Evaluating the Impact of Legal Metrology on Industrial Process

Summer Internship Project – III

Submitted for the partial fulfilment of the degree of

Bachelor of Technology

In

Electrical Engineering Department

Submitted By

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Submitted To

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Deemed to be university
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DECLARATION BY THE CANDIDATE

I hereby declare that the work presented in this project entitled **"Evaluating the Impact of Legal Metrology on Industrial Process"** which is being submitted in the partial fulfillment of the requirement for the award of degree of Bachelor of Technology in Electrical Engineering is an authentic record of our own work carried out under the guidance of **Dr. Ankit Tiwari**, Electrical Engineering Department.The matter presented in this project has not been submitted elsewhere by us for the award of any other degree/diploma.

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Place: Gwalior

This is to certify that the above statement made by the candidates is correct to the best of my knowledge and belief.

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PLAGIARISM CHECK CERTIFICATE

This is to certify that I, students of B.Tech. in **Electrical Engineering Department** have checked my complete project entitled **"Evaluating the Impact of Legal Metrolody on Industrial Process"** for similarity/plagiarism using the "Turnitin "software available in the institute.
This is to certify that the similarity in my project is found to be less than 30% which is within the specified limit.
The full plagiarism report along with summary is enclosed.

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ABSTRACT

The executive summary on my internship highlights an array of hands-on experiences and learning achievements. Through a collaboration with IILM, Ranchi, a deep understanding of Legal Metrology was acquired. Real-time projects delved into the fundamentals of Industrial Machines, complemented by the creation of informative posters for laboratory setups. Participation in various industrial visits, including Smart Meters, Eagle Manufacturing, Adani wilmar, and Petrotec, provided practical insights into manufacturing processes. Calibration of weighing instruments was undertaken at Flowtech and Prompt Equipment's, enriching technical skills. The visit to the CSIR- NPL marked a significant milestone, followed by visit to NTH. Visits to Endeavour Instruments Lab and work on Petrol dispenser further diversified the learning spectrum. The successful completion and submission of all reports, projects, and posters underscore the dedication and proficiency attained throughout these experiences.

ACKNOWLEDGEMENT

We extend our heartfelt gratitude to Madhav Institute of Technology & Science, Gwalior for their unwavering support towards our project and career endeavors. Special thanks to Dr. Nikhil Paliwal for his invaluable guidance during our internship at the Regional Reference Standard Laboratory. We are indebted to the Electrical Engineering department for their extensive mentorship, both professionally and personally. This report owes its existence to the generous financial and academic backing from Madhav Institute of Technology & Science, Gwalior.

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CERTIFICATE OF INTERNSHIP

Azadi Ka Amrit Mahotsav

सत्यमेव जयते

OIML

Certificate No.: RRSLA/INTERN/2024/05/04

Dated. 25.06.2024

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प्रमाणपत्र/CERTIFICATE

This certificate is awarded to Ms. **Radhika Yadav** of Madhav Institute of Technology & Science, Gwalior, Madhya Pradesh for successfully completion of one month Internship Program on "Legal Metrology-Industrial Familiarization" from 25th May 2024 to 26th June 2024 at RRSL, Ahmedabad.

(Ashutosh Agarwal)
Director (Legal Metrology)

Contents

ACRONYMS

LM - Legal Metrology

LMD – Legal Metrology Department

LMR - Legal Metrology Regulations

SWS - Standards of Weights and Measures

RWM - Registration of Weights and Measures

PC - Packaged Commodities

SI - International System of Units

MRP - Maximum Retail Price

MA – Model Approval

MI – Measuring Instruments

P&A Department - Personnel & Administration Department

HR Department - Human Resources Department

HIM - Historical Importance of Metrology

SCOPE - Standards Covering Objective Protection and Enforcement

TECH - Technology Enhancing Calibration and Harmonization

CASE - Consumer Awareness and Successful Examples

MNMC - Measurements and Measuring Instruments in Commerce

GLOBAL - Global Legal Organizations and Bureaus for Aligned Legislation

IMPACT - Importance of Metrology for Protection, Accuracy, Compliance, and Trade

NOMENCLATURE

1. Standards of Weights and Measures (SWSM):
    - Establishes uniform measurements based on the International System of Units (SI) for consistency across trade.

2. Registration of Weights and Measures (RWM):
    - Mandatory process for manufacturers, packers, importers, sellers, and repairers to ensure only authorized instruments are used.

3. Packaged Commodities (PC):
    - Regulates packaging and labeling to provide consumers with accurate information, including manufacturer details, production date, expiry, and maximum retail price (MRP).

4. Verification and Stamping (VS):
    - Ensures weighing and measuring instruments are verified and certified by the Legal Metrology Department (LMD) for accuracy and reliability.

5. Penalties and Offences (PO):
    - Specifies fines and imprisonment for violations such as using unverified instruments, improper labeling, or tampering with measuring devices.

6. International System of Units (SI):
    - A globally accepted system of measurement units, forming the basis for standardized weights and measures.

7. Maximum Retail Price (MRP):
    - The highest price at which a product can be sold to consumers, as mandated on packaging.

