

INTERNSHIP ON PLASTIC PRODUCT MANUFACTURING

Submitted in partial fulfillment of the requirements for the award of
Bachelor of Engineering degree in

ELECTRICAL AND ELECTRONICS ENGINEERING

BY

SARITHIRA P (41140078)



**DEPARTMENT OF ELECTRICAL AND ELECTRONICS
ENGINEERING SCHOOL OF ENGINEERING**

SATHYABAMA

**INSTITUTE OF SCIENCE AND
TECHNOLOGY(DEEMED TO BE
UNIVERSITY)**

Accredited with Grade “A” by NAAC

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
BONAFIDE CERTIFICATE

This is to certify that this Report is the bonafide work of **SARITHIRA.P (41140078)** who carried out the internship entitled As **INTERNSHIP TRAINING ON EXPOSURE ON PLASTIC PRODUCT MANUFACTURING** under my supervision from 22-05-2023 to 29-05-2023

Head of the Department

Submitted for Viva voice Examination held on _____

INTERNAL EXAMINER

(SIGNATURE)

EXTERNAL EXAMINER

(SIGNATURE)

DECLARATION

I AM **SARITHIRA.P** here by declare that the Report entitled **INTERNSHIP TRAINNING ON EXPOSURE ON PLASTIC PRODUCT MANUFACTURING** done by me at **CENTRAL INSTITUTE OF PETROCHEMICALS ENGINEERING AND TECHNOLOGY, MADURAI** is submitted in partial fulfilment of the requirements for the award of Bachelor of Engineering degree in **ELECTRICAL AND ELECTRONICS ENGINEERING**.

DATE:22-05-2023-29-05-2023

PLACE:MADURAI



SARITHIRA P

SIGNATURE OF CANDIDATE

ACKNOWLEDGEMENT

I am pleased to acknowledge my sincere thanks to Board of Management of **SATHYABAMA** for their kind encouragement in doing this Report and for completing it successfully. I am grateful to them.

I convey my thanks to **DR. N. M. NANDHITHA, Prof. & Dean, School of Electrical and Electronics Engineering** and **DR.S.RADHIKA ,Head of the Department, Dept. of ELECTRICAL AND ELECTRONICS ENGINEERING** for providing me necessary support and details at the right time during the progressive reviews.

I wish to express my thanks to all Teaching and Non-teaching staff members of the Department of **Electrical and Electronics Engineering** who were helpful in many ways for the completion of the Report.

SARITHIRA P

Name of the candidate.

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ABSTRACT

The internship training conducted at the Central Institute of Petrochemicals Engineering and Technology (CIPET), Madurai, provided a comprehensive and hands-on exposure to the intricate world of plastic product manufacturing using Computer Numerical Control (CNC) machines. This immersive experience aimed to equip the interns with practical knowledge and skills in the field of CNC machining, specifically tailored for plastic materials.

Throughout the internship period, the interns gained valuable insights into the manufacturing processes involving CNC machines, such as machining setup, tool selection, programming, and quality control. The program emphasized the significance of precision and efficiency in the production of plastic components, as well as the importance of adhering to industry standards and safety protocols.

The report outlines the key aspects of the internship, including the theoretical foundation of CNC machining, practical training on various CNC machines, and the real-world applications of CNC technology in plastic product manufacturing. Additionally, it discusses the challenges encountered and the problem-solving skills developed by the interns during the training period.

The internship at CIPET not only fostered technical competencies but also enhanced interpersonal skills through teamwork and collaboration with experienced professionals. Furthermore, it highlighted the critical role of sustainable practices in the plastics industry and the imperative need for eco-friendly manufacturing processes.

This report serves as a comprehensive documentation of the internship experience, providing a detailed account of the knowledge gained, practical skills acquired, and the overall impact on personal and professional growth. It underscores the significance of CNC machining in the contemporary plastics industry and the pivotal role played by institutions like CIPET in nurturing future talent.

