECHNOLOGY

S.P.B. Patel Engineering Collage

Near Shanku's water park, Ahmedabad – Mehsana Highway, linch
Gujarat

DECLARATION

We hereby declare that the internship report submitted along with the internship entitled **INDO GERMAN TOOL ROOM** submitted in partial fulfillment for the degree of bachelor of engineering in mechanical engineering to Gujarat Technological University, Ahmedabad, is a bonafide record of original project work carried out by me at Indo German Tool Room under the supervision of **Prof. MONIL SHAH** and that no part of this report has been directly copied from any students or report or taken from any other source, without providing due reference.

Sengal Bhaumikkumar Rameshbhai ______________

ACKNOWLEDGEMENT

I wish to express my appreciation to Prof. Kunalsinh Kathia, Prof. Monil Shah, Prof. Taushif Shaikh, Prof. Akash Modi, Prof. Ashutosh Gohel, Dr. Shailesh Patel and Dr. Pooja Mehta for the knowledge imparted during my academic tenure at Saffrony Institute of Technology. A special thanks goes to Prof. Monil Shah for making sure I gained sufficient knowledge during my graduate studies and for her encouragement.

I am grateful to Indo German Tool Room's Mr. Lokesh Oza for this internship opportunity. I also want to thank Mr. Rahul Shekokar , Mr. Axit Gujrati and Ms. Nilam Parmar who have provided encouragement and the type of assignments which make for a successful internship. Ms. Nilam Parmar's vision and approach must be followed by all industry heads and managers. Most importantly, I wish to thank my parents for their encouragement and support and the sacrifices they made so that I could pursue this internship.

I perceive this opportunity as a big milestone in my career development. I will strive to use gained skills and knowledge in the best possible way, and I will continue to work on their improvement, to attain desired career objectives. I am also grateful for them to offer me with a job opportunity and work with these wonderful people at their esteemed organization after the internship opportunity.

ABSTRACT

This report contains the work done by the author during his internship at Indo German Tool Room, Ahmedabad. It shows the process of learning industrial standards, manufacturing process, their process work flows and Designing processes. In the report, the author discusses the processes of Design of plastic mould which includes their production and quality maintenance. The author also discusses the Mould and press tool design processes' prospects using manufacturing fundamentals. At the end of internship period, the author made a design model of a press tool and plastic mould system to present it at the company.

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CHAPTER 1. INTRODUCTION

1.1 Company Profile

Indo German Tool Room has been established in Ahmedabad by the co operation of Office of the Development Commissioner (MSME), ministry of MSME Government of India under a bilateral agreement with Government of Federal Republic of Germany. The Government of Gujarat has contributed towards the required land, buildings and infrastructure. The Tool Room started its operations from its modern manufacturing and training facilities at Vatva in 1994.

The Board of the Governing Council members directs the activities of the Tool Room. The members are from various fields of expertise and the Development Commissioner AS & DC (MSME) is the Chairman. The Tool Room is an autonomous body registered under the Societies act.

Fig: 1.1 Indo German Tool Room

1.2 Objective Of The Tool Room

To serve micro small & medium enterprise, particularly metal & plastic groups in the field of Training in Tool & Die Technology, CAD/CAM/CAE Solutions. Design, Development and Manufacturing of quality Press Tools, Moulds, Dies, Jigs & Fixtures, Gauges, SPM, Precision Inspection and Reverse Engineering on CMM, Job Work etc. Consultancy for Product Development, Productivity and Quality improvement.

Location

The Tool Room is located along the Mehmedabad Road in GIDC, Vatva The campus covers an area of 63,000 sq.m. & is located within the Industrial Area. The Ahmedabad Airport is 20 km away from the campus. Ahmedabad Railway Station is 10 km and Maninagar Railway Station is 4 km away. The campus is connected to the city by municipal bus services. Ahmedabad is well connected by road, rail and air with the rest of the country.

General Amenities

The campus is located in the Vatva Industrial area and is connected by road with the residential neighborhood of Maninagar. The IGTR campus has self- contained facilities such as furnished guesthouse, air-conditioned auditorium, furnished hostel for girls & boys and a canteen with moderate facilities, internet, recreation & indoor-outdoor sports. The self-contained campus has residential quarters for the Managers, Engineers and Technicians of the Tool Room. A library and information resource centre with technical books and periodicals etc, is available for the use of Trainees and Tool Room personnel. Hostel: Limited hostel facilities for both boys & girls trainees are available.

Candidates willing to avail the facility have to indicate their request in the application form. All trainees staying in the hostel will be governed by separateset of Hostel Rules and Canteen / Mess Rules applicable from time to time.

CHAPTER 2 . INTRODUCTION TO PLASTIC MOULD

2.1 Basic Of Plastic

Polymeric material that has the capability of being molded or shaped, usually by the application of heat and pressure. Plastics are (mostly) synthetic (human-made) materials, made from polymers, which are long molecules built around chains of carbon atoms, typically with hydrogen, oxygen, sulfur, and nitrogen filling in the spaces.

2.2 Types Of Plastic

2.2.1 Thermoplastic

Plastics that can be deformed easily upon heating and can be bent easily. Thermoplastic have a linear or branched molecular structure.

2.2.2 Thermoset Plastic

Plastics that cannot be softened again by heating once they are molded. Thermoset have three dimensional network of covalent intermolecular bonds.

2.3 Types Of Plastic Based On Application

2.3.1 Commodity Plastic

Commodity plastics are plastics produced in high volumes for applications where exceptional material properties are not needed.

2.3.2 Engineering Plastic

Engineering plastics are a group of plastic materials that have better mechanical and/or thermal properties than the more widely used commodity plastics.

2.3.3 High Performance Plastic

High performance plastics differ from standard plastics and engineering plastics primarily by their temperature stability, but also by their chemical resistance and mechanical properties

2.4 Structure Of Plastic Material

2.4.1 Linear Structure

Monomer units are linked together to form linear chain.
Examples: Nylon, high density polyethylene, polyvinyl chloride.

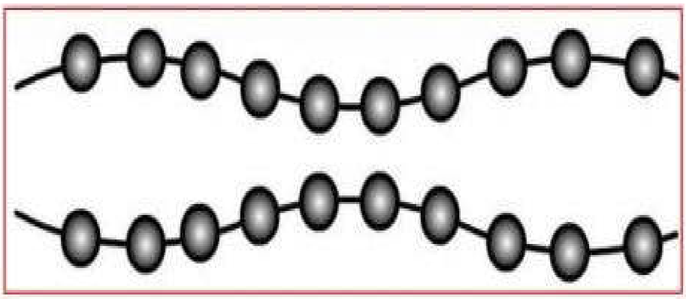


Fig: 2.1 Liner Structure

2.4.2 Branched Structure

The monomers are joined to form long chains with branches of different lengths.
Examples: Low density polyethylene, glycogen, and starch.

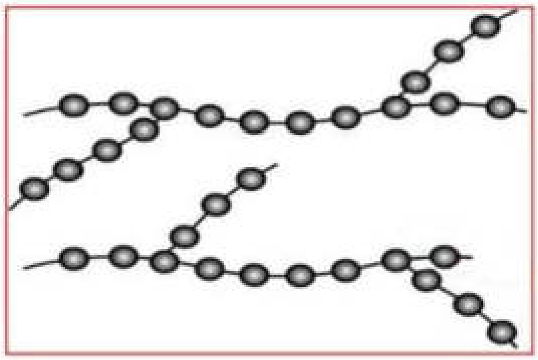


Fig: 2.2 Branched Structure

2.4.3 Cross Linked Structure

The monomer units are cross-linked together to form cross-linked chains. Chains are connected by covalent bonds.
Example: Rubber, Bakelite.

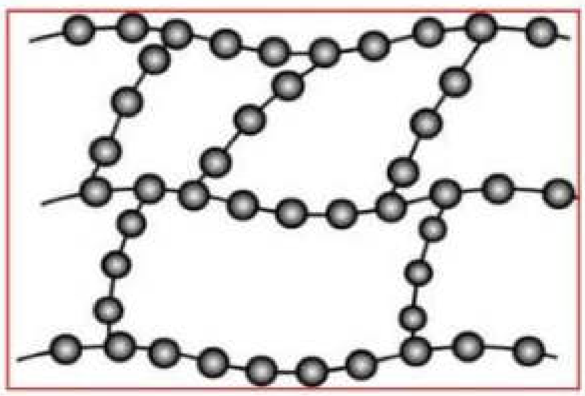


Fig: 2.3 Cross Linked Structure

2.4.4 Network Structure

The monomers are joined together to form a large three dimensional network.
Example: Epoxy, phenol formaldehyde.

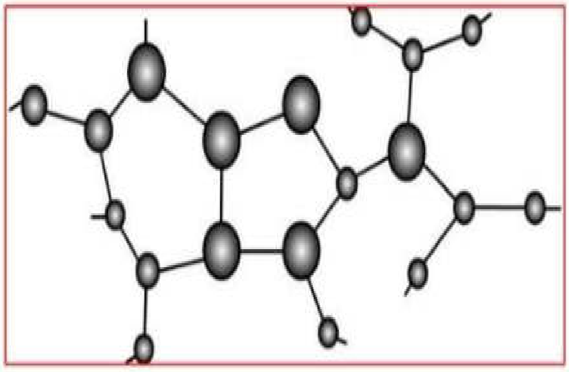


Fig: 2.4 Network Structure

2.5 Properties Of Plastic

2.5.1 Strength

The plastics are sufficiently strong and can be used for load bearing structural members. Strength of plastics can further be increased by reinforcing them with various fibrous materials. Plastic as structural material has not gained much popularity because of the following reasons:

- High cost of construction.
- High temperature susceptibility, Poor stiffness.
- Being subjected to creep under constant load.

2.5.2 Weather Resistance

The plastics, prepared from phenolic resins, are only good in resisting weather effects. Certain plastics are seriously affected by ultraviolet light.

2.5.3 Fire Resistance

Plastics, being organic in nature, are combustible.But the resistance to fire temperature depends upon the plastic structure.Cellulose acetale plastics burn slowly.Polyvinyl chloride (PVC) plastics are non-inflammable. Phenol formaldehyde and urea formaldehyde plastics are used as fire proofing materials.

2.5.4 Durability

Plastics generally possess sufficient durability, provided they offer sufficient surface hardness. Thermoplastic varieties are found to be attacked by termites and rodents.

2.5.5 Dimensional Stability

Plastics easily maintain its shape and do not go under plastic deformations.

2.5.6 Chemical Resistance

Plastics offer great resistance to moisture, chemicals and solvents. Many plastics are found to possess excellent corrosion resistance. Plastics are used to convey chemicals.

2.5.7 Thermal Resistance

The plastics have low thermal conductivity and therefore foamed or expanded varieties of plastics are used as thermal insulators.

2.5.8 Working Conditions

All operations like drilling, sawing, punching, clamping etc are carried out easily on plastics, just like wood.

2.5.9 Moisture Resistance

This property depends upon variety of plastics used, for example, cellulose plastics are considerably affected by the presence of moisture, whereas polyvinyl chloride plastics offer high resistance to moisture.

2.5.10 Ductility

Plastics, generally, have low ductility and hence plastic structural members may fail without prior warning

2.6 Introduction Of Moulding Machine

Molding is a manufacturing process that involves shaping a liquid or malleable raw material by using a fixed frame known as either a mold or a matrix. The mold is generally a hollow cavity receptacle, commonly made of metal, where liquid plastic, metal, ceramic, or glass material is poured. In most cases, the mold is derived from the initial pattern or template of the final object its main objective is to reproduce multiple uniform copies of the final product. As the liquid cools and hardens inside the mold, the final configuration is achieved. Its removal is facilitated by the use of a release agent or ejection pins.

Types of plastic mould machining are as follows:

1. Injection mould.
2. Blow moulding
3. Extrusion mould
4. Compression mould
5. Roto mould
6. Transfer mould

2.7 Injection Moulding Machining

Injection molding is a method of forming a plastic product from powdered thermoplastics by feeding the material through the machine component called the hopper to a heated chamber in order to make it soft and force the material into the mold by the use of the screw. In this whole process pressure should be constant till the material is hardened and is ready to be removed from the mold. This is the most common and preferable way of producing a plastic products with any complexity and size.

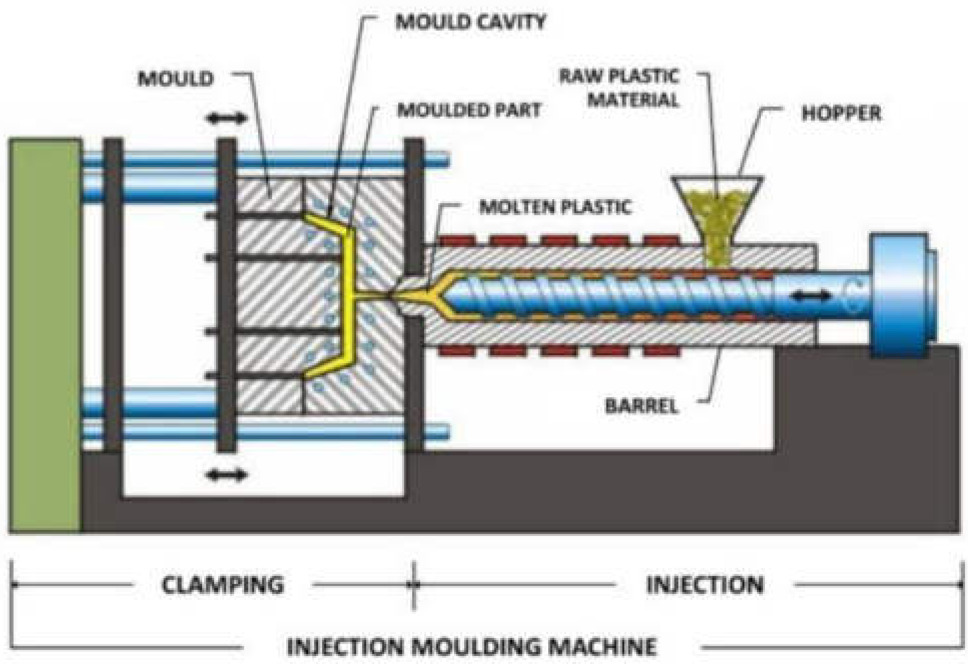


Fig: 2.5 Injection Moulding Machine

2.7.1 Main Components Of Injection Molding Machine

Injection Unit:

1) Screw motor drive
2) Reciprocating screw and barrel
3) Heaters, Thermocouple, Ring plunger

Hopper:

In the molding process the plastic materials are supplied in the form of small pellets.

The hopper functions as the holder of these pellets. The pellets are then gravity fed from the hopper to the barrel.

Barrel:

The main use of the barrel is to give support for the screw. The Barrel consists of heater bands which function as a temperature recorder for each section of the barrel.

The Screw :

Also known as the reciprocating screw is used in compressing, melting and conveying the plastic material.

The Screw consists of three zones :

1) The feeding zone,

2) The Transition zone and

3) the metering zone.

In the feeding zone there will be no change to the plastic materials and they will remain pellets and will be transferred to the next zone which is the **transition zone** , In this zone melting of the pellets will occur and the molten plastics will be transferred to the next zone which is the **metering zone**, In this zone the molten material will be ready for injection.

The Nozzle:

The purpose of the nozzle is to provide the flow path for the plastic melt from the machine cylinder to the mould.

Clamping Unit

The clamping unit holds the mold together, opens and closes it automatically, and ejects the finished part. The mechanism may be of several designs, either mechanical, hydraulic or hydro mechanical. It consist of three main components:

1) Mold

2) Clamping motor drive

3) Tie bars, the sender is clamped into the edge of a workbench.

2.7.2 Types Of Injection Moulding Machine

1) Hand Injection Moulding Machine

This is a basic type of injection molding machine. it is mainly used where the component precision is not high, for average surface finish , production rate is low & is limited by size. Machine consists of a vertical barrel, which has a plunger on it & a clamping unit. The material is fed in the barrel & the external band surrounding it heats it. A thermostat controls the temperature. When the material is sufficiently melted for the feed, it is pushed by the plunger, which is manually powered. Hand molding machines doesn't have any cooling attachments or ejection facilities. The mold has to be physically opened by hand & component knocked out

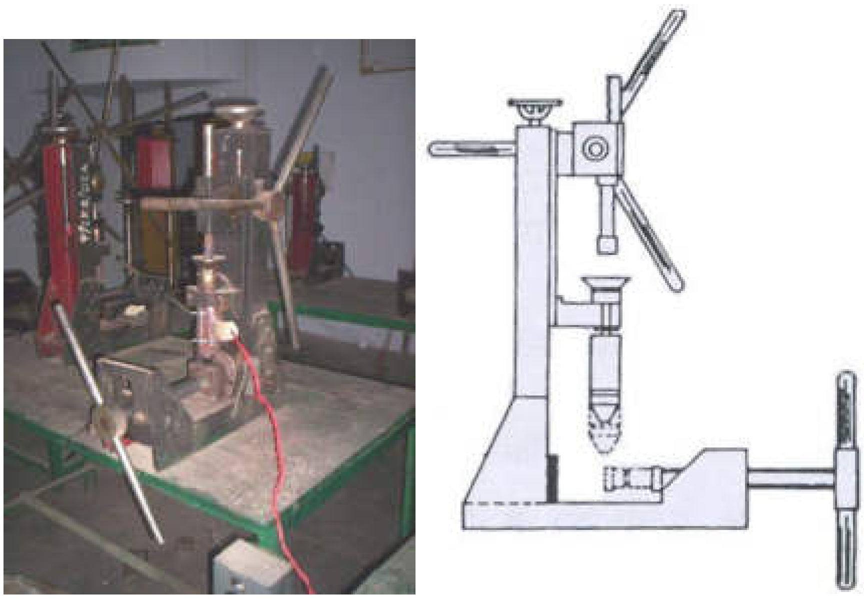


Fig: 2.6 Hand Injection Molding machine

2) Plunger Type Injection Moulding Machine

Semi automatic machines are of two types they are vertical & horizontal. In vertical feeding direction is perpendicular to clamping direction where as In horizontal It is in line with the mold. In this kind of machines injection is automatic & cycle can be set for injection & the amount of material fed can be controlled as well as pressure. Ejection is Manual. Moderate quality of component can be achieved.

Fig: 2.7 Plunger Type Injection Molding machine

3) The Reciprocating Screw Types Injection Moulding Machine.

A reciprocating screw uses a rotating screw to plasticize the material. As the screw turns, the plasticized material is forced in front of it, pushing the screw back. The material is injected by bringing the screw forward, which then acts as a plunger. This machine divided into different zones like, feeding zone, compressing (or transition) zone and metering zone.

Fully automatic machines provides fully automated injection, clamping, opening & ejection, pre-heater with hydraulic facilities for side cores or splits. Latest machines consist of microprocessor controller, which scan store the parameters set for the each mold & later can be recalled. This is for high precision component with optimized cycle time. Large volumes of Production can be handled & the machine ranges from as low as 10 tons to 1200 tons.

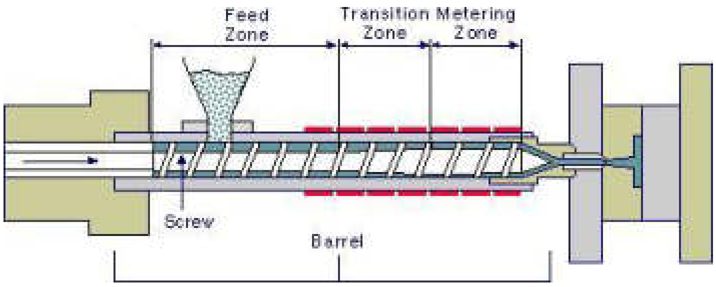


Fig: 2.8 Reciprocating Type Injection Molding machine

2.7.3 Injection Molding Machine Operator Cycle

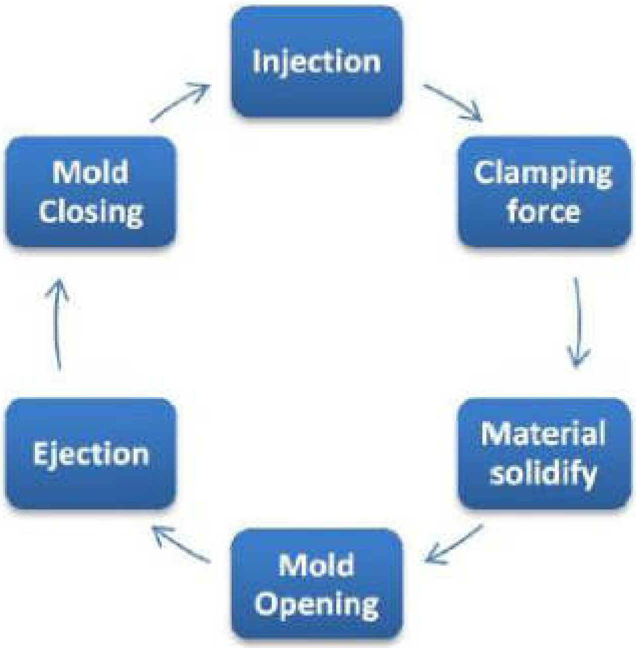
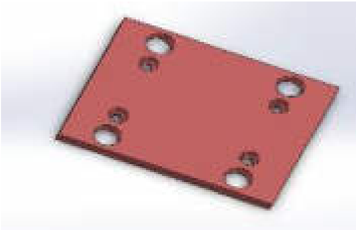
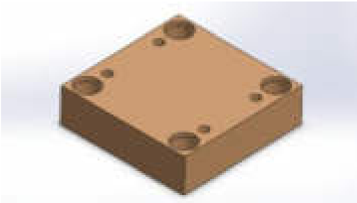
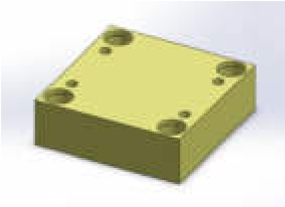
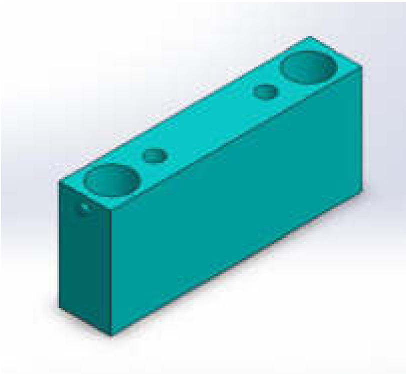
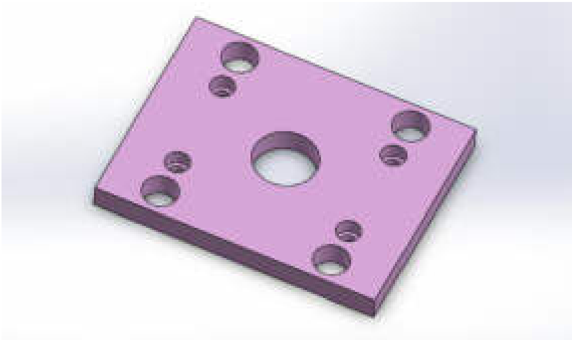


Fig : 2.9 Machine Operator Cycle

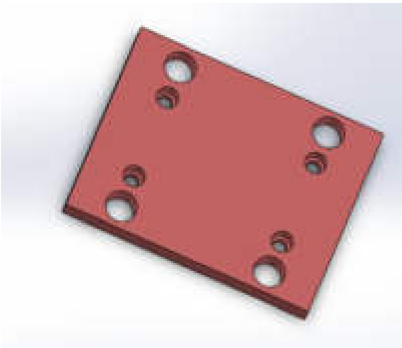
2.8 Mould Design

Top Plate **Cavity Plate** **Core PLate**

Spacer Block Bottom Plate

Ejector Plate Ejector Back Plate

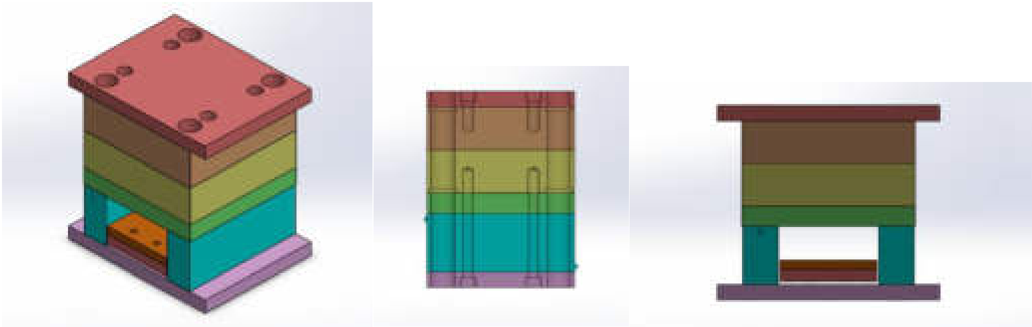


Fig: 2.10 Mould Design

CHAPTER 3. PRESS TOOL

3.1 Introduction Of Press Tool

Press tool is special purpose tool which is use to produce to product by sheet metal either manual or machine. It is a combination of die, punch and some other accessories which can produce a particularly shape an sheet metal with application of pressure. Press tool are commonly used in Hydraulic pneumatic & Mechanical press to produce components at high volume.

3.2 Press Tool Operations

Cutting Operation
The operations in which sheet metal component is divided into several parts is called cutting operation.

Non Cutting Operation
These operation are generally forming operation in which the shape of material is change by plastic deformation.

Hybrid Operation
It is combination of the cutting and bending operation.

3.3 Cutting Operation Example

3.3.1 Blanking Operation

In which the punch is imposed or pressed in specimen to cut the material. In blanking the punched part will be the usefull. Product and the remaining wil be the scrap part.

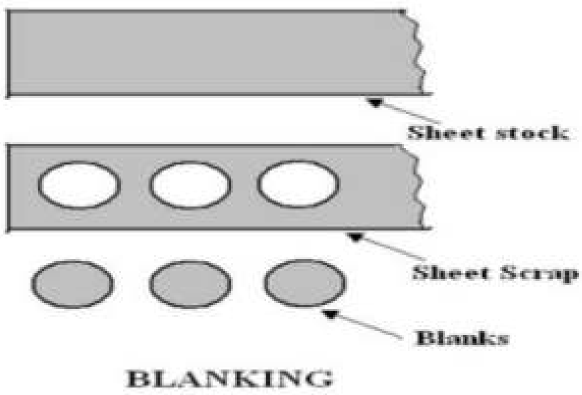


Fig: 3.1 Blanking Operation

3.3.2 Piercing Operation

In this process the hole are cut by press machine. But in piercing the punched part will be scrap and remaining would be useful product.

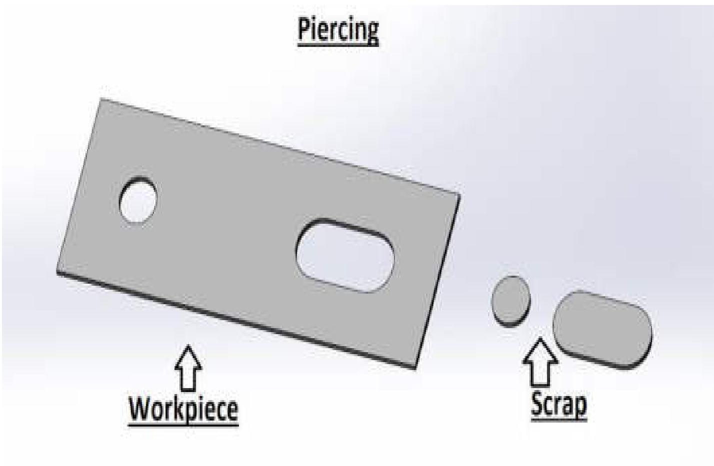


Fig: 3.2 Piercing Operation

3.3.3 Cut-Off Operation

Cut off operation separates the work material along a straight line or angular or irregular in a single cut. No scrap is produced in cutting off operation.

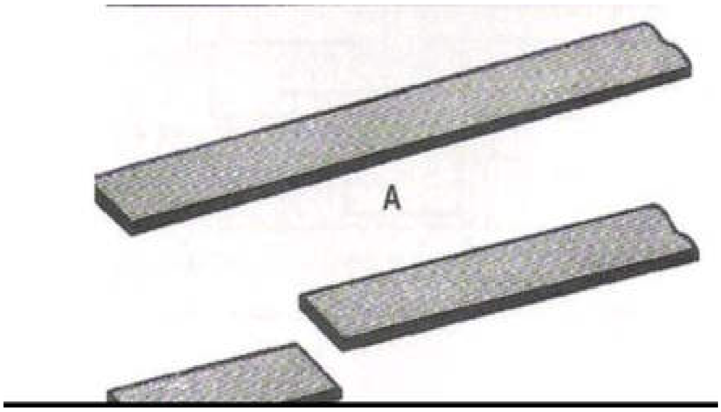


Fig: 3.3 Cut off operation

3.3.4 Parting Operation

Parting off is an operation which involves cutoff operation to produce blank from the strip as shown in the figure. During parting, some scrape is produced. Therefore, parting is the next best method for cutting blanks.

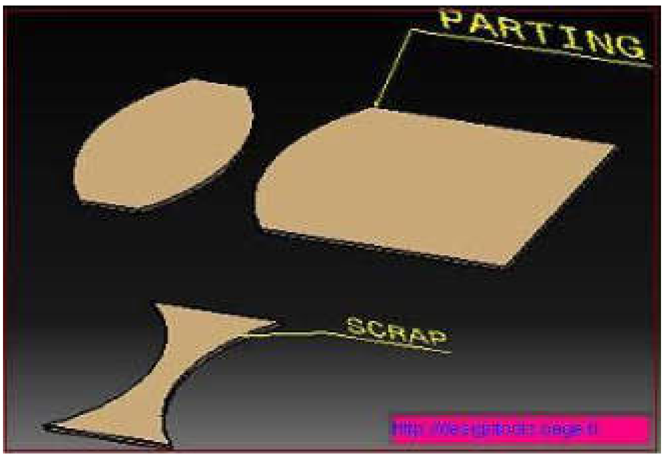


Fig: 3.4 Parting Operation

3.3.5 Notching

Notching involves cutting out a portion of a metal from the side of sheet or strip. Semi notching removes a portion of a metal from the interior of the sheet.

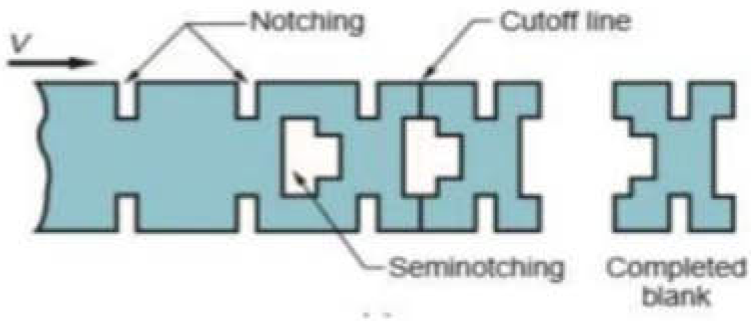
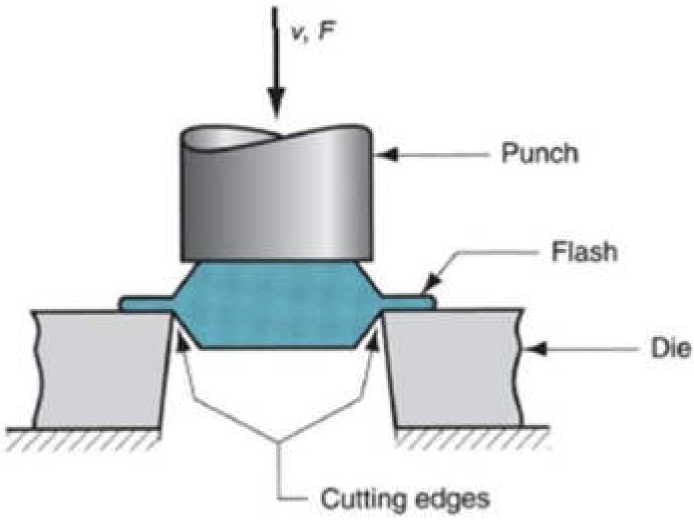


Fig: 3.5 Notching

3.3.6 Trimming

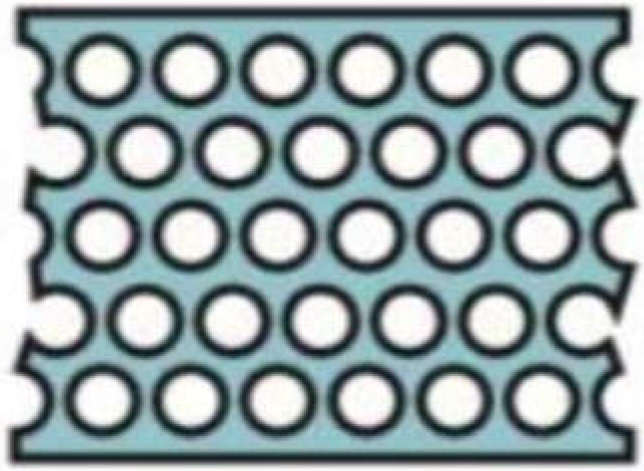
Trimming is a cutting operation performed on a formed part to remove excess metal and establish size.



Fig; 3.6 Trimming

3.3.7 Perforating

Perforating involves the simultaneous punching of apattern of holes in a sheet metal. The hole pattern is usually for decorated purposes, or to alloy passage of light, gas or fluid.



Fig; 3.7 Perforating

3.4 Types Of Press Tool

3.4.1 Progressive Tool

Progressive tool are those in which progressive tools perform work at a number of stations simultaneously. A final component is taken off at final station, with each stroke of press.

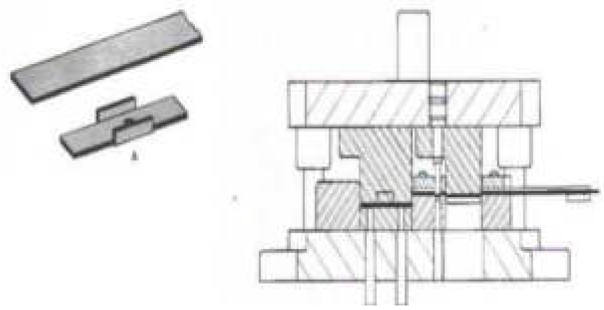


Fig: 3.8 Progressive Tool

3.4.2 Compound Tool

In compound tool all or maximum features of the component can be produced in one stroke of the ram. Basically compound tools are inverted tool. Used to maintain high accuracy between the features and to get burr on same side.

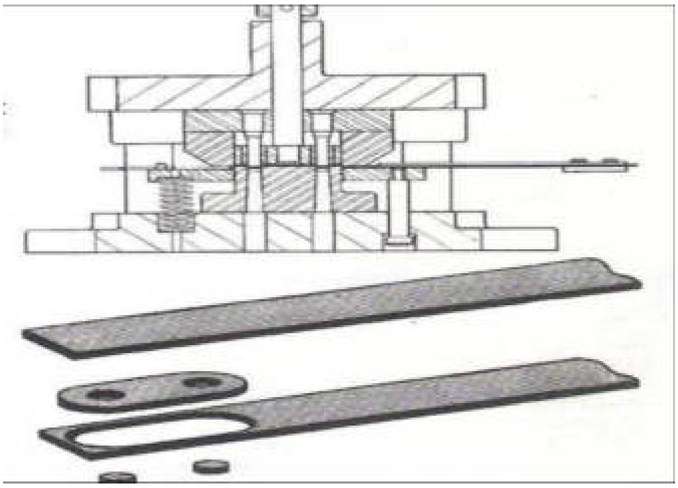


Fig: 3.9 Compound Tool

3.4.3 Combination Tool

In combination tool two or more operations such as forming, drawing. extruding, embossing may be combined on the component with various cutting operations like blanking piercing, broaching and cut off.

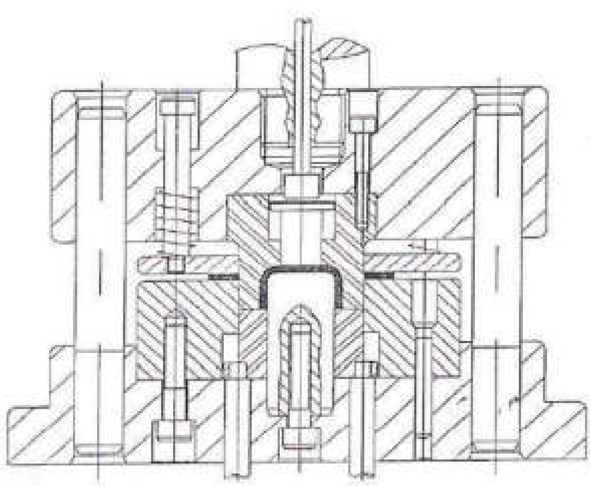
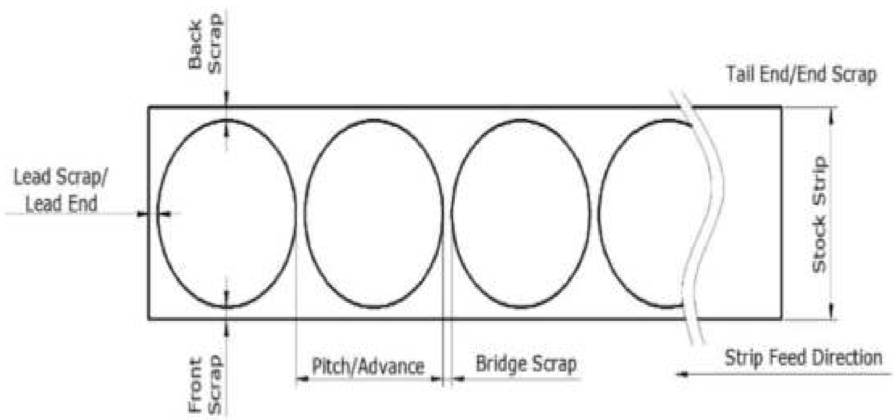


Fig: 3.10 Combination Tool

3.5 Basic Of Strip Layout

The first step designing a die is to layout the stock strip exactly as it will appear after all operation have been performed. It is called scrap strip layout. Fifty to seventy per cent of the cost of a stamping is for material. Therefore, the method applied for laying out the scrap strip directly influences the financial success or failure of any press operation. The blank must be positioned so, a maximum area of the strip is utilized in production of stamping.

3.6 Terminology Of Strip



Fig; 3.11 Terminology Of Strip

Strip Feed Direction: It is the direction in which stock strip is fed into the die.

Lead Scrap / Lead End: It is the end of the stock strip heading towards the die.

End Scrap / Tail End: It is the end of the stock strip opposite to the lead end (Left out portion after all finish operation).

Front Scrap: This is the scrap bridge on that edge of the strip which is towards the operator.

Back Scrap: This is the scrap bridge on that edge of the strip which is away from the operator.

Bridge Scrap: This portion of material remaining the two adjacent openings after blanking.

Pitch: Distance between two consecutive operations on a strip.

3.7 Strip Layout Format

Narrow Run Or Wide Run

If the length of a component is more than its width it is necessary to make a choice whether to keep the length side or width side towards the feeding direction.
As shown in Fig. if the narrow side is towards feeding direction it is called a narrow run, otherwise it is the wide run

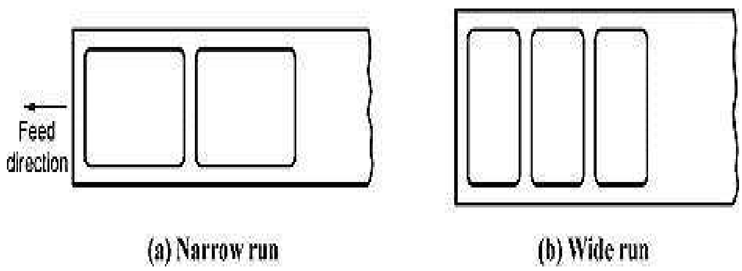


Fig: 3.12 Strip Layout Format

3.8 Different Blank Layout

3.8.1 Single Row, One Pass Layout

At 'A' parts are located in a Vertical Position in the strip. This method is preferred because the maximum number of parts can be cut from one strip.
At 'B' parts are located in Horizontal Position in the strip. This method is preferred when severe bends E are required in subsequent operation and this involves more strips required to produce same parts.
At 'C' parts are located in Angular Position in the strip. This method is preferred in some contours to achieve economical utilization as well as further C advantage of allowing bends without possible fracture.

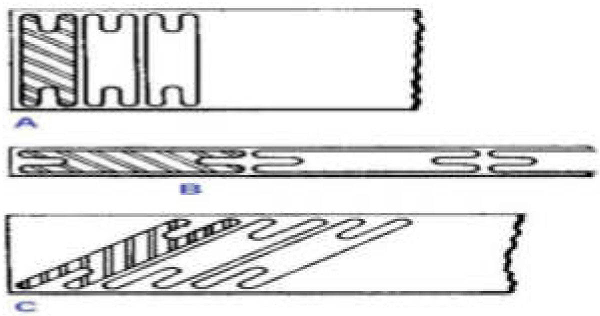


Fig: 3.13 Single Row, One Pass Layout

3.8.2 SINGLE ROW, TWO PASS

In this method material can be saved for certain part shapes. In this case, blanks are twice passed through the die by making the strip up-side down. 10% to 15% higher labour cost will occur in double-run layouts. During feeding greater care to be taken by operator. Extra labor cost is offset by the saving in material when blanks are large and waste is considerable.

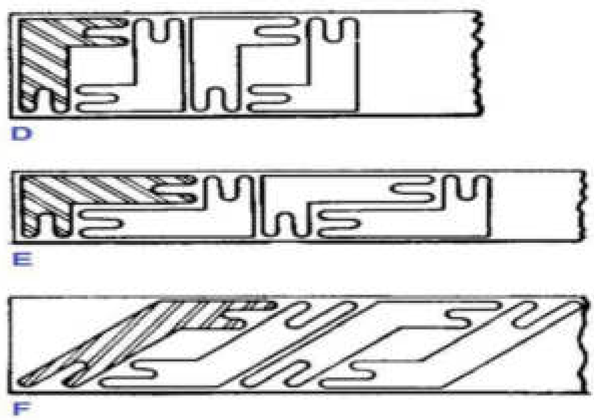


Fig: 3.14 Single Row, Two Pass

3.8.3 Double Row One Pass Layout

Double row, one pass layout shown at ‘C’ and ‘D’ used for gang dies. An extra punch and die opening is applied to the die for cutting two blanks with each stroke, and strip run through once only. This method is applied when added expense of extra punch and die hole is justify.