8. Legal Metrology Department (LMD):
    - The government body responsible for implementing the Act's provisions, includingverification and certification of measuring instruments.

9. Measuring Instruments (MI):
    - Tools and devices used for measuring weight, length, volume, capacity, and otherquantities in trade and commerce.

10. Model Approval (MA):
    - Guidelines and requirements for the design, construction, and performance ofmeasuring instruments before they are authorized for use.

CHAPTER 1: INTRODUCTION

Regional Reference Standard Laboratory (RRSL) Ahmedabad, established by the Government of India under the Directorate of Legal Metrology, operates under the Ministry of Consumer Affairs. As part of a network of seven labs across India (including Ahmedabad, Faridabad, Bhubaneshwar, Bangalore, Guwahati, Nagpur, and Varanasi), RRSL Ahmedabad is entrusted with the critical task of providing calibration, verification, and testing services. These services primarily cater to government bodies, public sector undertakings (PSUs), and private industries.

At RRSL Ahmedabad, the focus lies on ensuring precision and reliability in measurements by offering calibration services for various measures and balances. This ensures that instruments comply with stringent accuracy standards and are traceable to national standards. This commitment to accuracy and traceability makes RRSL Ahmedabad a trusted partner for both government and private sector entities in matters of metrology. With a dedication to maintaining high standards and upholding the integrity of measurements, RRSL Ahmedabad plays a vital role in promoting fair trade practices and consumer protection in the region.

CHAPTER 2: LITERATURE SURVEY

The literature survey will encompass an exploration of the regulatory landscape and the significance of calibration services provided by Regional Reference Standard Laboratory (RRSL) Ahmedabad. It will delve into the framework established by the Government of India under the Directorate of Legal Metrology, operating under the Ministry of Consumer Affairs. The survey will highlight the pivotal role of RRSL Ahmedabad within the network of seven labs across India, emphasizing its mandate to provide calibration, verification, and testing services.

Furthermore, the literature survey will discuss the importance of calibration in ensuring precision and reliability in measurements, particularly in government bodies, public sector undertakings (PSUs), and private industries. It will elaborate on the diverse range of measuresand balances for which RRSL Ahmedabad offers calibration services, underscoring the criticalneed for accuracy and traceability to national standards.

Moreover, the survey will explore the broader implications of RRSL Ahmedabad's activities in promoting fair trade practices and consumer protection through its commitment to upholding metrological integrity. By synthesizing these insights, the literature survey will provide a comprehensive understanding of the regulatory framework, the role of RRSL Ahmedabad, and the significance of calibration services in ensuring quality assurance and compliance with metrological standards.

CHAPTER 3: LEGAL METROLOGY

Application of legal metrology is laws and **regulations to ensure the accuracy of measurements used in trade and commerce. It establishes standards for units of measurement, verifies the calibration of measuring instruments, and regulates the labelling of pre-packaged goods.**

The aim of legal **metrology is to safeguard consumer interests by guaranteeing metrological precision in weighing and measuring devices utilized in business transactions.**

Our Mission: No Less, No More, Just Exact!

In order to achieve this objective, the department is implementing the following acts and rules:

1. The Legal Metrology Act 2009
2. The Legal Metrology (Packaged Commodities) Rules 2011
3. Andhra Pradesh Legal Metrology (Enforcement) Rules 2011
4. Legal Metrology (General) Rules 2011
5. Legal Metrology (Numeration) Rules, 2011
6. Legal Metrology (National Standards) Rules, 2011
7. Legal Metrology (Government Approved Test Centre) Rules, 2013
8. The Motor Spirit and High-Speed Diesel (Control of Supply, Distribution & Prevention of Malpractices) Order of 2005

Functions

- Weighing and measuring equipment verification.
- Examination to ensure correct usage of verified and stamped weights and measures by traders.
- Assessment of deliveries conducted with verified and stamped weights and measures.
- Recording offenses discovered during **inspections.**
- Guaranteeing compulsory declarations on pre-packaged goods.
- Ensuring maximum retail price (MRP) on pre-packaged goods.
-

Acts & rules in brief

1) Legal Metrology Act 2009: This act aims to establish standards and enforce weights, **measures, and numeration in trade and commerce, along with related matters.**

2) Legal Metrology (Packaged Commodities) Rules 2011: These regulations mandate specific declarations on pre-packaged goods, including details like the packer's address, manufacturer's information, quantity, packing date, and maximum retail price (MRP).

3) Andhra Pradesh Legal Metrology (Enforcement) Rules 2011: These rules, formulated by the state government in consultation with the central government, are designed to enforce the provisions of the Legal Metrology Act within the state.

4) Legal Metrology (General) Rules 2011: These regulations, established by the central government, set forth physical characteristics, accuracies, testing methods, and procedures related to weights and measures.

5) **Legal Metrology (Numeration) Rules 2011: Formulated by the central government,**

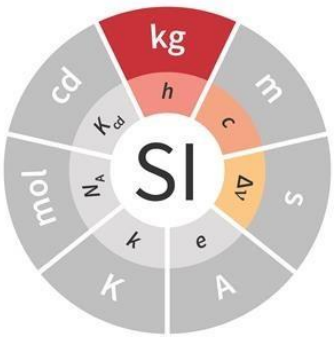
these rules define stndards for numeration across the country.