CHAPTER 1

INTRODUCTION ABOUT THE COMPANY

Central Institute of Petrochemicals and Engineering and Technology (CIPET) is a premier institution in India dedicated to providing education and training in the field of plastics and petrochemicals. CIPET operates under the jurisdiction of the Ministry of Chemicals and Fertilizers, Government of India. It plays a crucial role in nurturing talent, promoting research and development, and supporting the growth of the plastics and petrochemical industries in the country.

Establishment: CIPET was established in 1968 with the objective of developing skilled human resources in the field of plastics engineering and technology. Over the years, it has grown into a network of 38 centers across India, each offering specialized courses and training programs.

CIPET is actively involved in research and development activities related to

plastics and petrochemicals. It collaborates with industry partners and conducts research projects aimed at developing innovative materials, processes, and technologies. focusing on exposure to plastic product manufacturing on CNC machines, indicates that CIPET provides practical training opportunities to students and professionals in various aspects of plastics manufacturing and machining.

Central Institute of Petrochemicals and Engineering and Technology is a vital institution in the field of plastics and petrochemicals in India, contributing to the growth and development of these industries while producing skilled professionals and fostering innovation. Your internship experience at CIPET would have given you valuable insights and hands-on experience in the plastics manufacturing sector.

CHAPTER 2

NATURE OF WORK DONE

2.1 Nature of Work Done in the Company:

1. Machine Operation: You likely received hands-on experience operating CNC (Computer Numerical Control) machines used in plastic product manufacturing. This involves setting up the machines, loading materials, and running them to produce precise plastic components.

2. Tool Setup: Understanding how to set up cutting tools and other accessories on CNC machines is crucial for producing accurate and high-quality plastic parts.

3. Programming: Learning to program CNC machines involves creating instructions that guide the machine's movements to shape and cut plastic materials according to the desired specifications.

4. Quality Control: Ensuring the manufactured plastic products meet quality standards is a critical aspect of the work. This includes measuring dimensions, inspecting for defects, and making necessary adjustments.

5. Safety Protocols: You would have been trained on safety procedures and precautions related to working with CNC machines and plastic materials to prevent accidents and ensure a safe work environment.

6. Material Handling: Managing and handling plastic materials used in the manufacturing process, including understanding the properties of different plastics and their suitability for specific applications.

7. Problem Solving: Interns are often exposed to real-world challenges in manufacturing, requiring them to troubleshoot issues that may arise during the

production process

.

2.2 Certification Course

The certification course you completed at the Central Institute of Petrochemicals Engineering and Technology in Madurai likely included the following components:

1. Theory: I have received classroom instruction on the principles of plastic product manufacturing, CNC technology, and related topics.
2. Practical Training: This involved hands-on training on CNC machines, where you learned to apply the theoretical knowledge to real-world manufacturing tasks.
3. Certification: Upon successful completion of the course and meeting the evaluation criteria, I have received a certification attesting to my skills and knowledge in plastic product manufacturing using CNC machines.

CHAPTER 3 METHODS AND PROECESSSES

3.1 CNC MACHINES

3.1.1 Types of CNC Machines:

1. CNC Milling Machines: These machines are used to remove material from a workpiece by rotating a cutting tool. They are commonly used for making parts with complex shapes.
2. CNC Turning Machines (Lathe): CNC lathes are used for cylindrical or rotational parts. They rotate the workpiece and cut it using various tools to create shapes such as cylinders, cones, and threads.
3. CNC Router Machines: These machines are primarily used for cutting and shaping wood, plastic, and other softer materials. They are commonly used in woodworking and sign-making industries.

