SUMMER INTERNSHIP REPORT 2024

BUREAU OF INDAIN STANDARD

PATNA BRANCH OFFICE(PTBO)

TRIPTI SINGH
B-TECH 4TH YEAR
MECAHNICAL ENGINEERING
NIT, PATNA

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मानकः पथप्रदर्शकः
Bureau of Indian Standards

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ABSTRACT

This report encapsulates my experiences and learning during the summer internship at the Bureau of Indian Standards (BIS) Branch Office in Patna. The primary objective of this internship was to gain a comprehensive understanding of the standardization process, product certification, and quality assurance mechanisms employed by BIS and gap analysis, if any between BIS and other parties.

During the internship, I was introduced to the core functions of BIS, including the formulation of Indian Standards, certification schemes, laboratory testing, and consumer grievance redressal. My responsibilities included assisting in the development and review of Indian standards, participating in various exposure visits, and observing the product testing and certification processes.

This project not only enhanced my knowledge of product standards and safety requirements but also provided practical insights into the challenges faced by industries in adhering to these standards.The internship also offered opportunities to interact with experienced professionals and industry experts, providing me with a broader perspective on the impact of standardization and quality assurance on trade and consumer welfare.

Overall, the summer internship at BIS Patna was an enriching experience that significantly enhanced my understanding of standardization and quality assurance processes. It equipped me with practical skills and knowledge that will be instrumental in my future career endeavors. This report details the activities undertaken, the skills acquired, and the contributions made during the internship period, highlighting the pivotal role of BIS in promoting quality and safety across various sectors in India.

ACKNOWLEDGMENT

I would like to express my heartfelt gratitude to the Bureau of Indian Standards (BIS) Branch Office, Patna, for providing me with the opportunity to undertake a summer internship at such a prestigious institution. This experience has been instrumental in expanding my knowledge and practical understanding of standardization, product certification, and quality assurance.

First and foremost, Special thanks to Shri Suman Kumar Gupta (Scientist-E & Head PTBO) for his mentorship and for providing me with opportunities to engage in meaningful projects and activities. I extend my sincere thanks to Shri Vijay Kumar Gauraw, Shri Sudhanshu Suman, Shri Himanshu Kumar, my internship supervisor, for their invaluable guidance, support, and encouragement throughout the internship period. Their insights and expertise were crucial in helping me navigate the various tasks and projects I was assigned.

I am deeply grateful to the entire team of BIS Patna for their warm welcome and constant support. Their willingness to share knowledge and provide assistance whenever needed made my internship experience both educational and enjoyable.

I would also like to acknowledge National Institute of Technology, Patna for facilitating this internship opportunity and for the continued support from the faculty and administration. The theoretical foundation and academic training provided by my institution were essential in enabling me to contribute effectively during my internship.

Furthermore, I am thankful to my peers and colleagues at BIS Patna, whose camaraderie and collaboration made this journey even more enriching. The discussions, brainstorming sessions, and collective problem-solving efforts significantly enhanced my learning experience.

In conclusion, this internship has been a transformative experience, and I am profoundly grateful to all those who contributed to making it a success. I look forward to applying the knowledge and skills acquired during this period to my future academic and professional endeavors.

INTRODUCTION

HISTORY OF BUREAU OF INDIAN STANDARDS

- Early Beginnings

  1947-1986: BIS traces its roots back to 1947 when the Standards Institution of British India (SIBI) was set up. In 1947, after India gained independence, SIBI became the Indian Standards Institution (ISI). Its primary role was to formulate national standards and certify products for quality and safety.

- Evolution and Expansion

  1986: The Indian government reconstituted ISI as the Bureau of Indian Standards (BIS) under the Bureau of Indian Standards Act, 1986. This act empowered BIS to further expand its role in setting standards and certifying products across various industries, including manufacturing, agriculture, consumer goods, and services.

  2016: under the BIS Act 2016 BIS has been providing traceability benefits to the national economy in a number of ways – providing safe reliable quality goods; minimizing health hazards to consumers; promoting exports and imports substitute; control over proliferation of varieties etc. through standardization, certification and testing.

Figure 1: BIS locations in pan India.

CORE ACTIVITIES

The core activities of the Bureau of Indian Standards (BIS) encompass a wide range of functions aimed at promoting quality, safety, and reliability across various sectors. Here are the key activities undertaken by BIS:

1. Standards Formulation

   Development: Formulating national standards (Indian Standards, IS) across diverse sectors such as manufacturing, agriculture, consumer products, services, and technology.

   Harmonization: Aligning Indian standards with international standards to facilitate trade and promote global competitiveness of Indian products.

2. Conformity Assessment

   Product Certification: Evaluating and certifying products that meet Indian standards through a rigorous testing and certification process [Figure 2].

   BIS Mark: Granting the prestigious BIS certification mark (formerly ISI mark) to certified products, indicating conformity to specified quality and safety standards.

3. Laboratory Testing and Quality Assurance

   Testing Facilities: Operating state-of-the-art laboratories equipped with advanced testing equipment to conduct comprehensive tests on a wide range of products.

   Quality Assurance: Ensuring products comply with regulatory requirements and consumer safety standards through robust quality testing and inspection procedures.