Legal Metrology covers a wide range of quantities used in trade and commerce. Here are some of the most common ones:

- **Length:** This speaks of the linear separation between two locations. In legal metrology, the metre (m) is the standard unit of length in most countries. It is the fundamental lengthunit of the Worldwide System of Units.

Submultiples			Multiples		
Value	Sl symbol	Name	Value	SI symbol	Name
10^{-1} m	dm	decimetre	10^{1} m	dam	decametre
10^{-2} m	cm	centimetre	10^{2} m	hm	hectometre
10^{-3} m	mm	millimetre	10^{3} m	km	kilometre
10^{-6} m	μm	micrometre	10^{6} m	Mm	megametre
10^{-9} m	nm	nanometre	10^{9} m	Gm	gigametre
10^{-12} m	pm	picometre	10^{12} m	Tm	terametre
10^{-15} m	fm	femtometre	10^{15} m	Pm	petametre
10^{-18} m	am	attometre	10^{18} m	Em	exametre
10^{-21} m	zm	zeptometre	10^{21} m	Zm	zettametre
10^{-24} m	ym	yoctometre	10^{24} m	Ym	yottametre

- **Mass:** Matter content of a thing is expressed as mass. In legal metrology, the kilogramme(kg) is the traditional unit of mass. In the SI it is also the fundamental unit of mass.



SI Unit

- **Volume:** This refers to the three-dimensional space occupied by matter. The **liter (L**) is the most common unit of volume used in legal metrology. It is derived from the cubic meter(m^3).
- **Capacity:** This refers to the amount of fluid a container can hold. The **liter (L)** is also commonly used as the unit of capacity in legal metrology.
- **Weight:** A thing's weight is the force that gravity applies to it. While mass is a fundamental property of matter, weight can vary depending on the gravitational pull. However, in legal metrology, weight is often used

interchangeably with mass for practical purposes, assuming a standard gravitational acceleration. The **kilogram (kg)** can be used to denote weight as well.

- **Temperature:** Temperature is a physical property that reflects the thermal energy of a substance. Degrees **Celsius (°C)** is the most widely used unit of temperature in legal metrology. It is part of the SI.

3.1 Objective of the legal metrology Act, 2009

- Approval of model of weight or measure before manufacturing/ import
- Ensure accuracy and reliability in measurements used in trade and commerce.
- Prohibition on manufacture, repair or sale of weight or measure without license
- Provision of Government Approved Test Centre has been introduced
- Verification and stamping of weight or measures
- Appointment of Legal Metrology Officers of Centre/State/Uts
- Protect consumer rights by enforcing fair trade practices.
- Establish standards for weights and measures to maintain uniformity.
- Regulate the manufacturing, sale, and use of weighing and measuring instruments.
- Issue Certificate after verified Weights and Measures
- After that Manufacturer use Weights without any fear

3.2 Application of Legal Metrology

1) **To Ensure Fair Trade:** Legal metrology plays a crucial role in maintaining fair trade by regulating the manufacture, sale, and use of weighing and measuring devices. This ensures that consumers receive the exact amount of goods and services they pay for.

2) **To Protect Consumers:** It safeguards consumers from fraudulent practices and unsafe products by regulating the weighing and measurement of items, including hazardous materials like explosives and pharmaceuticals.

3) **Verification:** Verification, along with its different forms and related words, involves checking, testing, or adjusting a weight or measurement to make sure it meets the standards set by the law. This process ensures that the weight or measurement is accurate. It also includes re-checking and calibration when necessary.

4) **Pre-packaged commodity:** pre-packaged commodity means a commodity which without the purchaser being present is placed in a package of whatever nature, whether sealed or not, so that the product contained therein has a predetermined quantity.

5) **To Provide the Necessary Infrastructure for Correct Measurements:** It includes setting up legal requirements, control/conformity assessment of regulated products and activities, supervision, and providing infrastructure for accurate measurements.

CHAPTER 4: INDUSTRIAL MACHINES

We had the opportunity to work with numerous machines during our time, and I'd like to highlight a few of them in detail. These include the DC Multi-output Power Supply, RMS Leakage Current Tester, Drop Test Equipment for Electric Irons, Profile Projector, Long Test Pin, Tumbling Barrel Apparatus, and the Digital Micro Ohm Meter. While it's impossible to list all the machines we engaged with, some selected ones showcase the diverse range of equipment we handled and the practical experience we gained.

1) DC Multi-Output Power Supply

Introduction:
The DC Multi Output Power Supply Machine is a versatile device that provides multiple directcurrent (DC) outputs from a single power source. It's commonly used in laboratories, workshops, and testing environments to power various electronic devices and circuits simultaneously.

Functionality:
This power supply converts AC (alternating current)from the mains into DC, then distributes this DC power through several outputs. Each output can be adjusted to deliver different voltage and current levels, making it highly flexible for various applications. Users can set thedesired voltage and current using control knobs or digital interfaces, and the machine ensures stable and reliable power delivery to each onnected device.