4. CNC Plasma Cutters: These machines use a high-velocity jet of ionized gas (plasma) to cut through electrically conductive materials like metal.
5. CNC Laser Cutters: Laser cutters use a focused laser beam to cut or engrave materials, including plastic, wood, and metal.
6. CNC Waterjet Cutters: Waterjet cutting machines use a high-pressure stream of water mixed with abrasive particles to cut through various materials with high precision.
7. CNC Wire EDM (Electrical Discharge Machining): Wire EDM machines use electrical discharges to remove material from the workpiece. They are often used for extremely precise and intricate parts.

3.1.2 Processes

1. CAD/CAM Software: You might have learned how to use Computer-Aided Design (CAD) software to create 2D or 3D models of the parts you want to manufacture. Computer-Aided Manufacturing (CAM) software is then used to generate the tool paths and G-code necessary for CNC machining.
2. Tool path Generation: Understanding how to generate efficient tool paths is crucial in CNC machining. This involves planning the sequence of tool movements to achieve the desired part geometry.
3. Material Selection: Knowing the properties of different plastics and materials is important for selecting the right material for your specific application.
4. Fixing: Learning how to securely hold the work piece in place on the CNC machine's table or chuck is critical to ensure accurate and repeatable machining.
5. Machining Operations: You might have been exposed to various machining operations such as drilling, milling, turning, facing, and contouring, depending on the type of CNC machine and the parts being produced.
6. Quality Control: Understanding how to measure and inspect parts to ensure they meet design specifications and quality standards is an essential aspect of CNC machining.
7. Safety: Safety protocols and best practices in the CNC machining environment, including the use of personal protective equipment (PPE), are crucial for maintaining a safe workplace.

These are some of the key methods and types you might have learned during your internship in plastic product manufacturing using CNC machines. CNC machining is a versatile and precise manufacturing method with applications in various industries, including aerospace, automotive, and electronics.

3.2 PROCESSING

Plastic processing can be defined as converting the plastics' raw ingredients into (semi-) finished products. These bulk plastics come in resin, granules, pellets, powders, sheets, preforms, or fluids and are converted into formed shapes of parts.

3.2.1 INJECTION MOLDING MACHINE

An injection molding machine is a manufacturing device used to produce plastic parts by injecting molten plastic material into a mold. This process is commonly used in the mass production of plastic components and products. Here's how an injection molding machine typically works:

1. **Mold Preparation:** The process starts with the preparation of a mold, which is a two-part tool made of metal (usually steel or aluminum) that has a cavity in the shape of the desired part. The two mold halves are clamped together.
2. **Material Loading:** Plastic pellets or granules are loaded into a hopper attached to the injection molding machine. The material is then conveyed into a heated barrel.
3. **Melting and Injection:** Inside the heated barrel, the plastic material is melted by heating elements and the friction generated by a screw that pushes the material forward. Once the material is molten, a hydraulic or electric piston injects it into the closed mold cavity under high pressure.
4. **Cooling:** After the plastic material is injected into the mold, it starts to cool and solidify. Cooling can be accelerated by cooling channels within the mold. The cooling time depends on the thickness and geometry of the part.
5. **Mold Opening:** Once the plastic has cooled and solidified inside the mold, the mold halves are opened, and the part is ejected. Ejector pins or plates are used to push the part out of the mold.
6. **Cycle Repeat** The process then repeats for the next part. Injection molding machines can produce a large number of identical parts in a relatively short period of time.

Injection molding offers several advantages, including high production speed, precision, and the ability to create complex shapes. It's used in a wide range of industries to produce products such as automotive components, consumer goods, medical devices, and more.