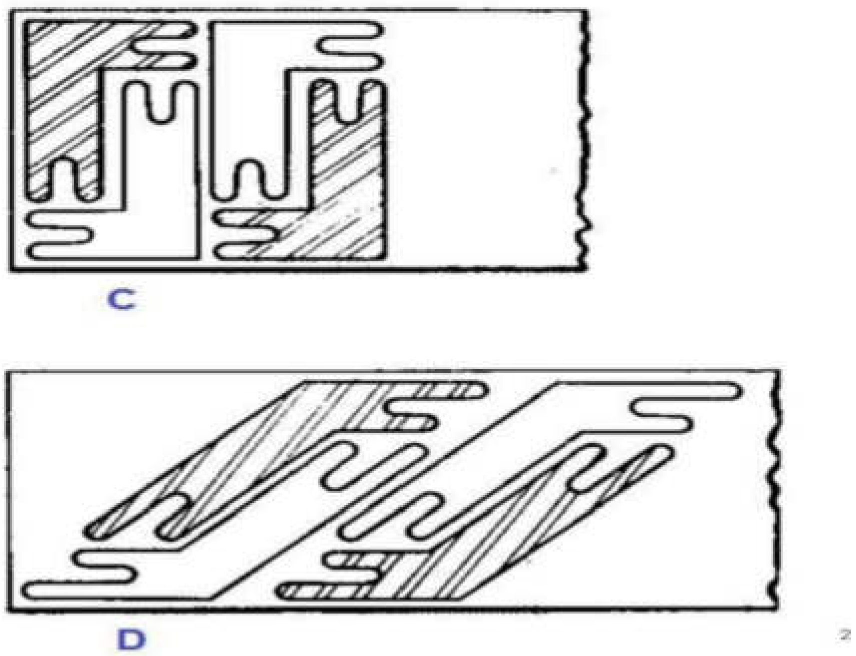


Fig: 3.15 Double row one pass layout

3.8.4 Double ROW DOUBLE PASS LAYOUT

Double row, two pass layout shown at ‘A’ and ‘B’ gives economy in material utilization. Here the strip run through the die twice as in previous examples, but blanking centers are closer together giving greater operating speed.

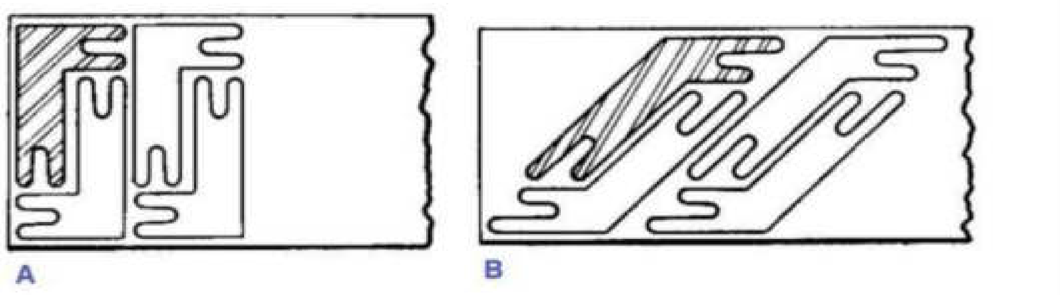


Fig: 3.16 Double row double pass layout

3.8.5 Triple Row One Pass Layout

Triple row, one pass layout shown at 'A' and 'B' used for gang dies of Progressive type. At 'A' is the layout for a die used to produce washers at high speed, while at 'B' is shown a die to produce elliptical blanks. Such die may have more than three rows; the number is limited only by press size and production requirements.

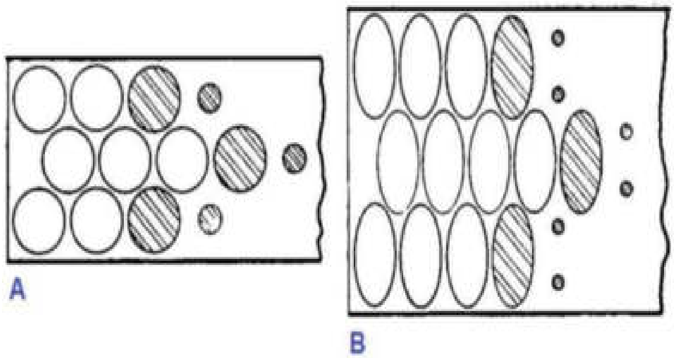


Fig: 3.17 Triple row one pass layout

3.9 Blanking Tool Calculation

3.9.1 Blanking Operation (Punch Clearance)

$C = c * t * \sqrt{(T_{max}/10)}$ mm/side

Where, c = constant 0.01 to 0.005, t = sheet thickness in mm

T_{max} = Shear strength N/mm^2

3.9.2 Force Calculation

A) Cutting Force = $t * L * T_{max}$ Where, L = Cutting lenth in mm

B) Stripping Force = 10% of Cutting Force

C) Press Tonnage = Cutting Force + Stripping Force

3.9.3 Strip Layout & Economic Factor

Choose strip layout according to economic factor of Wide Run and Narrow Run.

Economic factor = (A * N)/(P * W) * 100

Where, A = Area of component, N = Number of Row, P = Pitch,

W = Width of Sheet

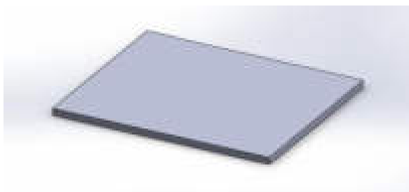
3.9.4 Thickness Of The Plate

1) Die Plate Thickness = 3√(cutting force) in cm**.**
2) Thickness of Top & Bottom plate = 2 * Die plate thickness.
3) Thickness of punch holder & stripper plate = 0.8 * Die plate thickness.
4) Thrust plate thickness = 6 mm to 8 mm.
5) Solid Margin = 2 * Die plate thickness.
6) Size of Bolt = Stripping Force/Number of hole.

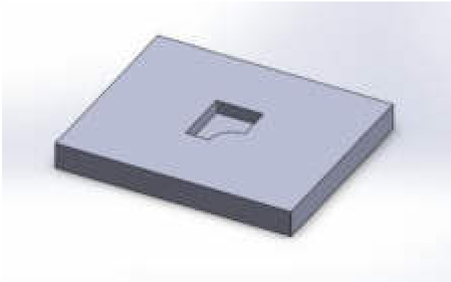
3.10 Press Tool Assembly

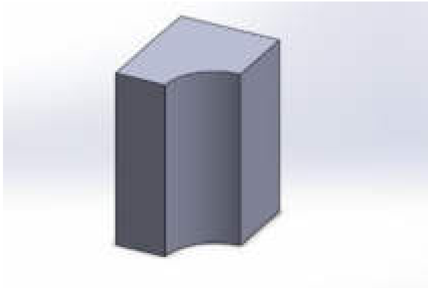
3.10.1 Top Half

Top plate.



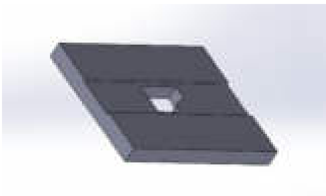
Thrust Plate

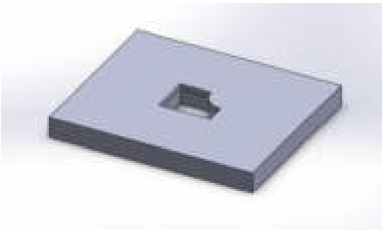


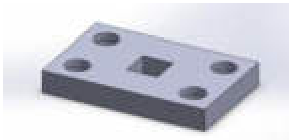


Punch Holder Plate. Punch profile

3.10.2 Bottom Half

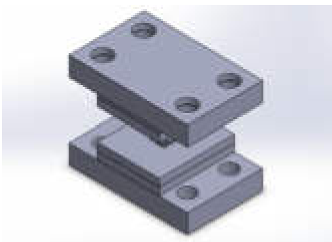






Stripper plate Die plate Bottom plate

3.10.3 Assembly



CHAPTER 4. GAUGES

4.1 Introduction To Gauges

A gauge is a device used to make measurements or in order to display certain dimensional information. Wide variety of tools exist which serve such function ranging from simple pieces of material against which sizes can be measured to complex pieces of machinery. Gauges are used to measure different types of object having various size, shaped and thickness, the gap in space, diameter of material or pressure of the flow.

4.2 Types Of Gauges

4.2.1 Plug Gauge

A plug gauge is a fixed gauge that is used for measuring the size of hole. Plug gauge come with different diameters. They are helpful to measure the inside diameter of drilled holes or hole that are machined into a manufacturing part, component or assembly.

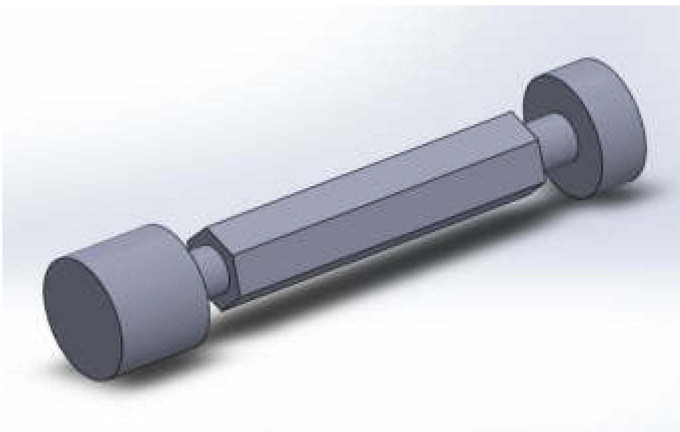


Fig: 4.1 Plug Gauge

4.2.2 Ring Gauge

A ring gauge is a fixed gauge that is used for measuring the external diameter of cylindrical object. Ring gauge incorporates the tolerance principal with "Go" and "No Go" section.

Fig: 4.2 Ring Gauge

4.2.3 Taper Gauge

They are measuring device used to measure the width of gap, grooves hole diameter and the inner diameter of the pipe.

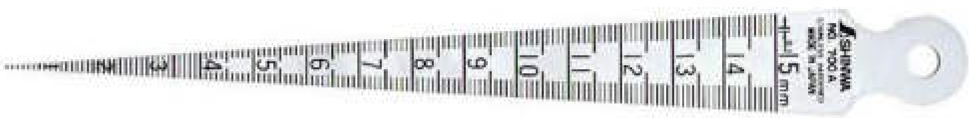


Fig: 4.3 Tapper gauge

4.2.4 Snap Gauge

These are mainly used for checking the shaft. Snap gauges are also known as gap gauges. It is a form of Go/ No-Go gauge used for both cylinder and non cylindrical parts. Go snap gauge is used with a higher limit of the shaft, and no go gauge is used with a lower limit of the shaft.

Fig: 4.4 Snap Gauge

4.2.5 Feeler Gauge

This type of gauge is used for clearance between the mating surface.They are manufactured in the form of bunch of blades using steel.They are made of 0.3 mm to 1 mm thickness and 10 mm long.To measure the size of clearance one or two blades are inserted in between the contacting surface until an exact blade is found.

Fig: 4.5 Feeler Gauge

4.3 Calculation Of Plug Gauge

Gauge diameter 35H7.

Upper deviation = 0.025 mm

Lower deviation = 0

Upper Limit = 35.025 mm

Lower limit = 35 mm

Working tolerance (tolerance) = Upper Limit - Lower Limit

= 35.025 - 35

= 0.025 mm

Gauge Tolerance = 10 % of working tolerance

= 10 * 0.025

= 0.0025 mm

Wear tolerance = 10 % of gauge tolerance

= 10 * 0.0025

= 0.00025 mm

- Design of Go Gauge

Lower limit of gauge = Basic size + wear allowance

= 35 + 0.00025

= 35.00025 mm

Highest limit of gauge = Basic size + (Gauge tolerance + wear tolerance)

= 35 + (0.0025 + 0.00025)

= 35.00275 mm

Limit of Go Plug Gauge = $35.00025^{+0.0025}_{-0.000}$

- Design of No Go Gauge

Lower limit of Gauge = Basic size

= 35.025 mm

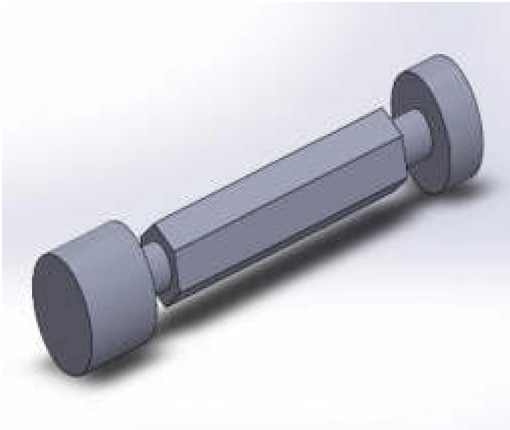
Highest limit of Gauge = Basic size + Gauge tolerance

= 35.025+ 0.0025

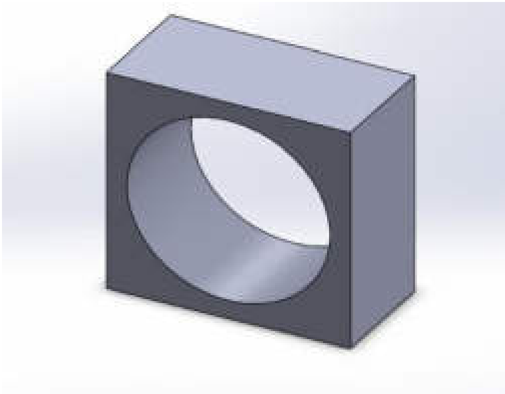
= 35.0275

Limit of No-Go Gauge = $35.0275^{+0.0025}$

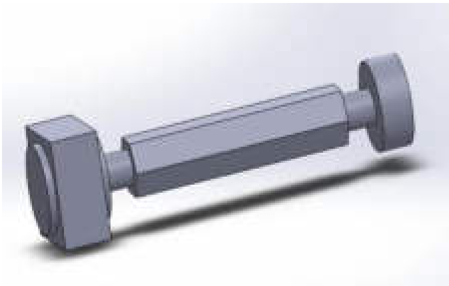
4.4 Plug Gauge Assembly



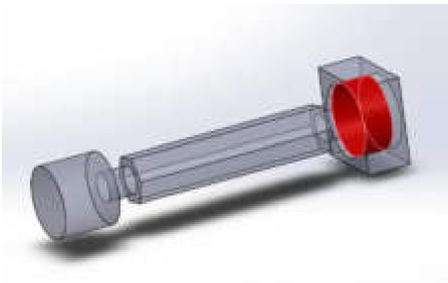
Plug gauge.



Hole



Clearance Fit.



Interference Fit

Fig.4.4 Plug Gauge Assembly

CHAPTER 5. AUTOCAD

5.1 Introduction To CAD (Computer Added Design)

CAD software is computer added design software.We can create a design with help of software in computer.CAD software is being widely used in areas such as, Concept design, Details part design, design, Assembly design, Thermal & structural analysis, Motion study & analysis etc.

5.2 Types Of The Software

5.2.1 Parametric Software

A parametric model contains information like dimensions, constraints, and relationships between various entities like edges, sketches and features. You can easily make changes to the design, and it updates and responds to those changes.
Example :- SolidWorks, Catia, free CAD, Creo parametric, fusion 360.

5.2.2 Non Parametric Software

A **non**-parametric model does not contain such relationships. It is essentially a "dumb model" which often happens when a CAD model is imported from another program. Dumb models can be modified, but they do not have the additional constraints and relationships to allow the update to affect other design elements.

5.3 Autocad Window

Application Button: This provide the user with file option like save, open and print.

Ribbon: This is a collection of tool panels representing groups of tools and features where you will be selecting tools to draw, edit or to perform other functions.

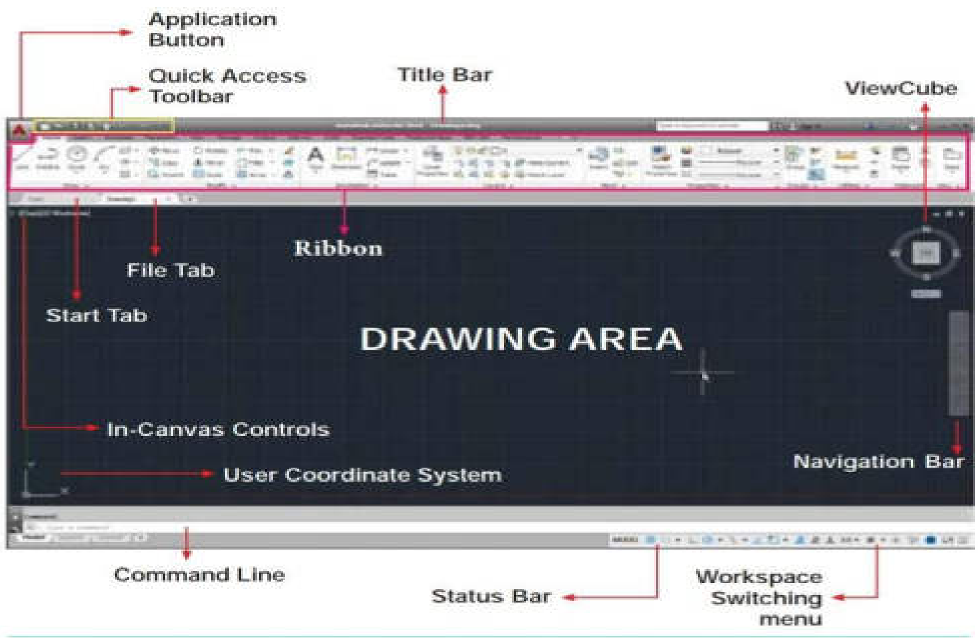


Fig: 5.1 Auto CAD Window

Drawing area: This is a virtual sheet or modelling environment where your designs appear. It is a boundless area on which designs are created on a 1:1 scale regardless of their actual life size. The drawing area is also called the canvas. In the default condition, the drawing area will have three icons on display.

i. The user coordinate system icon at the bottom left corner.

ii. The cross hairs or drawing cursor which may be at any position on the screen depending on whether the user has touched the mouse or not.

iii. The view cube at the top right comer. This is very useful in 3D drawing because it facilitates viewing the object from multiple directions.

Quick Access toolbar: This includes the basic file-handling functions that you find in virtually all windows application programs.

UCS: UCS stands for User Coordinate System. In the lower-left corner of the drawing area, there is L-shaped arrow. This is the UCS icon, which tells you your orientation in the drawing. This icon becomes helpful as you start to work with complex 2D drawings and 3D models. The X and Y arrows indicate the X- and Y-axes of your drawing.

Command Window: It's located just below the drawing area. As you type in commands on the command line, or pick commands on the ribbon panels, a message is displayed on the command window telling you what to do next.

Status Bar: The status bar is a thin strip of the AutoCAD window found between the command window and the taskbar. To the extreme left it carries the coordinate readout which indicates to the user the current position of the cursor. Towards the right next to the coordinate readout is the drawing aids panel.

5.4 Darw Command Tools

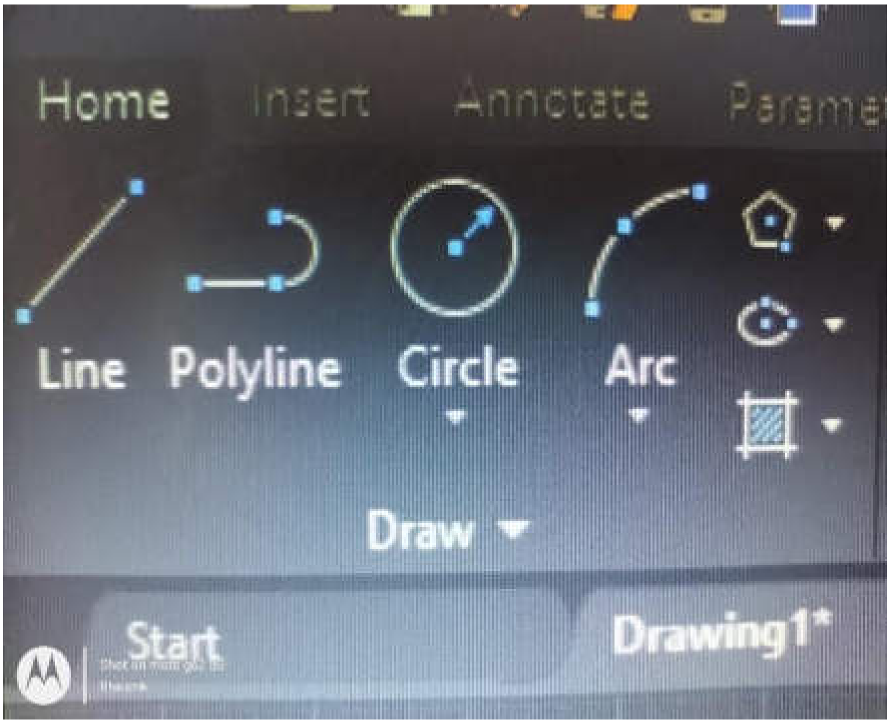
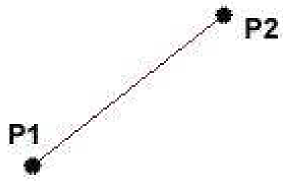


Fig: 5.2 Command Tool

Line: With the Line command you can draw a simple line from one point to another.

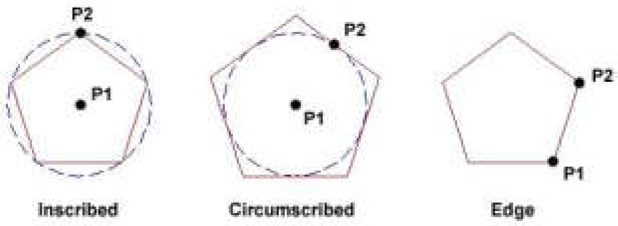
Construction Line: The construction line commands creates a line of infinite length which passes through two picked point.



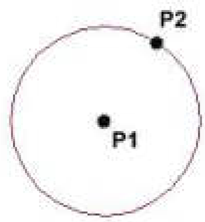
Polyline: The Polyline command is similar to the line command except that the resulting object may be composed of a number of segments which form a single object.

Rectangle: The Rectangle command is used to draw a rectangle whose sides are vertical and horizontal. The position and size of the rectangle are defined by picking two diagonal corners.

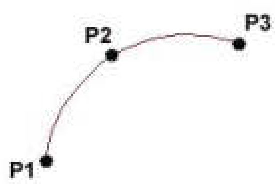
Polygon: The Polygon command can be used to draw any regular polygon from 3 sides up to 1024 sides. This command requires four inputs from the user. the number of sides, a pick point for the centre of the polygon, whether you want polygon inscribed or circumscribed and then a pick point which determines both the radius of this imaginary circle and the orientation of the polygon. The polygon command creates a closed polyline in the shape of the required polygon.



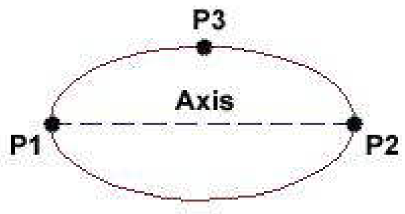
Circle: The Circle command is used to draw circles. There are a number of ways you can define the circle. The default method is to pick the centre point and then to ei o either pick a second point on the circumference of the circle or enter the circle radius at the keyboard.



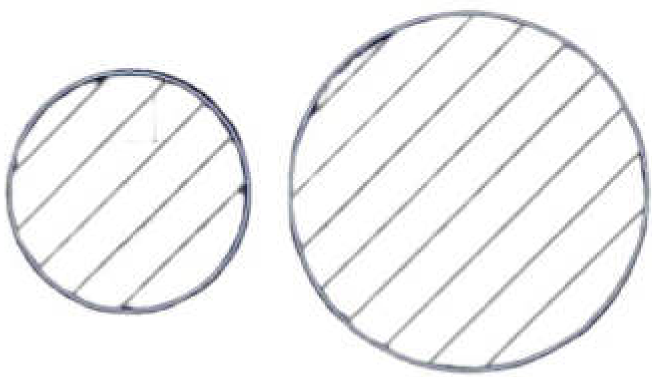
Arc: The Arc command allows you to draw an are of a circle. There are numerous ways to define an are; the default method uses three pick points, a start point, a second point and an end point.



Ellipse: The Ellipse command gives you a number of different creation options. The default option is to pick the two end points of an axis and then a third point to define the eccentricity of the ellipse.

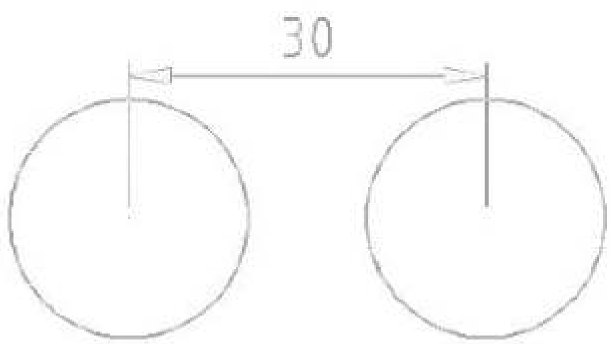


Hatch: Hatch is used to add shaded patterns to objects and shapes. You can pick: Pattern, Scale, Angle, Points.



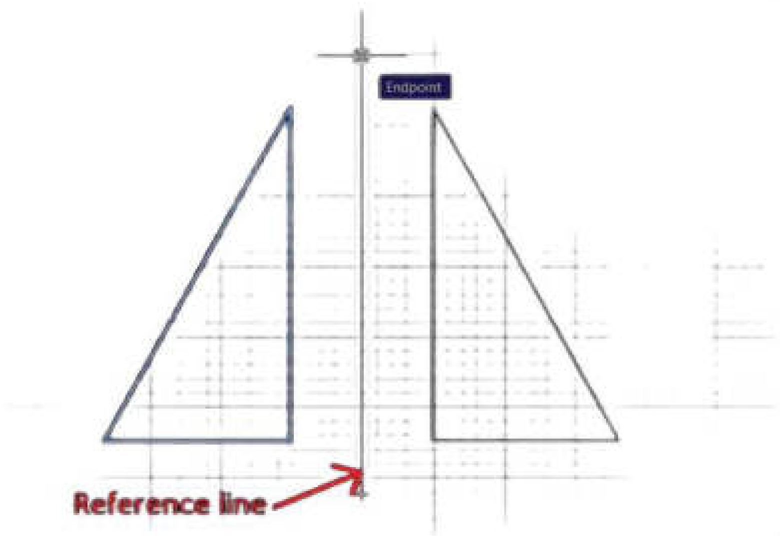
5.5 Modify Commands

Offset: Create a duplicate object parallel with the original object. If this object is a Polyline or a Circle, the duplicate shape will be transformed inwards or outwards.

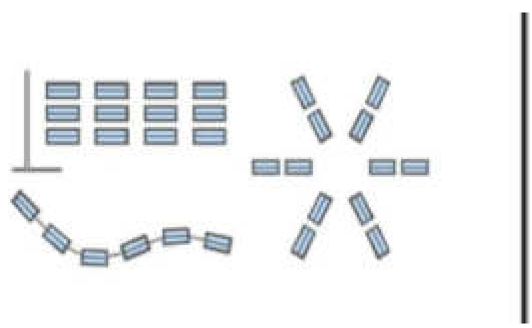


Copy: Copy's one or more objects.

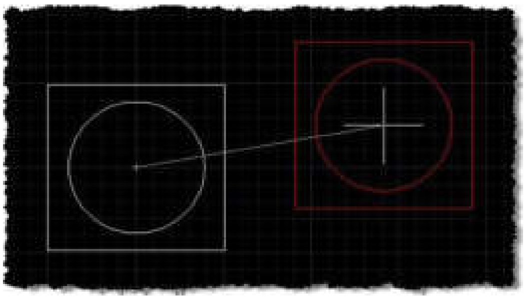
Mirror: Create a mirror image of an object. It is useful for creating symmetrical objects because you can quickly draw half the object and then mirror it instead of drawing the entire object.



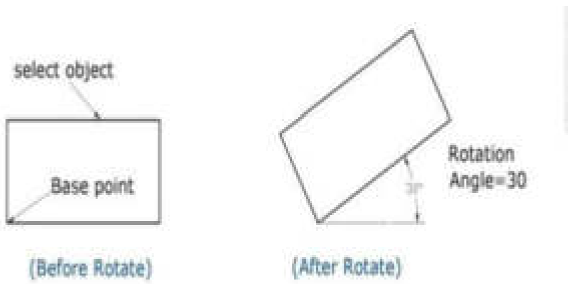
Array: Create copies of objects in a rectangular or polar pattern. This is especially useful when you need to duplicate several objects at the same distance from each other. For rectangular arrays, you control the number of rows and columns and the distance between each. For polar arrays, you control the number of copies of the object and whether the copies are rotated.



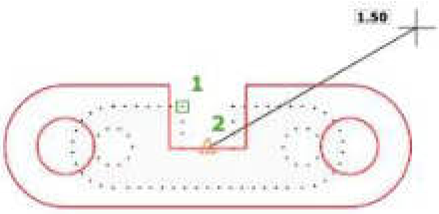
Move: Moves one or more objects.



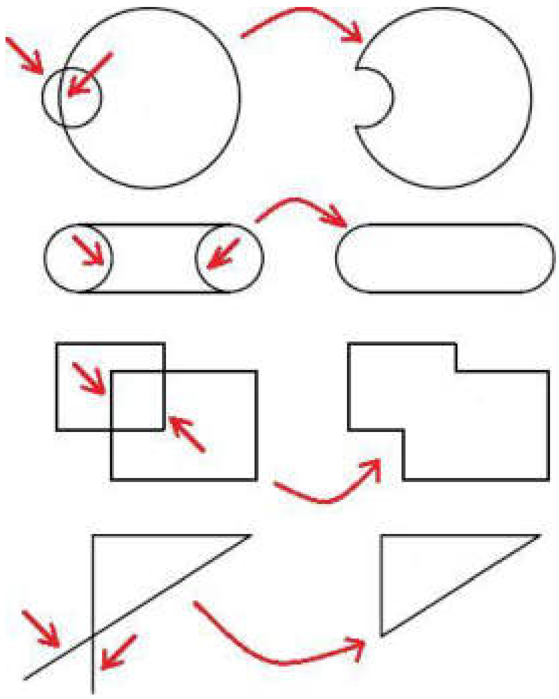
Rotate: You can rotate objects with an absolute or relative angle. When using an absolute angle: Specify the base point and then specify the rotation angle.



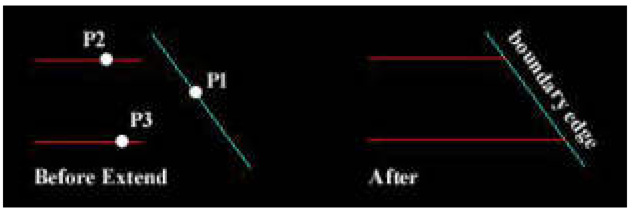
Scale: A scale factor greater than enlarges the object. It is also possible to scale an object using a reference object. This method scales the object equally in all directions.



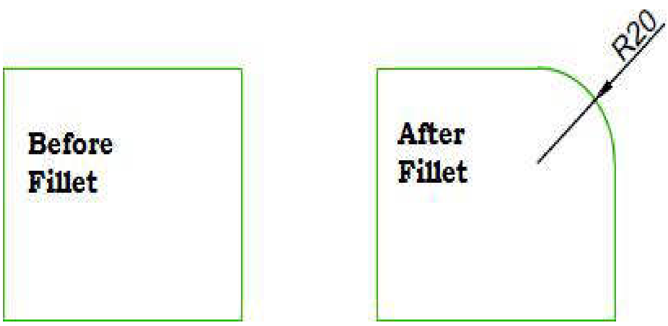
Trim: With the trim option objects can be shortened or lengthened with the edges of other objects. Objects can exactly be fitted between these objects.



Extend: With the extend option you can shorten or lengthen objects to meet the edges of other objects. For example a line can be exactly fitted between objects. Extending an object works in the same way as trimming.

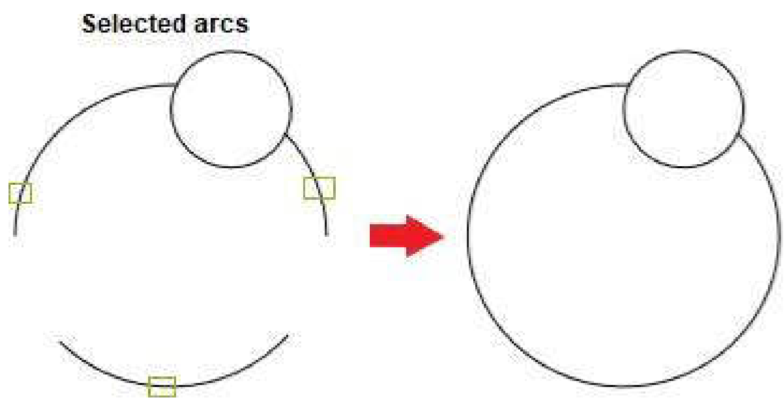


Fillet: You can use the fillet tool to connect two objects with an are with a specified radius. The inside corner is called a fillet and an outside corner is called a round.



Chamfer: Chamfer is almost identical to fillet, but it will make a straight line instead of an arc.

Join: You can use the join option to combine similar objects into one single object. It is also possible to create complete circles from arrays.



5.6 Dimensions Toolbar

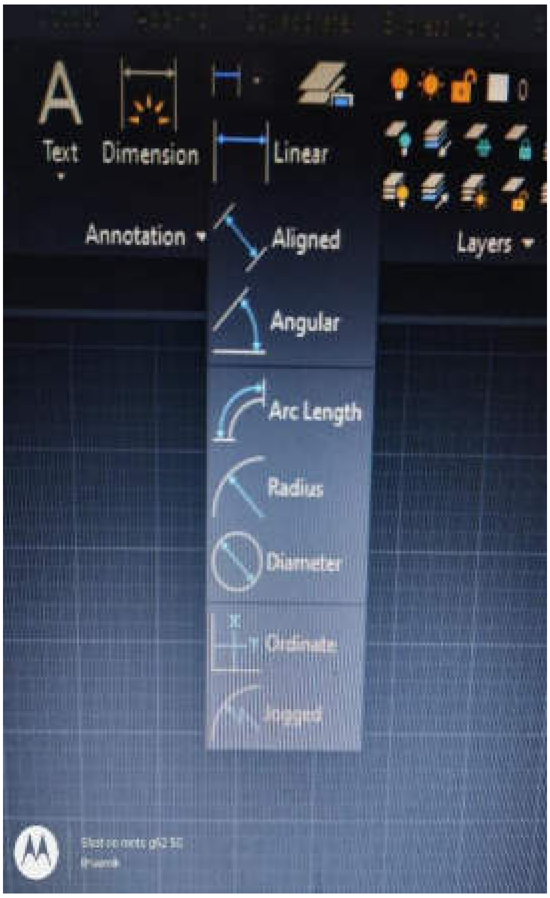


Fig: 5.3 Dimensions Toolbar

Linear Dimensions:- Linear dimensions can be horizontal, vertical, or aligned, You can create an aligned, horizontal, or vertical dimension with the DIM command depending on how you move the cursor when placing the text.

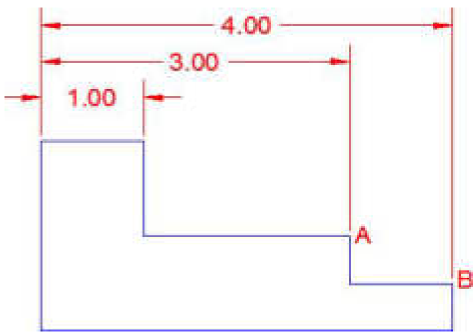


Fig: 5.4 Linear Dimensions

Radial Dimensions :- A radial dimension measures the radius or diameter of arcs and circles with an optional centreline or centre mark.

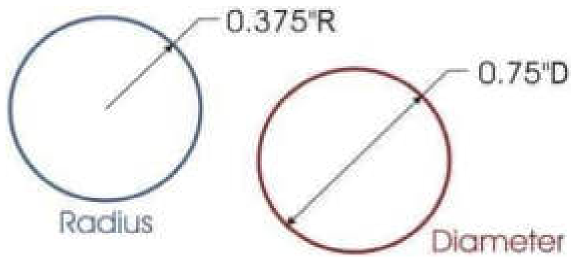


Fig: 5.5 Radial Dimensions

Angular Dimensions :- Angular Dimensions measures the angle between two selected geometric object or three points.

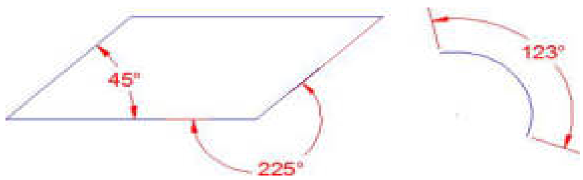


Fig: 5.6 Angular Dimensions

Ordinate Dimensions - Ordinate dimensions are used to locate the X or Y coordinate value of a point. Click point 1 to identify the point location, click point 2 to locate the dimension line.

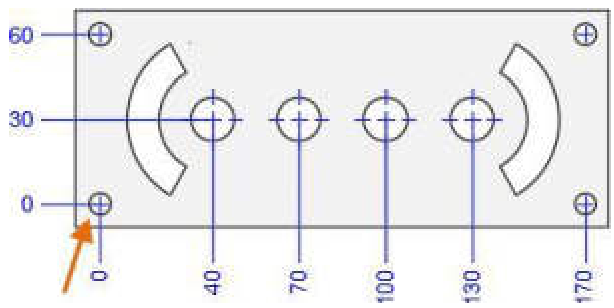


Fig: 5.7 Ordinate Dimensions

Continued Dimensions - Continued dimensions, also called chained dimensions, are multiple dimensions placed end-to-end.

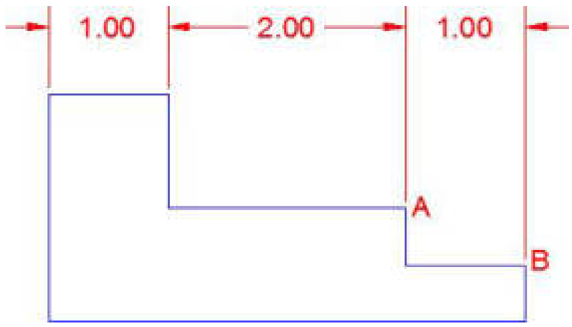


Fig: 5.8 Continued Dimensions

Baseline Dimension:- Baseline dimensions are multiple dimensions with offset dimension lines measured from the same location.

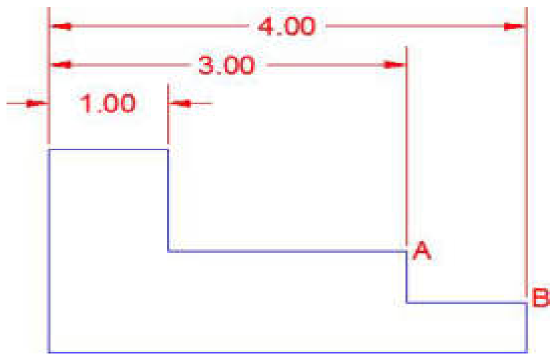


Fig: 5.9 Baseline Dimensions

5.7 2D Sketch Example

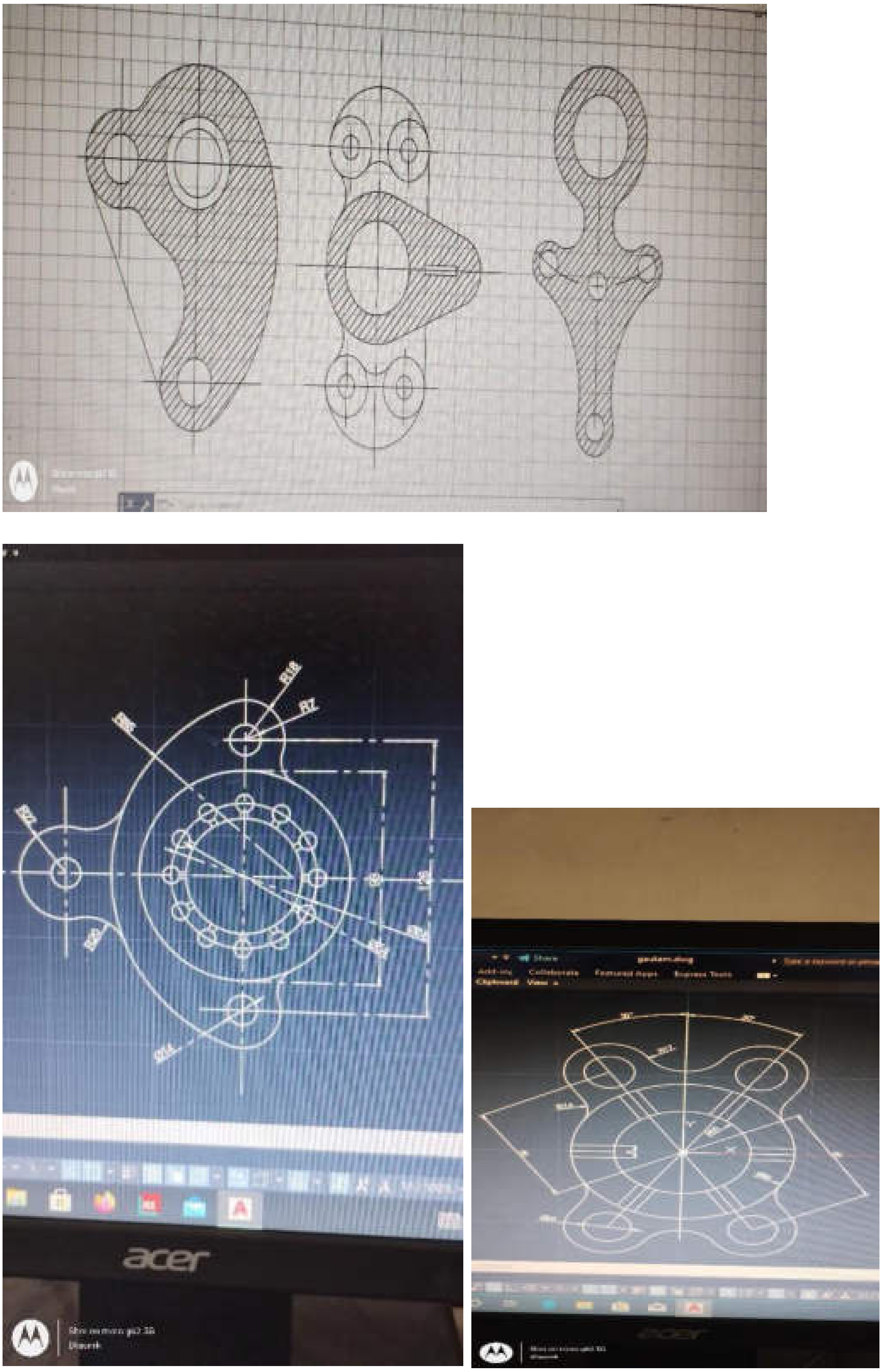
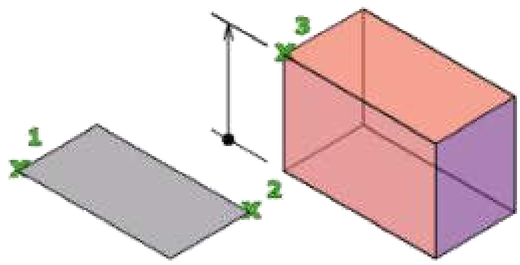


Fig: 5.10 2D Sketch

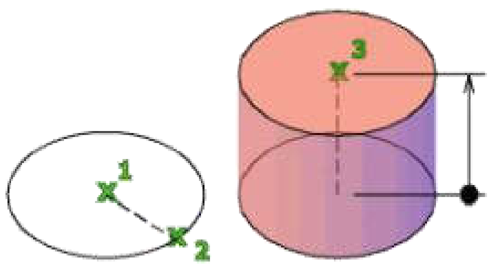
5.8 3D Modeling

3D solid primitives are standard shapes which are provided among the ribbon options on the 3D modelling workspace. They include box, wedge, cone, cylinder, sphere, pyramid and torus. The principles of drawing them are similar.