Picture 1: DC Multi-Output Power Supply

Advantages:

- Versatility: Can power multiple devices at once with different voltage and currentneeds.
- Convenience: Reduces the need for multiple power supplies, saving space and simplifying setups.
- Precision: Allows fine-tuning of voltage and current outputs, ensuring accurate powerdelivery.
- Safety: Equipped with protections against overvoltage, overcurrent, and short circuits,enhancing user and device safety.

Applications:

- Laboratories: Ideal for powering various experimental setups and testing circuits.
- Educational Institutes: Useful for student projects and practical electronics training.
- Workshops: Powers multiple tools and devices, facilitating repairs and builds.
- Research and Development: Supports prototype development and testing by providing reliable power to new devices and circuits.

The DC Multi Output Power Supply Machine is a crucial tool in any setting that requires dependable and adjustable power for multiple electronic components.

2) RMS - Leakage Current Tester

Introduction:

An RMS-Leakage Current Tester is a device used to measure the leakage current in electrical and electronic devices. Leakage current is the small amount of electrical current that flows from a device to the ground or another conductive part, even when the device is turned off. This tester ensures that the leakage current remains within safe limits to prevent electrical shocks and ensure device safety.

Functionality:

The tester operates by applying a voltage to the device under test and measuring the current that leaks through the insulation. It uses the Root Mean Square (RMS) method to provide an accurate measurement of the leakage current over time. This method takes into account the varying nature of electrical signals, providing a true representation of the leakage current.

Fault Condition:

In a fault condition, the leakage current exceeds the acceptable safety limits. This can be caused by damaged insulation, moisture, or other defects in the device. The RMS-Leakage Current Tester identifies these faults, allowing for timely maintenance and repair to prevent potential hazards.

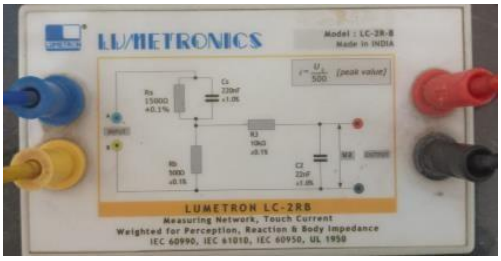
Advantage:

- Safety Assurance: Ensures devices are safe to use by keeping leakage current within safe limits.
- Prevention of Electrical Shocks: Helps prevent electrical shocks by detecting excessive leakage currents.
- Device Longevity: Identifies faults early, preventing damage to the device and extending its lifespan.

Applications:

- Household Appliances: Ensures the safety of devices like refrigerators, washing machines, and electric irons.
- Medical Equipment: Critical in maintaining the safety of medical devices that are in constant contact with patients.
- Industrial Machinery: Used in factories to monitor and maintain the safety of various machinery.
- Consumer Electronics: Ensures that gadgets like smartphones, laptops, and televisions are safe for everyday use.

By regularly using an RMS-Leakage Current Tester, we can maintain the safety and reliability of electrical and electronic devices, ensuring they operate within safe parameters.



Picture 2: RMS -Leakage Current Tester

3) Profile Projector

Introduction:
A Profile Projector, also known as an optical comparator, is a device used to measure the dimensions and geometry of small mechanical parts with high precision. It works by projecting the magnified image of a part onto a screen where measurements can be taken accurately.

Functionality:

- Placement: The part to be measured is placed on the projector's stage.
- Lighting: A light source illuminates the part, creating a shadow or silhouette.
- Projection: The silhouette is magnified and projected onto a screen using a lens system.
- Measurement: The projected image is compared against calibrated scales or digital readouts on the screen to measure dimensions like length, width, angles, and radii.

Fault Conditions:

- Blurry Image: Caused by improper focus or dirty lenses.
- Inaccurate Measurements: Resulting from misalignment of the part or wear and tear on the machine.
- Lighting Issues: Inadequate or uneven lighting can distort the image.
- Mechanical Failures: Such as problems with the moving stage or lens system
- Inaccurate Measurements: Resulting from misalignment of the part or wear and tear on the machine.
- Lighting Issues: Inadequate or uneven lighting can distort the image.
- Mechanical Failures: Such as problems with the moving stage or lens system.

Advantages:

- High Precision: Provides very accurate measurements of small parts.

- Non-Destructive: Allows measurement without damaging the part.
- User-Friendly: Simple to operate with clear visual feedback.
- Versatile: Can measure various dimensions and geometries.

Applications:

- Quality Control: Used in manufacturing to ensure parts meet specifications.
- Inspection: Helps in inspecting and verifying the dimensions of components.
- Tool Making: Assists in the precise fabrication of tools and dies.
- Research and Development: Useful in prototyping and testing new parts and designs.
- Profile projectors measure dimensions, angles, contours, and surface finish, aiding quality control in manufacturing.
- Profile Projectors are commonly used, such as metalworking, plastics manufacturing, electronics, etc.

In summary, a Profile Projector is a vital tool in precision measurement, offering high accuracy and ease of use across various industrial applications.

Picture 3: Profile Projector

CHAPTER 5: INDUSTRIAL VISITS

We all visited these companies extensively and observed a wide range of machines, learning how they operate and understanding the intricacies of calibration.
I am highlight some of the memorable industrial visits I had the privilege to experience. These visits have been enriching opportunities to witness firsthand the inner workings of various industries and gain valuable insights into their operations.