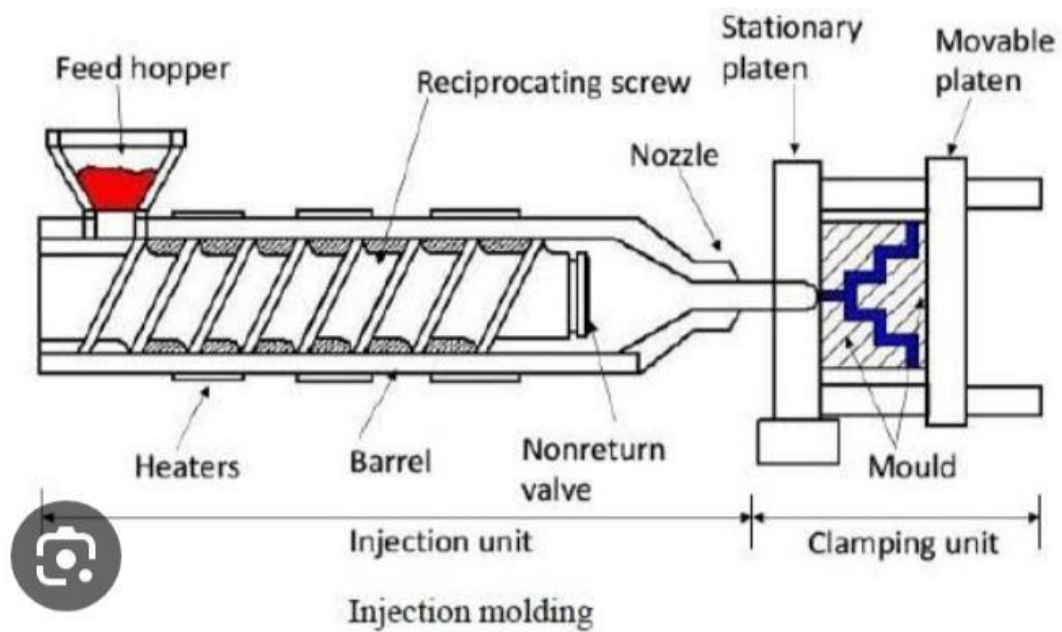


FIG 1 INJECTION MOLDING MACHINE

3.2.2 BLOW MOLDING

1. Process: Blow molding is a manufacturing process used to create hollow plastic parts and containers. It involves melting plastic material and then inflating it like a balloon inside a mold to form the desired shape. There are three primary types of blow molding

2. Extrusion Blow Molding: In this common variant of blow molding, a molten tube of plastic, called a parison, is extruded from an extrusion machine. The parison is then clamped into a mold, and air is blown into it to expand and take the shape of the mold cavity.

3. Injection Blow Molding: This method combines elements of injection molding and blow molding. A preform is injection molded, which is then transferred to a blow molding machine where it is inflated into the final shape.

4. Stretch Blow Molding:* Typically used for PET (polyethylene terephthalate) bottles, stretch blow molding involves stretching a preform while simultaneously blowing it into the final shape.

Applications: Blow molding is commonly used to produce bottles, containers, and hollow parts like automotive ducts, toys, and industrial components.