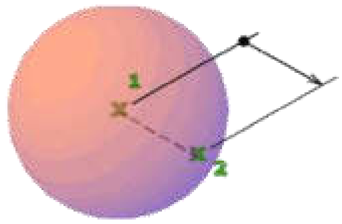
Box :- Box command on the toolbar modelling is used to draw 3D models such as cubes and block. Creates a box with sides of equal length.



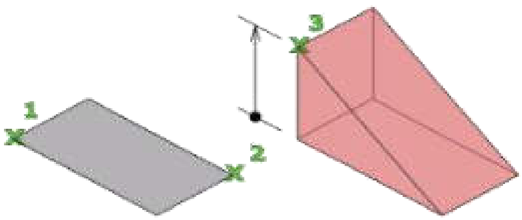
Cylinder :- The cylinder was created using a centre point (1), a point on the radius (2), and a point for the height (3). The base of the cylinder is always on a plane parallel with the work plane.



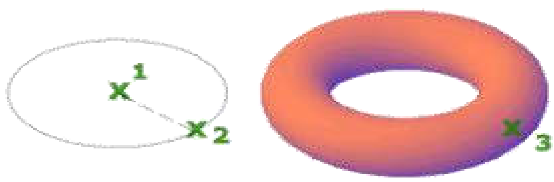
sphere :- Specifies the center point of the sphere. When you specify the center point, the sphere is positioned so that its central axis is parallel to the Z axis of the current user coordinate system (UCS). Defines the radius or diameter of the sphere.



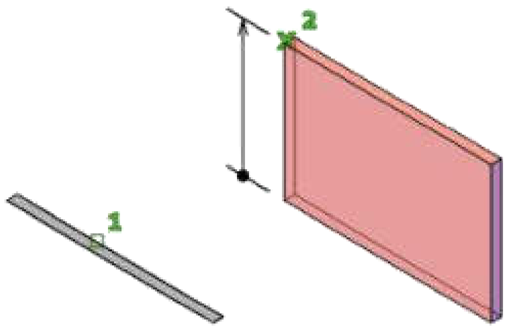
Wedge :- The direction of the taper is always in the positive X-axis direction of the UCS.



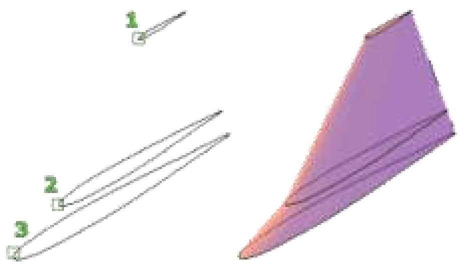
Torus :- Specifies the centre point of the torus. When you specify the center point, the torus is positioned so that its central axis is parallel to the Z axis of the current user coordinate system (UCS). Defines the radius of the torus and then define the radius of the tube.



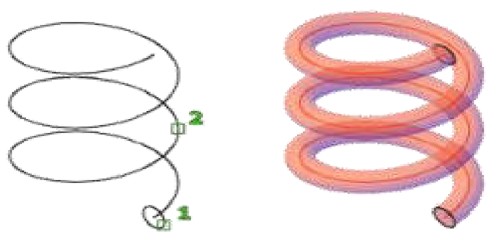
Extrude :- Objects can be extruded orthogonally from the plane of the source object, in a specified direction, or along a selected path. You can also specify a taper angle.



Loft :- Creates 3D solid or surface in the space between several cross sections. The cross sections define the shape of the resulting solid or surface. You must specify at least two cross sections.



Sweep :- Creates a 3D solid or 3D surface by sweeping a 2D object or subobject along an open or closed path.



Revolve :- Creates a 3D solid or surface by sweeping an object around an axis. You cannot revolve objects contained within a block or objects that will self-intersect. REVOLVE ignores the width of a polyline and revolves from the center of the path of the polyline.

5.9 3D Drawing And Layout

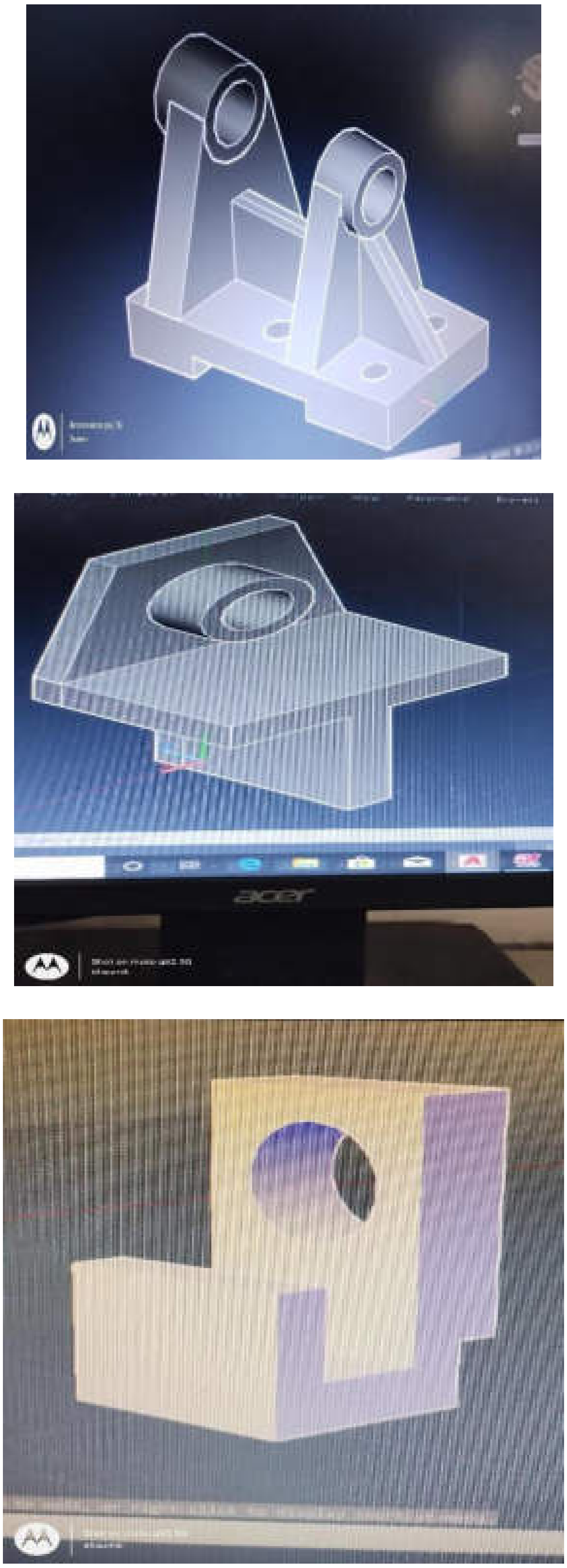


Fig: 5.11 3D Drawing

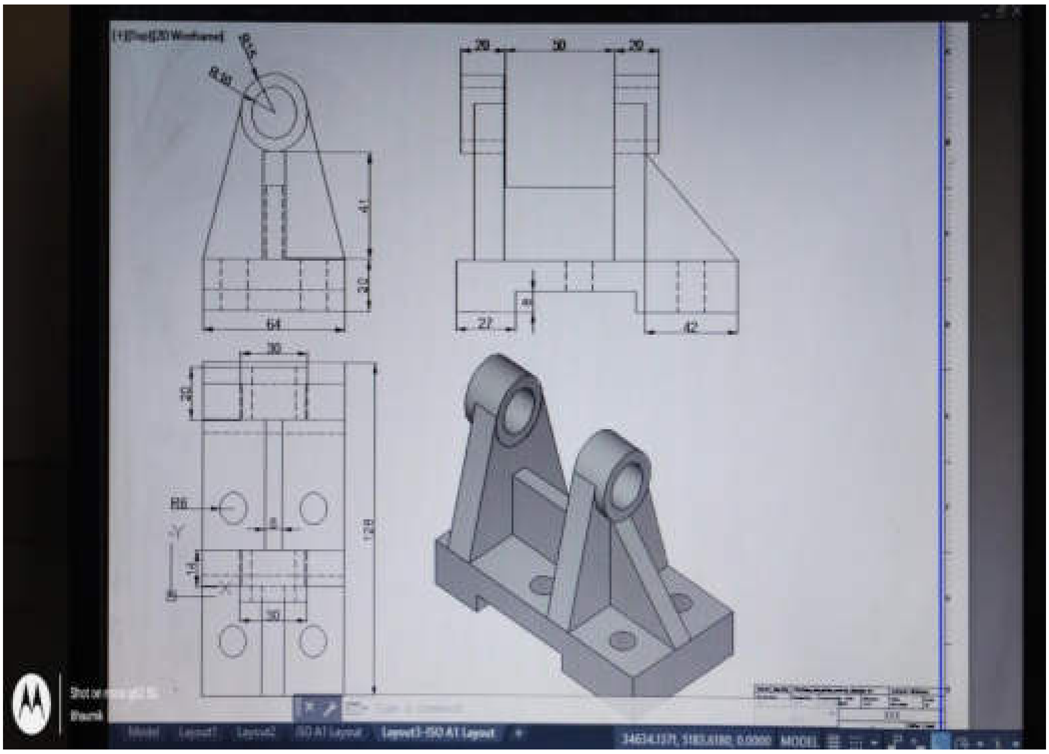
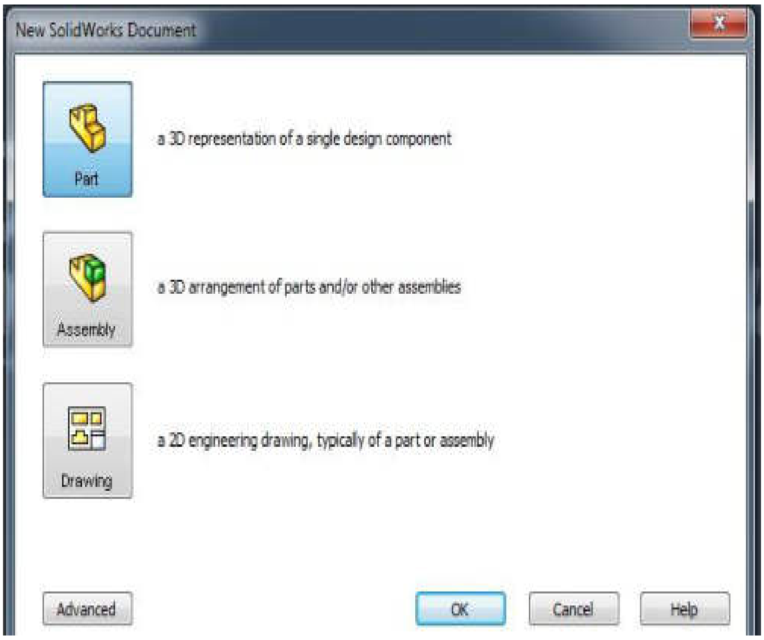


Fig: 5.12 Model Layout

CHAPTER 6 SOLIDWORKS

6.1 Introduction

SolidWorks is a solid modelling computer-aided design (CAD) and Computer-Aided Engineering (CAE) computer program that runs on Microsoft Windows. SolidWorks is published by Dassault Systems.



Parts: 2D design (Sketch), 3D design (Features), Part design consider in the part design section.

Assemblies: Assembling of two or more than two parts consider in this section.

Drawings: Designing with standards is consider in the drawing section.

6.2 Solidworks User Interface

The interface is native Windows interface, and such behaves in the same manner as other Windows applications.

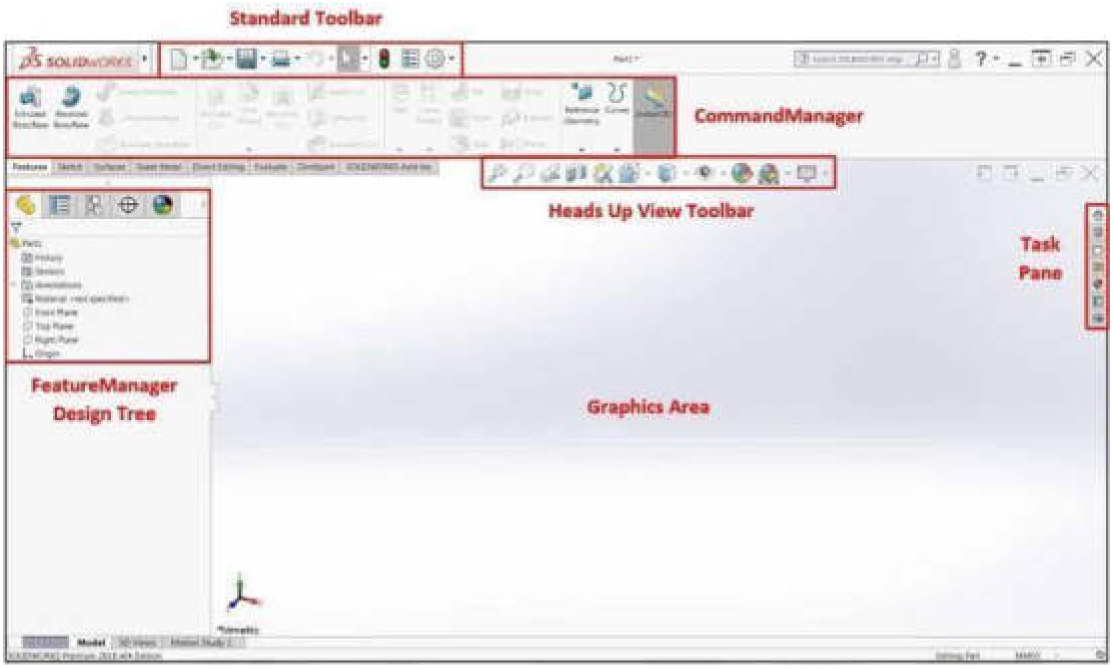


Fig: 6.1 SolidWorks User Interface

Standard Toolbar

The Standard Views toolbar provides tools to: Orient the part, assembly, or sketch in one of the pre-set standard views.

Command Manager

The Command Manager is a context-sensitive toolbar that dynamically updates based on the toolbar you want to access. By default, it has tool bars embedded in it based on the document type. When you click a tab below the Command Manager, it updates to show that toolbar.

View Toolbar

The Standard Views toolbar provides tools to: Orient the part, assembly, or sketch in one of the pre-set standard views.

Graphics Area

The graphics area displays and lets you manipulate parts, assemblies, and drawings.

Feature Manager Design Tree

The Feature Manager design tree on the left side of the SOLIDWORKS window provides an outline view of the active part, assembly, or drawing. This makes it easy to see how the model or assembly was constructed or to examine the various sheets and views in a drawing.

Task Pane

The SOLIDWORKS Task Pane provides access to SOLIDWORKS resources, libraries of reusable design elements, views to drag onto drawing sheets, appearance utilities, and other useful items and information.

6.3 THE VIEW TOOLBAR

The View toolbar provides took for manipulating Solid Works parts, drawings, and assemblies.

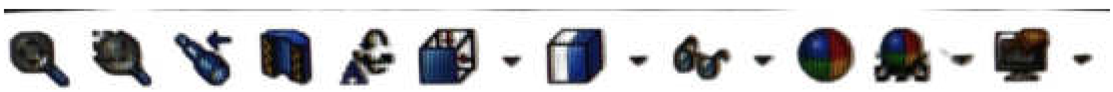


Fig: 6.2 View Toolbar

Zoom To Fit: Rescales the view so the entire part, drawing, or assembly is visible.

Zoom To Area: Zooms in on a portion of the view that you select by creating a Bounding box.

Rotate View: Dynamically turns the part or assembly image around a view centre. As you move the mouse.

Pan: Dynamically moves the image. Press and hold the left mouse button while moving the cursor around on the screen.

Perspective: Displays a perspective view of the model. A perspective view is the most normal view as seen by the eye or a camera. Parallel lines recede into the distance to a vanishing point. Perspective may be used in combination with any of the view modes.

6.4 Sketching

Sketching is the act of creating 2-dimensional profile comprised of wire frame geometry. Sketches are used for all sketched feature in Solid Works.
Sketch Entities/Geometry: Solid Works offers a rich variety of sketch took for creating profile geometry.

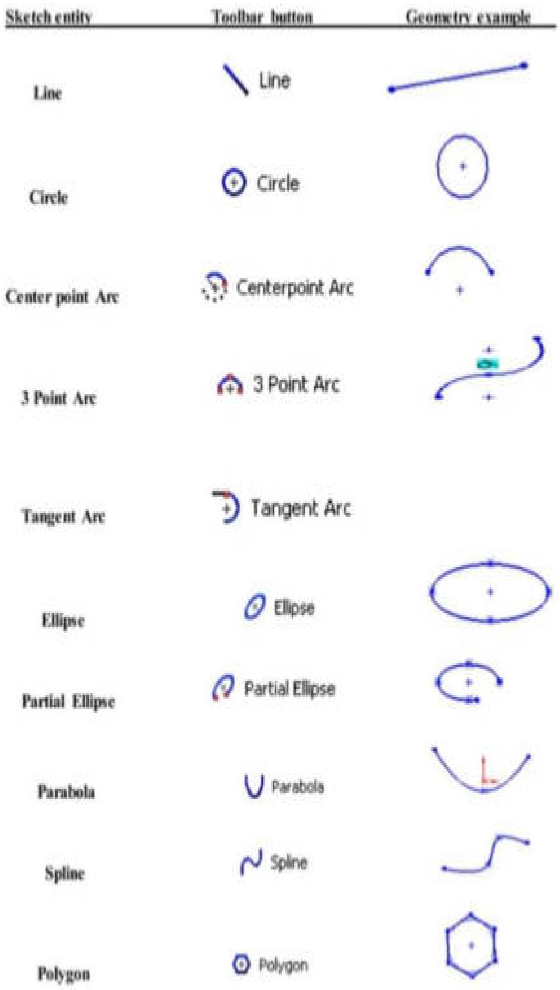


Fig: 6.3 Sketch Command

6.5 Status Of a Sketch

6.5.1 Under Constrained

This usually appears when first drawnAdditional dimensions or relations are required. Under defined sketch entities are blue (by default).

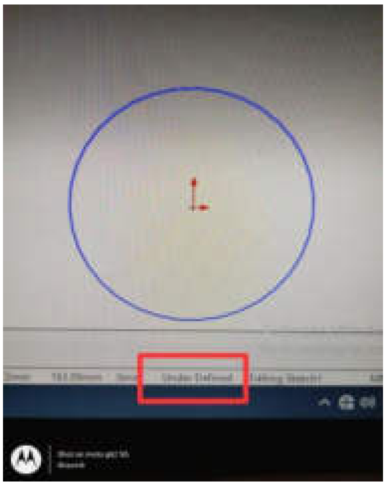


Fig: 6.4 Under Constrained Sketch

6.5.2 Fully Constrained

When more constraints and dimensions are added to the sketch- the sketch Become completely defined.No additional dimensions or relationships are required. Fully defined sketch entities are black (by default).

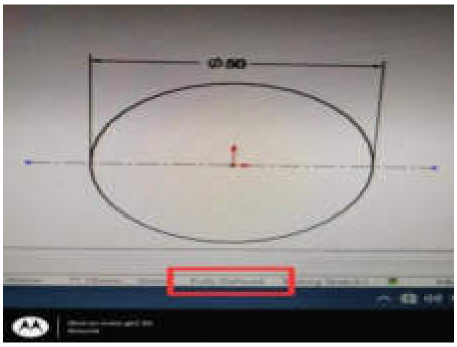


Fig: 6.5 Fully Constrained Sketch

6.5.3 Over Constrained

Adding any dimension to fully defined Would serve to over define the sketch. Comas conflicting dimensions or relations, or both. Over defined sketch entities are yellow (by default).

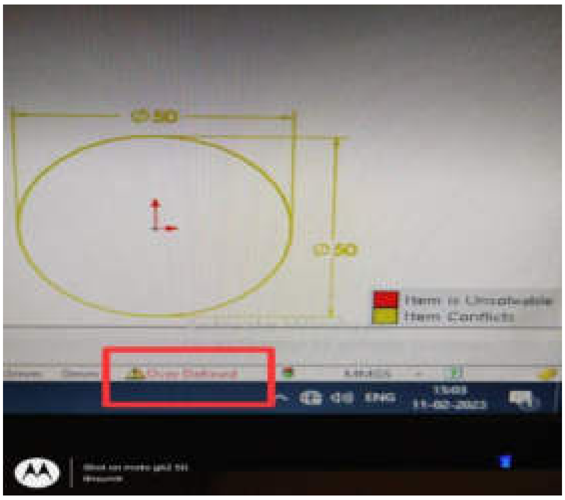


Fig: 6.6 Over Constrained Sketch

6.6 View Display Style

You can display drawing views in the following modes, from cyber the View toolbar or in the view Property Manager.

Fig: 6.7 Display Style Tools

You can display drawing views in the following modes, from cyber the View toolbar or in the view Property Manager:

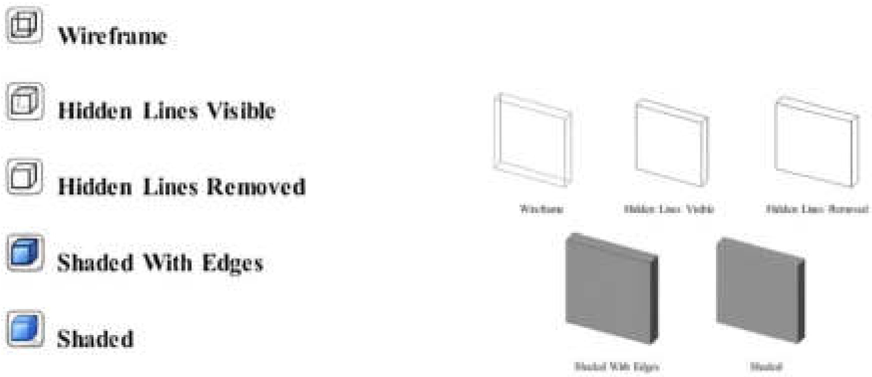
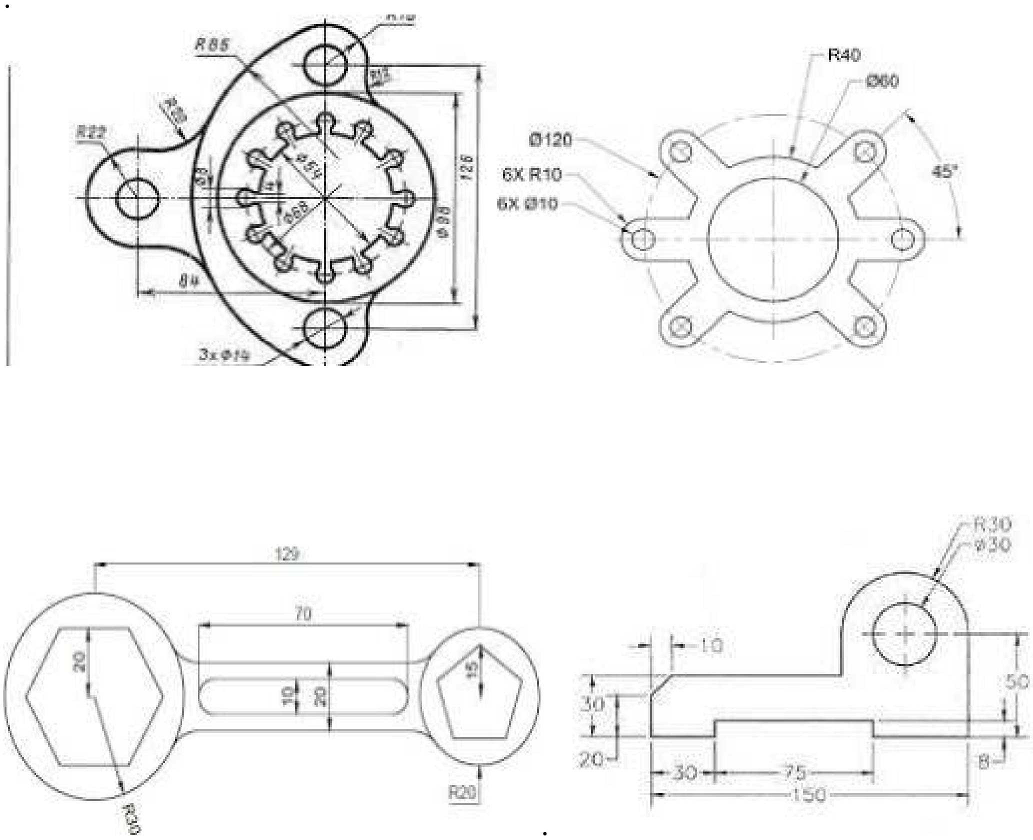


Fig: 6.8 Display Styles

6.7 2D Sketch Example

.



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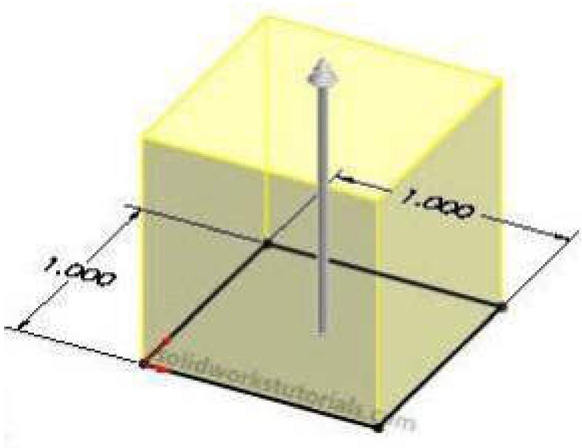
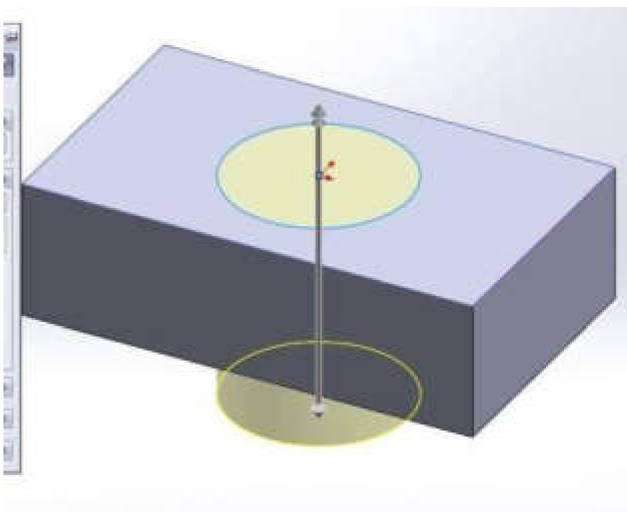
6.8 Creating Features

Features are the individual stupes that, when combined, make up the part. You can abo add same types of features to assemblies.

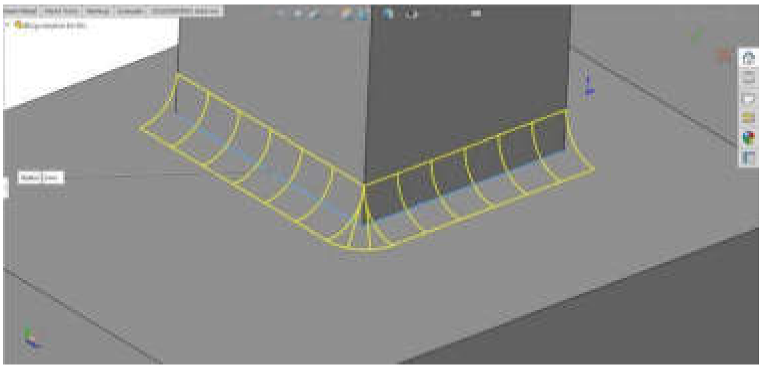
Extrude: Extrude extends the sketched profile of a feature in one or two directions as either a thin Feature or a sold feature. An exarade operation can other add material to a part (as a buse or boss) or remove material from a part in a cut or hole).



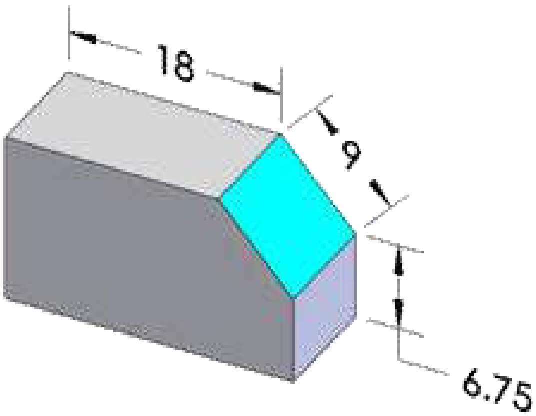
Cut : A cut is a feature which removes material from a part or an assembly.
A cut may be created by Extrude, Sweep, Revolve, or Left (from one or more sketches), or Thicken or cut With Surface.



Fillet Round :- Fillet Round creates a rounded internal or external face on the part. You can fillet all edges of a fice, selected sets of fices, selected edges, or edge loops.

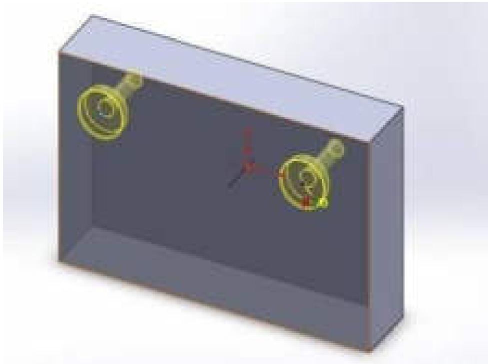


Chamfer :- Chamfer creates a bevelled edge on the selected edges and/or faces.



Draft :- Draft tapers faces using a specified angle to selected faces in the model, to make a moulded part easier to remove from the mould. You can insert a draft in an existing part or draft while extruding a feature. You can draft using either a neutral plane or a parting line.

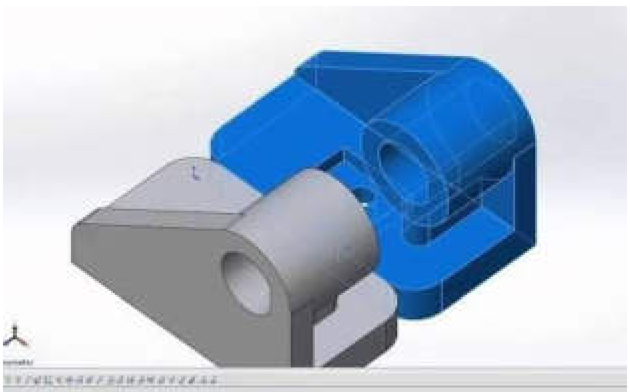
Hole :- Hole creates various types of hole features in the model. You place a hole on a face, then specify is location by dimensioning it afterwards.



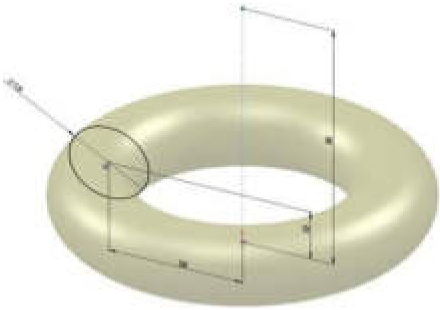
Simple hole :- Places a circular hole of the depth you specify. Wizard Creates holes with complex profes, such as Counter bore

Countersunk hole :- it is best to create holes near the end of the design process. This helps you avoid inadvertently adding material inside an existing hole.

Mirror Feature :- Mirror Feature creates a copy of a feature (or features), mirrored about a plane. You can either use an existing plane or create a new one. If you modify the original feature, the mirrored copy is updated to reflect the changes.



Revolved features :- Revolved Bass/Base -material added by rotating the profiles about a centreline.

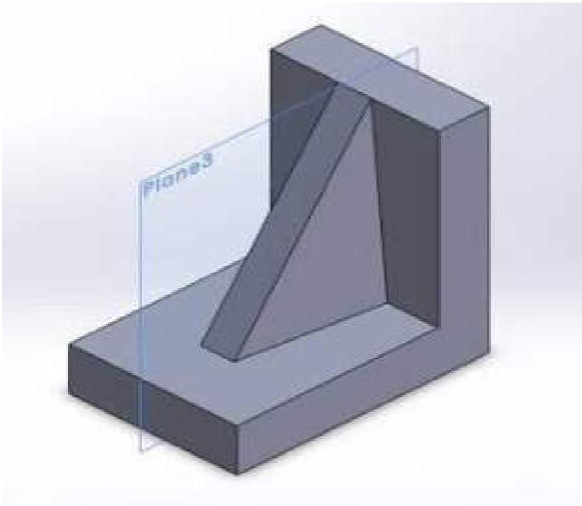


Swept :- Swept Boss/Base -material added by sweeping a profile along the path.

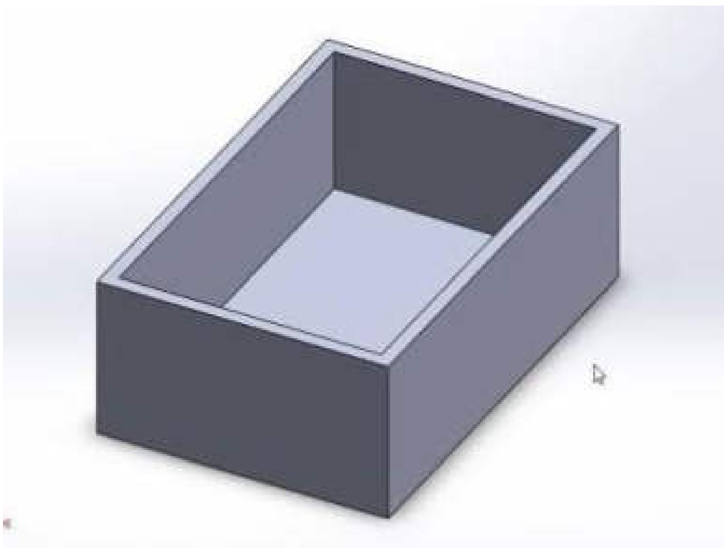
Cut Sweep-material removed by sweeping a profile along the path.

Lofted :- Loft creates a feature by making transitions between profiles. A loff can be a base, boss, cut, or surface. You create a loft wing two or more profiles. Only the first, last, or first and last profiles can be points. All sketch entities, including guide curves and profiles, can be contained in a single 3D sketch.

Rib :- Rib is a special type of extruded feature created from open or closed sketched counter. It adds material of a specified thickness in a specified direction between the contour and an existing part. You can create a rib using single or multiple sketches.



Shell :- Shell tool hollows out a part, leaves open the faces you select, and creates thin walled features on the remaining faces. If you do not select any fice on the model, you can shell a solid part, creating a closed, hollow model. You can also shell a model using multiple thicknesses.



6.9 3D MODEL PRACTICE

Fig: 6.9 3D Model Work

CHAPTER 7 CNC MACHINING

7.1 Introduction

CNC :- Computer Numerical Control CNC Machining is a subtractive Manufacturing process tools to make a custom designed part. A computer user programing to direct machine tools to subtract material. The CNC meaning can be defined as a process in which pre-programmed computer software dictates the movement of factory machinery and tools. As a result, manufacturers can produce parts in less time, reduce waste and eliminate the risk of human error.

Fig: 7.1 CNC Turning Machine

7.2 CNC Machining part

Fig: 7.2 CNC Machine Part

MCU
HEADSTOCK
CHUK
TOOL POST
BED
TAILSTOCK

Machine Control Unit
It's brain of CNC machine. The CNC MCU complete all of the CNC machining controlling operation.

Headstock
Due to the fact that the workpiece are secured to the headstock
.
Chuck
Chuck is positioned on the main axis, the workpiece are room to fix.

Tool Post
Tool posts provide a base for securing and positioning tool post holders.

Bed
These components carry the whole machine's waight, Necessities mounting all other part.

Tailstock
A tailstock enables a CNC machine to precisely and safely process shaft-type work pieces.

7.3 Common CNC Machining Operation

7.3.1 CNC Turning

CNC turning is a manufacturing process that involves holding bars of material in a chuck and rotating them while feeding a tool to the piece to remove material until the desired shape is achieved.

Turning Operation

Boaring

Boaring is the process of enlarging a hole that has already been drilled (or cast) by means of a single-point cutting tool.

Fig: 7.3 Boaring Operation

Facing

Facing is the process of removing material from the end and/or shoulder of a workpiece, using a special tool to produce a smooth surface perpendicular to the rotational axis of the workpiece.

Fig: 7.4 Facing Operation

Grooving

Grooving is a turning operation that creates a narrow cut, a "groove" in the workpiece.

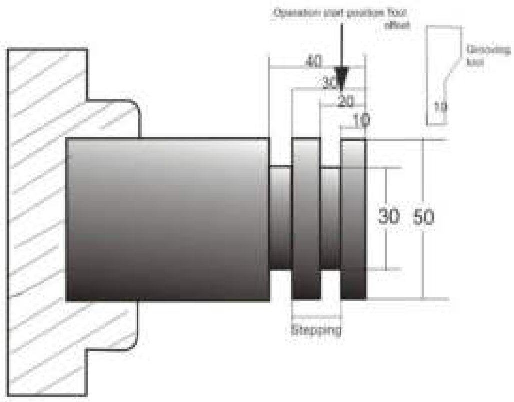


Fig: 7.5 Grooving Operation

Turning Example

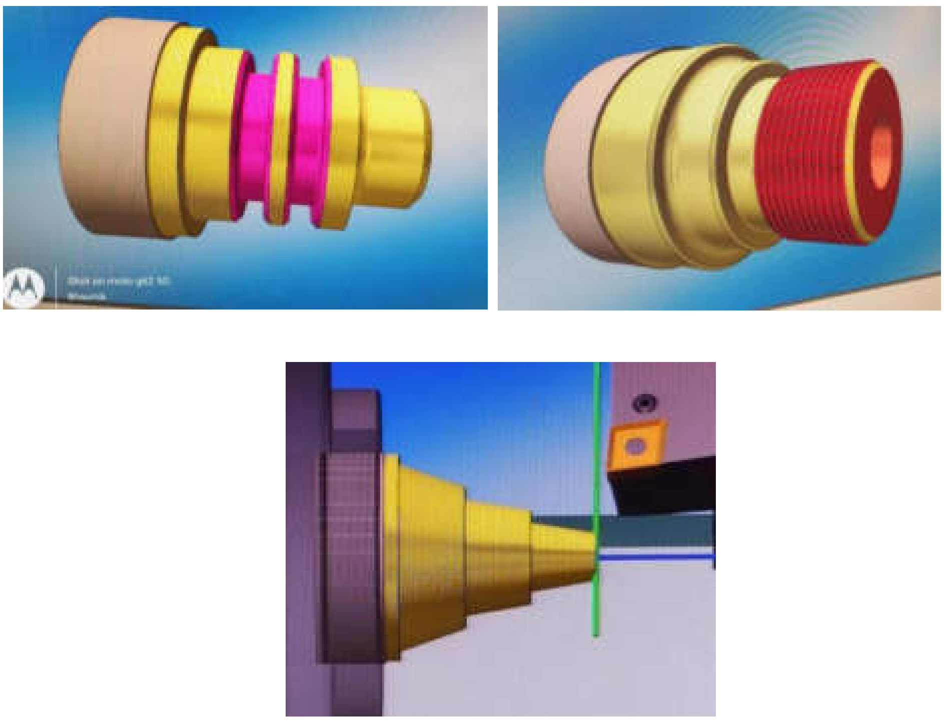


Fig: 7.6 Turning Example

Fig: 7.7 CNC Turning Parts

7.3.2 CNC Milling

Using computerized controls and rotating cutting tools, CNC milling removes material from the workpiece to create a finished product that meets the required specifications.