1. Shree Gokulesh Petroleum (Indian Oil)
2. Smart Meters Technologies Pvt Ltd
3. Adani Wilmar Oil Packaging Unit
4. Petrotec Pvt Ltd
5. Prompt Equipment's Pvt Ltd.
6. Flowtech Measuring Instruments Pvt Ltd
7. Eagle Scale Manufacturing Pvt Ltd

1) Shree Gokulesh Petroleum (Indian Oil)

We visit to Shree Gokulesh Petroleum**,** a renowned Indian Oil fuel station in Ahmedabad, provided an insightful experience into the operations of a modern fuel retail outlet. The purpose of the visit was to understand its infrastructure, customer services, and contribution to the local economy and community.

Overview and Facilities
Shree Gokulesh Petroleum offers various products, including petrol, diesel, and lubricants, catering to a wide customer base. The station is equipped with advanced fuel-dispensing units, ensuring accurate measurements and transparency. Automated systems allow seamless digital payment options, including UPI and card payments, enhancing customer convenience.

The station also provides amenities such as free air refilling for vehicle tires, clean drinking water, and restroom facilities. These features ensure a pleasant experience for customers. Furthermore, a small convenience store is available for basic essentials, adding to the station's utility.

Safety and Environmental Measures
A strong focus on safety was observed during the visit. The station is equipped with fire extinguishers, sand buckets, and clearly marked emergency exits. The staff appeared well-trained to handle emergencies, reflecting Indian Oil's high safety standards. Additionally, vapor recovery systems are installed to minimize harmful emissions, and regular equipment checks ensure compliance with environmental regulations.

Customer Service and Efficiency
The staff demonstrated professionalism and a customer-first approach. They assisted visitors

in selecting appropriate fuel grades and provided guidance on lubricant options. The integration of technology, such as Automated Tank Gauging (ATG), allows efficient inventory monitoring, ensuring uninterrupted service.

Challenges and Recommendations
The station faces challenges during peak hours, leading to minor delays in service. Parking space for larger vehicles is also limited. To address these issues, it is recommended to expand the service lanes and consider enhancing infrastructure to accommodate high demand. Incorporating solar panels for energy needs could further strengthen its commitment to environmental sustainability.

Conclusion
The visit to Shree Gokulesh Petroleum highlighted the essential role of fuel stations in supporting urban transportation and community needs. Its focus on safety, environmental care, and customer satisfaction sets an excellent benchmark in the industry. With minor improvements, the station can further enhance its operational efficiency and environmental stewardship, contributing positively to Ahmedabad's energy ecosystem.

Picture 4: Glimpses of Shree Gokulesh Petroleum

2) Smart Meters Technologies Pvt Ltd

Introduction
As part of our academic curriculum, we visited the Adani Gas Meter Construction site to understand the process of gas meter installation, safety protocols, and the role of technology in modern energy distribution. The visit provided insights into the operational aspects of a natural gas distribution system and its importance in sustainable energy management.

Overview of Adani Gas
Adani Gas is a leading player in the City Gas Distribution (CGD) network in India. The company focuses on supplying piped natural gas (PNG) to households, industries, and compressed natural gas (CNG) for vehicles. Their gas meter construction sites are critical in

ensuring accurate measurement and distribution of natural gas to consumers.

Details of the Visit

The visit began with a safety briefing by the site engineers, emphasizing the importance of personal protective equipment (PPE) and adherence to safety protocols. The students were divided into small groups to observe various stages of the gas meter installation process.

1. Meter Assembly:

The engineers demonstrated the assembly of gas meters, highlighting the role of precision in ensuring accurate measurement. The meters are designed with advanced technology to detect leaks and monitor gas flow in real-time.

2. Pipeline Integration:

The integration of gas meters with the main pipeline was explained. The process involves ensuring proper alignment and sealing to prevent leaks. Special tools and materials, such as Teflon tape and high-quality nuts, are used for secure connections.

3. Quality and Safety Checks:

Before commissioning, each meter undergoes rigorous testing for durability and accuracy. The engineers demonstrated pressure testing and leak detection methods, emphasizing the importance of maintaining safety standards.

Learning Outcomes

Technical Knowledge: Students gained insights into the working principles of gas meters and the technology used in their construction.

Safety Awareness: Observing the stringent safety measures reinforced the importance of safety in industrial operations.

Sustainability: The visit highlighted the role of natural gas as a cleaner alternative to conventional fuels, contributing to a sustainable future.

Conclusion

The visit to the Adani Gas Meter Construction site was an enriching experience, providing practical exposure to theoretical concepts. It deepened our understanding of gas distribution systems and their role in the energy sector. Such industrial visits bridge the gap between academics and industry, preparing students for real-world challenges.

Picture 5: Glimpses of Smart Meters Technologies Pvt Ltd

3) Adani Wilmar Oil Packaging Unit

Introduction
We had the opportunity to visit the Adani Wilmar oil packaging unit located in Ahmedabad. The visit was part of an educational program aimed at exposing students to real-world industrial operations. Adani Wilmar, a prominent joint venture between the Adani Group and Wilmar International, is a leader in India's edible oil and food product sector. Its flagship brand, Fortune, has a significant presence in Indian households.