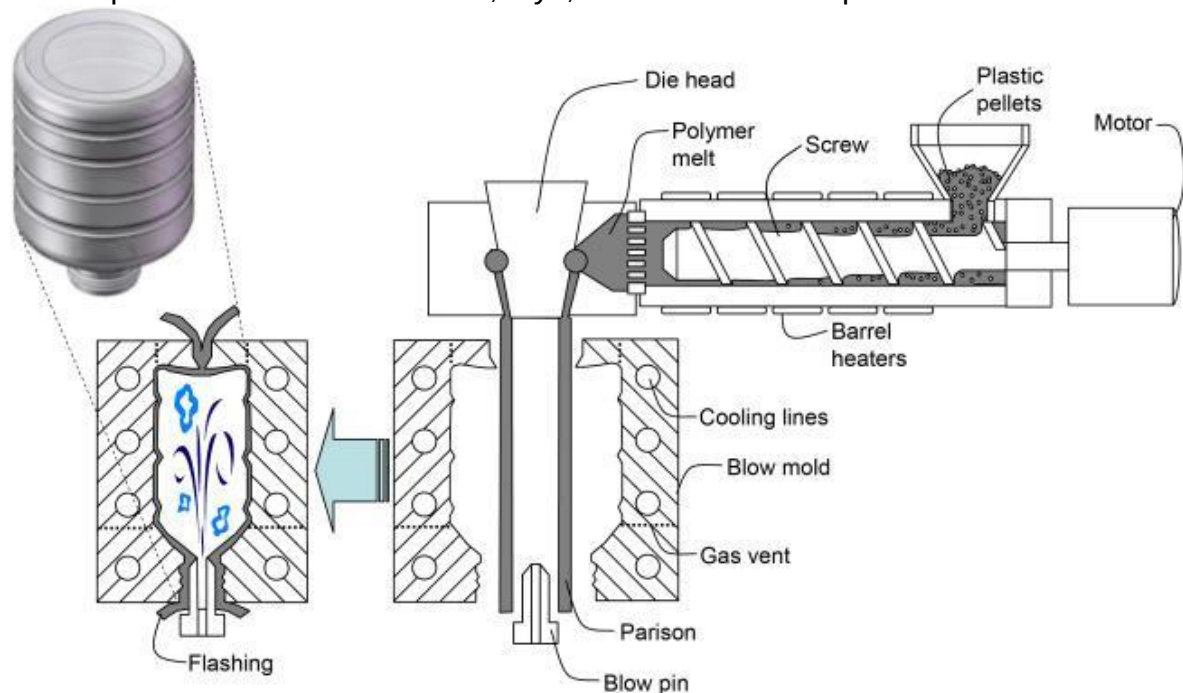




FIG 2 BLOW MOLDING MACHINE

3.2.3 Extrusion Molding

1. Process: Extrusion molding is a continuous manufacturing process where plastic material, usually in the form of pellets or granules, is melted and forced through a die to create a continuous profile or shape. The extruded material is then cooled and cut to the desired length. There are variations of extrusion molding, such as:

2. Profile Extrusion: Used for creating shapes like pipes, tubing, and window frames

3. Sheet Extrusion:* Produces flat sheets or films, which can be used in packaging, signage, and other applications. Blown Film Extrusion:* Used for

producing thin plastic films often used in packaging.

Applications: Extrusion molding is versatile and used to create a wide range of products, including pipes, tubing, sheet materials, plastic films, and profiles for various industries like construction, packaging, and automotive.