Milling Operation

Face Milling

Face milling is a machining process in which the milling cutting is placed perpendicular to the workpiece.

Fig: 7.8 CNC Milling

Peripheral Milling

Peripheral milling is a machining process in which the milling cutter is placed parallel to the workpiece.

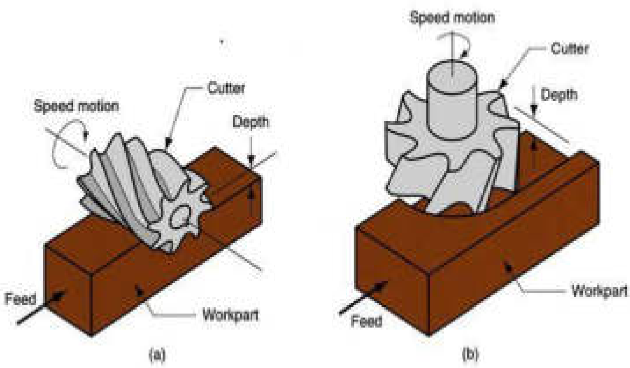


Fig: 7.9 Peripheral Milling

Milling Example

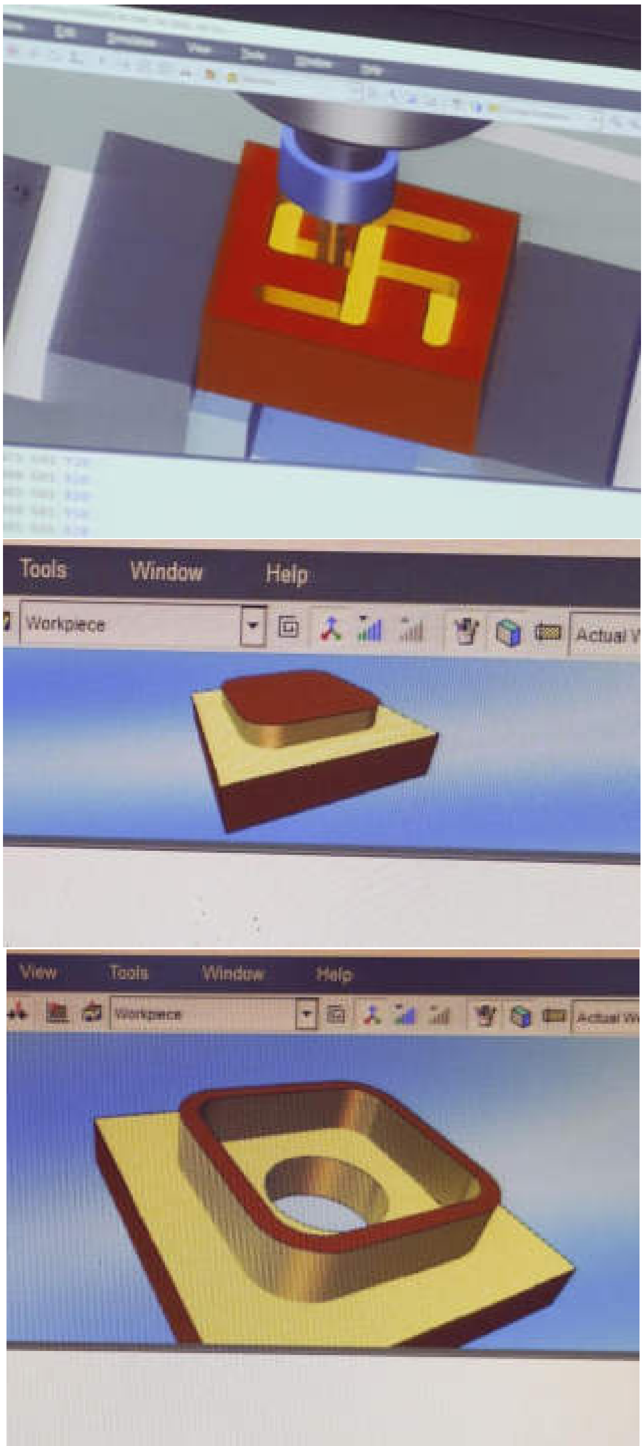


Fig: 7.10 Milling Example

CONCLUSION

In the internship, I learnt about the design process of the plastic mould, press Tool and operating of CNC machining like turning and milling, different types of Gauges and software like AutoCAD and Solidworks.wherein overall summarized applications of all these concepts learnt, have been covered up. With this internship coming to an end, I seek my vision to explore more in this domain and get to know more about the industrial field as this internship has made me learn a lot many things and dynamics taking place at production as well as administration level.

REFFERANCE

1) Injection Mould Design - by R.G.W. PYE

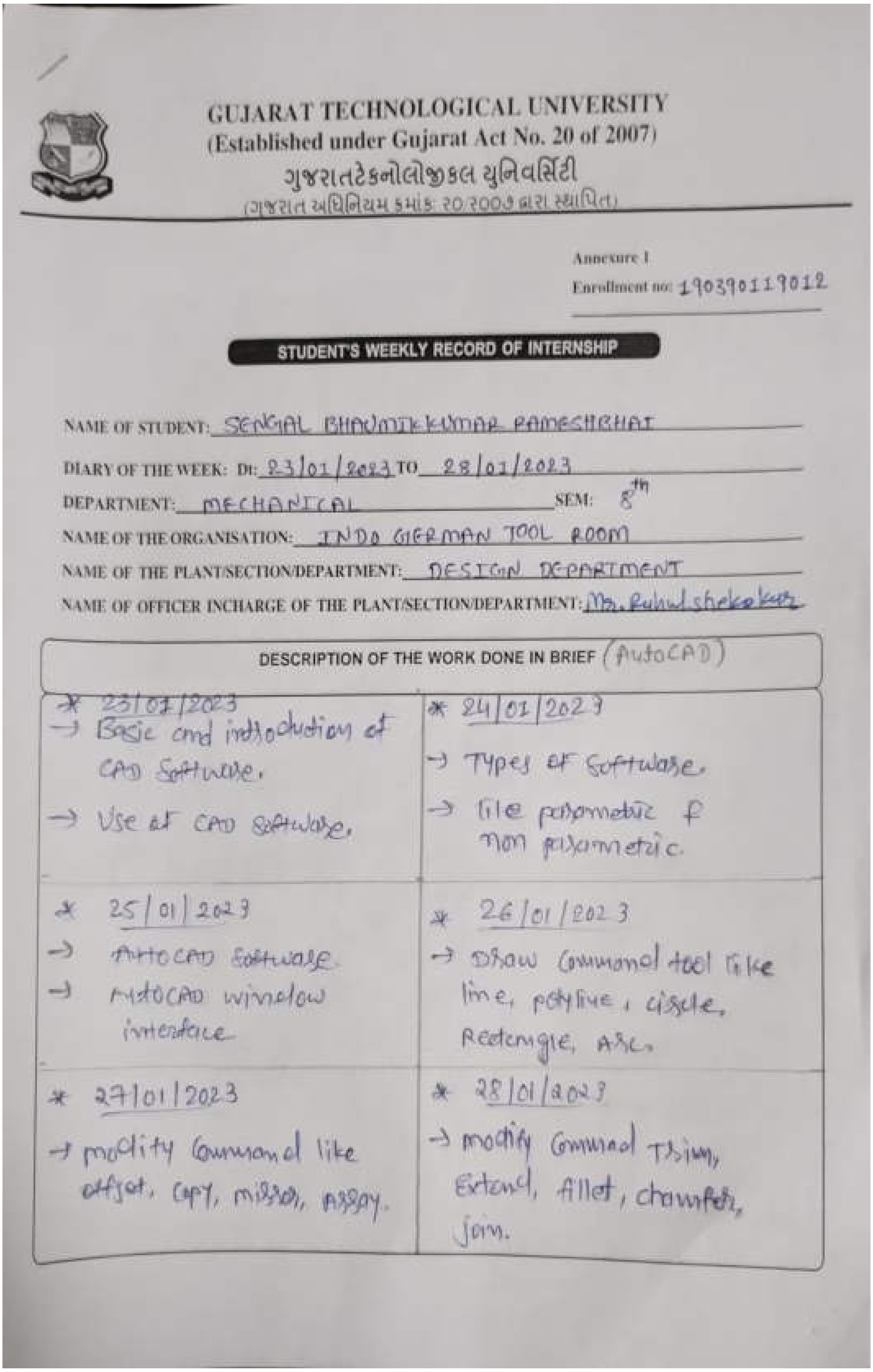
2) Press Tool Design and Construction - by P.H. JOSHI

3) Wikipedia

4) Indo German Tool Room Prospectus.

APPENDIX

Annexure 1



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(ગુજરાત અધિનિયમ ક્રમાંક: ૨૦/૨૦૦૭ દ્વારા સ્થાપિત)

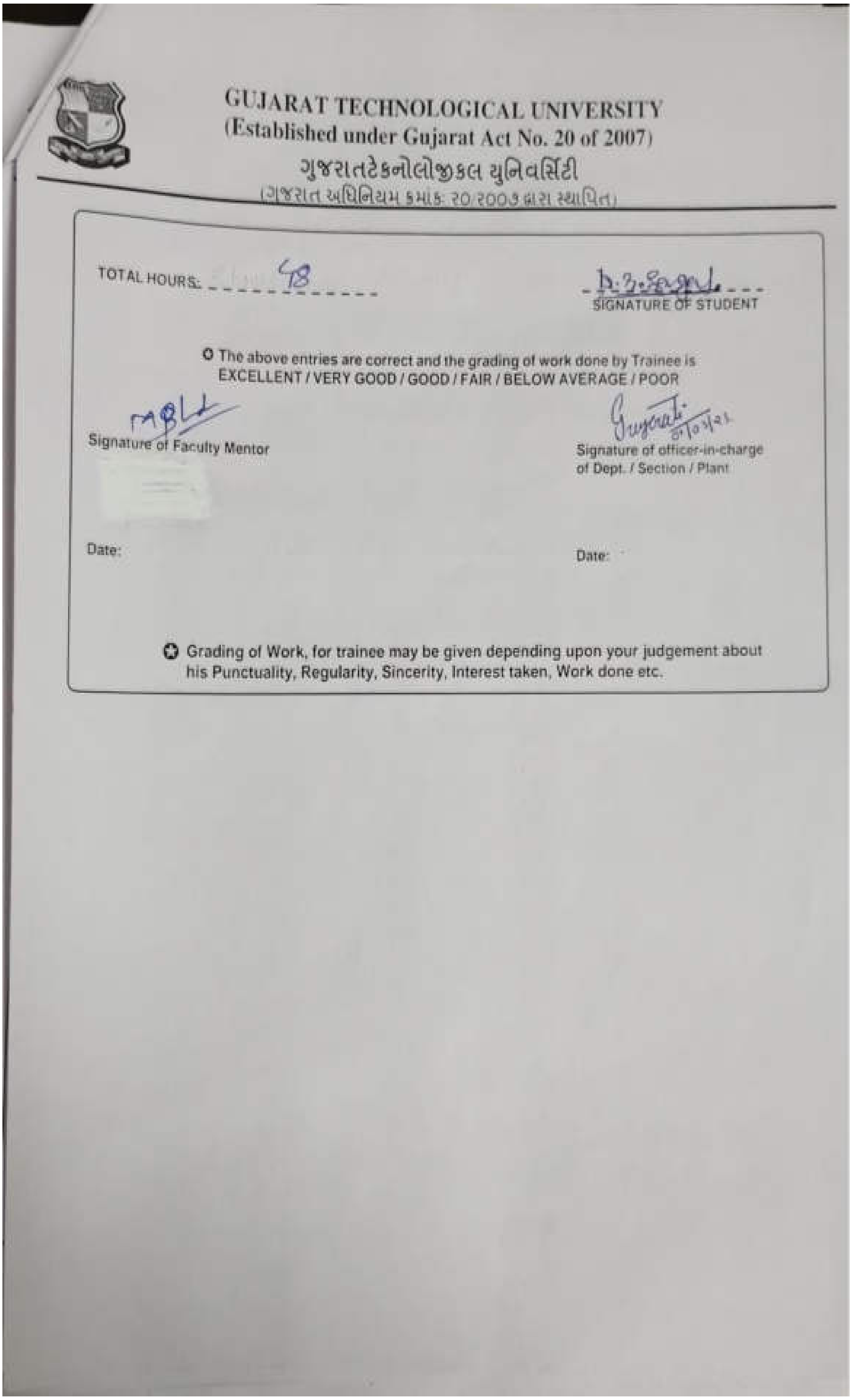
Annexure I
Enrollment no: 190390119012

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: SENGAL BHAUMIKKUMAR RAMESHBHAI
DIARY OF THE WEEK: Dt: 23/01/2023 TO 28/01/2023
DEPARTMENT: MECHANICAL SEM: 8th
NAME OF THE ORGANISATION: INDO GERMAN TOOL ROOM
NAME OF THE PLANT/SECTION/DEPARTMENT: DESIGN DEPARTMENT
NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT: Mr. Rahul shekokar

DESCRIPTION OF THE WORK DONE IN BRIEF (AutoCAD)

* 23/01/2023 → Basic and introduction of CAD Software. → Use of CAD Software.	* 24/01/2023 → Types of Software. → file parametric & non parametric.
* 25/01/2023 → AutoCAD Software. → AutoCAD window interface	* 26/01/2023 → Draw command tool like line, polyline, circle, Rectangle, Arc.
* 27/01/2023 → modify command like offset, copy, mirror, Array.	* 28/01/2023 → modify command Trim, Extend, fillet, chamfer, join.



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(ગુજરાત અધિનિયમ ક્રમાંક: ૨૦/૨૦૦૭ દ્વારા સ્થાપિત)

TOTAL HOURS: 48

SIGNATURE OF STUDENT

The above entries are correct and the grading of work done by Trainee is
EXCELLENT / VERY GOOD / GOOD / FAIR / BELOW AVERAGE / POOR

Signature of Faculty Mentor

Signature of officer-in-charge of Dept. / Section / Plant

Date:

Date:

Grading of Work, for trainee may be given depending upon your judgement about his Punctuality, Regularity, Sincerity, Interest taken, Work done etc.

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(ગુજરાત અધિનિયમ ક્રમાંક: 20/2007 દ્વારા સ્થાપિત)

Annexure X 2
Enrollment no: 190390119012

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: SENGHAL BHAUMIKKUMAR RAMESHBHAI

DIARY OF THE WEEK: Dt: 30/01/2023 TO 04/02/2023

DEPARTMENT: MECHANICAL SEM: 8th

NAME OF THE ORGANISATION: INDO GERMAN TOOL ROOM

NAME OF THE PLANT/SECTION/DEPARTMENT: DESIGN DEPARTMENT

NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT: MS. Rahul Khekokar

DESCRIPTION OF THE WORK DONE IN BRIEF (Solidworks)

* 30/01/2023 → Solidworks Introduction. → Solidworks model part, Assemblies, Drawings.	* 31/01/2023 → Solidworks user Interface
* 01/02/2023 → view tool bar in Solidwork like, Rotate, view, Pan, zoom.	* 02/02/2023 → Sketch Command like line, Circle, Arc, Ellipse, Polygon.
* 03/02/2023 → Status of sketch like, under define, fully define, & over defined.	* 04/02/2023 → view orientation, like, Front, Right, top, Bottom, Normal to plane.

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(ગુજરાત અધિનિયમ ક્રમાંક: ૨૦ ૨૦૦૭ દ્વારા સ્થાપિત)

TOTAL HOURS: 48

SIGNATURE OF STUDENT

○ The above entries are correct and the grading of work done by Trainee is
EXCELLENT / VERY GOOD / GOOD / FAIR / BELOW AVERAGE / POOR

Signature of Faculty Mentor

Signature of Officer-in-charge of Dept. / Section / Plant

Date:

Date: 25/04/2023

○ Grading of Work, for trainee may be given depending upon your judgement about his Punctuality, Regularity, Sincerity, Interest taken, Work done etc.

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Annexure: 3
Enrollment no: 190390119012

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: SENGAL BHAUMIKKUMAR RAMESHBHAI
DIARY OF THE WEEK: Dt: 06/02/2023 TO 11/02/2023
DEPARTMENT: MECHANICAL SEM: 8th
NAME OF THE ORGANISATION: INDO GERMAN TOOL ROOM
NAME OF THE PLANT/SECTION/DEPARTMENT: DESIGN DEPARTMENT
NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT: Mr. Rahul Shelcalcar

DESCRIPTION OF THE WORK DONE IN BRIEF (AutoCAD)	
* 06/02/2023 - Dimensions Toolbar like linear dimension, Radial, Angular, Ordinate dimension.	* 07/02/2023 - 2D sketch practice.
* 08/02/2023 - Isometric Drawings and view.	* 09/02/2023 - Command of 3D modeling like, Extrude, Cylinder, Sphere, Wedge.
* 10/02/2023 - part joining and subtracting like Union, Subtract, Intersect - 3D Drawing practice.	* 11/02/2023 - Drawing layout. - like top view, front view, Side view and isometric view.

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TOTAL HOURS: 48

SIGNATURE OF STUDENT

- The above entries are correct and the grading of work done by Trainee is EXCELLENT / VERY GOOD / GOOD / FAIR / BELOW AVERAGE / POOR

Signature of Faculty Mentor

Signature of officer-in-charge of Dept. / Section / Plant

Date:

Date:

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Annexure: 4
Enrollment no: 190390119012

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: SENGHAL BHAUMIKKUMAR RAMESHBHAI

DIARY OF THE WEEK: Dt: 13/02/2023 TO 18/02/2023

DEPARTMENT: MECHANICAL SEM: 8th

NAME OF THE ORGANISATION: INDO GERMAN TOOL ROOM

NAME OF THE PLANT/SECTION/DEPARTMENT: DESIGN DEPARTMENT

NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT: Mr. Rahul Shelokar

DESCRIPTION OF THE WORK DONE IN BRIEF (Solidworks)

* 13/02/2023 → View display style like zoom, pan, wireframe, Shaded, Hidden line visible.	* 14/02/2023 → 2D sketch practice.
* 15/02/2023 → Creating features like Extrude, cut, fillet, chamfer	* 16/02/2023 → Creating features like Revolve, swept, loft, Rib, shell
* 17/02/2023 → 3D model practice	* 18/02/2023 → 3D model practice.

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TOTAL HOURS: ____48______

SIGNATURE OF STUDENT

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Signature of officer-in-charge of Dept. / Section / Plant

Date:

Date: 25/04/2023

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Annexure-5
Enrollment no: 190390119012

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: SENGAL BHAUMIKKUMAR RAMESHBHAI
DIARY OF THE WEEK: Dt: 20/02/2023 TO 25/02/2023
DEPARTMENT: MECHANICAL SEM: 8th
NAME OF THE ORGANISATION: INDO GERMAN TOOL ROOM
NAME OF THE PLANT/SECTION/DEPARTMENT: DESIGN DEPARTMENT
NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT: Mr. Rahul Phokokar

DESCRIPTION OF THE WORK DONE IN BRIEF (CNC)	
* 20/02/2023 → Basic of cnc machining and operation.	* 21/02/2023 → Working of cnc machine parts.
* 22/02/2023 → G code & m code working	* 23/02/2023 → Turning practice in software. → With step turning.
* 24/02/2023 → Turning practice in software with fillet on job.	* 25/02/2023 → Turning practice in software with chamfer on job.

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TOTAL HOURS: 48

b. s. Sargal
SIGNATURE OF STUDENT

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Gayatri 10/03/23.

Signature of officer-in-charge
of Dept. / Section / Plant

Signature of Faculty Mentor

Date:

Date:

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Annexure 6
Enrollment no: 190390119012

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: SENGAL BHAUMIKKUMAR RAMESHBHAI
DIARY OF THE WEEK: Dt: 27/02/2023 TO 04/03/2023
DEPARTMENT: MECHANICAL SEM: 8th
NAME OF THE ORGANISATION: INDO GERMAN TOOL ROOM
NAME OF THE PLANT/SECTION/DEPARTMENT: DESIGN DEPARTMENT
NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT: Mr. Rahul chekekar

DESCRIPTION OF THE WORK DONE IN BRIEF (press TOOL)	
* 27/02/2023 → Basic of press Tool.	* 28/02/2023 → Layout of press Tool and working of parts.
* 01/03/2023 → press Tool operation like cutting, Non cutting and Hybrid	* 02/03/2023 → Blanking operation → Piercing operation
* 03/03/2023 → Types of press Tool.	* 04/03/2023 → Calculation of cutting clearance in blanking operation.

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TOTAL HOURS: 48

SIGNATURE OF STUDENT

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Signature of Faculty Mentor

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Date:

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Annexure: 7
Enrollment no: 190390119012

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: SINGAL BHAUMIKKUMAR RAMESHBHAI

DIARY OF THE WEEK: Dt: 06/03/2023 TO 11/03/2023

DEPARTMENT: MECHANICAL SEM: 8th

NAME OF THE ORGANISATION: INDO GERMAN TOOL ROOM

NAME OF THE PLANT/SECTION/DEPARTMENT: DESIGN DEPARTMENT

NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT: ____________

DESCRIPTION OF THE WORK DONE IN BRIEF

06/03/23 - Basic of strip layout.	07/03/2023 - Terminology of strip.
08/03/23 - Basic of strip margin.	09/03/2023 - Strip layout format like Narrow, wide & Angular Run.
10/03/2023 - Blank layout - Single Row, Single pass - Single Row, double pass	11/03/2023 - Double Row, Single pass - Double Row, double pass

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TOTAL HOURS: 8 hours * 6 days = 48 hours

SIGNATURE OF STUDENT

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EXCELLENT / VERY GOOD / GOOD / FAIR / BELOW AVERAGE / POOR

Signature of Faculty Mentor

Signature of officer-in-charge
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Date:

Date:

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Annexure: 8
Enrollment no: 190390119012

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: SENGHAL BHAUMIKKUMAR RAMESHBHAI

DIARY OF THE WEEK: Dt: 13/03/2023 TO 18/03/2023

DEPARTMENT: MECHANICAL SEM: 8th

NAME OF THE ORGANISATION: INDO GERMAN TOOL ROOM

NAME OF THE PLANT/SECTION/DEPARTMENT: DESIGN DEPARTMENT

NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT: MR. Rahul Shelcolcar.

DESCRIPTION OF THE WORK DONE IN BRIEF	
13/03/2023 - Introduction of Jig's & fixture.	14/03/2023 - Location of the workpiece. - Degree of freedom.
15/03/2023 - Different locating method.	16/03/2023 - Different locating method.
17/03/2023 - Types of Jig's	18/03/2023 - Types of Jig's

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TOTAL HOURS: 48

SIGNATURE OF STUDENT

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Signature of Faculty Mentor

Signature of Officer-in-charge of Dept. / Section / Plant

Date:

Date: 25/04/2023

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Annexure : 9
Enrollment no: 190390119012

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: SENGAL BHAUMIKKUMAR RAMESHBHAI
DIARY OF THE WEEK: Dt: 20/03/2023 TO 25/03/2023
DEPARTMENT: MECHANICAL SEM: 8th
NAME OF THE ORGANISATION: INDO GERMAN TOOL ROOM
NAME OF THE PLANT/SECTION/DEPARTMENT: DESIGN DEPARTMENT
NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT: Mr. Rahul Shelcokar

DESCRIPTION OF THE WORK DONE IN BRIEF	
* 20/03/2023 → Basic of the plastic ~~mould~~. material.	* 21/03/2023 → Types of plastic. Thermoplastic & Thermoset plastic
* 22/03/2023 → types of plastic based on application.	* 23/03/2023 → Properties of plastic.
* 24/03/2023 → plastic material for injection mold.	* 25/03/2023 → Structure of plastic material.

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TOTAL HOURS: 8 hours × 6days = 48 hours

SIGNATURE OF STUDENT

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Signature of Faculty Mentor

Signature of officer-in-charge
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Date:

Date: 25/04/2023

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Annexure 10
Enrollment no: 190390119012

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: SENGAL BHAUMIKKUMAR RAMESHBHAI
DIARY OF THE WEEK: Dt: 27/03/2023 TO 01/04/2023
DEPARTMENT: MECHANICAL SEM: 8th
NAME OF THE ORGANISATION: INDO GERMAN TOOL ROOM
NAME OF THE PLANT/SECTION/DEPARTMENT: DESIGN DEPARTMENT
NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT: Mr. Rahul [illegible]

DESCRIPTION OF THE WORK DONE IN BRIEF

* 27/03/2023 - Introduction of plastic moulding machine.	* 28/03/2023 → Types of plastic mould machine.
* 29/03/2023 - Introduction of injection mould machine.	* 30/03/2023 - machine component of injection plastic mould.
* 31/03/2023 - About of Injection unit of injection mould machine.	* 01/04/2023 - About clamping unit of injection mould machine.

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TOTAL HOURS: 8 hours * 6 days = 48 hours

SIGNATURE OF STUDENT

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Signature of Faculty Mentor

Signature of officer-in-charge of Dept. / Section / Plant

Date:

Date: 25/04/2023

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Annexure 11
Enrollment no: 190390119017

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: SENGAL BHAUMIKKUMAR RAMESHBHAI
DIARY OF THE WEEK: Dt: 03/04/2023 TO 08/04/2023
DEPARTMENT: MECHANICAL SEM: 8th
NAME OF THE ORGANISATION: INDO GERMAN TOOL ROOM
NAME OF THE PLANT/SECTION/DEPARTMENT: DESIGN DEPARTMENT
NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT: Mr. Rahul shelcokar

DESCRIPTION OF THE WORK DONE IN BRIEF	
* 03/04/2023 - Types of Injection moulding machine.	* 04/04/2023 - Operation cycle of injection moulding machine.
* 05/04/2023 - Operation sequence of of injection moulding machining.	* 06/04/2023 - Types of moulds.
* 07/04/2023 - Advantages & disadvantages of plastic mould machine.	* 08/04/2023 - Defects in plastic injection molding process.

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TOTAL HOURS: 8 hours * 6 days = 48 hours

SIGNATURE OF STUDENT

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Signature of Faculty Mentor

Signature of officer-in-charge
of Dept. / Section / Plant

Date:

Date 25/04/2023

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Annexure 12
Enrollment no: 190390119012

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: SENGAL BHAUMIKKUMAR RAMESHBHAI
DIARY OF THE WEEK: Dt: 10/04/2023 TO 15/04/2023
DEPARTMENT: MECHANICAL SEM: 8th
NAME OF THE ORGANISATION: INDO GERMAN TOOL ROOM
NAME OF THE PLANT/SECTION/DEPARTMENT: DESIGN DEPARTMENT
NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT: Ms. Rahul Shelcokar

DESCRIPTION OF THE WORK DONE IN BRIEF

* 10/04/2023 – Introduction of Gauges.	* 11/04/2023 – Types of gauges.
* 12/04/2023 – About plug gauge, Ring gauge and Snap Gauge.	* 13/04/2023 – About Feelar gauge, thread gauge and Caliper Gauge.
* 14/04/2023 – Calculation of plug Gauge.	* 15/04/2023 – Calculation of Ring Gauge.

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TOTAL HOURS: 8 hours * 6 days = 48 hours

SIGNATURE OF STUDENT

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Signature of Faculty Mentor

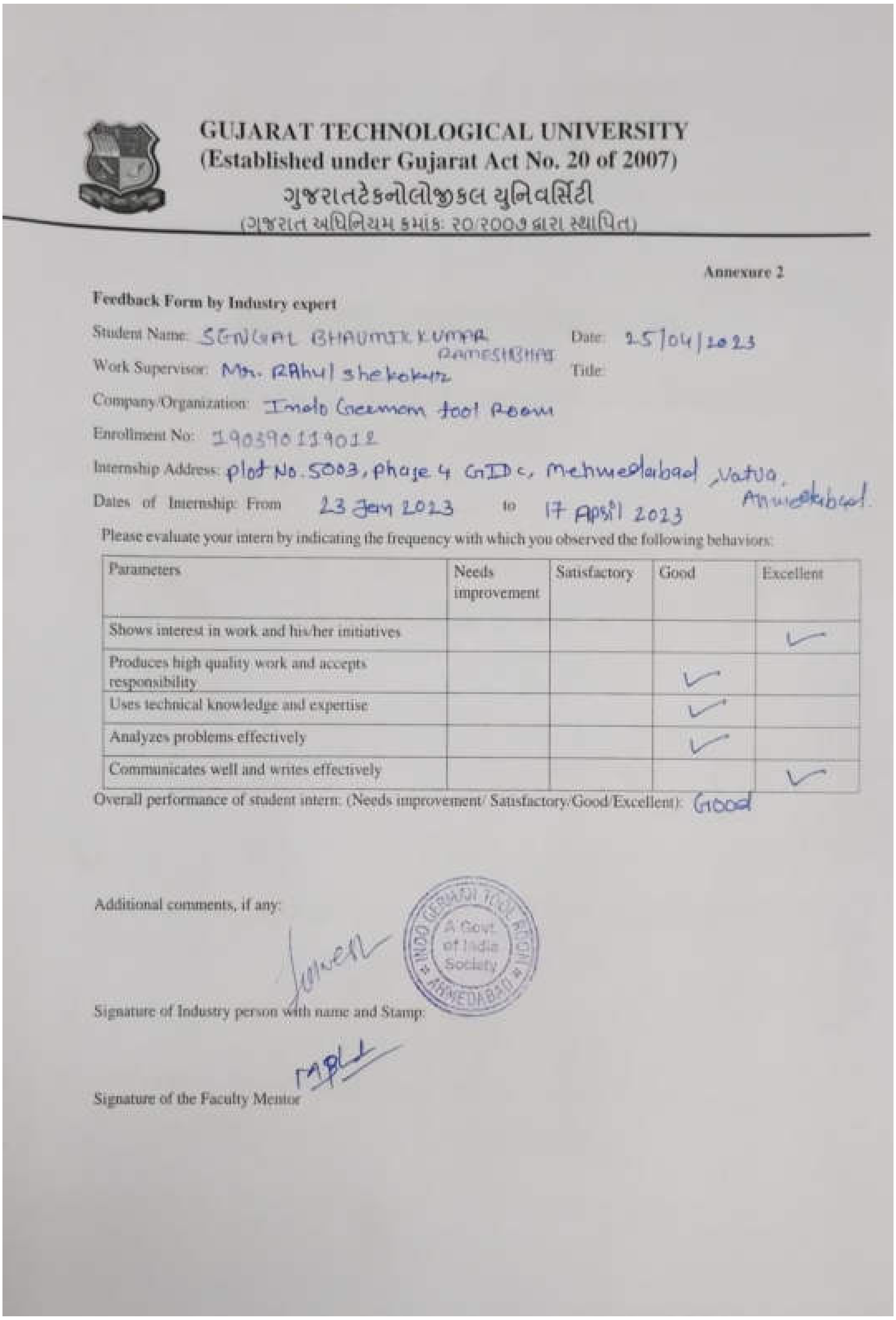
Signature of officer-in-charge of Dept. / Section / Plant

Date:

Date: 25/04/2023

- Grading of Work, for trainee may be given depending upon your judgement about his Punctuality, Regularity, Sincerity, Interest taken, Work done etc.

Annexure 2



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Annexure 2

Feedback Form by Industry expert

Student Name: SENGAL BHAUMIKKUMAR RAMESHBHAI   Date: 25/04/2023

Work Supervisor: Mr. RAhul shekokar   Title:

Company/Organization: Indo Geemom tool Room

Enrollment No: 190390119012

Internship Address: plot No. 5003, phase 4 GIDC, mehmedabad, Vatva, Ahmedabad.

Dates of Internship: From 23 Jan 2023 to 17 April 2023

Please evaluate your intern by indicating the frequency with which you observed the following behaviors:

Parameters	Needs improvement	Satisfactory	Good	Excellent
Shows interest in work and his/her initiatives				✓
Produces high quality work and accepts responsibility			✓	
Uses technical knowledge and expertise			✓	
Analyzes problems effectively			✓	
Communicates well and writes effectively				✓

Overall performance of student intern: (Needs improvement/ Satisfactory/Good/Excellent): Good

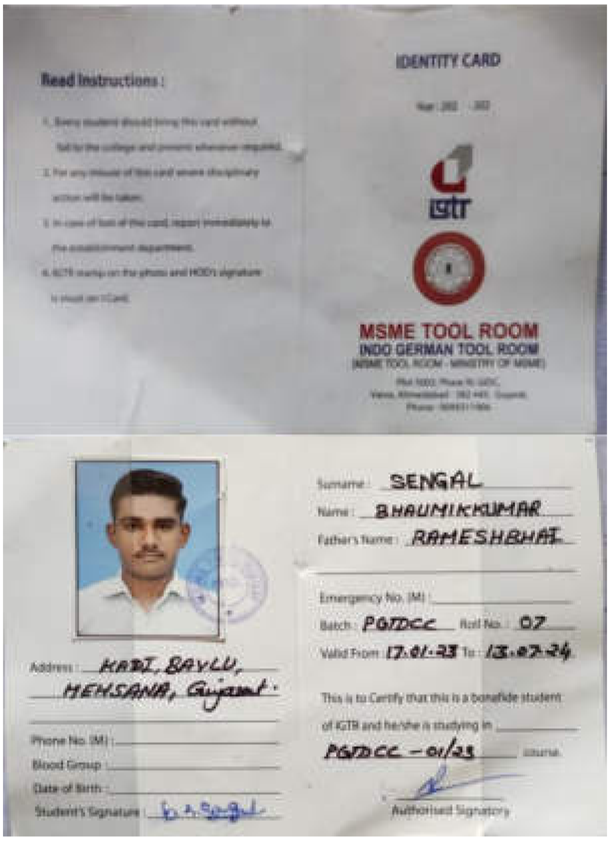
Additional comments, if any:

INDO GERMAN TOOL ROOM
A Govt. of India Society
AHMEDABAD

Signature of Industry person with name and Stamp:

Signature of the Faculty Mentor

I Card


Read Instructions :

IDENTITY CARD

MSME TOOL ROOM
INDO GERMAN TOOL ROOM

Surname : SENGAL
Name : BHAUMIKKUMAR
Father's Name : RAMESHBHAI
Emergency No. (M) :
Batch : PGTDCC Roll No. : 07
Valid From : 17.01.23 To : 13.07.24
Address : KADI, BAYLU, MEHSANA, Gujarat.
Phone No. (M) :
Blood Group :
Date of Birth :
Student's Signature :
This is to Certify that this is a bonafide student of IGTR and he/she is studying in PGTDCC - 01/23 course.
Authorised Signatory

INTERNSHIP AT MARUTI SUZUKI INDIA LIMITED.

INTERNSHIP REPORT

Submitted by

Ronit Ramniwas Sharma

190390119013

In partial fulfillment for the award of the degree of

BACHELOR OF ENGINEERING

In

Mechanical Engineering

S.P.B. Patel Engineering College, Mehsana

S.P.B. PATEL
ENGINEERING COLLEGE
SAFFRONY INSTITUTE OF TECHNOLOGY

GUJARAT TECHNOLOGICAL UNIVERSITY

Gujarat Technological University, Ahmedabad

May, 2023

S.P.B. Patel Engineering College

Near Shanku's Water Park, Ahmedabad – Mehsana Highway, Linch, Gujarat

CERTIFICATE

This is to certify that the project report submitted along with the project entitled **Internship at Maruti Suzuki India Limited.** has been carried out by **Ronit Ramniwas Sharma** under my guidance in partial fulfillment for the degree of Bachelor of Engineering in Mechanical Engineering, 8th Semester of Gujarat Technological University, Ahmedabad during the academic year 2022-23.

Sign	Sign
Prof. Monil Shah	Prof. Kunalsinh Kathia
Internal Guide	Head of Department

Company Certificate

MARUTI SUZUKI
Way Of Life!

MSIL: PROJ: 2022-23

Date: 1st of May 2023

TO WHOM SO EVER IT MAY CONCERN

This is to certify that **Mr. RONIT SHARMA** Student of **SBP PATEL ENGINEERING COLLEGE** has undergone project training with **Maruti Suzuki India Limited, Manesar** as per Details given below: -

Project Title	:	Shop layout designing in Auto-CAD. Robot asset management
Training Period	:	23-Jan-2023 to 23-Apr-2023
Department /Division	:	WS-MB (Weld Shop)

He has completed the above period to our satisfaction and our assessment of his overall project efforts & Learning is **EXCELLENT.**

The grading scales used at Maruti Suzuki India Limited are :

- Excellent
- Very Good
- Good
- Satisfactory
- Poor

During the training we found him hardworking ,eager to learn and with good initiative . He was able to develop good inter personal relations with people in the Department /Division .

We wish him very best in his future career.

With Best Wishes

Kumar Nitesh
Deputy General Manager – Human Resources

MARUTI SUZUKI INDIA LIMITED

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CIN: L34103DL1981PLC011375

S.P.B. PATEL
ENGINEERING COLLEGE
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GUJARAT TECHNOLOGICAL UNIVERSITY

S.P.B. Patel Engineering College, Mehsana

Near Shanku's Water Park, Ahmedabad – Mehsana Highway, Linch, Gujarat

DECLARATION

We hereby declare that the Internship / Project report submitted along with the Internship / Project entitled **Internship at Maruti Suzuki India Limited.** submitted in partial fulfillment for the degree of Bachelor of Engineering in **Mechanical Engineering** to Gujarat Technological University, Ahmedabad, is a bonafide record of original project work carried out by me under the supervision of **Prof. Monil Shah (Internal Guide)** & Mr. **Vikas Moudgil (External Guide)** and that no part of this report has been directly copied from any students' reports or taken from any other source, without providing due reference.

Name of the Student	Sign of Student
1. Ronit Ramniwas Sharma	________________

ACKNOWLEDGMENT

I would like to express my deepest gratitude for providing me with the opportunity to internship at your esteemed organization, **Maruti Suzuki India Limited**, under the guidance and supervision of Mr. Vikas Modugil Sir.

During my time at Maruti Suzuki India Limited, I was able to gain invaluable experience and knowledge in the field of WELD DEPARTMENT. Mr. Vikas Modugil Sir was an excellent mentor and provided me with valuable guidance throughout my internship.

He was always willing to share his knowledge and expertise, which has greatly contributed to my professional growth. Also, I would like to express my gratitude to Ayush Bansal Sir (DPM) for his valuable assistance during my internship period and project.

His guidance and expertise were instrumental in completing my project successfully, and I am thankful for his support throughout the internship. I am grateful to the entire team at Maruti Suzuki India Limited for their support and encouragement during my internship.

Abstract

The internship at ***Maruti Suzuki India Limited*** *provided me with a unique opportunity to gain hands-on experience in the automotive industry. During my internship, I worked in the WELD Department, where I learned about various processes and procedures related to how the outer body is produced. I also had the chance to work on a project that involved designing in AutoCAD, where I designed the overall department layout and also looked at the different workstation robot working processes, what programming language is used, and what parameters are used. Also, I learned how the body goes under check segments with different markings. I also learned about a few Japanese terms like 5S, 3K, 3M, and PPE. Overall, the internship was an excellent learning experience and provided me with valuable insights into the workings of a leading automobile company*

List of Figures

Abbreviations

QA	Quality Assurance
QC	Quality Control
MCU	Machine Control Unit
CNC	Computerized Numerical Control.
PDI	Pre dispatch Inspection

Table of Contents

CHAPTER 1. OVERVIEW OF THE COMPANY

1.1 COMPANY PROFILE:

Maruti Suzuki India Limited (MSIL), formerly known as Maruti Udyog Limited, a subsidiary of Suzuki Motor Corporation of Japan, is India's largest passenger car company, accounting for over 50 per cent of the domestic car market. Maruti Udyog Limited was incorporated in 1981 under the provisions of Indian Companies Act 1956 and the government of India selected Suzuki Motor Corporation as the joint venture partner for the company.

In 1982 a JV was signed between Government of India and Suzuki Motor Corporation. It was in 1983 that the India's first affordable car, Maruti 800, a 796-cc hatch back was launched as the company went into production in a record time of 13 month. More than half the number of cars sold in India wear a Maruti Suzuki badge. They are a subsidiary of Suzuki Motor Corporation Japan.

The company offer full range of cars– from entry level Maruti 800 & Alto to stylish hatchback Ritz, A star, Swift, Wagon R, Celerio, SPresso and sedans DZire, SX4 and Sports Utility vehicle Grand Vitara, Brezza Since inception, the company has produced and sold over 7.5 million vehicles in India and exported over 500,000 units to Europe and other countries. Maruti Suzuki has two state–of–the–art manufacturing facilities in India. The first facility is at Gurgaon spread over 300 acres and the other facility is at Manesar, spread over 600 acres in North India. The Gurgaon facility – Maruti Suzuki's facility in Gurgoan houses three fully integrated plants.

While the three plants have a total installed capacity of 350,000 cars per year, several productivity improvements or shop floor Kaizens over the years have enabled the company to manufacture nearly 700,000 cars/ annum at the Gurgaon facilities.

The Manesar facility – Its Manesar facility has been made to suit Suzuki Motor Corporation (SMC) and Maruti Suzuki India Limited's (MSIL) global ambitions. The plant was inaugurated in February 2007. At present the plant rolls out World Strategic Models Swift, A–star & SX4 and DZire. The plant has several in–built systems and mechanisms.

Diesel Engine Plant– Suzuki Powertrain India Limited – Suzuki Powertrain India Limited the diesel engine plant at Manesar is SMC's & Maruti's first and perhaps the only plant designed to produce world class diesel engine and transmissions for cars.

The plant is under a joint venture company, called Suzuki Powertrain India Limited (SPIL) in which SMC holds 70 per cent equity the rest is held by MSIL. This facility has an initial capacity to manufacture 100,000 diesel engines a year. This will be scaled up to 300,000 engines/annum by 2010.