Objective of the Visit
The primary purpose of the visit was to help students gain practical insights into the processes and technologies used in the packaging of edible oils. The visit also aimed to demonstrate how automation, quality control, and sustainability practices are integrated into the production cycle of a modern manufacturing unit.

Overview of the Facility
Upon reaching the facility, the students were welcomed by the plant's management team, who provided an introduction to Adani Wilmar's history, market strategies, and its role in the FMCG sector. The packaging unit, a state-of-the-art facility equipped with advanced machinery, adheres to global quality standards and sustainability protocols.

The plant was organized into various sections, each designed for a specific function, from oil reception to packaging and dispatch. The emphasis on hygiene, safety, and efficiency was evident throughout the tour.

Key Learnings
1. Automated Packaging Process:
The students observed the entire packaging process, which is almost entirely automated. Raw oil is processed, filtered, and transferred into bottles or pouches using high-precision machinery. Tasks such as bottle sterilization, filling, capping, labeling, and sealing are performed by robots, ensuring minimal human intervention and maximum efficiency.

2. Quality Assurance:
Quality control is a critical component of Adani Wilmar's operations. The facility employs rigorous testing protocols at every stage, from raw material intake to the final product. Advanced technology is used to ensure that the oils meet the highest quality and safety standards, free from contaminants or inconsistencies.

3. Sustainability Practices:
The company's commitment to sustainability was evident in its use of recyclable materials for packaging and its focus on energy-efficient operations. The management team shared insights on how they aim to reduce their carbon footprint while maintaining productivity.

4. Safety and Hygiene Standards:
Maintaining strict safety and hygiene protocols was another highlight of the visit. Workers are provided with appropriate safety gear, and the facility is regularly sanitized to meet food safety requirements.

Interactive Session
Following the tour, an interactive session was held where students engaged with the plant's managerial staff. They inquired about various aspects, including challenges in the FMCG industry, career opportunities, and the role of technology in streamlining manufacturing processes. The staff also shared their experiences and tips for succeeding in industrial careers.

Conclusion
The visit to Adani Wilmar's oil packaging unit was a highly informative experience for the students. It provided a comprehensive understanding of how a leading FMCG company integrates technology, quality control, and sustainability into its operations. The exposure to real-world industrial practices broadened the students' perspectives and enhanced their appreciation for the complexities of modern manufacturing.

Such educational visits are invaluable in bridging the gap between theoretical knowledge and its practical applications, inspiring students to pursue careers in industrial and technological fields.

Picture 6: Glimpses of Adani Wilmar Oil Packaging Unit

4) Petrotec Pvt Ltd

Introduction
We had the privilege of visiting the Petrotech Equipment Manufacturing Facility in Ahmedabad. The visit was organized to provide practical exposure to the processes involved in the production of specialized equipment for industries like oil, gas, and petrochemicals. Petrotech Equipment is known for manufacturing heat exchangers, pressure vessels, and other critical machinery that plays a vital role in energy and industrial applications.

Objective of the Visit
The visit aimed to offer students a hands-on learning experience by showcasing the manufacturing process, technological advancements, and quality control measures employed at the facility. It was designed to enhance the students' understanding of industrial applications of mechanical engineering principles and their relevance in the energy sector.

Overview of the Visit
Upon arrival, the students were greeted by the facility's management team, who shared a brief history of the company and its operations. A safety briefing followed, ensuring that the students understood the precautions necessary in an industrial setting. The tour then commenced, covering various departments within the facility.

The plant was divided into sections, including the design department, fabrication workshop, testing laboratory, and storage area. Each area was equipped with specialized machinery and operated under strict safety and efficiency guidelines.

Key Observations and Learnings

1. Design and Drafting:
Students were introduced to the initial stages of equipment development, where engineers utilize software tools to create precise technical drawings. This process is critical in ensuring that the final product meets both client specifications and regulatory standards.

2. Manufacturing and Fabrication:
The fabrication area showcased large-scale equipment and tools used for cutting, welding, and assembling raw materials into finished components. Advanced techniques such as automated welding and CNC machining were demonstrated, highlighting the importance of precision and efficiency in production.

3. Testing and Quality Assurance:
The facility's quality assurance team guided students through the rigorous testing processes required to ensure equipment reliability and safety. Techniques like hydrostatic testing and ultrasonic inspections were demonstrated, emphasizing the role of quality control in maintaining global industry standards.

4. Sustainability and Waste Management:
Petrotech’s efforts toward sustainability were evident in their use of efficient manufacturing methods and eco-friendly waste disposal systems. The management discussed their strategies for reducing energy consumption and minimizing the environmental impact of their operations.

Interactive Session
A Q&A session with the facility’s engineers allowed students to delve deeper into the operational challenges and technological advancements shaping the industry. The discussion also covered career opportunities, skills in demand, and the future of manufacturing in a rapidly evolving energy sector.

Conclusion
The visit to the Petrotech Equipment Manufacturing Facility was an insightful experience that bridged the gap between theoretical learning and practical application. Students gained valuable knowledge about the complexities of industrial manufacturing, the importance of precision, and the emphasis on sustainability in modern operations.