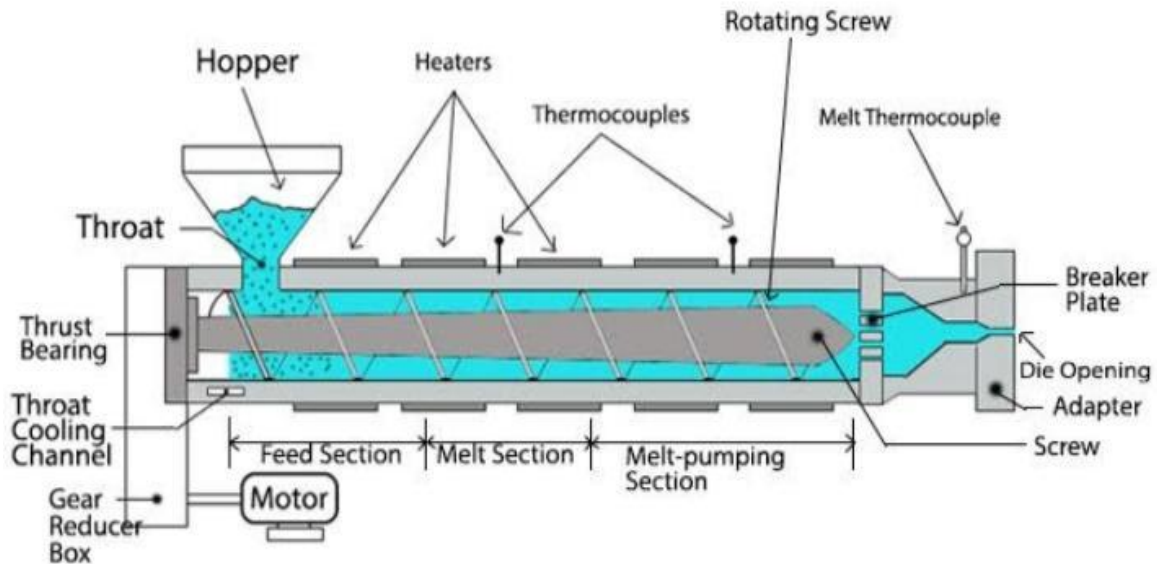


FIG 3 EXTRUSION MOLDING MACHINE

3.3 TESTING

Plastic testing is an essential process used to determine the properties, quality, and suitability of plastic materials for specific applications. There are several tests available to evaluate different aspects of plastics.

3.3.1 VARIOUS STANDARDS

There are several widely recognized plastic testing standards used worldwide. These standards provide guidelines and procedures for testing different properties and characteristics of plastics. Here are some of the prominent plastic testing standards

1. ASTM D638: This standard, developed by the American Society for Testing and Materials (ASTM), covers the tensile properties of plastic materials. It outlines the methods for determining the tensile strength, elongation, and modulus of elasticity of plastics.
2. ASTM D790: Another ASTM standard, ASTM D790, specifies the test methods for flexural properties of unreinforced and reinforced plastics. It provides procedures for determining flexural strength, flexural modulus.
3. ISO 527: The International Organization for Standardization (ISO) developed ISO 527 as a standard for determining the mechanical properties of plastic materials in tension. It includes methods for testing tensile properties such as tensile strength, elongation at break, and modulus of elasticity. \
3. ISO 178: This ISO standard focuses on determining the flexural properties of rigid and semi-rigid plastics. It provides procedures for measuring flexural strength, flexural modulus, and other related properties.
4. ISO 75: ISO 75 defines the methods for testing the heat deflection temperature of plastics. It outlines procedures for measuring the temperature at which a plastic specimen deforms under a specified load.
5. ISO 180: This standard specifies the Izod impact test method for determining the impact strength of plastics. It involves striking a notched specimen with a pendulum and measuring the energy absorbed during the fracture.
6. ISO 11357: ISO 11357 provides guidelines for the determination of various thermal properties of plastics, such as the glass transition temperature (T_g), melting temperature (T_m), and heat capacity.
8. ASTM D6382: This ASTM standard covers the measurement of melt flow rate (MFR) and melt volume rate (MVR) of thermoplastics. It is used to determine the flow properties of plastics under specific conditions of temperature and load. These are just a few examples of the many plastic testing standards

3.3.2 PROPERTIES

Plastic testing properties refer to the specific characteristics or properties that are

evaluated during the testing of plastic materials. These properties help determine the suitability of plastics for different applications. Here are some important plastic testing properties

Mechanical Properties:

Tensile Strength: The maximum stress a plastic material can withstand before breaking when subjected to tension.

Flexural Strength: The ability of a plastic material to resist bending or flexing forces.

Impact Resistance: The resistance of plastic to impact or sudden shock.

Hardness: The material's resistance to indentation or scratching.

Compression Strength: The ability of a plastic material to withstand compressive forces.

Elongation at Break: The extent to which a plastic can stretch before breaking.

Thermal Properties:

Melting Point: The temperature at which a plastic changes from a solid to a liquid state.
Heat Deflection Temperature (HDT): The temperature at which a plastic deforms under a specified load.

Coefficient of Thermal Expansion: The measure of how much a plastic material expands or contracts with temperature changes.

Thermal Conductivity: The ability of a plastic to conduct heat. **Flammability:** The ease with which a plastic material can ignite and sustain combustion

Chemical Compatibility: The reaction of a plastic material when exposed different chemicals, such as acids, solvents, or oils

Permeability: The ability of a plastic to resist the penetration of gases, liquids, or vapors.