1.2 MARUTI QUALITY POLICY:

Quality has been of paramount importance to them. They deal with only genuine components to ensure highest standards in quality and reliability. Company quality policy has been designed in tune with customer requirements. Quality strategy is to maintain the reputation of the company by constantly meeting and exceeding customer expectations on every occasion. Company ensures that all quality specifications are agreed to and clarified by both customers and suppliers before proceeding further with the procurement process and ensure delivery of defect free quality. Company always commits ourselves for every order equally to ensure total product quality and reduce variation. Company strives hard to constantly improve our quality, cost, delivery and service levels towards obtaining customer satisfaction.

1.3 QUALITY SYSTEM:

It has always been Maruti's endeavors to achieve customer satisfaction through continuous improvement of its product and services by following 'PDCA' (Plan Do-Check-Act) in all functions of its organization, with ISO Certificate on 9001, 14001, 27001, 45001

CHAPTER 2. STRUCUTRE OF COMPANY

2.1 PRESS SHOP

The press shop can be regarded as the starting point of the car manufacturing process. It supplies components to all three plants. The press shop has a batch production system, whereas the plants have a line production system.

The press shop maintains an inventory of at least four days. The weld shop, as per the requirements, picks up the finished body parts from the press shop.

These are divided as A, B, and C. Components are large outer components, such as, for example, roofs, door panels, etc.

These components are manufactured in the press shop at Maruti due to:

- Uncoiling
- Cleaning
- Levelling
- Measuring
- Shearing/ cutting
- Piling/ stacking

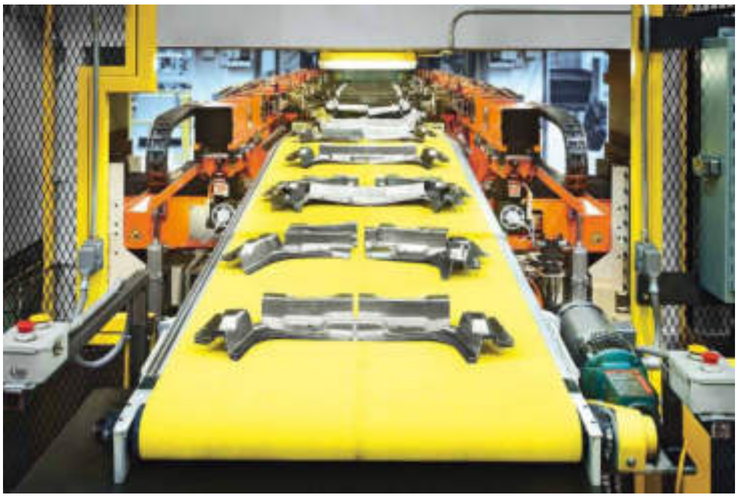

Fig 2.1 Press Shop

2.2 WELD SHOP

The body panels produced in the press shop and the other small components are joined here to form the outer body. In a typical car body, 1400 different components are welded together. Maruti Suzuki produces more than 2500 car bodies from the weld shop itself in a single day.

This shop is divided into three main workstations, and under those are sub-stations:

- Under Body: FUB------ RUB------MF
- Main Body: Under Body + Side Body + Roof
- White Body: Main Body + Doors + Fenders

2.3 PAINT SHOP

The painting of a car body means protection of sheet metal, inside and out, underneath as well as on top besides giving them a coat of bright shiny color. • The first stage is a multi-part rust-proofing treatment by complete immersion of the body shell in a huge bath of anti-rust alkyd primer.

This is followed by surface priming. The entire under body, wheel arches, insides of the body sills, etc. are treated with multi-coats of epoxy primer followed by baking in huge high- temperature ovens

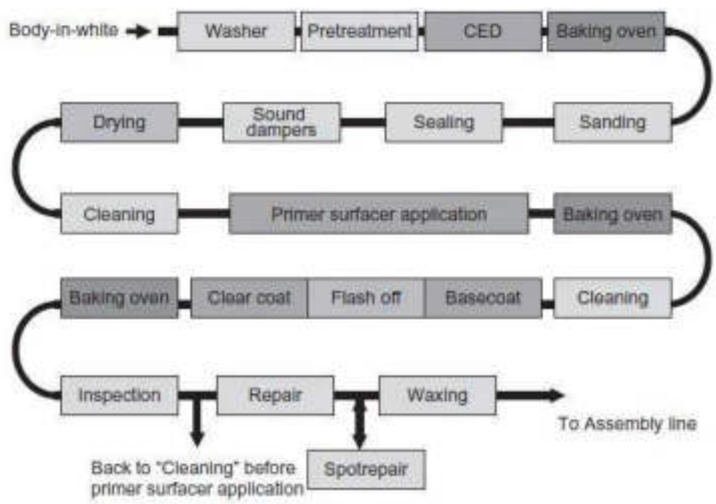

Fig 2.2 Paint Shop

2.4 ASSEMBLY SHOP

The assembly shop receives the PB-OK, i.e., paint body OK, from the paint shop. Here, the body is loaded on an overhead conveyor. As the conveyor moves the body, fittings are made at various stations.

Components of the Zen, Alto, and Wagon-R are fitted on a common assembly line. The sequencing of models is done by PLC, i.e., Programmable Logic Control. There are three assembly shops named ASSY-A, ASSY-B, and ASSY-C. Plant 2 and Plant 3 have similar setups, but in Plant 1, there are separate assembly lines for separate models.

Altering the speed of the conveyor can alter the capacity of production. The Assay-B conveyor runs at 3.23 m/min. The conveyor belt can run at a maximum speed of 4 m/min. The assembly shop has a continuous production system. The assembly lines in Plant 2 and Plant 3 are both basically U-shaped multi-production lines.

The assembly line can be subdivided into the following:

- Trim line
- Chassis line
- Final line

Fig 2.3 Assembly Shop

2.5 VEHICLE INSPECTION

Vehicle inspection has the following testing stations:

- Toe in test
- Slip test
- Headlamp test
- Appearance test
- Drum test
- Brake test
- Shower test
- Road test
- Final check

CHAPTER 3. WSMB AND SAFETY RULES

3.1 WSMB: WELD SHOP – MANESAR B

As an Intern in the Maruti Suzuki Weld Shop, I had opportunity to learn about the various welding techniques used in the automobile industry. I also get hands-on experience in welding and work with experienced technicians to understand the entire welding process. During my internship period, I learn about the safety measures that need to be taken during welding and the importance of quality control in the manufacturing process.

- I also got to work with a team of professionals who will guide you and provide you with feedback on your work. Overall, my 12-week internship period in the Maruti Suzuki Weld Shop was valuable learning experience that help me to gain practical knowledge and skills in the fields of welding and automobile manufacturing.

- My role in this summer internship is to understand how the complete outer body of a car is processed on the production line.
- Learning production line and how they are set. Learning about major Safety Rule followed.
- Identify and analyze the working processes of various workstations. Learning the design of different models and how they are analyzed on sheets and scales.
- Learning what different materials are used for joint patches, small parts, and more. Preparing a report of model changes with mitigation guidelines.

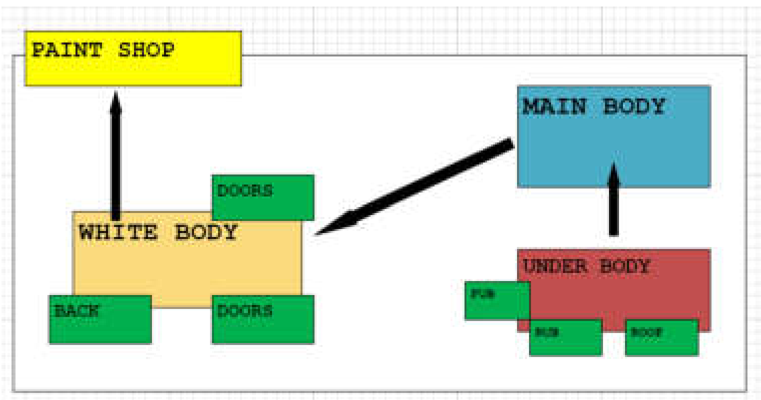

Fig 3.1 Weld-Shop Layout

- Process starts from WBON and finishes with WBOK.
- All of production starts at the underbody station, where all of the outer main parts on the front, rear, and roof are weld by RSW.
- When the body is done from the underbody, through the GTS process, it is transferred to the main body workstation.
- Then it gets transferred to the white body workstation where all of the doors are set, and then it goes under a check segment where two workers check all of the parts closely and mark them on a sheet whether they are joined or set properly or not.
- In this department, every minute, one car is produced, and then the body is moved to the paint shop.
- All of Underbody, Main body and White body are connected with GTS (Gravity Transfer System) Every Workstation has their work sheet where all of instruction is written WIS (Work Instruction System)

3.1.1 UNDER BODY

This is the first main workstation where the front underbody (FUB), rear underbody (RUB), and main floor (MF) parts get welded.

JIG is the space where parts are loaded to get welded. Robots pick up loaded parts, and other robots weld the parts.

There are a total of 36 parts that get welded at this station, and this station occupies less space compared to other main workstations.

There are chain hosts for transferring jobs from one jig to another on sublines. Finally, these underbodies are put on the conveyor and welded together to form the underbody

3.1.2 MAIN BODY

The chassis number is punched on the cowl top, and it is welded to the front engine room panel. As the body moves on the conveyor roof, side body panels are welded to it to form the main body. The side body panels are prepared on the sublines.

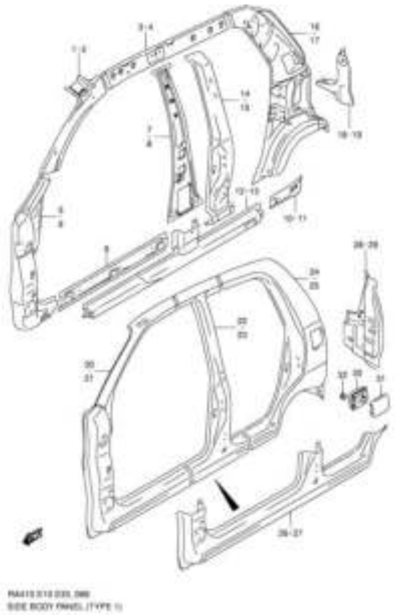

Fig 3.2 Side- Body INNER and OUTER PANEL

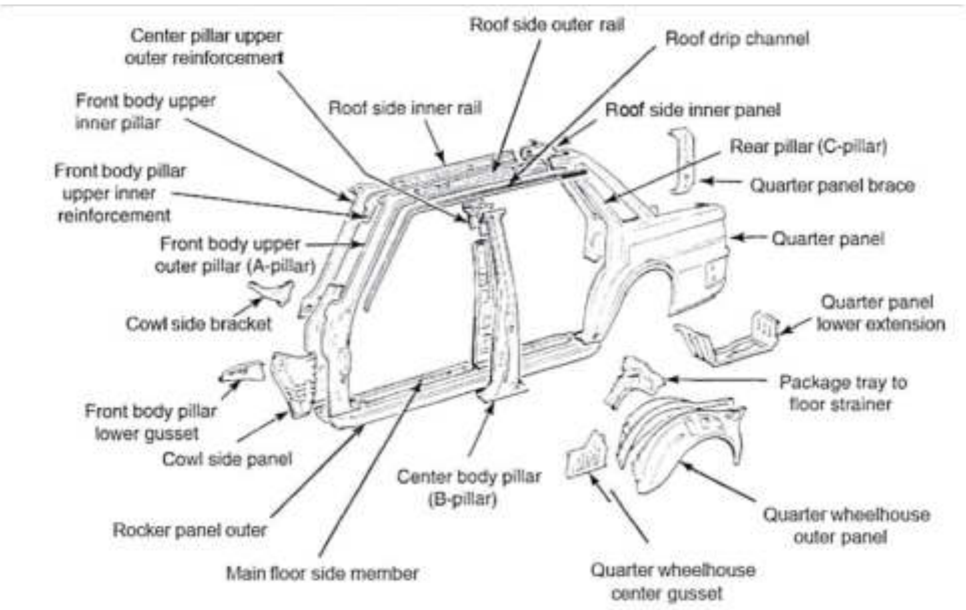

Fig 3.3 Main Body with Components

- There are two panels, the inner and outer panels of the side body. These panels are prepared before they go to the main line of the main floor.
- The reason for preparing separate panels is because they occupy more space as compared to rest stations. Also, this is heavy to carry for this station, which is kept near the Press Shop as if there are required panels just nearby to carry for this station, which is kept near the Press Shop as if there are required panels just near it. AGV vehicles help shift panels.

3.1.3 WHITE BODY

To complete body weld process white body is the station where all the doors, hood, and back door are bolted and screwed to it. The body is checked for dents, burrs, and spatter, and these defects are repaired. After inspection and repairs, the body is called WBOK. It is sent to the paint shop thereafter.

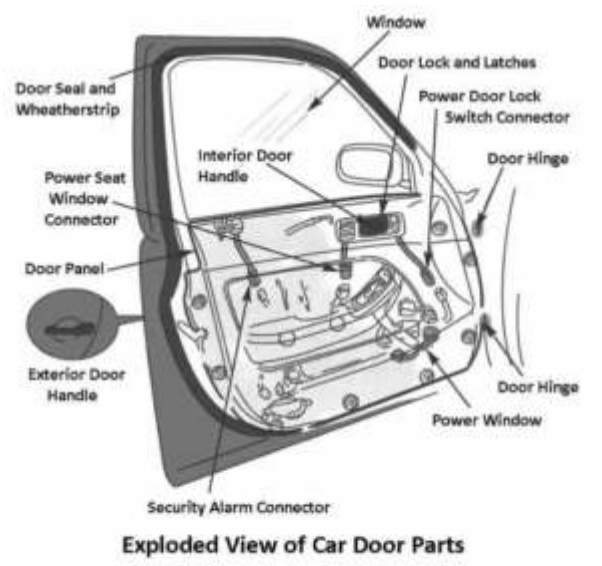

Fig 3.4 Door INNER and OUTER PANEL

- As in the side body case, in the white body, the inner and outer panels of doors are set before they get fixed to the body.
- The reason behind this is that doors are joined with too many smaller parts, and these parts need to be fixed in a proper way, so the same process is done as with side bodies.

3.1.4 SEALER

Sealer is used to join the inner and outer parts of the body.
It is divided into two parts:

i. Hemming sealer
ii. Mastic sealer

Heming sealer is used to join the outer and inner bodies of It is also known as Glass Bid Sealer, and it is black in color. Its code is SH300S-T.

Fig 3.5 Hemming Sealer

Mastic sealer is used to join the midbody of the inner and outer door panels, and it is white in color. Its code is RB-3278 IN.

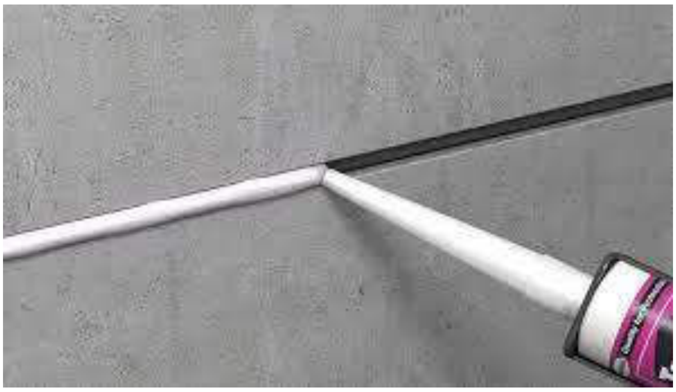

Fig 3.6 Mastic Sealer

3.2 SPOT RESISTANCE WELDING

Spot Resistance Welding (RSW) is an electrical resistance welding process that joins overlapping metals between two electrodes. Pressure is applied by squeezing the workpieces between the electrodes and heat is generated by the passage of welding current through the resistive metals.

This allows the materials to fuse and create a welding joint. The joint created through resistance spot welding resembles a button or a nugget, thus the term spot welding was coined as the current is applied precisely over a small area on the metal's surface.

As the metals are fused using large amounts of energy in a short period, the area around the weld nugget stays unharmed by the excessive heat, thus the heat-affected zone is minimal and a clean weld is created.

Where Q is the heat energy, I is the current, R represents the electrical resistance and T is the time or duration in which the current is applied.

$$Q = I^2RT$$

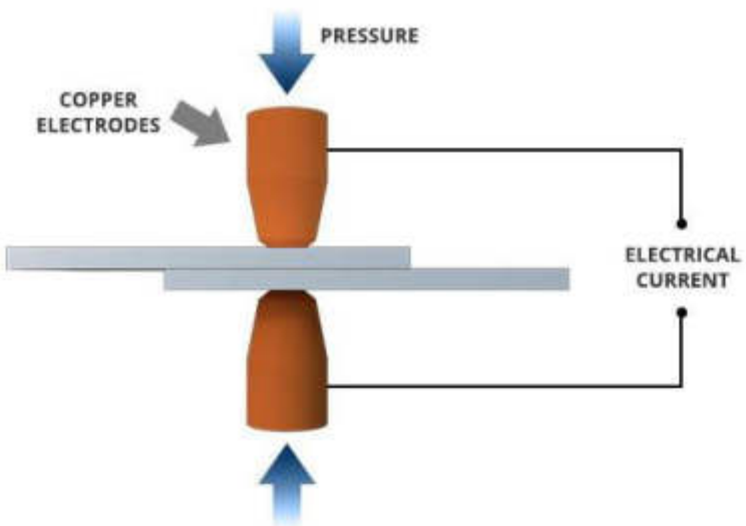

Fig 3.7 Resistance Spot Welding

3.3 JAPANESE TERMS

3K- Kimeraareta, Kihon Dori & Kichin to mamora

1. Kimeraareta- What has been decided.
2. Kihon Dori- Exactly as per standard.
3. Kichin to mamora- Must be followed.

It means “What has been decided must be followed exactly as per the standard”. This concept is displayed prominently at work place across company

3G- Genchi, Genbutsu & Genjitsu

1. Genchi- Actual Place.
2. Genbutsu- Actual Thing.
3. Genjitsu- Actually It means.

“In case of an abnormality, all the concerned members should actually go to the place where the problem has occurred, see the actual thing & take realistic action to solve the problem”.

5S- Seiri, Seiton, Seiso, Seiketsu & Shitsuke

1. Seiri- Sort.
2. Seiton - Set in Order.
3. Seiso – Shine.
4. Seiketsu -Standardize.
5. Shitsuke -Sustain.

The list describes how to organize a work space for efficiency and effectiveness by identifying and storing the items used, maintaining the area and items, and sustaining the new order.

3.4 KAIZEN

Kaizen is a Japanese term that means "continuous improvement." It is a philosophy that involves making small, incremental changes to processes, products, and services to improve quality and efficiency over time. Kaizen was developed in the Japanese manufacturing industry after World War II and has since been adopted by many other industries and organizations around the world.

- The key principles of kaizen include focusing on the customer, identifying and eliminating waste, empowering employees to make improvements, and using data and analysis to drive decision-making.
- Kaizen also emphasizes the importance of teamwork, communication, and collaboration in achieving continuous improvement. Kaizen can be applied to any area of an organization, from production and operations to marketing and customer service.
- By continuously improving processes, organizations can reduce costs, increase productivity, and enhance customer satisfaction.

Fig 3.8 Kaizen

3.5 COORDINATE MESURING MACHINE

A Coordinate Measuring Machine, also known as a CMM, is a piece of equipment that measures the geometries of physical objects. CMMs using a probing system to detect discreet points on the surfaces of objects. The very first CMM made its appearance in the early 60s. Originally developed by Ferranti Company in Scotland in the 50s, this 2-axis CMM used a 3D tracing device with a simple digital readout that displayed XYZ positions. Ferranti used its CMM to measure precision components for their military products.

- Three-axis models were developed in the later 60s.CMMs are most often used to test a part or assemble to determine whether or not it respects the original design intent. CMMs are integrated within quality assurance or quality control workflows to check the dimensions of manufactured components to prevent or resolve quality issues.
- The advantages of using CMMs over manual inspections or checks performed with conventional metrology instruments, such as micrometers and height gauges, are: accuracy, speed and the reduction of human error.
- There are several different types of CMMs. Typically, CMMs are categorized based on their structures. Each structure has its pros and cons. Let’s take a look at different CMM types in more detail.

Fig 3.9 CMM

3.6 SAFETY RULES

PPE KIT: Personal Protective Equipment

PPE is equipment that will protect the user against the risk of accidents or adverse effects on health. It can include items such as safety helmets, gloves, eye protection, high-visibility clothing, wrist cover, safety footwear, safety harnesses, and respiratory protective equipment.

Fig 3.10 PPE KIT

CHAPTER 4. PROJECT - I

After all of the processes, the workstation area, and where and how materials are kept, I was given a project that had to be done in AutoCAD. I was given the task of designing the WELD Department in the actual original layout, which was already designed by the company's best design team.

The reason to design the company layout was that there were certain changes made during the last time, and more vendor parts were increased as production was at peak levels. Secondly, the WELD Department is also competing with Alto (2018) spare parts, where the company has a policy of supplying car parts for the next 5 years.

So, another project by the company was to design a layout showing all of the areas like the office, transportation area, material space area, car production area, and more.

In this layout the yellow dotted line shows material moves and green doted lines shows movements on vendor vehicle in/out for export of materials. During working in this project, I learned how to create new design and also learned how to design 3D design in AutoCAD.

Company uses Creo and Ansys for their all-work purposes. The Purpose giving this Project was to explore deeply how AutoCAD can be used in more of further design work and 3D way.

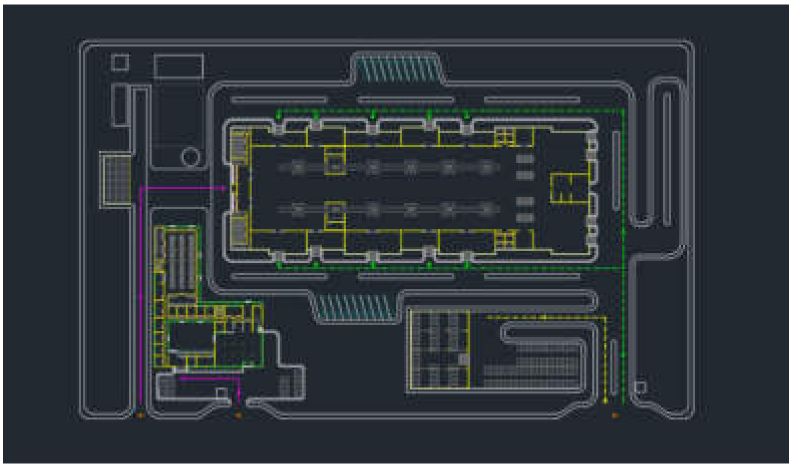

Fig 4.1 Project – I Layout

CHAPTER 5. PROJECT – II

This department is completely automated, with robots working in each workstation space, and these robots are programmed by the engineers and team.

During this second project, I was told to check all of the robot asset series, see their working algorithms, and check their condition to see if they were working well or not.

This robot is programmed in the **TP Language** (Type Programming Language).

Reason for appointing this project:

- To learn how series of robots are parallelly set at programming language algorithms with multiple task sets.
- To understand under what conditions a robot stops working
- To understand what the maintenance parameters of this robot.

Fig 5.1 Project – II FANUC ROBOT

CHAPTER 6. CONCLUSION.

Through this 12week summer internship at Maruti Suzuki India Limited, I gained hands-on experience in various areas of the workplace. Learned about the company's operations, culture, and processes and developed skills and knowledge that can be beneficial for their future careers.

Maruti Suzuki India Limited has provided me with an opportunity to study and gain knowledge in vehicle production. During this summer internship, I learned about the whole car manufacturing and production process and looked at the advanced technologies used in the company.

Also, throughout my internship, I also learned about sales, market research, sales strategies, and customer satisfaction measures. I also got a chance to work and communicate with high positing teams. Worked on Project based on AutoCAD and Robot Programming Algorithm and their working parameters.

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2. https://www.ozeninc.com/industry-solutions/auto-paint-process/
3. https://www.creaform3d.com/blog/what-is-cmm-and-their-types/
4. https://www.ndtv.com/business/stock/maruti-suzuki-india-ltd_maruti/reports
5. https://www.marutisuzuki.com/

MARUTI SUZUKI
Way Of Life!

24th November 2022

TRAINING & PLACEMENT OFFICER
SBP PATEL ENGINEERING COLLEGE
AHMEDABAD

Subject: Practical/Industrial Training/ Project Work

Dear Sir/Madam,

This is with reference to your request letter for internship / on-the job training to **Mr. RONIT SHARMA in Maruti Suzuki India Limited. (Manesar Car Plant)**

We are glad to inform that the request for summer internship has been accepted. The duration of training would be **12-Weeks (1/2/2023 to 3/30/2023)**. Please advise your student to report at our factory in Manesar on **1/2/2023** at 10.00 a.m. The trainee should also bring 03 passport size photographs & photo copy of 12th standard mark sheet.

The student is required to produce attested copies of mark sheets as applicable at the time of reporting for training as a proof.

At the time of joining, Trainee is required to submit an Undertaking to be executed on the Non-Judicial Stamp Paper of Rs.50/- (Format Overleaf).

Please note that the candidate will not be paid any stipend and would have to make her/his own arrangements for boarding, lodging transport, etc.

Thanking you,

Yours Sincerely

Vinay Rastogi
Authorized Signatory

MARUTI SUZUKI INDIA LIMITED

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CIN: L34103DL1981PLC011375

Appendix

GUJARAT TECHNOLOGICAL UNIVERSITY
(Established under Gujarat Act No. 20 of 2007)
ગુજરાતટેકનોલોજીકલ યુનિવર્સિટી
(ગુજરાત અધિનિયમ ક્રમાંક: ૨૦/૨૦૦૭ દ્વારા સ્થાપિત)

Annexure 1
Enrollment no: 190390119013

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: RONIT RAMNIWAS SHARMA
DIARY OF THE WEEK: Dt: 23/01/2023 TO 27/01/2023
DEPARTMENT: MECHANICAL BRANCH SEM: VIII th
NAME OF THE ORGANISATION: MARUTI SUZUKI INDIA LIMITED
NAME OF THE PLANT/SECTION/DEPARTMENT: WELD DEPARTMENT
NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT: AYUSH BANSAL

DESCRIPTION OF THE WORK DONE IN BRIEF

23/01/2023 - 27/01/2023
Week : 01

we met Amit Yadav, HR of Training and Internship Team, who guided us and explained how MSIL Manesar Plant works, and also gave us brief knowledge past and future of the Maruti Suzuki India Limited.

Four Major Department are there;
① weld Department
② Paint Department
③ Assembly Department
④ Quality and Test Department.

They are respectively divided, and this all department are fully automatic robot based work.

Wagon-R, Ciaz, Ertiga, Vitara Breeza, Celerio, S-Presso are model they manufacture and at 1minute → 1 car gets ready.

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TOTAL HOURS: 45 HOURS

SIGNATURE OF STUDENT

The above entries are correct and the grading of work done by Trainee is
EXCELLENT / VERY GOOD / GOOD / FAIR / BELOW AVERAGE / POOR

Signature of Faculty Mentor

Signature of officer-in-charge of Dept. / Section / Plant

Date:

Date: 17/02/23

Grading of Work, for trainee may be given depending upon your judgement about his Punctuality, Regularity, Sincerity, Interest taken, Work done etc.

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Annexure I
Enrollment no: 190390119013

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: RONIT RAMNIWAS SHARMA

DIARY OF THE WEEK: Dt: 30/01/2023 TO 03/02/2023

DEPARTMENT: MECHANICAL BRANCH SEM: VIIIth

NAME OF THE ORGANISATION: MARUTI SUZUKI INDIA LIMITED

NAME OF THE PLANT/SECTION/DEPARTMENT: WELD DEPARTMENT

NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT: AYUSH BANSAL

DESCRIPTION OF THE WORK DONE IN BRIEF

30/01/2023 - 03/02/2023
Week: 02

I was assigned to the weld Department for my Internship work complete duration. This Department is the starting department of MSIL, where all cars bodies are designed and manufactured.

This department is divided into different work station, and each station is fully automatic robot performs task with 2-3 labour present. CPS/PLC connects entire robot server and work chain of this robot present. This Department is divided into 2 lines

B-line: Wagon-R.
C-Line: Celerio & S-Presso.

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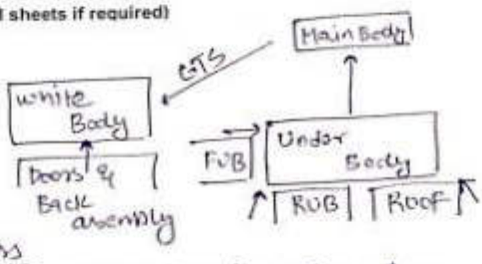
SUPPLEMENTRY NOTES
(add additional sheets if required)

① FUB : Front Under Body.
② RUB : Rear Under Body.
③ MF : Main Floor.

This work process is conected under GTS Process



GTS: Gravity Transfer System.

→ I met with the Senior Manager and DPM of our Department;

VIKASH MOUDGIL SIR : Senior Manager
AYUSH BANSAL SIR : DPM

Vikh Sir, introduced us with Ramesh Sir, the Senior Engineer and Rajat Sir, Junior Engineer of the weld Department.

Ramesh Sir, gave us complete tour of the Department and gave us basic rules and terms need to follow.

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SUPPLEMENTRY NOTES
(add additional sheets if required)

PPE Kit: Personal Protective Equipment;
(1) Helmet, (2) Gloves, (3) Glasses, (4) Arms cover, (5) Safety shoes.

also, we learned about few more terms like,
5S: Seiri, Seiton, Seiso, Seiketsu, Shiksuke.
3K: Kimeraareta, Kinon Dori, Kinchi to Mamora.
3G: Genchi, Genbutsu, Genjitsu.

The Department work chain:
[Vin Punching ⟶ Apron front ⟶ Dash Panel and Sides ⟶ Rear under ⟶ Rear Member ⟶ Panels ⟶ Main Floor ⟶ Main Body ⟶ White Body ⟶ Doors ⟶ check] ⟶ Done

• SPOT WELDING PROCESS is used in entire department.

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TOTAL HOURS: 45 HOURS

SIGNATURE OF STUDENT

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Signature of Faculty Mentor

Signature of officer-in-charge of Dept. / Section / Plant

Date:

Date: 17/02/23

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Annexure I
Enrollment no: 190390119013

STUDENT'S WEEKLY RECORD OF INTERNSHIP

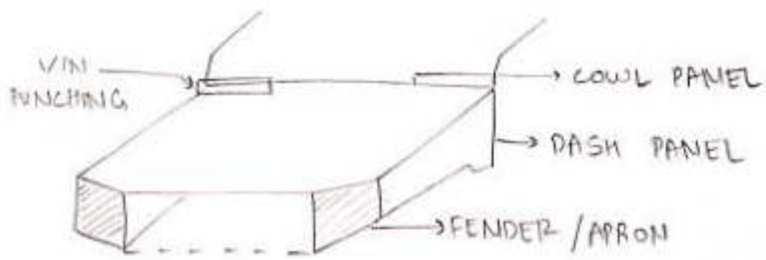
NAME OF STUDENT: RONIT RAMNIWAS SHARMA
DIARY OF THE WEEK: Dt: 06/02/2023 TO 10/02/2023
DEPARTMENT: MECHANICAL BRANCH SEM: VIIIth
NAME OF THE ORGANISATION: MARUTI SUZUKI INDIA LIMITED
NAME OF THE PLANT/SECTION/DEPARTMENT: WELD DEPARTMENT
NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT: AYUSH BANSAL

DESCRIPTION OF THE WORK DONE IN BRIEF

06/02/2023 - 10/02/2023
Week : 03

week 3 we looked overall plant work algorithum and prepared overself for learning.

- The first station we looked was
  FUB → FRONT UNDER BODY



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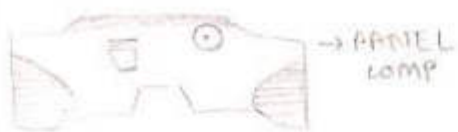
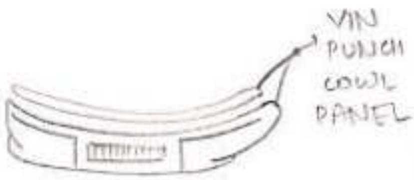
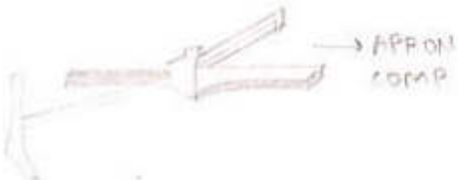
SUPPLEMENTRY NOTES
(add additional sheets if required)

FUB is the work station where all of front car parts are welded and this station work is divided into 4 sub station → VIN PUNCHING, APRON → DASH PANEL/SIDES.







→ Still all parts are interally joined by ~~[illegible]~~. Sealer.

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TOTAL HOURS: 45 HOURS

SIGNATURE OF STUDENT

○ The above entries are correct and the grading of work done by Trainee is
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Signature of Faculty Mentor

Signature of officer-in-charge of Dept. / Section / Plant

Date:

Date: 11/02/23

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Annexure I

Enrollment no: 190390119013

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: RONIT RAMNIWAS SHARMA

DIARY OF THE WEEK: Dt: 13/02/2023 TO 17/02/2023

DEPARTMENT: MECHANICAL BRANCH SEM: VIIIth

NAME OF THE ORGANISATION: MARUTI SUZUKI INDIA LIMITED

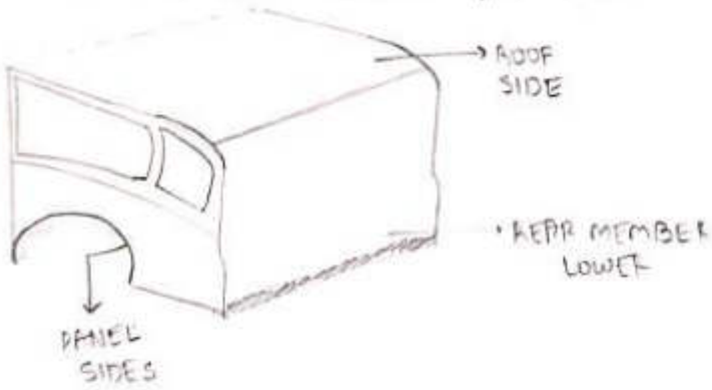
NAME OF THE PLANT/SECTION/DEPARTMENT: WELD DEPARTMENT

NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT: AYUSH BANSAL

DESCRIPTION OF THE WORK DONE IN BRIEF

13/02/2023 - 17/02/2023
Week - 04

week 04, learned about RUB → REAR UNDER BODY
This station was the next station after FUB.



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Annexure 1

Enrollment no: 190390119013

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: RONIT RAMNIWAS SHARMA

DIARY OF THE WEEK: Dt: 20/02/2023 TO 24/02/2023

DEPARTMENT: MECHANICAL BRANCH SEM: VIIIth

NAME OF THE ORGANISATION: MARUTI SUZUKI INDIA LIMITED

NAME OF THE PLANT/SECTION/DEPARTMENT: WELD DEPARTMENT

NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT: AYUSH BANSAL

DESCRIPTION OF THE WORK DONE IN BRIEF

20/02/2023 – 24/02/2023
week: 05

After learning FUB, RUB workstation work,
we Looked at MF and SideBody Processes;

- This workstation is quite tough to work and understand as in this station there are certain points where few parts are directly floaded, but their are certain points where parts are divided into inner and outer parts.

- MF → Main floor → MF Panel, Tunels
- SIDEBODY → Completing all outer body part.

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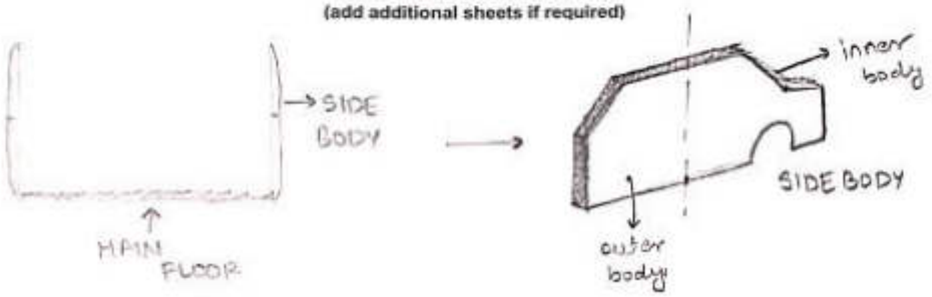
SUPPLEMENTRY NOTES
(add additional sheets if required)



→ The reason of setting inner and outer before loading because the sizes of this parts are too big and there are few parts which are complexive too weld, so, they join inner and outer seperately and then they load complete outer sidebody to weld JIG load for complete weld.

→ And this is how complete outer body of car is done at MAIN FLOOR station.

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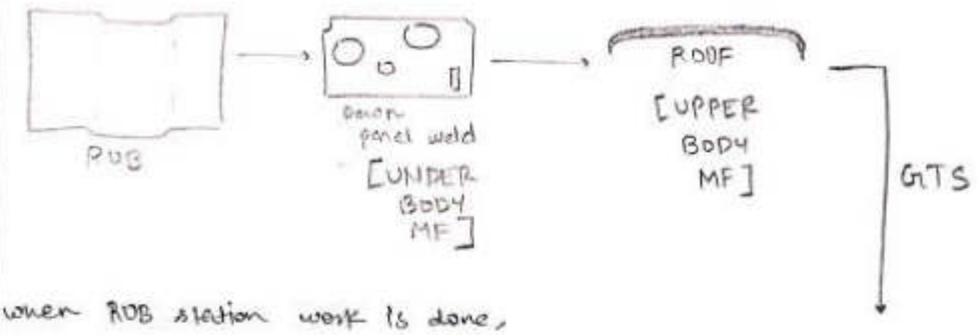
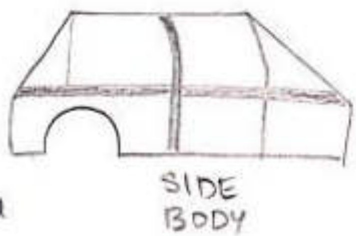
SUPPLEMENTRY NOTES
(add additional sheets if required)

MAIN FLOOR → SIDE BODY



when ROB station work is done, from GTS it transfer to MF. At MF station, UNDER & UPPER BODY MF gets weld and transfer to SIDEBODY where outer and inner doors and sidebody is welded and then it get ~~first~~ final weld.



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TOTAL HOURS: 45 HOURS

SIGNATURE OF STUDENT

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Signature of Faculty Mentor

Signature of officer-in-charge of Dept. / Section / Plant

Date:

Date: 11/03/2023

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Annexure 1

Enrollment no: 190390119013

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: RONIT RAMNIWAS SHARMA

DIARY OF THE WEEK: Dt: 27/02/2023 TO 03/03/2023

DEPARTMENT: MECHANICAL BRANCH SEM: VIIIth

NAME OF THE ORGANISATION: ~~WE~~ MARUTI SUZUKI INDIA LIMITED

NAME OF THE PLANT/SECTION/DEPARTMENT: WELD DEPARTMENT

NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT: AYUSH BANSAL

DESCRIPTION OF THE WORK DONE IN BRIEF

27/02/2023 – 03/03/2023

week: 06

Starting from FUB → RUB → MF → SIDEBODY, we come to last workstation where all doors and remaining parts are assembled which was WHITEBODY.

This station was the most important station as of all doors, back doors and "CHECK of BODY" is done here

This station is last station so there all car goes under check segment paper where they cross verify all points joints and parts.

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SUPPLEMENTRY NOTES
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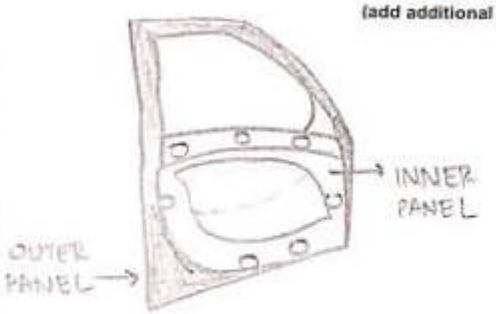
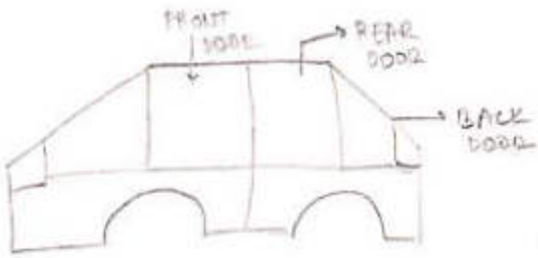


- The same process of assembly side body inner & outer part process is done done same at door station too.

INNER + OUTER → DOOR



- All Front Doors, Rear Doors, Back Doors and more of small parts are welded.

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SUPPLEMENTRY NOTES
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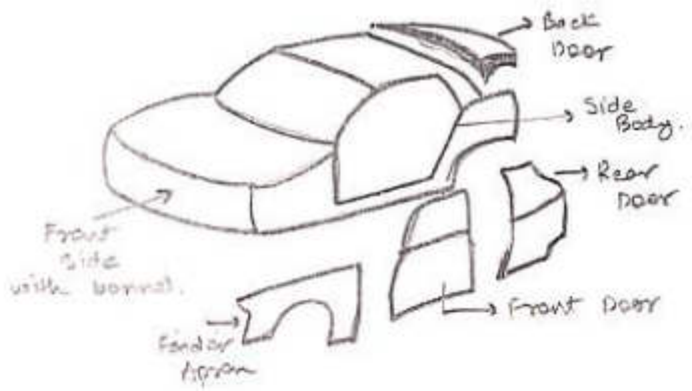

COMPLETE BODY with PARTS

• At white Body, this ~~are~~ all parts with each point of joints and their material property is checked at last CHECK SEGMENT.

• All of Dents, Sillar joints, all fitting is done in Segments.