Picture 7: Glimpses of Petrotec Pvt Ltd

5) Prompt Equipment's Pvt. Ltd.

Overview of the Visit

Prompt Equipment Pvt. Ltd. is renowned for its advanced products, including milk analyzers, IoT-enabled devices, and automation solutions designed to streamline operations in agriculture and dairy industries. This visit offered participants an opportunity to observe cutting-edge technologies and understand the company's contribution to the sector.

Key Activities

1. Welcome and Introduction:

The day began with an introductory session where company representatives shared the organization's vision, journey, and milestones in innovation and market leadership.

2. Guided Plant Tour:

Manufacturing Units: Participants observed state-of-the-art equipment being assembled. The streamlined processes emphasized efficiency and precision.

R&D Department: The team showcased ongoing research projects focused on enhancing product capabilities.

Quality Assurance Labs: Rigorous testing processes were demonstrated to highlight the company's commitment to reliability and standards.

3. Product Demonstrations:

Participants were given hands-on exposure to various products, such as milk analyzers for quality testing and IoT-enabled monitoring devices for dairy operations. The focus was on user-friendly features and real-time data analytics.

4. Interactive Session:

A Q&A session allowed participants to engage with experts on topics like product lifecycle, environmental sustainability, and customer support.

5. Feedback and Conclusion:

The visit concluded with a feedback session, where participants expressed appreciation for the valuable insights gained.

Key Learnings
Innovation and Technology: Prompt Equipment's focus on R&D ensures continuous advancements in their products.
Sustainability Practices: Eco-friendly processes highlight the company's dedication to environmental responsibility.
Customer-Centric Approach: Products are designed with usability and after-sales support in mind.

Conclusion
The visit was an enriching experience, providing a deeper understanding of industry applications of technology and innovation. It emphasized the importance of quality, efficiency, and customer focus in manufacturing.

Picture 8: Glimpses of Prompt Equipment's Pvt Ltd.

6) Flowtech Measuring Instruments Pvt Ltd

Introduction
We visited Flowtech Engineers in Ahmedabad as part of an educational program aimed at providing practical insights into the industrial manufacturing processes of valves and flow control equipment. Flowtech Engineers is a renowned manufacturer specializing in industrial valves, such as ball valves, butterfly valves, and control valves, which are widely used in industries like oil and gas, water treatment, and chemical processing.

Objective of the Visit
The primary purpose of the visit was to enhance the students' understanding of valve manufacturing, including design, production, and quality assurance processes. The visit also aimed to showcase the role of advanced technologies and precise engineering in producing reliable equipment for industrial applications.

Overview of the Facility
The visit began with a warm welcome by the Flowtech Engineers team, followed by a brief introduction to the company's operations, products, and market presence. Students were given safety instructions before proceeding with the plant tour.

The manufacturing facility was well-organized and divided into sections, including the design department, production floor, assembly line, testing area, and storage. Each section demonstrated the company's commitment to quality and efficiency in its operations.

Conclusion

The visit to Flowtech Engineers was an informative experience, providing students with a detailed understanding of the manufacturing processes behind industrial valves. It showcased the integration of technology, quality control, and sustainability in modern engineering practices.

Such visits are invaluable in helping students connect theoretical concepts with real-world applications, inspiring them to pursue careers in industrial and manufacturing sectors while equipping them with practical knowledge for their future endeavors.

Picture 9: Glimpses of Flowtech Measuring Instruments Pvt Ltd

7) Eagle Scale Manufacturing Pvt Ltd

Overview of the Visit

Eagle Scale Manufacturing, based in Ahmedabad, is a pioneer in the design and production of advanced weighing solutions. With an extensive range of products including electronic weighbridges, precision scales, and customized weighing systems, the company serves a variety of industries such as logistics, agriculture, and manufacturing.

Key Activities

1. Introduction and Welcome:

The visit commenced with a warm welcome from company representatives, followed by an informative session on Eagle Scale Manufacturing's history, milestones, and market presence. The presentation provided an overview of their innovative approaches and customer-centric solutions.

2. Plant Tour:

Manufacturing Units: Participants observed the assembly line for various weighing systems, gaining insights into the integration of mechanical and electronic components.

Calibration Process: A demonstration of the calibration techniques used to ensure high accuracy in the final products.

Testing Facilities: Participants were introduced to the rigorous quality control measures employed to maintain product reliability.

3. Product Demonstrations:

A hands-on session showcased several key products, including:

- Electronic weighbridges designed for heavy-duty industrial use.
- Precision scales for laboratory and retail applications.
- Customized weighing systems tailored to specific industry needs.