Environmental Stress Cracking Resistance (ESCR): The resistance of plastics to cracking when exposed to specific chemicals and stress conditions.

Physical Properties:

Density: The mass per unit volume of a plastic material.

Dimensional Stability: The ability of a plastic material to maintain its size and shape under various environmental conditions.

Transparency/Clarity: The degree to which light can pass through a plastic material. **Color Stability:** The resistance of a plastic to fading or discoloration when exposed to UV radiation or other environmental factors.

Electrical Properties:

Dielectric Strength: The maximum electric field strength a plastic material can withstand without electrical breakdown.

Volume Resistivity: The measure of a plastic's resistance to electrical current flow.
 Surface Resistivity: The measure of a plastic's resistance to current flow across its surface.

These properties, among others, are evaluated through various testing methods to ensure that plastic materials meet the required specifications and perform effectively in their intended applications.

3.3.3 VARIOUS TYPES OF TESTING MACHINES & MAKERS & IT'S PURPOSE

1. Opacity Tester- L mack(Testing Fungus In The Plastics &Testing Optical Properties)
2. Projection Microscope-Radical(Testing Carbon Dipersion)
3. Weighing Balance - Axis(To Find The Density Or Thickness)
4. Titration Apparatus - Fischer(Chemical Analysis)
5. Impact Tester - Tinius Olsen(To Find The Mechanical Properties)
6. Wvtr-Water Vapour Transmission Rate Tester--Labthink(Testing Water Observing By The Product)
7. Ftir-Fourier Infrared Spectroscope-Thermo Scientific
8. Vac-Vbs(Gas Permeability Tester)-Labthink(To Find The Permeability Properties)
9. Friction Tester-Interbational Equipement-(To Find The Surface Mechanical Properties For Film)
10. Dsc 800(Differential Scanning Colorimeter -Perkinelmer(Test The Thermal Properties)
11. Utm(Universal Testing Machine)-Tinius Olsen-(Testing Elongation)
12. Tga(Thermal Gravimeteri Analysis-Ta-(Thermal Properties)
13. Hazometer-Chn Spec-(To Find Theoptical Properties)
14. Profile Projection-Optomech-(To Test The Dimension For Minute Particles)
15. Cbc Tester-International Equipements-(To Find Teattitives)
16. Muffle Furnance-(Heating Process)
17. 0 Degree Impact-Saumiya-(Falling Weight Impact)
18. Hcl Test Apparatus-Asian
19. Melting Pont Apparatus-Veego-(Thermal Properties)20. Abroshion Tester-Mrc Scientific Instruments
21. Mfi-El Mech -(Blowing Properties)
22. Thermo Static Water Bath-Everflow Scientific Instruments
23. Vsp/Hdt Apparatus-Internationalequipements-(Thermal Properties)

CHAPTER 4

KNOWLEDGE AND EXPERIENCE

During the internship, I was exposed to the following aspects of plastic product manufacturing using CNC machine.

I gained a fundamental understanding of CNC machines, their components, and their applications in precision manufacturing.

I learned how to write and modify CNC programs to control the machining processes accurately. This involved using software like G-code and CAD/CAM tools.

I acquired knowledge of setting up CNC machines, including tool selection, fixture design, and work piece positioning.

I gained hands-on experience in selecting appropriate cutting tools, speeds, and feeds for different plastic materials. I also learned about various machining operations such as milling, turning, and drilling.

Quality Control: I was exposed to quality control techniques and inspection methods to ensure the produced plastic components met the required specifications and standards.

Practical Experience: Throughout the internship, I had the opportunity to work on real-world projects involving CNC machining of plastic components. Some of the key experiences include: I was involved in the design and prototyping of plastic parts using CAD software, followed by the conversion of designs into CNC programs. I operated CNC machines, closely monitoring the machining process, making necessary adjustments, and troubleshooting issues as they arose.