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TOTAL HOURS: 45 HOURS

SIGNATURE OF STUDENT

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Signature of officer-in-charge of Dept. / Section / Plant

Date:

Date: 11/03/2023

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Annexure I
Enrollment no: 190390119013

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: RONIT RAMNIWAS SHARMA
DIARY OF THE WEEK: Dt: 06/03/2023 TO 11/03/2023
DEPARTMENT: MECHANICAL BRANCH SEM: VIIth
NAME OF THE ORGANISATION: MARUTI SUZUKI INDIA LIMITED
NAME OF THE PLANT/SECTION/DEPARTMENT: WELD DEPARTMENT
NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT: AYUSH BANSAL

DESCRIPTION OF THE WORK DONE IN BRIEF

06/03/2023 - 11/03/2023
WEEK: 07

After learning all of workstation processes and understanding how things work, we move forward and looking at 'KAIZEN' and "CMM" workspace.

- KAIZEN → KAIZEN, is term where it explain how from small and incremental changes improves quality and effective overtime.

- CMM → Coordinate Measuring Machine, this helps to check detect points and check dimensions of manufacturing.

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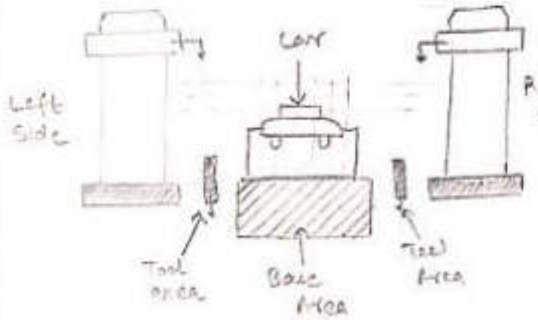
SUPPLEMENTRY NOTES
(add additional sheets if required)

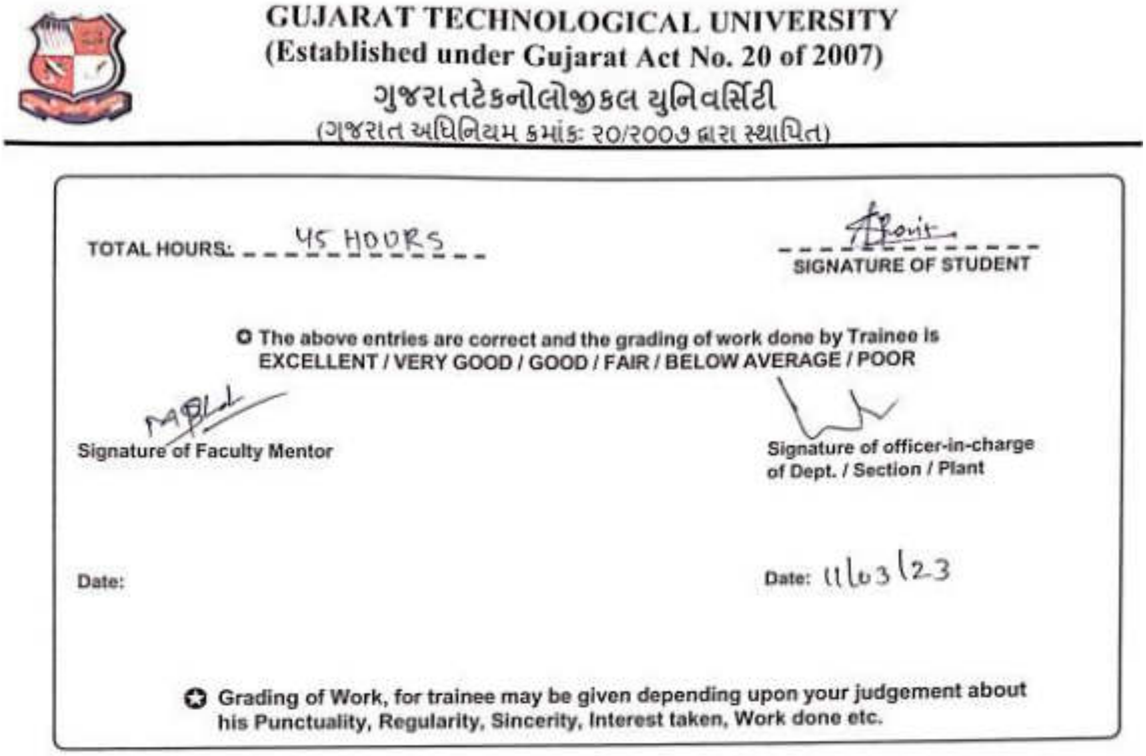


→ CMM
Coordinate Measuring Machine.

Everyone Involved → List of problem → Solution of problem → KAIZEN Process.

Solution of problem → Test → Regular Analysis → Sucessful Adopt

→ Repeat → Done Applied.



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TOTAL HOURS: 45 HOURS

SIGNATURE OF STUDENT

The above entries are correct and the grading of work done by Trainee is
EXCELLENT / VERY GOOD / GOOD / FAIR / BELOW AVERAGE / POOR

Signature of Faculty Mentor

Signature of officer-in-charge
of Dept. / Section / Plant

Date:

Date: 11/03/23

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Annexure I

Enrollment no: 19C39019013

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: RONIT RAMNIWAS SHARMA

DIARY OF THE WEEK: Dt: 13/03/2023 TO 17/03/2023

DEPARTMENT: MECHANICAL BRANCH SEM: VIIIth

NAME OF THE ORGANISATION: MARUTI SUZUKI INDIA LIMITED

NAME OF THE PLANT/SECTION/DEPARTMENT: WELD DEPARTMENT

NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT: AYUSH BANSAL

DESCRIPTION OF THE WORK DONE IN BRIEF

PROJECT : 01

AUTOCAD DESIGN

→ learned about AutoCAD Software Interference

→ Learned about measurement set and sizes used in company Project.

→ Read-out the last design of Company Weld Shop - B CAD Design.

→ Made some changes to last design.

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TOTAL HOURS: 45 HOURS

SIGNATURE OF STUDENT

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Signature of Faculty Mentor

Signature of officer-in-charge of Dept. / Section / Plant

Date:

Date: 15/4/23

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Annexure I
Enrollment no: 190390119013

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: RONIT RAMNIWAS SHARMA
DIARY OF THE WEEK: Dt: 20/03/2023 **TO** 25/03/2023
DEPARTMENT: MECHANICAL BRANCH **SEM:** VIIIth
NAME OF THE ORGANISATION: MARUTI SUZUKI INDIA LIMITED
NAME OF THE PLANT/SECTION/DEPARTMENT: WELD DEPARTMENT
NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT: AYUSH BANSAL

DESCRIPTION OF THE WORK DONE IN BRIEF

PROJECT: 01
AUTOCAD DESIGN

→ learned all the off-field sizes of components and trolley sizes.

→ Looked at the workspace size and presence of labour-work.

→ Figured-out the issue in past-last design and present layout design (sketch).

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Annexure I

Enrollment no: 190390119013

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: RONIT RAMNIWAS SHARMA

DIARY OF THE WEEK: Dt: 27/03/2023 TO 31/03/2023

DEPARTMENT: MECHANICAL BRANCH SEM: VIIIth

NAME OF THE ORGANISATION: MARUTI SUZUKI INDIA LIMITED

NAME OF THE PLANT/SECTION/DEPARTMENT: WELD DEPARTMENT

NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT: AYUSH BANSAL

DESCRIPTION OF THE WORK DONE IN BRIEF

PROJECT: 01

AutoCAD Design

→ worked on AutoCAD with last and new layout design.

→ Figured out the spaces and come up with new station set.

→ Cross-checked with other Weld Shop → A/c also too see the placement of station and components space.

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Annexure 1
Enrollment no: 190390119013

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: RUNIT RAMNIWAS SHARMA

DIARY OF THE WEEK: Dt: 3/4/2023 TO 8/4/2023

DEPARTMENT: MECHANICAL BRANCH SEM: VIIIth

NAME OF THE ORGANISATION: MARUTI SUZUKI INDIA LIMITED

NAME OF THE PLANT/SECTION/DEPARTMENT: WELD DEPARTMENT

NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT: AYUSH BANSAL

DESCRIPTION OF THE WORK DONE IN BRIEF

PROJECT: 02

ROBOT ASSET

→ Learned about Robot, Robot Mechanism, Robot Server System.

→ Looked at the placement of Robot acording to their programming.

→ Checked their maintance reason and inner work.

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TOTAL HOURS: 45 HOURS

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Annexure I

Enrollment no: 190390119013

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: RONIT RAMNIWAS SHARMA

DIARY OF THE WEEK: Dt: 10/4/23 TO 15/4/23

DEPARTMENT: MECHANICAL BRANCH SEM: VIIIth

NAME OF THE ORGANISATION: MARUTI SUZUKI INDIA LIMITED

NAME OF THE PLANT/SECTION/DEPARTMENT: WELD DEPARTMENT

NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT: AYUSH BANSAL

DESCRIPTION OF THE WORK DONE IN BRIEF

PROJECT: 02

ROBOT INFO

→ Learned how Robot is programmed.
Programming Language used is [TP Programming].

→ Controlled robot through B-TP Box.

→ Programmed robot with the Team.

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Annexure 1

Enrollment no: 190370119013

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: RONIT RAMNIWAS SHARMA

DIARY OF THE WEEK: Dt: 17/4/23 TO 22/4/23

DEPARTMENT: MECHANICAL BRANCH SEM: VIIIth

NAME OF THE ORGANISATION: MARUTI SUZUKI INDIA LIMITED

NAME OF THE PLANT/SECTION/DEPARTMENT: WELD DEPARTMENT

NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT: AYUSH BANSAL

DESCRIPTION OF THE WORK DONE IN BRIEF

FINAL TRAINING WEEK

→ Last week of my summer training we were given whole summary of learning and checked our project given by Company

→ ~~Made~~ Made up report with company about above work and present task done.

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TOTAL HOURS: 45 HOURS

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Signature of officer-in-charge of Dept. / Section / Plant

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Date: 23/4/23

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Annexure 2

Feedback Form by Industry expert

Student Name: RONIT RAMNIWAS SHARMA Date: 26/04/2023

Work Supervisor: MAHENDER SINGH Title: INTERNSHIP

Company/Organization: MARUTI SUZUKI INDIA MANESAR

Enrollment No: 190390119013

Internship Address: IMT MANESAR, GATE NO.-2 MARUTI SUZUKI MANESAR PLANT

Dates of Internship: From 23-01-2023 to 23-04-2023

Please evaluate your intern by indicating the frequency with which you observed the following behaviors:

Parameters	Needs improvement	Satisfactory	Good	Excellent
Shows interest in work and his/her initiatives				O
Produces high quality work and accepts responsibility				O
Uses technical knowledge and expertise			O	
Analyzes problems effectively			O	
Communicates well and writes effectively			O	

Overall performance of student intern: (Needs improvement/ Satisfactory/Good/Excellent):

Additional comments, if any:

Signature of Industry person with name and Stamp:

Signature of the Faculty Mentor

INTERNSHIP AT RATNAMANI METAL & TUBES LTD

AN INTERNSHIP REPORT

Submitted by

DHAVALKUMAR AMRABHAI SUTHAR

190390119014

In partial fulfilment for the award of the degree of

BACHELOR OF ENGINEERING

in

Mechanical Engineering Department

S.P.B. Patel Engineering Collage, Mehsana

S.P.B. PATEL
ENGINEERING COLLEGE
SAFFRONY INSTITUTE OF TECHNOLOGY

Gujarat Technological University, Ahmedabad

May, 2023

S.P.B. PATEL
ENGINEERING COLLEGE
SAFFRONY INSTITUTE OF TECHNOLOGY

S.P.B. Patel Engineering Collage, Mehsana

Near shanku's water park, Linch, Mehsana

Gujarat 384435

CERTIFICATE

This is to certify that the project report submitted along with the project entitled **RATNAMANI METAL & TUBES LTD** has been carried out by **Dhavalkumar Amrabhai Suthar** under my guidance in partial for the degree of Bachelor of engineering in mechanical engineering, 8th Semester of Gujarat technological university, Ahmedabad during the academic year 2022-23.

Prof. Monil Shah — Internal Guide

Prof. Kunal Kathiya — Head of the department

S.P.B. Patel Engineering Collage, Mehsana

Near sankush water park, linch, Mehsana

Gujarat 384435

DECLARATION

We hereby declare that the internship report submitted along with the internship entitled **Internship at Ratnamani Metal & Tubes LTD** submitted in partial fulfilment for the degree of bachelor of engineering in mechanical engineering to Gujarat Technological University, Ahmedabad, is a bonafide record of original project work carried out by me at Ratnamani Metal & Tubes LTD under the supervision of Prof. MONIL SHAH and that no part of this report has been directly copied from any students or report or taken from any other source, without providing due reference.

Dhavalkumar Amrabhai Suthar ______________

Works : Survey No. 474, Anjar - Bhachau Road, Village - Bhimasar, Taluka - Anjar, Dist. : Kutch - 370240. Gujarat. (INDIA)
Phone : +91 - 02836-285538/39/40, 285345
Fax : +91 - 02836-285261, 285262
Website : http://www.ratnamani.com

RATNAMANI®
METALS & TUBES LTD.

Date: 01st May 2023

TO WHOM IT MAY CONCEN

This is certify that **Dhaval Suthar**, a student of S.B.P Patel Engineering College, Mehsana has successfully completed his internship in the field of production, quality control, & maintenance 06/02/2023 to 30/04/2023 (Total number of weeks: 12) under the guidance of Mr. Balwant Vaishnav (Dy. Manager at maintenance department).

His internship activities include production & manufacturing system observation, quality control, & maintenance.

During the period of his internship program with us, he had been exposed to different processes and was found diligent, hardworking and inquisitive.

We wish him every success in his life and career.

For, Ratnamani Metals & Tubes Ltd.

Sunil Jain
General Manager (HR & Admin)

Corporate Office:
The First, A & B Wing 9th Floor, Behind Keshav Baug Party Plot, The First Avenue Road, Off 132 ft. Ring Road, Vastrapur, Ahmedabad -380015
Phone : +91-79-27415501 / 2 / 3 / 4 Fax : +91 - 79 - 27480999
E-mail Add : info@ratnamani.com
CIN : L70109GJ1983PLC006460
Web : http://www.ratnamani.com

GUJARAT TECHNOLOGICAL UNIVERSITY

CERTIFICATE FOR COMPLETION OF ALL ACTIVITIES AT ONLINE PROJECT PORTAL

B.E. SEMESTER VIII, ACADEMIC YEAR 2022-2023

Date of certificate generation : 09 May 2023 (15:26:41)

This is to certify that, ***Suthar Dhavalkumar Amrabhai*** (Enrolment Number - 190390119014) working on project entitled with ***Internship at Ratnamani metals and Tubes Ltd*** from ***Mechanical Engineering*** department of ***S. P. B. PATEL ENGINEERING COLLEGE, MEHSANA*** had submitted following details at online project portal.

Internship Project Report	**Completed**

Name of Student : Suthar Dhavalkumar Amrabhai

Name of Guide : Mr. Monil Shah

Signature of Student : ______________

*Signature of Guide : ______________

Disclaimer :
This is a computer generated copy and does not indicate that your data has been evaluated. This is the receipt that GTU has received a copy of the data that you have uploaded and submitted as your project work.

*Guide has to sign the certificate, Only if all above activities has been Completed.

ACKNOWLEDGEMENT

This internship would not have been possible without the kind support of many people. I take this opportunity to acknowledge someone who has been a great sense of support and inspiration throughout the research work successfully.

First of all, I am humbly expressing thanks to my respected guide **Prof. Monil Shah** lecturer in the Mechanical Engineering Department of S.P.B. Patel Engineering Collage, Mehsana for their valuable time and constant help to me.

I would also like to thank our Head of Department **Prof. Kunal Kathiya** who has always been ready to offer help at any time, despite having this busy schedule.

I would also like to thank the Dy. manger of Ratnamani metal & tubes Ltd **Mr. Balwant Vaishnav,** for practically advising and helping us to carry out our situation.

Finally, I am thankful to the college faculty and other staff members of saffron institute of Technology – Mehsana.

Thank you

Dhavalkumar Amrabhai Suthar - 190390119014

ABSTRACT

This report contains brief description of the 12 Weeks Internship program inside RATNAMANI METAL & TUBES LTD. This report especially elaborates the practical approach to manufacturing of pipe that are manufactured inside the industry. It includes all the theoretical knowledge and practical approach that I have learned during my internship period.

This report mainly focuses on the pipe manufacturing that is currently being carried out by the industry besides the manufacturing of some products that have been successfully completed. It also gives an insight into organization structure along with its brief introduction. Every effort has been made to include the manufacturing and quality that are in general the major tasks performed. All the activities performed at industry have been documented under different departments for clear understanding. In short, this report has been firmly organized to give the header a brief understanding of the organization along with its field experience.

Here during my internship I've witnessed how different manufacturing processes, quality control & organizing work is carried out in an organization. They are aiming to be a company which can produce different types of weld pipe and tubes of different specification & others different products also.

LIST OF FIGURES

LIST OF TABLES

TABLE OF CONTENTS

CHAPTER-1

INTRODUCTION

1.1 INTRODUCTION TO RATNAMANI

Since its inception in 1985, accepting challenges and ensuring customer delight has been the hallmark of Ratnamani. In just two decades, Ratnamani has grown to become a multi-product, multi-location public limited company providing total piping solutions to a diverse range of industries.

Ratnamani manufacturing facilities employ state-of-the-art technology to produce a wide range of Stainless Steel Welded / Seamless Tubes & Pipes and Carbon Steel Welded Pipes.

The company caters to the niche markets of almost all the emerging sectors like oil and gas, refineries, petrochemicals, process industries, power plants and water distribution.

The Company got approval from Nuclear Power Corporation of India Limited in the year 2003 for the supply of critical instrumentation seamless tubes & primary piping for nuclear reactors. Also the RMTL made up-gradation of ISO 9002 certification to ISO 9001-2000 under LRQA.

Ratnamani follows a total quality approach and its products conform to the highest international standards.

The company uses green power and has a robust safety, health environment.

The company's unflinching commitment to delight customer has ensured client loyalty.

The company manufactures mainly three types of pipes accordingly:

API (American Petroleum Institute) - For various chemicals, acids.

ASTM (American Standards for Testing of Materials) - for high pressure gas, fuels.

IS (Indian standards) - for sewage and water supply.

1.1.1 COMPANY DETAILS

Company Name: Ratnamani Metal & Tubes Ltd.

Location: Survey No.474, Anjar-Bhachau Road, Village: Bhimasar Tal: Anjar, Dist: Kutch, Gujarat370110.

Fig.1.1.1 outside of industry

Major customers of Ratnamani are as follow:

- Megha Engineering & Infrastructure LTD.
- Torrent Gas LTD.
- AGP LTD.
- IOCL (Indian Oil Corporation LTD).
- ONGC (Oil & Natural Gas Corporation).
- IGL (Indraprastha Gas LTD).

1.1.2 COMPANY PRODUCT

Ratnamani Metals and Tubes Ltd (Ratnamani) is a manufacturer of tubing and piping products. It offers carbon steel welded pipes and stainless steel welded and seamless tubes and pipes.

Carbon steel (cs) pipes are manufacturing into following categories:

1. HFW (high frequency welding) pipe manufacturing.
2. HSAW (HELICAL SUBMERGED ARC WELDING) pipe manufacturing.
3. L-SAW (longitudinal-seam submerged arc welding) pipe manufacturing.
4. C-SAW (circumference submerged arc welding) pipe manufacturing.
5. INDUCTION BENDING. (BEND Pipe manufacturing).
6. EXTERNAL COATING AND INTERNAL COATING (Coating Pipe manufacturing).

1.1.3 MISSION OF THE COMPANY

Production in large volume and cost-effectiveness in all segments.

Produce technologically superior products.

Achievement of customer delight through benchmarking global practice.

Consistent production through harmonious industrial relations strength then supplies chain management.

Customer satisfaction.

Employee satisfaction

Revenue growth.

1.1.4 AIM AND OBJECTIVE OF THE INTERNSHIP

To study different manufacturing process and to understand the various procedures adopted in the industry from an industrial engineering point of view

To understand how different subsystems coexists to make a whole by studying the different groups and their function.

Understand RMTL from the inside and outside.

List the main problems in the industry.

Analysing a project – problem identification and development.

1.1.5 SAFETY TRAINING

We were given safety training on the first day of internship on 06/02/2023.

Following are some important points of safety training:

Always wear helmet inside plant.

Always wear safety shoes.

Be alert inside plant, safety is our main aim.

Mobile phones are strictly prohibited inside plant.

Safety & discipline is main moto of the industry.

CHAPTER-2
HFW PIPE MANUFACTURING

2.1 RAW MATERIAL RECEVED INSPECTION STORAGE

The coil is received by the following companies as per pipe order.

Table 2.1 main coil supplier

AMNS (ArcelorMittal Nippon Steel India).
TISCO (Tata iron and steel company).
POSCO (Pohang iron and steel company).
JSW (Jindal south West).

Fig.2.1.1 coil storage

When the coil is received, some important factors such as heat number and thickness are observed.

In storage coil is arranged according to order.

2.2 OFFLINE COIL SLITTING

Carbon steel coil slitting processes has three steps: Uncoiling to flatten the metal out, blades (called knives) for cutting, and a re-coiler for winding the metal back into a coil.

Slitting is a process used to cut a wide coil of metal into several narrower coils. The process is primarily used to cut thin materials lengthwise and features a machine fitted with circular blades.

The slitter knives are mounted on two arbors together with spacers. The spacers determine the width of the cut and the horizontal clearance.

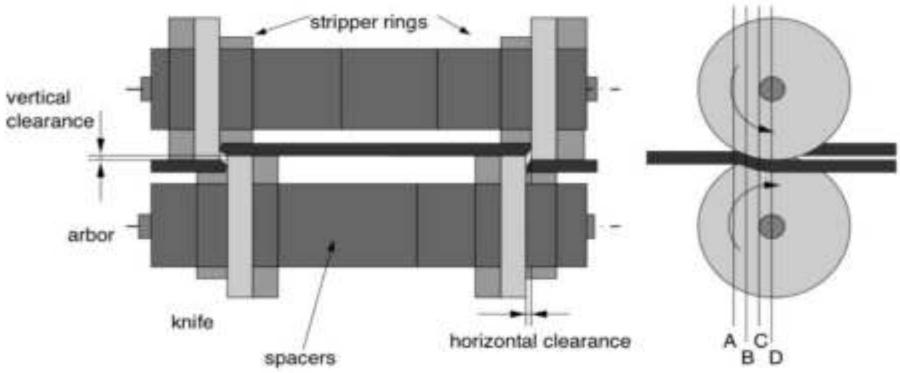


Fig.2.2.1 slitting process

Shape defects (length variations such as buckles, twists and thickness variation across the width) and internal stresses in the incoming coil influence the result of the slitting process. Therefore, a leveller or a temper mill can be added to the slitting line, to correct defects in the incoming coil, which ensures a better quality of the slitted strips.

2.3 COIL LOADING & UNCOILER

After slitting, the material is taken to the plant.

Loading of coil is done by industrial cranes which has a capacity of up to 30 tones.

There are such 26 cranes are available in cs plants.

Fig.2.3.1 coil loading & un-coiler

2.4 STRIP LEVELING & END SHEARING

In strip levelling the coil is brought directly forward.

Shearing is the process of cutting sheet metal to size out of a larger roll or flat stock. As the material moves through the shear machine, cutting blades come together in order to fracture the material into separate, smaller pieces.

Shearing is performed by slicing through a piece of sheet metal with a blade that's most often affixed to a tool or machine.

Fig.2.4.1 strip levelling & end shearing

2.5 COIL JOINT

Coils are joined by SAW (submerged arc welding).

Submerged-arc welding (SAW) is a common arc welding process that involves the formation of an arc between a continuously fed electrode and the work piece. A blanket of powdered flux generates a protective gas shield and a slag which protects the weld zone.

SAW is ideally suited for longitudinal and circumferential butt and fillet welds. However, because of high fluidity of the weld pool, molten slag and loose flux layer, welding is generally carried out on butt joints in the flat position and fillet joints in both the flat and horizontal-vertical positions.

Thickness of filler metal(EM-12K) in welding is 3.15mm and 4mm.

Fig.2.5.1 coil joint

2.6 Horizontal strip accumulator

This process increases the production rate.

In this process coil goes inside a loop and proceeds to the process.

Till than another coil is kept and welded on the other side.

Fig.2.6.1 horizontal strip accumulator

2.7 Edge milling

Slitter blades and edge milling trims strip edges to provide the precise strip width required during the forming and ERW seam welding process.

After the edge milling, ultrasonic test (5.2.2) is done on the coil.

2.8 PIPE FORMING

The forming process begins at the Breakdown Pass where the material is gradually bent from a flat steel strip into a rounded tube.

Fig.2.8.1 pipe forming

Different rollers are used according to different dimension.

Fig.2.8.2 different rollers

2.9 High frequency welding

A high frequency electrical current flow through contact tips into the strip edges to produce the heat required for bonding the strip edges together as the material passes through the weld roll stand.

High frequency welding (HFW) steel pipe is that ERW pipe produced with a welding current frequency equal to or greater than 70 kHz.

Fig.2.9.1 HFW Welding

2.10 Weld seam normalizing

Normalization is the process in which carbon steel is heated to 1600°F and then air-cooled. This process assures the steel completely transforms to austenite. Normalizing steel has a relatively high strength and ductility. It also has a higher strength than annealed steel.

Normalizing involves heating a material to an elevated temperature and then allowing it to cool back to room temperature by exposing it to room temperature air after it is heated.

Fig.2.10.1 Normalizing

2.11 AIR AND WATER QUENCHING

This is an air and water cooling method for cooling the hot pipe.

Fig.2.11.1 air and water quenching

2.12 PIPE SIZING

The Sizing Section squeezes the welded pipe into the precise roundness, outer diameter, and straightness tolerances specified by the customer.

Fig.2.12.1 pipe sizing

After the sizing is done in the pipe some sample is cut from the pipe and flattening test (5.1.5) is done on it.

If there is a requirement RBT test (5.1.6) is also done it.

2.13 INSIDE PIPE CLEANING

In this process pipe are cleaning in inside by water.

After the inside cleaning of the pipe, hydro testing (5.2.5), Auto UT(5.2.1), RTR(5.2.2) and manual UT (5.2.4) are to be done on it.

2.14 AUTOMATIC LASER MESURMENT SYSTEM

The automatic measurement robot measures, Diameter (mm), Out of roundness (mm), Wall thickness (mm), Bevel angle (degree), Root face (mm), Straightness (mm), Squareness (mm) & Wall thickness (mm).

Fig.2.14.1 Automatic laser measurement system

Robot 1 majors F end and robot 2 majors T end, also PBMS (Pipe body measurement system) majors the pipe body.

2.15 AUTOMATIC MARKING SYSTEM

Here, marking data is entered by system and it will marked by the automatic marking system.

2.16 STOCK YARD AND DISPATCH

Fig.2.16.1 Stock yard and dispatch

CHAPTER 3

HSAW PIPE MANUFACTURING

3.1 RAW MATERIAL INSPECTION & STORAGE.

In coil inspection the following things are seen as necessary which are seen as necessary which are in the table. (Note – the following coil information is an example of single coil during the running project)

Table 3.1 coil information

RMTL Batch No	KC2D0336
Supplier No	0223007857
Supplier Name	JSW DOLVI
Heat Number	B011666
Coil plate size	1600.000 mm × 9.00 mm
Coil / plate specification	IS - 2062
Coil / plate grade	E250B
Qty (kg)	30020

3.2 HSAW PIPE MANUFACTURING PROCESS

3.2.1 COIL CAR AND UNCOILER

The coil is loaded on the coil car which then uncoils the coil using a coil opener.

The coil opener is itself assembled on the coil car to uncoil the coil.

Fig.3.2.1 coil car and un-coiler

3.2.2 PINCH ROLL AND LEVELER

Pinch roll is used to straighten the coil when uncoiled.

Leveller is used to further straighten the coil when opened after coming from coil opener.

Fig.3.2.2 pinch roll and leveller

3.2.3 END SHEAR

The ends of the coil are called fish, which is removed at the end shear station.

3.2.4 COIL JOINING

The front end of the new coil and the back end of the old coil is joined using SAW welding.

The coil car is set on a rail track which moves back when the coil is needed to be joined together, and moves forward as the coil is being used to make pipe(In this method production rate is increased).

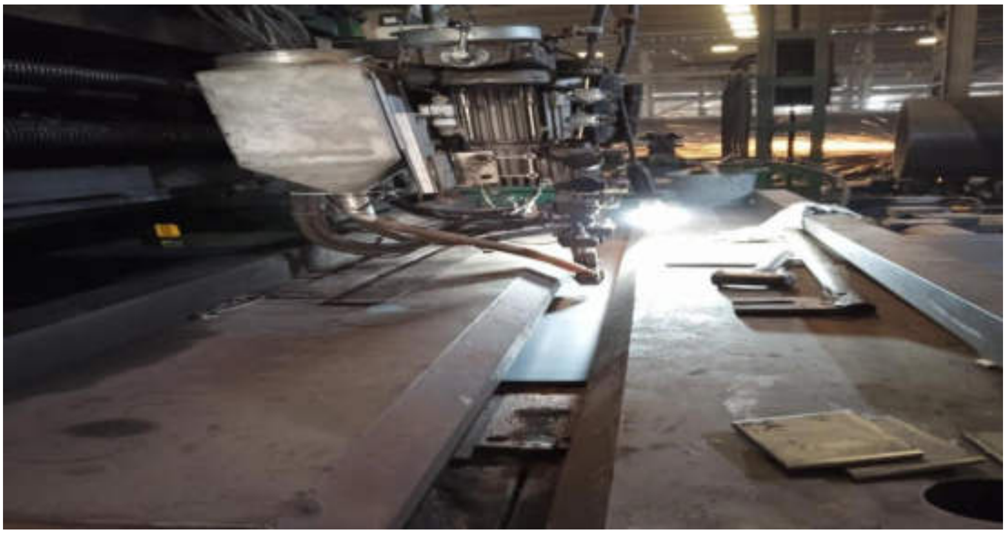


Fig.3.2.4 coil joining by saw welding

3.2.5 PINCH ROLL

A second pitch roll is provided to remove any other misalignments in the coil.

3.2.6 LEVELLING STATION 2

A second leveller is given to straighten the sheet again if needed.

Usually the second leveller is used when the thickness of sheet is more and needs more pressure to straighten.

3.2.7 COIL UT

The sheet is checked for any defects inside of the sheet.

If any defect is found then the sheet is marked and notified to the purchase department.

3.2.8 EDGE MILLING 1 & 2

Edge milling makes V-groove on the edges to weld the pipe properly.

Fig.3.2.8 Edge milling

3.2.9 PIPE FORMING

The sheet is inserted in a roller which then bends the sheet to form a pipe.

The helix angle is calculated on the basis of diameter of the pipe required and width & thickness of the coil.

Fig.3.2.9 Pipe forming

Calculation of helix angle (θ) of mill is to be done as follows,

$$\mathbf{Cos\ \Theta = B / (OD\text{-}T) \times \pi}$$

B = Width

OD = Outer diameter of pipe

T = thickness of pipe

3.2.10 INSIDE GMAW

Pipe is first welded using GMAW (Gas Metal arc Welding) for initial joint.

Electrode : EM3-12K , Gas : CO2 80% , Ar 20%

This process helps the pipe to hold its position and the bend do not lose.

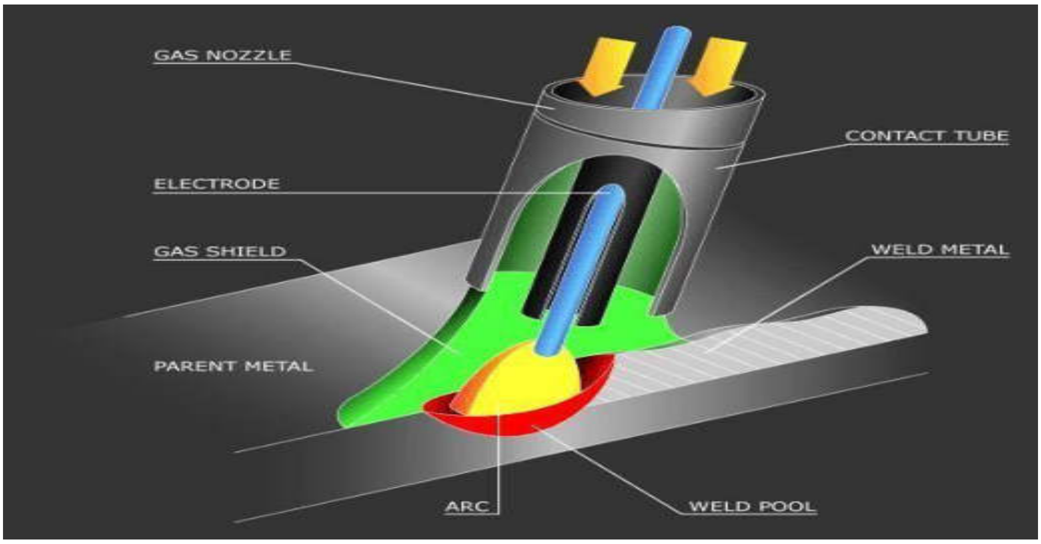


Fig.3.2.10 GMAW Welding

3.2.11 PIPE CUTTING (PLASMA CUTTING)

The required length of the pipe is measured and the pipe is cut accordingly.

The pipe is cut is using plasma cutter. Some extra length is kept as it is required for cutting samples for testing its quality.

Plasma cutting (plasma arc cutting) is a melting process in which a jet of ionized gas at temperatures above 20,000°C is used to melt and expel material from the cut.

3.2.12 VISUAL INSPECTION

The pipe is inspected for any defects which could be formed while performing GMAW or while transferring pipe through trolly.

3.2.13 TAB JOINING

A tab is joined on both the ends of the pipe at the welded portion.

3.2.14 TWO STEP SAW WELDING

SAW welding is conducted on both internal and external portion of the pipe.

Usually single layer does the work, but if the thickness is needed then multilayer welding is done (also known as tandem welding).

Table 3.2.14 Current-voltage specification

Welding	**Current**	**Voltage**
ID	590 – 620 A	27 – 32 V
OD	590 – 620 A	27 – 32 V

Fig.3.2.14 two step welding

3.2.15 TAB REMOVING

Tab is removed after the welding is finished.

3.2.16 INSIDE FLUX CLEANING

After the welding is performed a layer of flux builds on the weld line. It has to be cleaned.

After this, samples are to be cut for laboratory testing.

3.2.17 END CHAMFER

The ends are chamfered at 45°, using end milling machine.

NOTE – After this process, tests like RTR (2.2.3) hydro testing (2.2.7), MPI (2.2.5) and Auto UT are to be done on pipes.

3.2.18 VISUAL INSPECTION

The weld is inspected manually for any defects.

In visual inspection the dimensions like, Diameter (mm), Out of roundness (mm), Wall thickness (mm), Bevel angle (degree), Root face (mm), Straightness (mm), Squareness (mm) & Wall thickness (mm) are to be measured.

3.2.19 WEIGHING

The pipe is weighed and is confirmed by the TPI and the industry’s logistics department.

3.2.20 STOCK YARD AND DISPATCH

The pipe is then moved to the stockyard for storage.

According to the requirement the pipe is then moves on the truck for dispatch or moves to coating department for coating.

CHAPTER 4

LSAW PIPE MANUFACTURING

4.1 PLATE STORAGE AND INSPECTION

Plates are used instead of coils in LSAW plant due more thickness up to 60mm.

Plate is inspected for any defects such as rust, dent, and dimensions are measured.

Fig.4.1 plate storage & inspection

➢ 4.2 LSAW PIPE MANUFACTURING PROCESS

The LSAW pipe diameter range is normally from 16 inch to 60 inch (406mm to 1500mm). They have good performances even on high pressure and have a low-temperature corrosion resistance.

Longitudinal Submerged Arc Welding is a specific welding technique used in pipe production where the finished product requires a particularly high wall thickness due to high internal or external pressures.

With this in mind the main applications of LSAW pipes include oil, natural gas, gas, central heating, water supply, sewage treatment and other similar uses.

In LSAW pipe mills, processing is carried out by cold forming heavy carbon steel plates, the pipe pre-material on which many of the pipe properties depend.

4.2.1 TAB JOINING

Tabs are welded on all four corners of the plate.

Automatic ultrasonic testing (5.2.1) is then done on the sheet.

4.2.2 PLATE EDGE MILLING

Milling is used to make V-groove on edge of plate.

4.2.3 PLATE EDGE PRE BENDER

The plate is bend form the edges to make it bend easy in the next process.

The sheet metal bending process involves applying a force to a sheet metal part to change its geometry.

This force causes stress on the sheet metal beyond its yield strength, causing the material to physically deform without breaking or failing. The press brake is a commonly used tool to bend sheet metal.

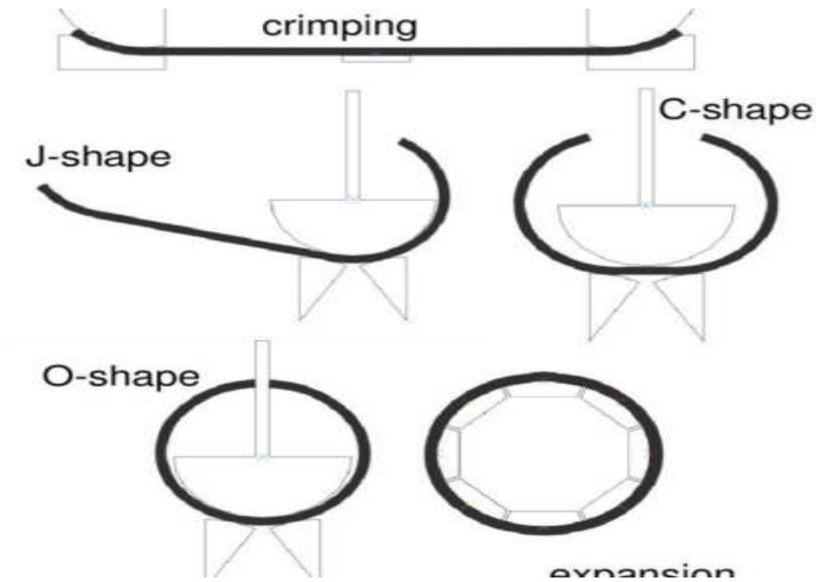


Fig.4.2.3 plate edge pre bender

4.2.4 JCO FORMING

Load is applied on the plate in stages and on decided sections which bends the plate to make a cylinder.

The plate is divided in equal parts from both the sides and centre is marked.

Then the load is applied on one half of the plate to make a shape resembling "**J**".

Then the load is applied on the other side because of which the sheet makes "**C**" shape.

Then the load is applied on all sides to make "**O**" shape.

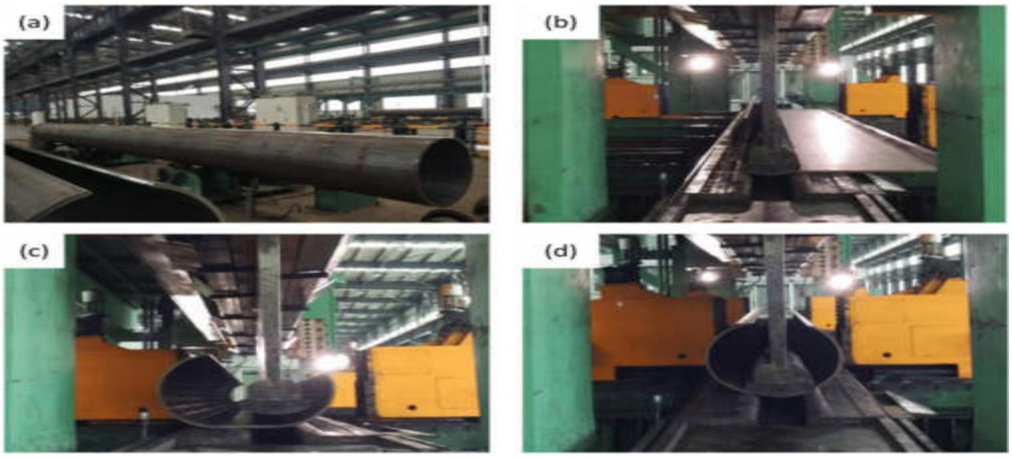


Fig.4.2.4 JCO forming

4.2.5 CONTINUOUS TACK WELDING

Pipe is assembled on a welding station which holds the pipe in **O** shape and tack welding on the V groove.

The type of welding in this is gas metal arc welding.

4.2.6 TACK WELDING INSPECTION AND TACK REPAIR

Tack is inspected to find any defect or any under run.

If any repair is required then the tack will be repaired.

4.2.7 INTERNAL OR EXTERNAL WELDING

Internal SAW welding and External SAW welding is conducted on the pipe using tandem method or if required multiple runs.

Fig.4.2.7 internal & external welding

4.2.8 STRAIGHTENING

If any bend like problem in pipe is found then straitening will be done.

Fig.4.2.8 straitening process

4.2.9 TAB REMOVAL AND VISUAL INSPECTION

Tab is removed after the welding is finished.

The pipe is inspected visually to find any defects on the surface.

Then RTR testing (5.2.2) is done on the pipe.

4.2.10 COLD EXPANSION AND COLD SIZING

When sheet is converted into pipe the shape obtained is oval, to get the shape and to get the pipe in cylindrical shape and to get into dimensional criteria cold expansion is carried out.

After that hydro testing is done on the pipe.

4.2.11 END BEVELING

The ends are chamfered at 45°.

Then automatic UT (5.2.1), manual UT (5.2.4) and RTR (5.2.2) testing is done on the pipe.

4.2.12 SAMPLING FOR CHEMICAL & MECHANICAL TEST

A sample is cut from the pipe to be sent to the quality lab to inspect.

4.2.13 FINAL INSPECTION

The pipe is inspected for any defect and the specifications demanded by the customer are checked.

Specifications such as; Outer diameter, Internal diameter, Ovality, Straightness, Length, Beed height, Bevel angle, Root face, Squareness, etc.

4.2.14 WEIGHING AND PIPE MARKING

The pipe is weighed and is confirmed by the TPI.

The pipe is marked with its number and other necessary details.

4.2.15 STOCK YARD AND DISPATCH

The pipe is then moved to the stockyard for storage.