4. Interactive Discussion:

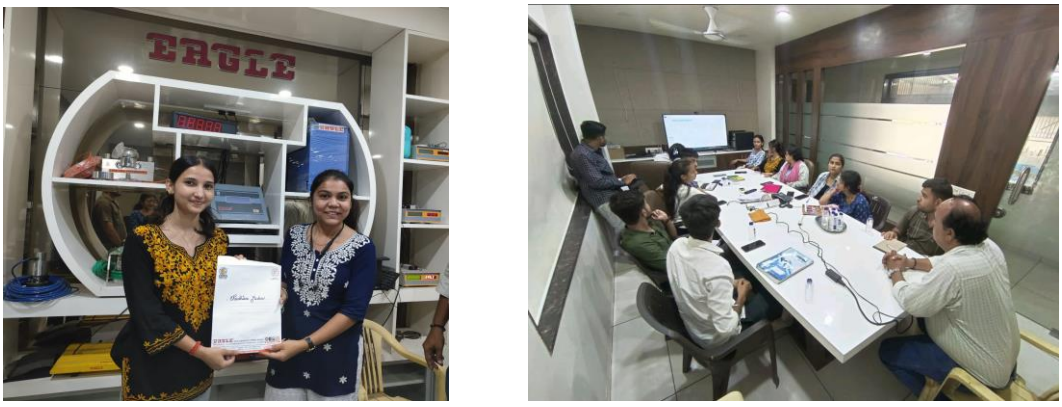
An engaging Q&A session followed, where participants inquired about technological advancements, maintenance practices, and the company's strategies for staying competitive in the global market.

5. Feedback and Conclusion:

The visit concluded with a feedback session where participants shared their experiences and appreciation for the company's transparency and commitment to excellence.

Conclusion

The visit to Eagle Scale Manufacturing was highly educational, providing an in-depth understanding of the intricacies of modern weighing systems. The experience highlighted the importance of precision, innovation, and customer focus in industrial manufacturing.



Picture 10: Glimpses of Eagle Scale Manufacturing Pvt Ltd

CHAPTER 6: CSIR-NPL VISIT

During our internship tenure, we got the amazing opportunity to Visit the NATIONAL PHYSICAL LABORATORY (CSIR-NPL), New Delhi. We were delved into the knowledge of various types of laboratories.

The CSIR- National Physical Laboratory of India, situated in New Delhi, is the measurement standards laboratory of India. It maintains standards of SI units in India and calibrates the national standards of weights and measures.

CSIR-NPL is the Indian Time Authority. CSIR-NPL provides time traceability to Indian Space Research Organization (ISRO) via CVGNSS and TWSTFT.

The visit was a gateway to a world where precision meets innovation, where theories transform into tangible experiments. From the intricate measurements in the length and dimension lab to the meticulous study of mass and the complexities of numetric and hydraulic pressure labs, each moment was a testament to the dedication and passion of scientific exploration.

Picture 11: Glimpses of NPL visit

CHAPTER 7: NTH VISIT

During our internship tenure, we got the amazing opportunity to Visit the NATIONAL TEST HOUSE, Ghaziabad. We were delved into the knowledge of various types of tests of various types of equipments.

NTH is India's largest multi-location multidisciplinary industrial central government's testing laboratory. National Test House is a premier scientific and technical institution of this country employed in the service of the country for more than 110 years.

The strength of NTH lies in its specialized and experienced Scientists and Engineers drawn from diversified fields of Science and Technology, who are positioned in various laboratories located across the country. The Scientists are supported by qualified and highly skilled technicians, laboratory supervisors, workshop operators and supporting staff. A team of Scientists have been trained and qualified as Assessors by the National Accreditation Board for Testing and Calibration Laboratories (NABL) who conduct assessments of laboratories to assist NABL.

The visit was more than just a tour-it was a deep dive into the meticulous procedures that govern equipment testing. Our interns were able to witness the meticulous attention to detail and the advanced testing methodologies employed at National Test House. Understanding the nuances of how fans, switches, and cables undergo rigorous evaluation highlighted the importance of precision and reliability in engineering practices.

Picture 12: Glimpses of NTH visit

CHAPTER 8: EXTRACURRICULAR

During our internship, we were fortunate to organize and participate in several community-centric initiatives. One such event was a blood donation camp, where we collaborated with local healthcare organizations to encourage voluntary blood donations. This noble endeavor aimed to address the critical shortage of blood in our community and contribute to saving lives. Additionally, we organized a Swachh Bharat cleanliness drive, mobilizing volunteers to clean public spaces, parks, and neighborhoods. This initiative aimed to promote cleanliness and hygiene, fostering a healthier environment for all. Finally, we celebrated International Yoga Day by organizing a yoga session, where participants were introduced to various yoga asanas and meditation techniques. This event highlighted the physical and mental benefits of yoga and encouraged individuals to incorporate it into their daily lives. Through these initiatives, we not only fulfilled our social responsibility but also gained valuable experience in event planning, team management, and community engagement.

Picture 13: Glimpses of Swachh Bharat, Blood donation and Yoga day

LEARNING OUTCOMES

After the completion of my internship, I am able to:

CO1 Explain the concepts of Legal Metrology and different types measuring unit.

CO2 Apply different types of weighing method to verify test weight.

CO3 Explain the different types of load cell and there working principal.

CO4 Discuss various types of weights, weighing instrument, standard balances and different types of accuracy class.

CO5 Explored diverse industry experiences at Eagle Scale, FilSilPek, Promt Equipment, etc.

CO6 Explored time scale & equipment like Atomic Hydrogen clock, PTP Server.

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