I learned about the importance of safety protocols in a manufacturing environment and gained insights into routine machine maintenance procedure I collaborated with fellow interns and CIPET staff, which improved my teamwork and communication skills.

My internship at CIPET provided me with valuable knowledge and experience, including:

- Proficiency in programming CNC machines for plastic product manufacturing.
- Understanding of material selection and machining parameters for plastics
- Hands-on experience in machine setup, operation, and maintenance.
- Quality control skills for ensuring product precision and consistency.
- Effective teamwork and communication skills in an industrial setting.

CHAPTER 5

SUMMARY AND CONCLUSION

I completed an internship training program at CIPET in Madurai, focused on plastic product manufacturing using CNC (Computer Numerical Control) machines. During this program, I gained hands-on experience and valuable insights into various aspects of plastic manufacturing and CNC machining.

CNC Machine Operation: The internship provided me with practical training in operating CNC machines, including setup, programming, and tooling.

Programming Skills: I learned how to create and modify CNC programs to manufacture specific plastic components. This involved writing G-code and understanding the software used for CNC programming.

Material Selection and Handling: I acquired knowledge about selecting appropriate plastic materials for different applications and how to handle and prepare these materials for machining:

I was trained in conducting inspections and measurements to ensure the precision and quality of the manufactured plastic products. Safety protocols and practices were an integral part of the training to ensure a secure working environment when dealing with CNC machines and plastic materials.

I learned the importance of maintaining accurate records, including machine settings, tool changes, and quality control data, to track and document the manufacturing process. Upon successful completion of the internship training, I received a certification from CIPET, which validates my knowledge and skills in plastic product manufacturing using CNC machines.

Overall, my internship at CIPET in Madurai provided me with valuable hands-on experience and a strong foundation in the field of plastic product manufacturing and CNC machining. This training has equipped me with the skills and knowledge necessary to excel in the manufacturing and engineering industries.

In conclusion, my internship at CIPET in Madurai was an enriching experience that enhanced my understanding of plastic product manufacturing using CNC machines. The knowledge and skills I acquired during this internship will undoubtedly be valuable as I pursue a career in the field of manufacturing and engineering.

CERTIFICATE OF COMPLETION

सेन्ट्रल इंस्टिट्यूट ऑफ पेट्रोकेमिकल्स
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रसायन एवं पेट्रो रसायन विभाग

रसायन एवं उर्वरक मंत्रालय, भारत सरकार

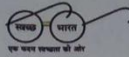
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CENTRAL INSTITUTE OF PETROCHEMICALS
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(Formerly Central Institute of Plastics Engineering & Technology (CIPET))

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CIPET/CSTS/MDU/CAD-ITP/2023-24/01

May 30, 2023

TO WHOMSOEVER IT MAY CONCERN

This is to certify that **Ms. SARITHIRA P**, S/o. Mr. PALPANDI M, student of B.E (Electrical & Electronics Engineering) from Sathyabama Institute of Science and Technology, Chennai has successfully completed the "Internship Training Program On Exposure of Plastics Product Manufacturing Using CNC Machines" from 22.05.2023 to 29.05.2023 at CIPET: CSTS, Madurai.

During the Internship Training period, the performance of the trainee was found good.

Course Coordinator

Training I/C-VTC

Director & Head



केन्द्र : अहमदाबाद, अमृतसर, औरंगाबाद, अगरतला, बडो, बालासोर, बेंगलुरु, भोपाल, भुवनेश्वर, चन्द्रपुर, चेन्नई, देहरादून, गुरुग्राम, गुवाहाटी, ग्वालियर, हैदराबाद, हाजीपुर, हल्दिया, इम्फाल, जयपुर, कोच्चि, कोरबा, लखनऊ, मधुरै, मुरथल, मैसूरु, रायपुर, रांची, वलसाड एवं विजयवाड़ा

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