According to the requirement the pipe is then moves on the truck for dispatch or moves to coating department for coating

CHAPTER 5

PIPE TESTING METHOD

Two types of testing are done in the pipe industry.

5.1 DESTRUCTIVE TESTING (DT)

As the name suggests, destructive testing (DT) includes methods where the material is broken down in order to determine mechanical properties, such as strength, toughness and hardness.

Advantages of Destructive Testing (DT):

- Verifies properties of a material.
- Determines quality of welds.

5.1.1 TENSILE TEST

Tensile (elongation) testing is a type of stress testing performed by elongating or compressing a component to determine the strength of the material. Breaking strength, maximum elongation and compression, and tensile strength are all measured to calculate physical properties and to determine which materials can withstand a great amount of force.

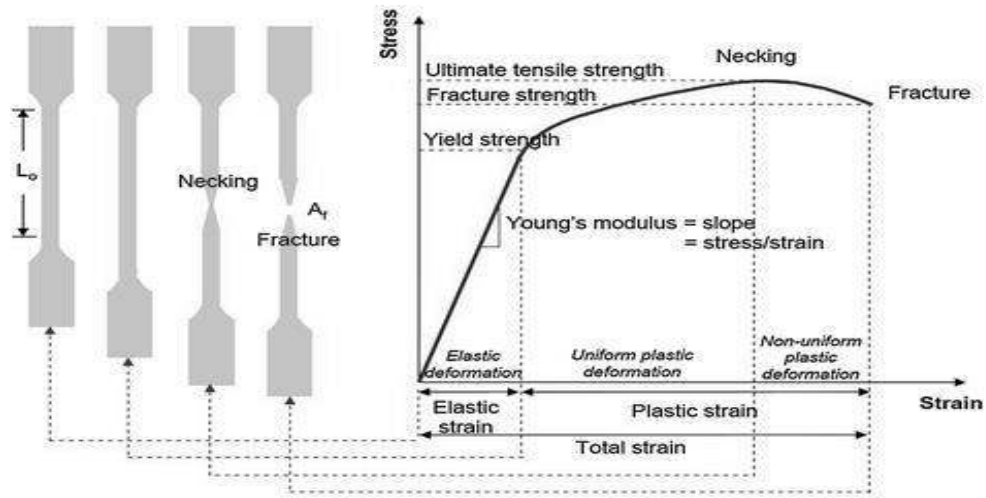


Fig.5.1.1 the shape of ductile specimen changes during tensile testing

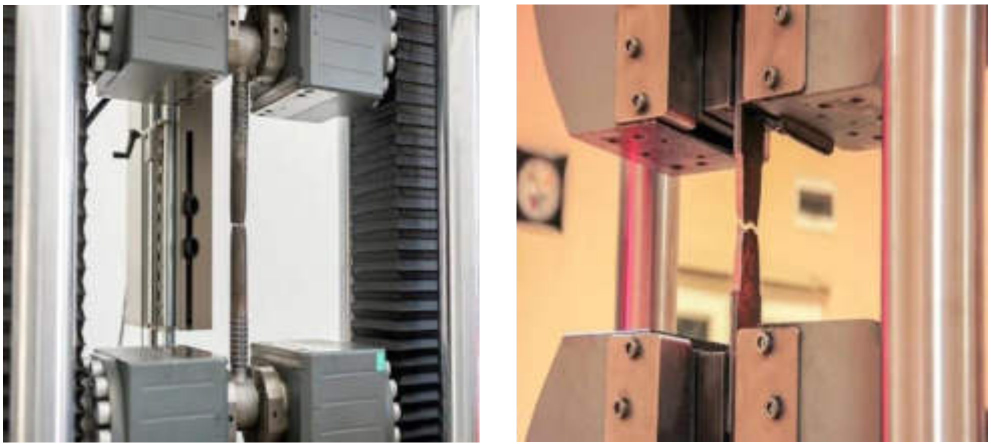


Fig 5.1.2 Tensile Test

5.1.2 GUIDED BEND TEST

The guided bend test is used where the coupon is wrapped around a former of a specified diameter and is the type of test specified in the welding procedure and welder qualification specifications. For example, it may be a requirement in ASME IX, ISO 9606 and ISO 15614 Part 1.

Fig.5.1.2 Guided bend test

A guided bend test sample containing the weld is located at its centre point while being supported by lower anvils. It is bent 180 degrees and the sample is visually checked for cracks or defects. No cracks should appear on the surface greater than 1/8 inch.

5.1.3 CHARPY IMPECT TEST

The Charpy impact test is performed to evaluate the resistance of plastics to breakage by flexural shock according to standard test method ASTM D6110[7].

It indicates the amount of energy needed to break standard test specimens under specific conditions of specimen, mounting, notching and pendulum velocity at impact.

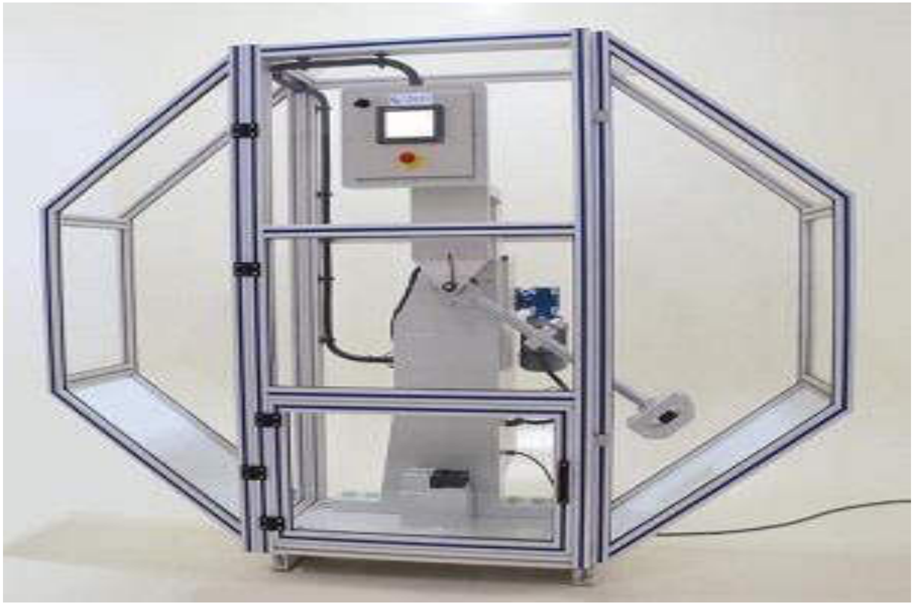


Fig.5.1.3 Charpy impact test

The Charpy impact test measures the energy absorbed by a standard notched Specimen while breaking under an impact load.

The amount of energy absorbed by the test specimen to break is called Knotch impact energy.

The Knotch Impact Energy KV = mgH – mgh

m – Mass of the Pendulum.

H – Height of Pendulum starting point.

g – Gravity.

h – Height of the pendulum from the first reversal point.

5.1.4 VICKERS HARDNESS TEST

The Vickers hardness test is a test performed to measure the hardness of materials, specifically thin sections and small parts.

A square base pyramid shaped diamond is used for testing in the Vickers scale. Typically loads are very light, ranging from 10gm to 1kgf, although "Macro" Vickers loads can range up to 30 kg or more.

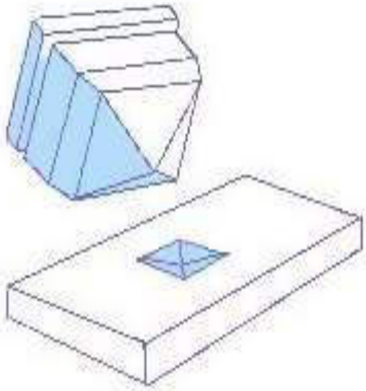



Fig.5.1.4 Vickers hardness testing

The Vickers number (HV) is calculated using the following formula:

HV = 1.854(F/D2)

Where F being the applied load (measured in kilograms-force) and D^2 the area of the indentation (measured in square milli meters). The applied load is usually specified when HV is cited.

5.1.5 FLATTENING TEST

Flattening test has two ways. One is that the outside diameter of sample is pressed to the original 2/3 when the pressure's direction is vertical with weld seam.

The other is that the outside diameter of sample is pressed to the original 1/3 when the pressure's direction is in a line with weld seam.

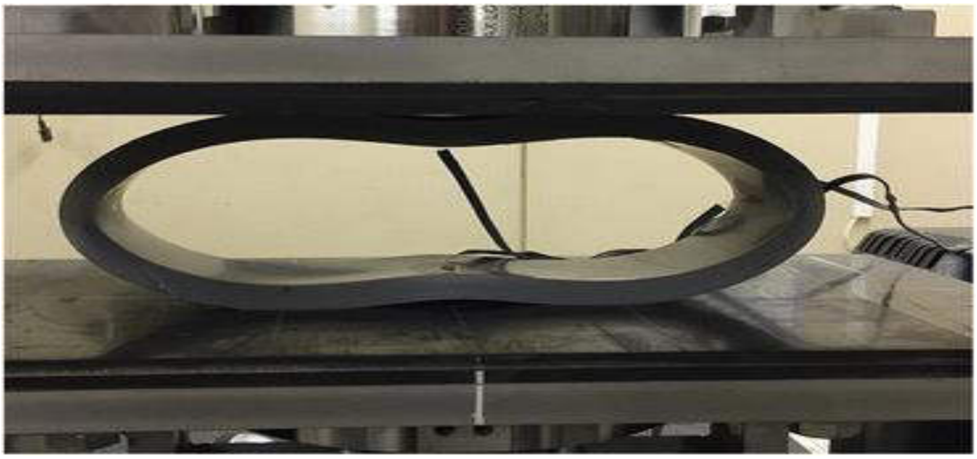


Fig.5.1.5 flattening test

5.1.6 RBT TEST

The reverse bend test consists of repeated bending through 90°, in opposite directions, of a rectangular test piece held at one end, each bend being over a cylindrical support of specified radius.

A defect of 3 to 4 mm is permissible in the RBT test.

Fig.5.1.6 RBT Test

5.2 NONDESTRUCTIVE TEST (NDT)

5.2.1 ULTRASONIC (UT) TEST

Once the welding is complete, automatic UT is performed on the pipe, and if a defect is detected, white paint will spray on defective part and checked manually. This process is done automatically using UT machine.

Most ultrasonic inspection is done at frequencies between 0.5 and 20 MHz the sound waves travel through the material with some loss of energy (attenuation) due to material characteristics.

The basic principle of ultrasonic testing is illustrated in Fig. 2.2.3

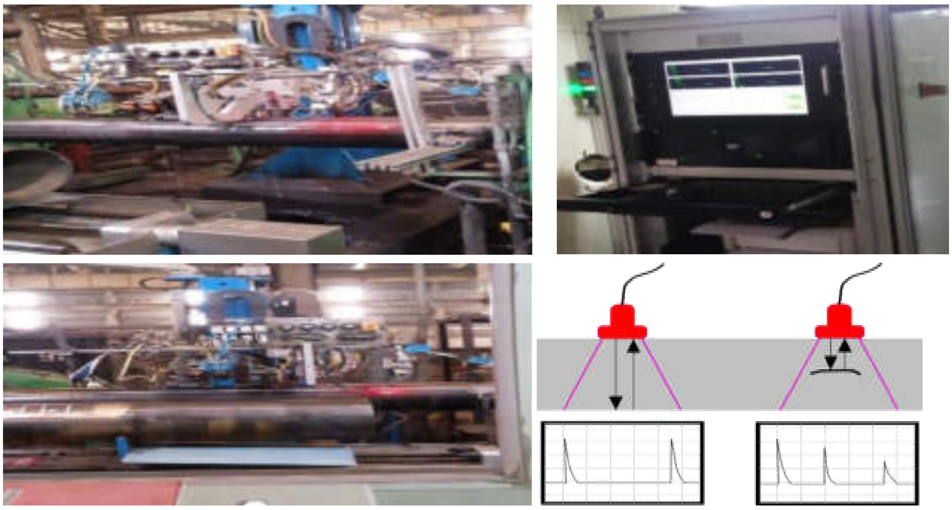


Fig.5.2.1 Ultrasonic Test

List of Ultrasonic probes:

- Angle Beam Probes (single element)
- Angle Beam Probe (single element)
- Straight Beam Probes (double element)
- Straight Beam Probes with replaceable membrane (dual element)
- Straight Beam Probe with ceramic face (single element)

5.2.2 REALTIME RADIOGRAPHY (RTR) TEST

Real-time radiography (RTR), or real-time radioscopy, is a non-destructive test (NDT) method whereby an image is produced electronically rather than on film so that very little lag time occurs between the item being exposed to radiation and the resulting image.

During this method, X-rays are discharged on one side of the object, which then penetrate the object and are absorbed by sensors on the opposite side.

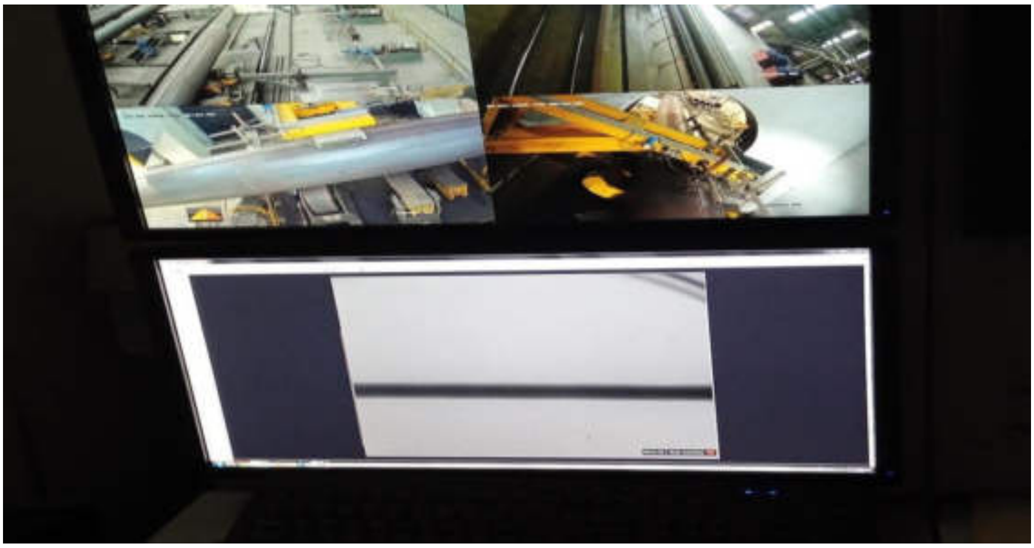


Fig.5.2.2 RTR image

5.2.3 MANUAL ULTRASONIC (UT) TEST

Manual ultrasonic testing is a form of non-destructive testing that is typically used to detect volumetric flaws, material integrity and component thickness.

Fig.5.2.3 manual UT

5.2.4 DYE PENETRATION TEST (DPT)

The Dye Penetration Testing (DPT) is a test uses to identify, the discontinuities in welding joints and connections. And uses to detect the cracks, fractures, etc.

It is low cost inspection method also known as Liquid Penetrate Inspection (LPI).

In dye penetrant testing, inspectors generally follow these six steps:

1. Clean the surface
2. Apply the dye penetrant
3. Remove extra penetrant and apply remover
4. Apply developer
5. Inspection
6. Clean the surface.

Fig.5.2.4 DPT Test (pitting is marked)

5.2.5 HYDRO TESTING

A **hydrostatic test** is a way in which the pipes, can be tested for strength and leaks. The test involves filling the pipe with a liquid water, and pressurization of the pipe to the specified test pressure.

This allows engineers to see where leaks appear (signifying small holes) as well as find out how strong each welded seam really is.

Fig.5.2.5 hydro testing

Each length of pipe shall be tested by the manufacturer to a hydrostatic pressure which will produce is the pipe wall a stress not less than 60% of the minimum specified yield strength for carbon and ferritic alloy steel pipe, or 50% of the specified minimum yield strength for austenitic alloy steel pipe.

The test pressure or stress shall be determined by the following equation:

$$P = 2St / D$$

P = hydrostatic pressure in psi or MPa.

S = pipe wall stress in psi or MPa.

t = specified nominal wall thickness in mm.

D = specified outside diameter of pipe in mm

5.2.6 CYCLIC HYDRO

The testing applies liquid or air pressure at a cyclical rate, which is typically a specified amount of time on and time off.

During this test, its pressure is first kept at 50% of the pressure which is kept for one hour, then kept at 75% which is also kept for one hour and then kept at 100% which is observed for 24 hours.

An example of cyclic hydro during the project is given in the table.

Table 5.2.6 cyclic pressure & holding time

Cyclic pressure	**Holding time**
50% of hydro test pressure = 48 kg/cm^2	1 Hour
75% of hydro test pressure = 72 kg/cm^2	1 Hour
100% of hydro test pressure =95kg/cm^2	6 Hour

5.2.7 BURST TEST

Burst test is type of destructive test.

Continuous pressure is applied to the pipe during the test.

The pressure at which the pipe bursts is considered as the highest pressure.

Here at this pressure the pipe can withstand is seen in figure below.

CHAPTER - 6

WELD DEFECTS

6.1 EXTERNAL DEFECTS

6.1.1 SURFACE CRACKS

Surface cracking forms cracks in the surface of hot welds immediately after welding. The causes of these defects include the use of improper shielding gas; insufficient deoxidizer; oil, rust, plating or other matter adhering to the surface of the groove in the base material; and moisture contained in the material.

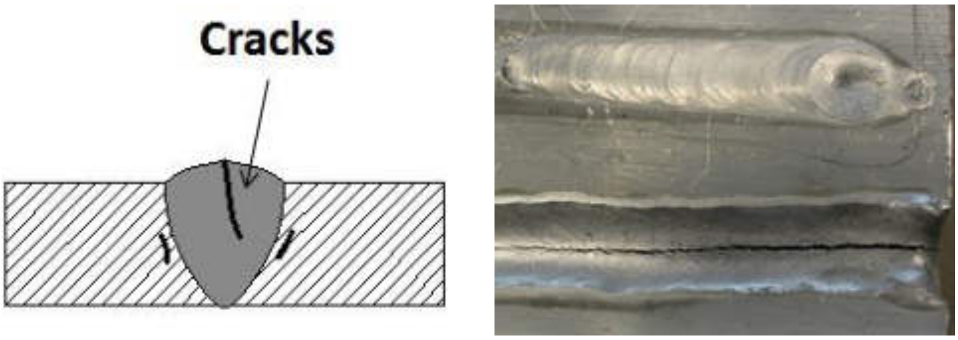


Fig.6.1.1 surface cracks

6.1.2 OVERLAPS

Overlap occurs when molten metal flows over the surface of the base material and then cools without fusing with the base material. A typical cause of overlap is the supply of too much weld metal due to low welding speed. Overlap in fillet welds is caused by the drop of excessive molten metal due to gravity.

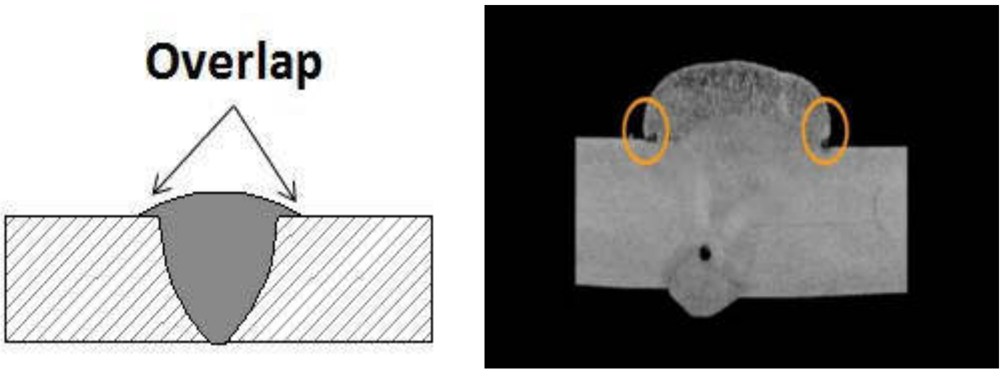


Fig.6.1.2 overlaps in welding

6.1.3 UNDERCUT

In welding, undercutting is when the weld reduces the cross-sectional thickness of the base metal.

This type of defect reduces the strength of the weld and work pieces.

Typical causes are excessively high welding current or welding speed.

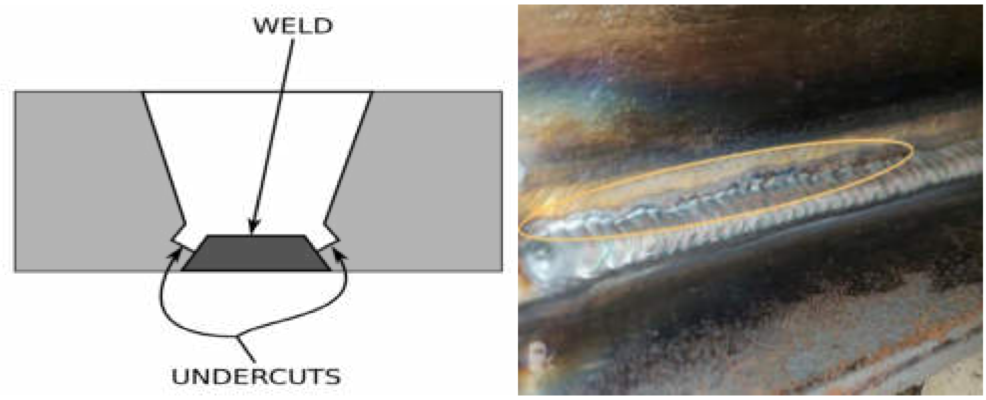


Fig.6.1.3 undercut in welding

6.1.4 EXCESSIVE PENETRATION

Excessive penetration occurs when excess weld metal protrudes through the weld root. It is usually caused by a joint gap that is too large, root faces that are too small or heat input that is too high and can cause erosion and/or corrosion.

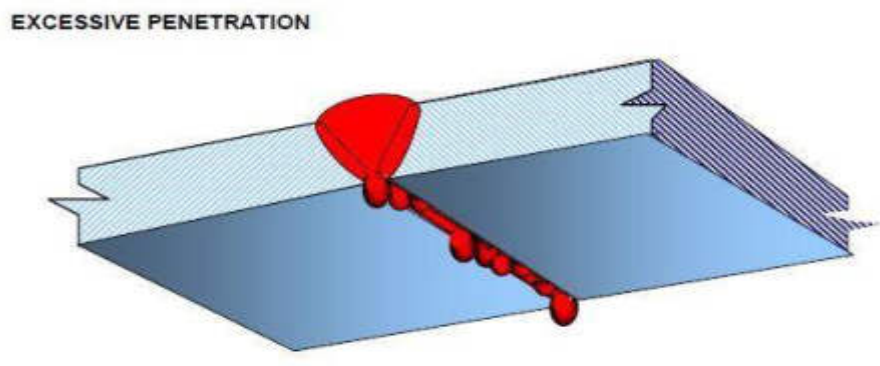


Fig.6.1.4 excessive penetration in welding

6.1.5 SURFACE POROSITY

Porosity is caused by gas particles getting absorbed into the weld pool while it is molten, and then being released when the pool solidifies. This can be because of poor gas-shielding.

Fig.6.1.5 surface porosity

6.1.6 SPATTERS

Weld spatter is formed by droplets of molten material that has been splashed or scattered during welding, leading to the formation of unsightly globules of material. Weld spatter can potentially cause burn injuries as the molten droplets travel through the air.

Fig.6.1.6 Spatters in welding

6.1.7 ARC STRIKE

This is a defect caused by instantaneously striking an arc on the base material.

Arc strike may be the cause of cracking in the base material.

Fig.6.1.7 Arc strike

6.2 INTERNAL DEFECTS

6.2.1 LACK OF FUSION

Lack of fusion in welding occurs when the weld metal fails to fuse with the side wall or joint, or when two weld beads fail to completely join together.

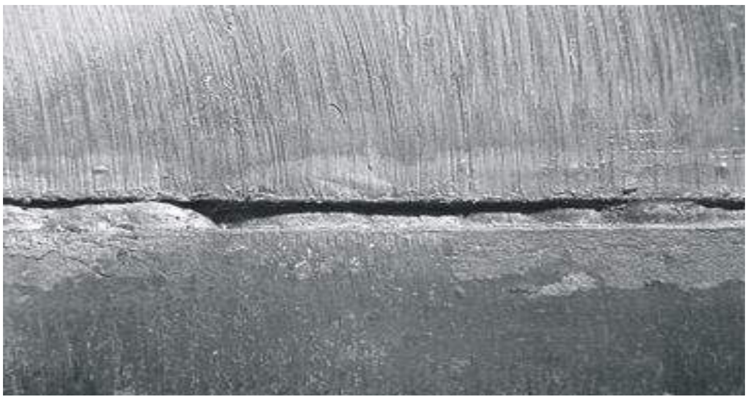


Fig.6.2.1 lack of fusion

6.2.2 INTERNAL CRACK

Internal cracking forms cracks inside the weld.

Typical cracking types classified as internal defects are weld metal cracking (root cracking) and heat-affected-zone (HAZ) cracking (under bead cracking).

Weld metal cracking is a defect produced inside the molten metal.

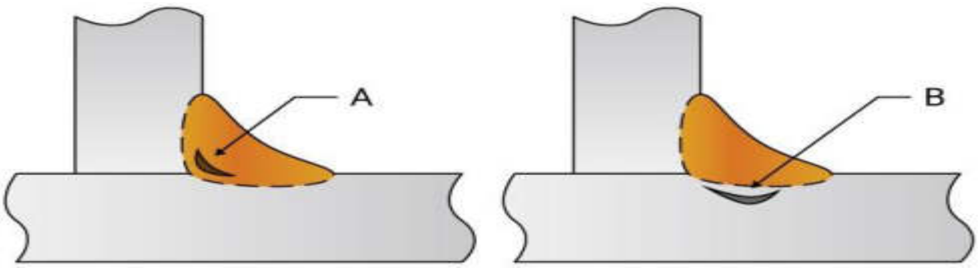


Fig.6.2.2 internal crack

6.2.3 INTERNAL POROSIY

Porosity is caused by the absorption of nitrogen, oxygen and hydrogen in the molten weld pool which is then released on solidification to become trapped in the weld metal.

Nitrogen and oxygen absorption in the weld pool usually originates from poor gas shielding.

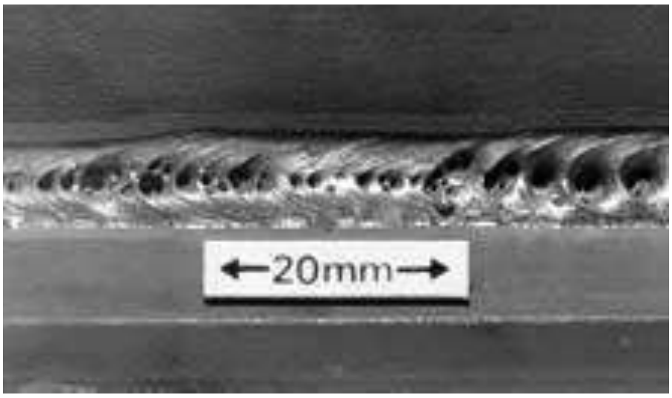


Fig.6.2.3 internal porosity

6.2.4 SLAG INCLUSION

Slag inclusions are non-metallic particles trapped in the weld metal or at the weld interface.

Slag inclusions result from faulty welding technique, improper access to the joint, or both. Sharp notches in joint boundaries or between weld passes promote slag entrapment.

Fig.6.2.4 Slag inclusion

6.2.5 INTERNAL BLOW HOLES

This defect is produced when the gas that could not escape before the solidification of molten metal collects to form spherical cavities inside the bead.

If these gas cavities solidified on the bead surface and left holes, they become the surface defect known as pits (open defect).

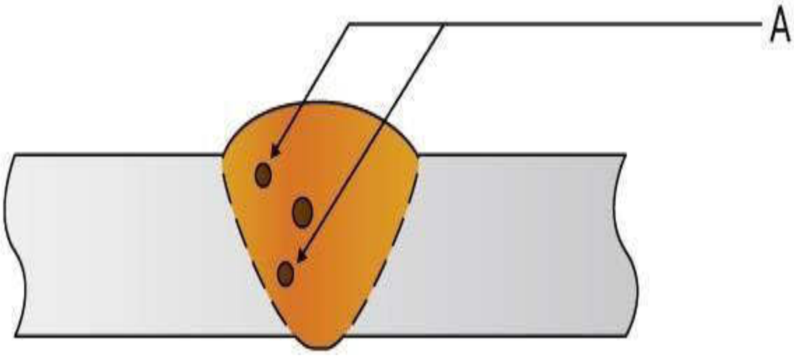


Fig.6.2.5 internal blow holes

CHAPTER 7

3LPE COATING

7.1 INTRODUCTION OF COATING

3-Layer Polyethylene (3LPE) is a multilayer coating composed of three functional components: A high performance Fusion Bonded Epoxy (FBE) primer, followed by a copolymer adhesive and an outer layer of polyethylene which provides tough, durable protection.

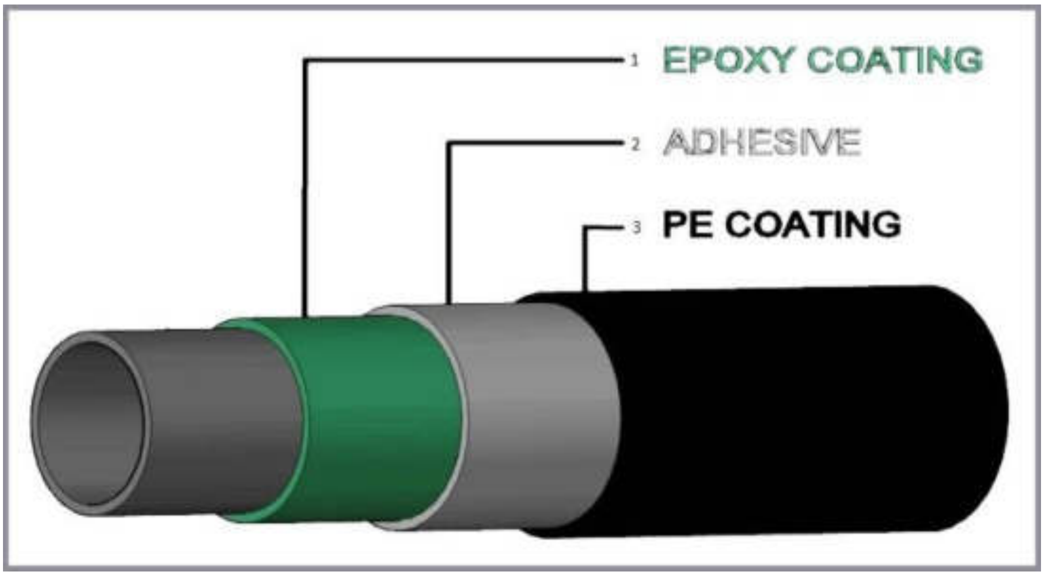


Fig.7.1. 3LPE coating

Both external and internal coating sections are converted in this chapter as follows.

7.2 EXTERNAL COATING PROCESS

The codes and standards for 3LPE are ISO 21809-1, DIN 30670 or CAN/CSA Z245.

3LPE coated steel pipes are used for transportation of drinking water, oil and gas and other fluids. The 3LPE coated pipes can be used in the high temperatures as high as 60 °C to 80 °C.

7.2.1 BARE PIPE RECEIVED AT INLET

In pipe manufacturing the raw material is coil while in coating the raw material is bare pipe itself.

7.2.2 VISUAL INSPECTION

Necessary visual inspection is done on the pipe and release verification of the pipe is observed.

7.2.3 PREHEATING BY CNG / LPG

The pipe is heated as per customer's requirement and as per QAP.

Fig.7.2.3 preheating by CNG / LPG

7.2.4 ABRASIVE BLAST CLEANING

Abrasive blasting is the operation of forcibly propelling a stream of abrasive material (shots & grits) against a surface under a high pressure to smooth a rough surface, shape a surface or remove contamination.

7.2.5 ACID TREATMENT AND WATER WASH

Acid treatment consists of an acid wash over the pipe and a water wash.

7.2.6 AIR DRYING

Pipe temperature is maintained by dry air.

The temperature of dry air is kept as per customers' requirement and QAP.

Inspection of the above process is given below as per QAP.

Table 7.2.1 inspection requirement

INSPECTION ACTIVITY	FREQUENCY OF INSPECTION	ACCEPTANCE CRITERIA
Recording of ambient temperature, relative humidity, dew point & elapsed time	Each pipe	Dew point shall be 3 °C
Degree of cleanliness	Every hour	Cleanliness SA 2 ½ as per ISO 8501-1
Surface roughness profile	Every hour	60 to 100 µM (RZ) Verified by using press o-film and record should be kept.
Anchor Patten viewed with 30x magnification	Every hour	Surface profile shall not be dished and rounded when viewed with 30x magnification.
Degree of dust	Every hour	Max class 02 (iso 8502-3) or class 2 using pressure sensitive tape conforming ice 60454-2
Abrasive mix quality check (shots & grits) ratio to be established during PQT	Once	No oil, dust and other contamination
Dwell time	Each pipe	Dwell time minimum 20 sec. (no drying out acid solution on pipe surface)

7.2.7 CHROMATE APPLICATION

Chromate is applied to better absorb the epoxy while Chromate is in liquid form.

Chromate treatment is a chemical process where a chromium compound solution is applied to a metal surface, to form a protective chemical coating of chromate. A chemical reaction occurs between the base material and chromic-acid-bearing compound to produce a corrosion-resistant film that is physically and chemically bonded to the base metal.

The thickness of chromate ranges from 150 to 200 microns.

7.2.8 FBE APPLICATION

Induction heating is done before FBE application.

Fusion bond epoxy is an environmentally-safe thermosetting coating that is sprayed onto the pipe surface after it has been cleaned and heated to over 450ºF.

The epoxy powder melts onto the steel surface and fuses to the pipe, creating a hard barrier.

Epoxy is used to protect the pipe and reduce corrosion.

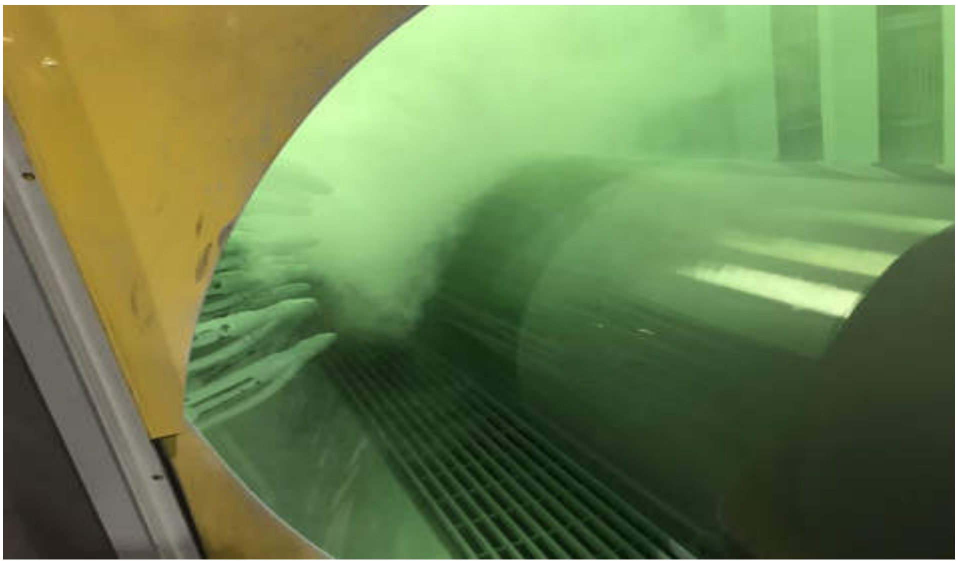


Fig.7.2.8 FBE application

7.2.9 ADHESIVE AND PE APPLICATION

Adhesion by coating is a process of bonding objects using an adhesive that wets a target and then solidifies.

There are various types of adhesives, including liquid and solid types. The solid adhesives must be melted by heat, and the objects become bonded when the adhesive solidifies.

The thickness of the adhesives up to 200 microns.

Polyethylene is a multi-purpose, thermoplastic powder coating designed to meet a wide range of qualifications.

The thickness of polyethylene is minimum up to 2.6 mm but it depends on the requirement.

Fig.7.2.9 Adhesive & PE application

7.2.10 WATER QUENCHING AND VISUAL INSPECTION

The coating pipe is cooled by water.
Necessary inspection is done on the coating.

Fig.7.2.10 water quenching

7.2.11 END BRUSHING & BEVEL GRINDING

Bevel the pipe end as required. For butt-weld joints, use an angle grinder to cut a 30° bevel, leaving a residual web height of approximately 1.6 mm. Then use a rotary steel brush to bevel the PE/PP-coating.

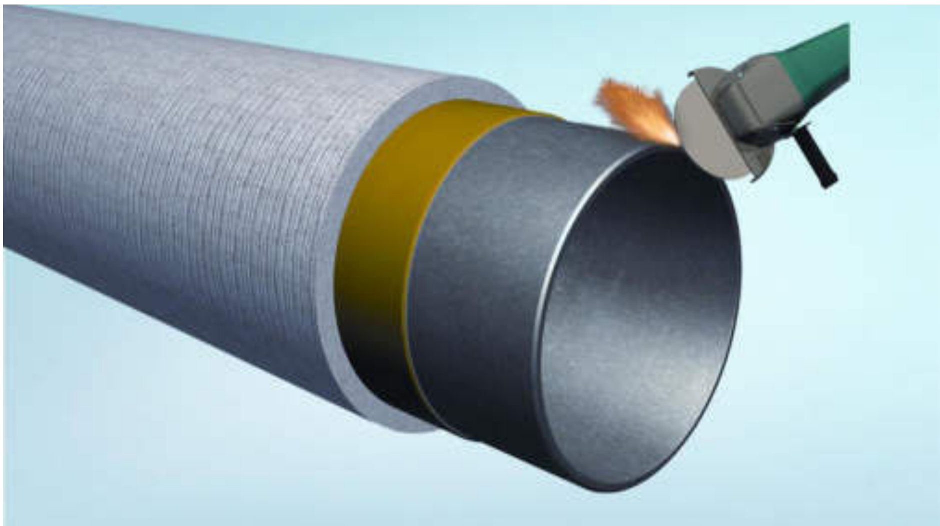


Fig.7.2.11 end brushing & bevel grinding

7.2.12 HOLIDAY DETECTION

Holiday testing is a non-destructive test method applied on protective coatings to detect unacceptable discontinuities such as pinholes and voids.

The test involves checking an electric circuit to see if current flows to complete the circuit.

Holiday testing allows the detection of even smallest coating flaws invisible to the naked eye.

There are various techniques and equipment available for holiday detection.

All holiday detectors are available with a wide range of accessories that will allow holiday testing on all types of substrates and applications.

7.2.13 FINAL INSPECTION & MARKING

The coating layer is inspected any misalignment or any defects.

The pipe is marked with is number and other necessary details.

The external coating pipes moves to the internal coating.

7.2.14 PEEL TEST (OTHER TEST IN EXTERNAL COATING)

Peel tests involve applying a tensile force to a flexible substrate that is bound by an adhesive to either another flexible substrate (such as tape, thin film, or rubber) or a rigid substrate (such as metal, rigid plastic, or composite).

The peel adhesion test is used to determine the force required to de-bond two components joined by an adhesive.

Fig.7.2.14 peel test

7.3 INTERNAL COATING PROCESS

The process of internal coating is very short and simple.

Internal coating of the Pipes helps to enhance the corrosion resistance ability of pipes, improves the flow, and also helps to reduce deposit formation.

7.3.1 BARE PIPE RECEIVED AT INLET

After the external coating the pipe is moved to the internal coating station.

7.3.2 VISUAL INSPECTION

The surface of the pipe is inspected for any defects or dents.

7.3.3 ABRASIVE BLAST CLEANING

Just like the process mentioned in the external coating process the internal surface of the pipe is cleaned using small metal balls and abrasive which makes the surface of the pipe rough.

7.3.4 INTERNAL BLOW OFF

The internal surface of the pipe is cleaned using high pressurized air which removes any metal particles.

7.3.5 VISUAL INSPECTION

The pipe is inspected for any defects which could appear in abrasive cleaning.

7.3.6 INTERNAL PAINT SPRAY

The internal surface of the pipe is painted by liquid epoxy.

Pipe is kept steady and a rod is put inside the pipe and at the end there is a paint gun which rotates at 2000 rpm and sprays the liquid epoxy on the internal surface of the pipe.

The pipe is then rotated to let the epoxy set on every part of the pipe equally, and to dry.

Fig.7.3.6 internal paint spray

7.3.7 FINAL INSPECTION

The coating layer is inspected to find any misalignment or any defects.

7.3.8 MARKING & STORAGE

The pipe is marked with its number and other necessary details.

The pipe is stored till its release order is received.

Fig.7.3.8 marking & storage

7.3.9 DISPATCH

When the release order is received the pipe is loaded onto a truck and is sent to its respective destinations.

CHAPTER 8

INDUCTION BENDING

8.1 INTRODUCTION OF INDUCTION BENDING

Induction Bending is a precisely controlled and efficient pipe bending technique. Local heating using high-frequency induced electrical power is applied during the induction bending process. Pipes, tubes, and even structural shapes (channels, W & H sections) can be bent efficiently in an induction bending machine. Induction bending is also known as hot bending. For bigger pipe diameters, when cold bending methods are limited, Induction bending of pipe is the most preferable option. Around the pipe to be bent, an induction coil is placed that heats the pipe circumference in the range of 850 – 1100 degrees Celsius.

8.2 INDUCTION BENDING PROCESS

The following steps are performed for the induction bending of the pipe or pipeline system:

The pre-inspected pipe or pipeline to be bent is placed in the machine bed and clamped hydraulically.

Around the pipe, induction heating coils and cooling coils are mounted. To ensure uniform heating, the induction coil can be adjusted with a 3-plane movement.

By adjusting the radius arm and front clamp, the required bend radius can be fixed. There is one pointer to display the correct degree of turning.

Arc lengths are marked on the pipe. The pipe can be moved slowly whilst the bending force is applied by a fixed radius arm arrangement.

Once everything is set as required, hydraulic pressure, water level, and switches are inspected and then the induction bending operation is started.

Upon reaching the required temperature range, the pipe is pushed forward slowly at a speed of 10-40 mm/min, and the operation is stopped when the specified bend angle and pre-determined arc length are reached.

Just beyond the induction coil, the heated pipe material is quenched using a water spray on the outside surface of the pipe.

In the next step, the induction bend is removed and sent for inspection and measurement of tolerances.

The final step for the induction bends is the use of post-bend heat treatments for stress relieving, normalizing, etc. Induction bends are normally produced in standard bend angles such as 45°, 90° etc.

Fig.8.2 Induction bending

The important parameters that affect the induction bending process are:

- Pipe Diameter
- Surface Contamination
- Process Parameters like Temperature, Speed, Cooling rate, etc
- Bend Radius
- Bend Angle
- Hardenability of the Pipe Material, etc.

8.3 TESTING AND INSPECTION

Ratnamani has the full-fledged inhouse facility for following testing

1. Mechanical testing
2. Universal Testing Machine
3. Charpy Testing
4. Hardness Tester
5. Hydro testing
6. Bevelling machine
7. Thickness gauge
8. Non-destructive testing (X-ray/UTI/MPI)
9. Microscope for metallographic analysis
10. Spectrometer for chemical analysis
11. Corrosion testing

8.4 MANUFACTURING RANGE

Table 8.4 manufacturing range of induction bending

PARTICULARS	MACHINE NO. 1	MACHINE NO. 2
Pipe Diameter	4” – 24”	16” – 48”
Pipe Thickness	Up to 30 mm	Up to 40 mm
Bending Radius	2D – 8D (Max. R =4877 mm)	2D – 8D (Max. R =9754 mm)
Bending Angle	0° – 90°	0° – 90°
Angle Tolerance	± 0.5°	± 0.5°
Radius Tolerance	≤ 5 mm	≤ 5mm
Ovality At Ends	± 1%	± 1%
Ovality on Body	4D & above to 6%	4D & above to 6%
Wall Thinning	4D & above ≤ 8%	4D & above ≤ 8%

CHAPTER 9

MECHANICAL MAINTENANCE

9.1 RECIPROCATING COMPRESSOR:

The High Pressure (HP) compressor at RMTL is reciprocating type compressor.

Fig. 9.1 Reciprocating Compressor

There are 7 such HP Compressors, they work on 2 stage compression method for compressing the air.

Double stage or two stage reciprocating air compressor consists of two cylinders. One is called low pressure cylinder and another is called high pressure cylinder.

When piston in low pressure cylinder is at its outer dead centre (ODC) the weight of air inside cylinder is zero (neglecting clearance volume), as piston moves towards inner dead centre (IDC) pressure falls below atmospheric pressure & suction valves opens due to pressure difference.

The fresh air is drawn inside the low-pressure cylinder through air suction filter. This air is further compressed by piston and pressure inside & outside the cylinder is equal, at this point suction valves closed.

As piston moves towards ODC compression of air took place and when the pressure of air is in range of 4 bar to 5 bar square delivery valves opens & this compressed air is then entered into high pressure cylinder through inter cooler. This called as low-pressure compression.

If suction & discharge stroke took place on both side of piston then it is called Double Acting Low pressure compression.

Suction valves of high-pressure cylinder opens when air pressure in high pressure side is below to the receiver pressure & air from low pressure cylinder drawn into high pressure cylinder.

As piston moves towards the ODC, first stage air is further compressed.

When air pressure from low pressure cylinder and inside the high-pressure cylinder is equal, suction valves closed.

Now air is further compressed by piston until the pressure in the high-Pressure Cylinder exceeds that in the receiver & discharge valves opens. This desired high-pressure air is then delivered to receiver.

9.2 SCREW COMPRESSOR

The oil injected rotary screw compressor is a positive displacement type compressor.

A given quantity of air or gas is trapped in a compression chamber and the space that it occupies is mechanically reduced, causing a corresponding rise in pressure prior to discharge.

A rotary screw compressor has a pair of intermeshing rotors housed in a suitable casing to produce compression.

Referred to generally as a twin screws compressor each rotor comprises of a set of helical lobes affixed to a shaft

One rotor is called the male rotor and the other rotor is the female rotor. The number of lobes on the male rotor, and the number of flutes on the female, will vary from one compressor manufacturer to another. However, the female rotor will always have numerically more valleys (flutes) than the male rotor lobes for better efficiency

Male lobe acts like a continuous piston rolling down female flute which acts like a cylinder trapping air and reducing space continuously.

Fig.9.2(a) screw compressor rotor

With the rotation, the leading strip of the male lobe reaches the contour of the female groove and traps the air in the pocket previously formed.

The air is moved down the female rotor groove and is compressed as the volume is reduced.

When the male rotor lobe reaches the end of the groove, the trapped air is discharged from the air end.

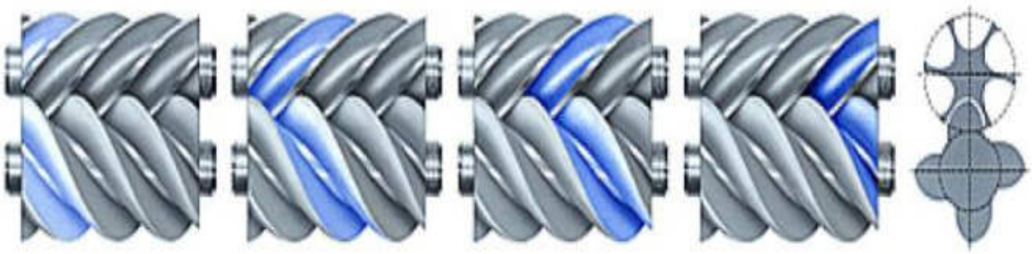


Fig.9.2(b) twin screw compressor

This type of twin-screw compressors can be oil free or oil injected. In the case of the oil lubricated compressor oil is injected.

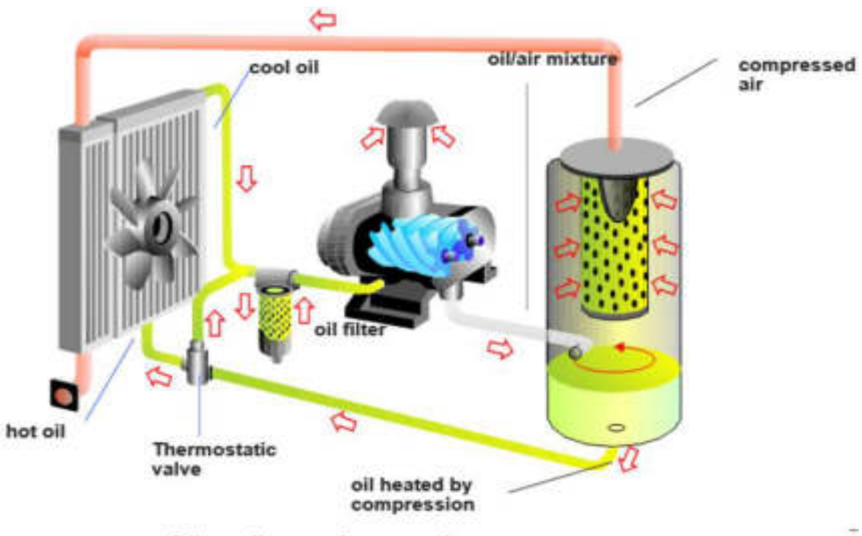
The oil performs four crucial functions:

- Cooling
- Lubrication
- Sealing
- Noise dissipation

9.2.1 OIL COOLING AND SEPARATION

The purpose of a compressor is to convert shaft work into a useful output, that is, air flow. As compressing air generates heat, all of the heat is retained within the compression chamber; this is adiabatic compression. If heat is added or taken away during the compression process this is called isothermal compression.

Oil injected screw compressors have a near isothermal compression process as the heat generated by the compression process is almost dissipated by the oil. The temperature of the oil injected into the compression chamber is generally controlled between 60-700 C. The discharge temperature must remain above the pressure dew point to avoid condensation of moisture that would mix with the oil. A thermostatic valve controls the quantity of the oil being circulated to the oil cooler or to the bypass in order to maintain the desired temperature over a wide range of ambient temperatures.



Oil cooling and separation

Fig.9.2.1 oil cooling & separation

9.3 HYDRAULIC SYSTEM

Hydraulic systems are everywhere in mechanical systems and made of a variety of standard components. With properly located and perfectly designed components, the hydraulic system should generate a minimum of heat (waste energy) and operate with minimum maintenance. In this article we will look over some of the primary systems that make up a hydraulic system.

9.3.1 PRIMARY COMPONENT OF HYDRAULIC SYSTEM

The hydraulic power pack is the heart of any hydraulic system. It has a motor, hydraulic pump, oil reservoir, air breather and various other components. The function of each sub-component is as follows…
Hydraulic power pack (featuring Reservoir, Primary energy source, Hydraulic pump, Pressure relief valve and pressure indicator, Filters, Fluid level indicator, Air breather)

Direction control valve

Other control valves

Actuator

Hoses (fixed and flexible)

Fig.9.3.1(a) hydraulic power pack

The reservoir stores hydraulic fluid and protects it from contamination. The primary energy source is the unit which will supply mechanical energy to the hydraulic pump. At RMTL the dc motor is used as primary energy source The primary energy source converts input energy into mechanical energy. This mechanical energy goes into the hydraulic pump to generate hydraulic energy (pressure and flow).

The hydraulic pump develops hydraulic energy. It can be one of many different types depending upon the application. The most frequently used pumps are reciprocating piston pumps, vane pumps, and gear pumps. This pump-motor unit together decides the power of the system and its selection limits the maximum pressure and maximum flow rate that can be generated from the system.

The pressure relief valve is an NC (normally closed) safety valve for the hydraulic system. As the pressure increases beyond a certain prescribed limit, the relief valve will bypass the fluid into the tank and maintain the system pressure below the maximum level.

Filters are another important component in any hydraulic system. A filter prevents contaminants from entering the hydraulic system and ensures satisfactory working with minimum maintenance. A suction line filter is located at the suction side of the pump and prevents the contaminants in the reservoir fluid from entering the hydraulic system. Reservoir fluid can get contaminated from small atmospheric dust particles coming from the air breather. The return line filter is located at the end of the return line. Small particles enter the fluid due to wear of the system and the return line filter takes care of them.

The fluid level indicator indicates the amount of fluid in the system reservoir. An empirical way is to store double the amount (by volume) of fluid a system demands at steady state operation.

The air breather is a non-return type valve. As the hydraulic pump sucks in liquid, a vacuum will be generated in the reservoir. This adversely affects the pump operation (decreases the head) and can also lead to cavitations during continuous operation (as it reaches vapor pressure) in the case of water as the hydraulic fluid.

The air breather is a NC (normally closed) valve and as the pressure inside the reservoir decreases below atmospheric pressure, it opens and allows air to enter the system. The most advanced and sensitive hydraulic systems use air breathers that can stop the contaminants in the air and also prevent atmospheric water (moisture) from entering the system.

Air breathers Hydraulic fluid level indicator

Fig.9.3.1(b) hydraulic fluid level indicator

Hydraulic power pack is the heart of a complete hydraulic system. It stores and supplies fluid from the reservoir, just like the human heart and pumps the fluid into the complete hydraulic system at the desired pressure and flow rate.

Pressure gauges and pressure relief valves are attached on the power pack to display the system parameters in real time and as a means of control in case of excessive pressure generation.

The direction control valve is a mandatory part of all hydraulic systems. It controls the direction of the fluid in the actuator and the direction in which the piston will travel. A system without a direction control valve would only operate for a single stroke. After the piston reaches the end point, there would be no way to change the direction of the fluid and reciprocate the piston back to the origin point. The direction control valve can be designated by understanding the number of ports and the number of positions that the valve can be configured to.

The symbolic representation of the direction control valve is shown in Fig. It can have 3 different positions. The 4 ports of this direction control valve are P, T, and A & B. Where P denotes pressurized fluid coming from the power pack, T denotes storage tank, and A & B denote the different sides of the hydraulic actuator. The first position of the direction control valve lets the fluid pass ideally from P to A. Fluid flowing back from the cylinder will pass through the port B to the Tank T.

Because of the 4 ports and 3 positions, this direction control valve is designated as 4/3 direction control valve.

The positions of the direction control valve can be adjusted by various mechanical or electrical means.

The simplest type of direction control valve comes with a hand lever and return springs.

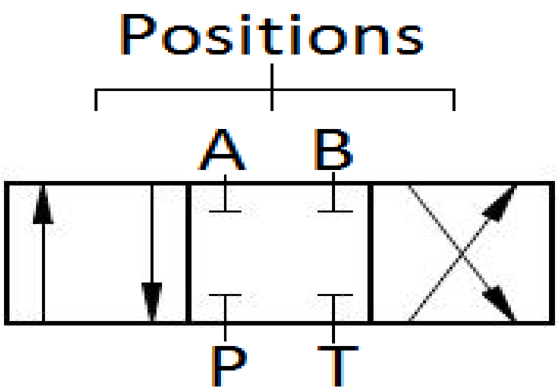


Fig.9.3.1(c) Direction control valve symbol

9.4 PNEUMATIC SYSTEM

Pneumatics is a branch of engineering that uses wind or high-pressure air to perform certain operations. A pneumatic system is a connection of various components such as (compressors, intercoolers, controllers, and actuators), that **converts the pressure energy of compressed air into mechanical work.**

Pneumatic systems are used where human strength and accuracy are not enough. Nowadays Pneumatic systems are widely used in various industries to automate several processes.

It not only lifts heavy loads and increases the accuracy but it also decreases the time period to perform certain activities.

9.4.1 PNEUMATIC SYSTEM COMPONENTS

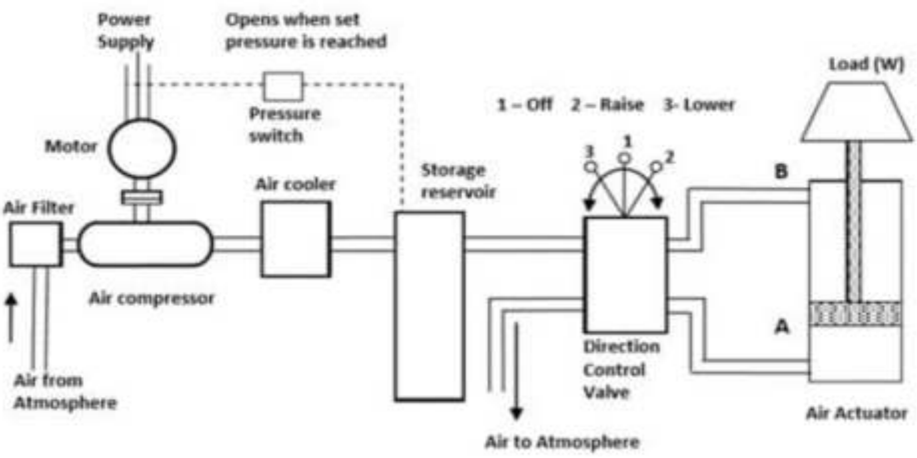


Fig.9.4.1 block diagram of pneumatic system

1. **Air filter**:

Air contains various impurities such as pollen grains, dust particulate, soot, etc. These impurities need to be removed from the air before it enters a pneumatic circuit.

Hence an air filter is used to restrict these impurities from entering the pneumatic circuit. The air filter is a fibrous or porous material that traps the solid particulate and allows air to move in.

It may also contain some absorbent material such as charcoal that absorbs pollutant gas particles and soot.

2. **Air compressor:**

As the name suggests the device used to compress the air is called an air compressor.

Generally, axial flow air compressors are used in pneumatic systems. These compressors have rotating blades called impellers that rotate with the help of a motor.

The impeller creates a vacuum that sucks the air via an air filter. The pressure of air at the outlet of the impeller is more than the atmospheric pressure.

3. Motor:

A suitable motor is used to run the compressor in a pneumatic system.

The capacity of the motor depends on the size of the compressor and the power required running the compressor. The motor is directly connected to the power supply.

4. Air cooler:

Air temperature increases when the air is compressed in the compressor. This hot air is not suitable for further operation.

Hence it is important to cool down the hot air coming out of the air compressor. The cooling of air is done by an air cooler.

The main objective of an air cooler is to reduce the temperature and moisture content in the air coming out from the air compressor.

5. Storage reservoir:

A storage reservoir is an air pressure vessel used to store compressed air under high pressure.

This storage device ensures a smooth supply of pressurized air and eliminates fluctuations caused due to loading and unloading of air demand.

Storage reservoirs play an important role in pneumatic systems as they ensure quick response to user demand. Storage reservoirs can store both dry and wet air depending on demand.

6. FRL unit:

The full form of FRL is ‘filter, regulator, and lubricator’ these three are generally used as one unit in a pneumatic system, but can also be used as different individual units.

FRL is an important component of a pneumatic system as it reduces losses and increases the efficiency of the system. The three basic functions of an FRL unit are as follows.

To filter out the wastewater, contaminants, and debris from the air coming out of the storage reservoir. This is done by filers and is generally the first step in an FRL unit.

The second function of the FRL unit is to regulate the pressure and restrict it from crossing the upper limit. This is done by a pressure regulator. Pressure regulation is an important step as it prevents damage to the system and also reduces unwanted losses due to high pressure.

The last stage of the FRL unit is air lubrication. In the air, lubrication is done by mixing a thin mist of oil or other lubricants into compressed air. This is generally done after filtration and regulation. This lubricated air reduces the friction between the moving parts of a pneumatic system and thus reduces the loss of energy and increases the life of the equipment.

If an FRL unit is not present in a pneumatic system it would decrease the life of the system, increase the energy consumption and reduce the efficiency of the system.

7. Directional control valve:

Directional control valves are the most important device used in a pneumatic system. The directional control valves or DVCs are used to control the direction and the amount of air entering the actuators.

The valves transfer the pressure energy of air to the actuators as per the command given by the operator. The generally used valve in a pneumatic system is a solenoid valve, also sometimes known as a spool valve.

These valves are operated by the action of a solenoid coil coupled with an electromagnet.

8. Actuators:

Actuators are devices that convert the pressure energy of fluid into mechanical movement. In the case of a pneumatic actuator the fluid used is air.

Actuators are the devices from which we get the results of pneumatic systems.

9.4.2 PNEUMATIC SYSTEM WORKING

The air comes into the compressor through an air filter due to the vacuum generated by the blades of the compressor.

The air is filtered out in the air filter and then goes into the compressor.

The compressed air then enters the air cooler where the temperature of the air is reduced to improve the efficiency of the system.

This compressed cold air is then stored in the storage reservoir to make the air readily available.

The air then enters the FRL unit where it is filtered again, pressure is regulated and some oil is added to lubricate the air.

From the FRL unit, the air goes into the direction control valve where the air is sent according to the user's action.

9.5 PUMPS

9.5.1 Non-positive displacement pump:

Non-positive displacement pumps are also designated as hydro dynamic pumps. Centrifugal pumps and propeller pumps are the best example of non-positive displacement pump. In case of non-positive displacement pump, flow is not constant but also it varies with variation in pressure. Output flow will be decreased when system pressure will be increased. Such types of pumps are also called as constant head pumps as head of such pumps will be constant.

Non positive displacement pumps are basically used for low pressure applications as such types of pumps are not capable to work against higher pressure and that is the basic reason that non positive displacement pumps are not designed for applications in hydraulic system.

Non positive displacement pumps are considerably used in chemical and oil industries where liquids are required to transport from one location to another.

9.5.2 Positive displacement pumps:

Positive displacement pumps are self-priming because there will be very close clearance between rotary and stationary components of pump. Such types of pumps are basically designed for high pressure application for example hydraulic fluid power application.

Positive displacement pumps will never generate the pressure but also they will produce the flow, pressure will be produced due to resistance in output fluid flow. If output section of pump will be opened completely then in that situation there will not be any resistance for fluid flow and hence pressure generated will be zero beyond atmospheric pressure or pressure gauge will show zero reading.

If output port of pump is closed partially then pressure will be produced due to presence of resistance of fluid flow, suppose if output port of pump is blocked completely then pressure will be increased significantly and may damage the component of hydraulic system in order to avoid damaging of hydraulic elements of system due to such high pressure, pressure relief valves are used in hydraulic system.

Such types of pumps deliver definite quantity of fluid to the hydraulic system for each cycle or for each revolution of shaft. Output fluid flow will be constant and will not depend on pressure of system or load on system.

9.6 MAINTENANCE AT RMTL

9.6.1 Preventive maintenance :

Preventive Maintenance (PM) has the following meanings:

The care and servicing by personnel for the purpose of maintaining equipment in satisfactory operating condition by providing for systematic inspection, detection, and correction of incipient failures either before they occur or before they develop into major defects.

Preventive maintenance tends to follow planned guidelines from time-to-time to prevent equipment and machinery breakdown

The work carried out on equipment in order to avoid its breakdown or malfunction. It is a regular and routine action taken on equipment in order to prevent its breakdown.

Maintenance, including tests, measurements, adjustments, parts replacement, and cleaning, performed specifically to prevent faults from occurring.

The primary goal of maintenance is to avoid or mitigate the consequences of failure of equipment.

This may be by preventing the failure before it actually occurs which Planned Maintenance and Condition Based Maintenance help to achieve. It is designed to preserve and restore equipment reliability by replacing worn components before they actually fail. Maintenance activities include partial or complete overhauls at specified periods, oil changes, lubrication, minor adjustments, and so on. In addition, workers can record equipment deterioration so they know to replace or repair worn parts before they cause system failure. The ideal machine maintenance program would prevent any unnecessary and costly repairs.

Machine maintenance for various equipment and facilities is quite nuanced. For instance, maintaining certain equipment may include a "preventive maintenance checklist" which includes small checks which can significantly extend service life.

9.6.2 Predictive maintenance :

Predictive maintenance (PdM) techniques are designed to help determine the condition of in-service equipment in order to predict when maintenance should be performed. This approach promises cost savings over routine or time-based preventive maintenance, because tasks are performed only when warranted.

The main promise of predictive maintenance is to allow convenient scheduling of corrective maintenance, and to prevent unexpected equipment failures. The key is "the right information in the right time". By knowing which equipment needs maintenance, maintenance work can be better planned (spare parts, people, etc.) and what would have been "unplanned stops" are transformed to shorter and fewer "planned stops", thus increasing plant availability. Other potential advantages include increased equipment lifetime, increased plant safety, fewer accidents with negative impact on environment, and optimized spare parts handling.

Predictive maintenance differs from its cousin preventive maintenance because it relies on the actual condition of equipment, rather than average or expected life statistics, to predict when maintenance will be required.

The "predictive" component of predictive maintenance stems from the goal of predicting the future trend of the equipment's condition. This approach uses principles of statistical process control to determine at what point in the future maintenance activities will be appropriate.

Most PdM inspections are performed while equipment is in service, thereby minimizing disruption of normal system operations. Adoption of PdM can result in substantial cost savings and higher system reliability.

9.6.3 Breakdown maintenance :

It means that people waits until equipment fails and repair it. Such a thing could be used when the equipment failure does not significantly affect the operation or production or generate any significant loss other than repair cost.

CONCLUSION

It was a wonderful learning experience at Ratnamani Metal & Tubes Ltd for 12 weeks of duration. I gained a lot of insight and knowledge regarding almost every aspect. I got exposure to all the departments at the plant, their working culture and their functioning. The friendly welcome from the firm and its employees is quite appreciable, sharing their experience and giving their piece of wisdom which they have gained over their long journey of work in this field helped me in understanding several new aspects of the industrial approach. I am very much thankful for the wonderful facility from Ratnamani Metal & tubes Ltd I hope this experience will surely help me in my future to shape my career.

REFERENCES

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- www.gtu.ac.in (GTU INOVATION COUNCIL)
- www.jindal.com
- www.shixami.com
- www.praj.net
- Fundamental of metal forming processes (second edition) by B. L. JUNEJA
- Indian Standards such as IS 1239 (Pt. 1)-04 & IS 1978-82
- www.angkasarayasteel.com
- www.themetalsfactory.com
- WPS of Ratnamani Metals & Tubes Ltd

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Annexure I

Enrollment no: 190790119014

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: Dhaval Suthar

DIARY OF THE WEEK: DT: 06/02/2023 TO 11/02/2023

DEPARTMENT: Maintanence SEM: VII

NAME OF THE ORGANISATION: Ratnamani metals and Tubes Ltd.

NAME OF THE PLANT/SECTION/DEPARTMENT: HSAW, maintanence.

NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT: Mr. Balwant Vaishnav.

DESCRIPTION OF THE WORK DONE IN BRIEF

After the interview, I have visited HOD and Project manager of the plant. From the next day onwards, I have visited whole HSAW (Helical Submerged Arc welding) plant and got knowledge about pipe production.

According to the Process flow chart, I have seen each and every step of the pipe production. SAW welding is used for coil joining. then GMAW welds is used for helical joint and finally process completes using 2-step SAW welding.

There are various types of tests are used for quality inspection of the weld of the pipe.

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TOTAL HOURS: 48

SIGNATURE OF STUDENT

○ The above entries are correct and the grading of work done by Trainee is
EXCELLENT / VERY GOOD / GOOD / FAIR / BELOW AVERAGE / POOR

Signature of Faculty Mentor

Signature of officer-in-charge
of Dept. / Section / Plant

Date:

Date: 13/02/2023

○ Grading of Work, for trainee may be given depending upon your judgement about his Punctuality, Regularity, Sincerity, Interest taken, Work done etc.

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Annexure I

Enrollment no: 190390119014

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: Suthar Dhaval

DIARY OF THE WEEK: Dt: 13/02/2023 TO 18/02/2023

DEPARTMENT: ~~maintenance~~ ME SEM: VII

NAME OF THE ORGANISATION: Ratnamani metals and Tubes LTD

NAME OF THE PLANT/SECTION/DEPARTMENT: maintenence

NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT: Mr. Balwant Vaishnav

DESCRIPTION OF THE WORK DONE IN BRIEF

* In this ~~the~~ week I have visited ~~the~~ different plants and observed the various process of pipe manufacturing. Processes are as below
  → ERW (Electric Resistence welding)
  → ~~L~~SAW (~~L~~ Longitudinal Submerged arc welding
  → CSAW (Circumferential submerged Arc welding)
* For 3 days I have ~~to~~ visited coating plant and obseved the process of pipe coating
* I have also go throush the maintenence of overhead cranes and ~~the~~ understood the working of the same.

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TOTAL HOURS: ~~96~~ 48

SIGNATURE OF STUDENT

The above entries are correct and the grading of work done by Trainee is ~~EXCELLENT~~ / VERY GOOD / ~~GOOD~~ / ~~FAIR~~ / BELOW AVERAGE / ~~POOR~~

Signature of Faculty Mentor

Date:

Signature of officer-in-charge of Dept. / Section / Plant
(BALWANT VAISHNAV)
DY. MAINTENANCE MANAGER

Date:

Grading of Work, for trainee may be given depending upon your judgement about his Punctuality, Regularity, Sincerity, Interest taken, Work done etc.

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Annexure I

Enrollment no: 190790119014

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: Khawal Suthar

DIARY OF THE WEEK: Dt: 20/02/2023 TO 25/02/2023

DEPARTMENT: mechanical SEM: VII

NAME OF THE ORGANISATION: RMTL

NAME OF THE PLANT/SECTION/DEPARTMENT: maintanence.

NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT: mr. Balwant Vaishnav.

DESCRIPTION OF THE WORK DONE IN BRIEF

⇒ This week I visited different plants and observed the various process of pipe manufacturing. Processes are as below

- ERW
- LSAW
- CSAW

⇒ for 3days I have visited coating plant and observed the process of pipe coating

⇒ I have also go through the maintanence of overhead cranes and understood the working of the crane.

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TOTAL HOURS: 48 Hours.

SIGNATURE OF STUDENT

The above entries are correct and the grading of work done by Trainee is
EXCELLENT / VERY GOOD / ~~GOOD / FAIR / BELOW AVERAGE / POOR~~

Signature of Faculty Mentor

Signature of Officer-in-charge
of Dept. / Section / Plant
(BALWANT VAISHNAV)

Date:

Date:

Grading of Work, for trainee may be given depending upon your judgement about his Punctuality, Regularity, Sincerity, Interest taken, Work done etc.

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Annexure I

Enrollment no: 190390119014

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: Dhawal Suthar

DIARY OF THE WEEK: DT: 27/02/2023 TO 04/03/2023

DEPARTMENT: mechanical SEM: VII

NAME OF THE ORGANISATION: Ratnamani metals & tubes limited.

NAME OF THE PLANT/SECTION/DEPARTMENT: maintanence.

NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT: Mr Balwant Vaishnav.

DESCRIPTION OF THE WORK DONE IN BRIEF

(1) Types of Compressor and their working.
→ Reciprocating and screw type compressor.

(2) Gear, Bearing and Coupling.

(3) How maintanence department works.

(4) Induction bending → Procedure.

(5) Dispatch. (final).
→ After varifying the dimension and the quality under the guidance of TPI, pipes are go for dispatch.

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TOTAL HOURS: 48 Hours.

SIGNATURE OF STUDENT

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EXCELLENT / VERY GOOD / GOOD / ~~FAIR~~ / ~~BELOW~~ AVERAGE / POOR

Signature of Faculty Mentor

Signature of officer-in-charge
of Dept. / Section / Plant
(BALWANT VAISHNAV)

Date:

Date:

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Annexure I

Enrollment no: 190390119014

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: Dhawal Suthar

DIARY OF THE WEEK: DI: 06/03/23 TO 11/03/2023

DEPARTMENT: mechanical SEM: VIII

NAME OF THE ORGANISATION: Ratnamani metals & tubes limited.

NAME OF THE PLANT/SECTION/DEPARTMENT: Maintanence

NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT: mr. Balwant Vaishnav

DESCRIPTION OF THE WORK DONE IN BRIEF

① slitting :
coil cutting as per required width.

② Hydro testing ~~cwsin~~
using incompressible fluid.

③ welding defects.

④ Remidies for different welding defects.
And criteria of rejecting the pipe.

⑤ standards Introduction.
→ ISO Standards which used in Industry.

⑥ Quality Assurance plane.
(QAP)

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TOTAL HOURS: 48 Hours

SIGNATURE OF STUDENT

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~~EXCELLENT~~ / VERY GOOD / ~~GOOD~~ / ~~FAIR~~ / ~~BELOW AVERAGE~~ / ~~POOR~~

Signature of Faculty Mentor

Signature of officer-in-charge
of Dept. / Section / Plant
(BALVANT VAISHNAV)

Date:

Date:

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Annexure I

Enrollment no: 190390119014

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: Dhaval Suthar

DIARY OF THE WEEK: Dt: 13/03/23 TO 16/03/23

DEPARTMENT: Mechanical SEM: VIII

NAME OF THE ORGANISATION: Ratnamanimetal & Tubes Ltd.

NAME OF THE PLANT/SECTION/DEPARTMENT: maintanence.

NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT: Mr. Balwant Vaishnav

DESCRIPTION OF THE WORK DONE IN BRIEF

Visited Dispatch yard
→ How this department works...

After making of bare pipes from production department, they collect it and trasfer it to coating plant.

After coating pipes are to be stored in storage yard and according to client requirement, pipes are transported on the site.

Obervation and Understanding of Inspection tests such as RTR, Hydro, MPI, X-ray, UT, DPI

QC. lab visit.

CS- store visit.

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TOTAL HOURS: _ _ _ _ _ _ _ _ _ _ _ _ _ _

Bansal.
SIGNATURE OF STUDENT

○ The above entries are correct and the grading of work done by Trainee is
EXCELLENT / VERY GOOD / ~~GOOD~~ / ~~FAIR~~ / ~~BELOW AVERAGE~~ / ~~POOR~~

Signature of Faculty Mentor

Signature of officer-in-charge
of Dept. / Section / Plant
(BALWANT VAISHNAV)

Date:

Date:

Ratnamani Metals & Tubes Ltd.
Bhimasar
(Kutch)
Works

○ Grading of Work, for trainee may be given depending upon your judgement about his Punctuality, Regularity, Sincerity, Interest taken, Work done etc.

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Annexure I

Enrollment no: 190390119014

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: Dhawal Suthar

DIARY OF THE WEEK: DE: 20/03/23 TO 25/03/23

DEPARTMENT: ME (mechanical Engi) SEM: VIII

NAME OF THE ORGANISATION: Ratnamani metals & Tubes Ltd.

NAME OF THE PLANT/SECTION/DEPARTMENT: maintenence.

NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT: Mr. Balwant Vaishnav

DESCRIPTION OF THE WORK DONE IN BRIEF

(1) Pneumatic Values :

→ learn the working of Pneumatic Values and it's components.
→ Check the air leakages in pneumatic Values.
→ learn the working of DC value.
→ working of FRL (Filter, Regulator, Lubricator)

(2) LP / HP Pump :

→ working. → Types
→ where to use. → Capacity.

(3) Hydraulic circuit :

Prime mover → Pre Regulator (Pr Relief, reduce) → Solenoid value DC Value ↓ Actuator (cylinder)

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TOTAL HOURS:_ _ _ _ _ _ _ _ _ _ _ _

Bawaf.
SIGNATURE OF STUDENT

○ The above entries are correct and the grading of work done by Trainee is EXCELLENT / ~~VERY GOOD~~ / ~~GOOD~~ / ~~FAIR~~ / ~~BELOW AVERAGE~~ / ~~POOR~~

Signature of Faculty Mentor

Signature of officer-in-charge of Dept. / Section / Plant
(BALWANT VAISHNAV)
(DY MANAGER- MAINT.)

Metals & Tubes Ltd. Bhimasar (Kutch) Works

Date

Date:

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Annexure I

Enrollment no: 190390119014

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: Dhaval Suthar

DIARY OF THE WEEK: DE: 27/03/23 TO 01/04/2023

DEPARTMENT: Mechanical SEM: VIII

NAME OF THE ORGANISATION: Ratnamani Metals & Tubes Ltd.

NAME OF THE PLANT/SECTION/DEPARTMENT: maintanence

NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT: Mr. Balwant Vaishnav

DESCRIPTION OF THE WORK DONE IN BRIEF

This whole week I have attended various breakdowns and Routine machine checkups.

This includes the maintanence of following plants.:
- Spiral 02, 03
- ERW
- Swelling (Storage Yard)
- Bending.

While attending the breakdown, I have observed the various techniques and jugaad to be used for different situation.

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[illegible] - - - - - - - - - - - - - -

Signature of Student

○ The above entries are correct and the grading of work done by Trainee is ~~EXCELLENT~~ / VERY GOOD / ~~GOOD~~ / FAIR / BELOW AVERAGE / POOR

Signature of Faculty Mentor

Signature of officer in charge of Dept. / Section / Plant

(BALWANT CHAUHAN / DY MANAGER - MAINT)

Date

Date

○ Grading of Work for trainee may be given depending upon your judgement about his Punctuality, Regularity, Sincerity, interest taken, Work done etc.

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Annexure I

Enrollment no: 190390119014

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: Dhaval Suthar

DIARY OF THE WEEK: DT: 03/04/23 TO 08/04/2023

DEPARTMENT: Mechanical SEM: VIII

NAME OF THE ORGANISATION: Ratnamani metals & Tubes Ltd.

NAME OF THE PLANT/SECTION/DEPARTMENT: maintenence.

NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT: Mr. Bulwant Vaishnav

DESCRIPTION OF THE WORK DONE IN BRIEF

This whole week I have attended various breakdowns and Routine machine checkups.

This includes the maintanence of following machines:
- slitting machine
- milling (spiral 02)
- Auto UT (ERW)
- Hydro tester (spiral 02, 03)
- Bending machine

while attending the maintanence work, I have learned about different mechanical elements and where to use it.

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TOTAL HOURS: - - - - - - - - - - -

- - - - - - - - - - - -
SIGNATURE OF STUDENT

○ The above entries are correct and the grading of work done by Trainee is EXCELLENT / ~~VERY GOOD~~ / ~~GOOD~~ / ~~FAIR~~ / ~~BELOW AVERAGE~~ / POOR.

Signature of Faculty Mentor

Signature of officer-in-charge of Dept. / Section / Plant

Date

Date

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ગુજરાત ટેકનોલોજીકલ યુનિવર્સિટી
(ગુજરાત અધિનિયમ ક્રમાંક ૨૦/૨૦૦૭ દ્વારા સ્થાપિત)

Annexure I

Enrollment no: 190390119014

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: Dhaval Suthar

DIARY OF THE WEEK: DT: 10/04/2023 TO 15/04/2023

DEPARTMENT: mechanical SEM: VIII

NAME OF THE ORGANISATION: Ratnamani metals & Tubes ltd.

NAME OF THE PLANT/SECTION/DEPARTMENT: maintanence

NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT: Mr. Balwant Vaishnav

DESCRIPTION OF THE WORK DONE IN BRIEF

This whole week I have attended various breakdowns and Routine machine checkups.

This includes the maintanence of following machines :
- Bevelling machine (Bending)
- Swelling machine
- X-ray
- Crane (Spiral 03, ERW, Yard)
- Tab joint (Spiral 02)

While attending the breakdown, I have learned, how to understand the problem and to think about it's possible solutions.

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TOTAL HOURS

SIGNATURE OF STUDENT

○ The above entries are correct and the grading of work done by Trainee is EXCELLENT / VERY GOOD / GOOD / FAIR / BELOW AVERAGE / POOR

Metals & Tubes Ltd.
Bhimasar (Kutch) Works

Signature of Faculty Mentor

Signature of Officer-in-Charge of Dept. / Section / Plant

Date

Date

○ Grading of Work, for trainee may be given depending upon your judgement about his Punctuality, Regularity, Sincerity, Interest taken, Work done etc.

GUJARAT TECHNOLOGICAL UNIVERSITY
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Annexure I

Enrollment no.
190310119014

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: Dhaval Suthar

DIARY OF THE WEEK: DT 17/04/2023 TO 22/04/2023

DEPARTMENT: Mechanical SEM: VIII

NAME OF THE ORGANISATION: Ratnamani metals & tubes Ltd.

NAME OF THE PLANT/SECTION/DEPARTMENT: maintenance

NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT: Mr. Balwant Vaghela

DESCRIPTION OF THE WORK DONE IN BRIEF

This week I have attended various breakdowns and Routine machine checkups.

This includes the maintenance of following machines:

- Hydro tester (Spiral 03)
- Auto UT (Spiral 03)
- Bevelling machine (Induction bending)
- Spiral 02 offline
- New Hydro (ERW)

During this week I have also learned the process of issuing material from store using SAP.

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Raval.
SIGNATURE OF STUDENT

TOTAL HOURS_ _ _ _ _ _ _ _ _ _ _ _ _

○ The above entries are correct and the grading of work done by Trainee
EXCELLENT / ~~VERY~~ GOOD / GOOD / FAIR / BELOW AVERAGE / POOR

Signature of Faculty Mentor

Signature of official in charge
of Dept. / Section / Plant
(BALWANT VAISHNAV)

Metals & Tubes Bhimasar (Kutch) Works

Date

Date:

○ Grading of Work, for trainee may be given depending upon your judgement about his Punctuality, Regularity, Sincerity, Interest taken, Work done etc.

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Annexure I

Enrollment no: 190390119014

STUDENT'S WEEKLY RECORD OF INTERNSHIP

NAME OF STUDENT: Dhaval Suthar

DIARY OF THE WEEK: DE: 24/04/2023 TO: 24/04/2023

DEPARTMENT: Mechanical SEM: VIII

NAME OF THE ORGANISATION: Ratnamani metals & Tubes Ltd

NAME OF THE PLANT/SECTION/DEPARTMENT: maintenance.

NAME OF OFFICER INCHARGE OF THE PLANT/SECTION/DEPARTMENT: Mr Balwant Vaishnav

DESCRIPTION OF THE WORK DONE IN BRIEF

This week I have attended various breakdowns and routine machine checkups.

This includes the maintenance of following machines:

- Slitting machine
- Spiral 02 final
- ERW crane
- Spiral 03 mill
- End chamfering (ERW)
- Cooling tower
- Compressor (ERW Plant)

During the maintenance work, I have cleared many technical fundas like, relation between flow rate and pressure etc.

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Bawat.

TOTAL HOURS: ___________ SIGNATURE OF STUDENT

○ The above entries are correct and the grading of work done by Trainee is EXCELLENT / VERY GOOD / GOOD / FAIR / BELOW AVERAGE / POOR

Signature of Faculty Mentor

Signature of officer-in-charge of Dept. / Section

Metals & Tubes Ltd. Bhimasar, Kutch

(BALWANT HASRAN)

Date

Date:

○ Grading of Work, for trainee may be given depending upon your judgement about his Punctuality, Regularity, Sincerity, Interest taken, Work done etc.

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Annexure 2

Feedback Form by Industry expert

Student Name: Dhaval Suthar Date:

Work Supervisor: Mr. Balwant Vaishnav Title:

Company/Organization: Ratnamani metals & Tubes Ltd

Enrollment No: 190390119014

Internship Address: Survey no 474, Anjar Bhachau road, Bhimasar, Gujarat

Dates of Internship: From 06/02/2023 to 30/04/2023

Please evaluate your intern by indicating the frequency with which you observed the following behaviors:

Parameters	Needs improvement	Satisfactory	Good	Excellent
Shows interest in work and his/~~her~~ initiatives	–	–	–	✓
Produces high quality work and accepts responsibility	–	–	✓	–
Uses technical knowledge and expertise	–	–	–	✓
Analyzes problems effectively	–	–	–	✓
Communicates well and writes effectively	–	–	–	✓

Overall performance of student intern: (~~Needs improvement~~/ ~~Satisfactory/Good~~/Excellent):

Excellent.

Additional comments, if any:

Signature of Industry person with name and Stamp:

Metals & Tubes Ltd.
Bhimasar (Kutch) Works

(BALWANT VAISHNAV)

Signature of the Faculty Mentor