4. Hallmarking

   Hallmarking is determination of proportionate content of precious metal in an article. From 01 July 2021, selling hallmarked gold jewellery [Figure 4] is mandatory in 256 districts of India. 33 more districts have been added in 2022. 55 additional districts have been added in 2023. In Bihar, 23 districts are under mandatory hallmarking.

5. Training and Consumer Protection

   Training Programs: Conducting training sessions, workshops, and seminars for industry stakeholders, manufacturers, and government officials on standards compliance, quality management, and certification processes.

   Skill Development: Enhancing technical skills and competencies among professionals involved in standardization, testing, and quality assurance.

Consumer Awareness: Educating consumers about the significance of quality standards and the importance of purchasing certified products bearing the BIS mark.

Consumer Grievance Redressal: Addressing consumer complaints related to product quality, safety, or misuse of the BIS mark through effective grievance handling mechanisms.

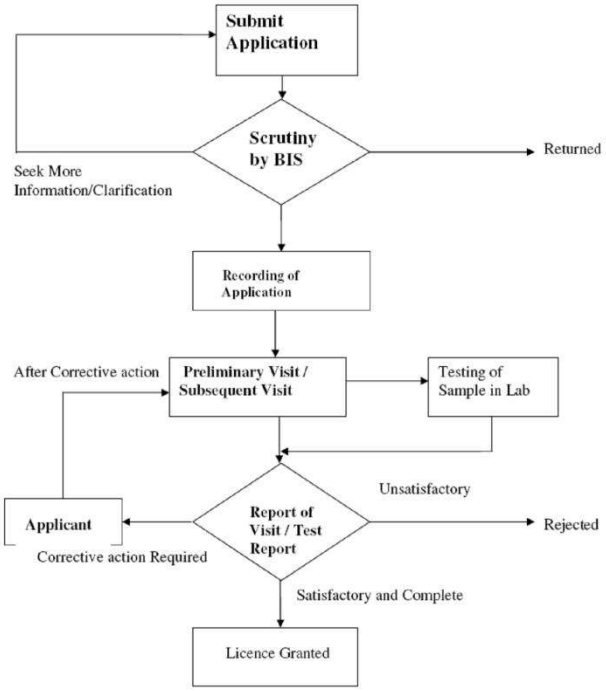


Figure 2: Certification process grant of licence

- BENEFITS OF CERTIFICATION

i. Ensures quality of product through third party guarantee

ii. Permits the choice of right product at the right price as the manufacturer is required to declare ratings and performance parameters of the product

iii. Ensure operation for a known (specified) period (life)

iv. Ensures satisfactory operation throughout the useful life of the product

v. Ensures safety of human life and property against element injurious to health in case of food products, electric shock in case of electrical equipment etc.

vi. Guarantees minimum performance: Examples - Efficiency of electric motors, Life of an electric bulb, Fuel consumption of a diesel engine, Radiation losses of storage water heaters

vii. Ensures Speedy rederessal of any complaint about the quality of product

- CERTIFICATION BENEFITS TO THE CONSUMER

i. The product has been inspected & tested to the relevant standard as per norms laid down in BIS Certification Scheme of testing and inspection.

ii. The Standard mark has been incorporated only after product conforms to relevant ISS.

iii. Quality Control system and testing lab of manufacturer is time to time inspected and ensured its effectiveness by Bureau through network of regional offices/ branch offices all over the country.

iv. ISI mark ensure 3rd party guarantee.

v. In case of complaint for ISI marked product, one can approach BIS for redressal of their grievances.

vi. Consumer get the information regarding ingredient, DOM, DOE, Identification, B.No., etc for ISI marked products.

Figure 3: BIS care app which can easily be downloaded from play store.

Figure 4: Explains what a jewellery hallmarking denotes.

It has logo such as: BIS logo , purity of gold, HUID.

Week 1

Visit To Industry and Laboratory

- **LABORTORY VISIT PBL**

1) **PRODUCT SPECIFICATION-** IS 1417 GOLD and gold alloys, jewellery/ artefacts - Fineness and marking

Test method- IS 1418 Determination of gold in gold bullion, gold alloys and gold jewellery/artefact - Cupellation (Fire Assay) method

1. Sampling

   Preparation of Sample: A representative sample of the gold ornament is prepared. This involves cutting a small piece from the ornament, ensuring it is free from impurities such as solder or other metals.

   Weighing: The sample is accurately weighed using a high-precision balance. The weight is recorded for further calculations.

2. Fusion:

   Place the mixture in a crucible and heat it in a furnace. The temperature should be around 1100°C to 1200°C.

3. Cupellation:

   Pour the molten mixture into a cupel (a porous container) and heat it again in the furnace.

   The lead will oxidize and be absorbed by the cupel, leaving behind a bead of gold and silver.

4. Parting:

   Treat the it with nitric acid to dissolve the silver, leaving behind pure gold. Wash and dry the gold residue.

4. Collection and Weighing

   Washing and Drying: The precipitated gold powder is washed to remove any remaining impurities and then dried.

   Final Weighing: The dried gold powder is weighed again using a high-precision balance. This weight represents the gold content in the sample.

5. Calculation

Percentage of Gold: The percentage of gold in the ornament is calculated using the following formula:

Percentage of Gold= (Weight of Gold Powder /Weight of Sample)×100

2) **PRODUCT SPECIFICATION:** IS 1489: Specification for Portland-Pozzolana Cement - Part 1: Fly Ash Based

Testing Methods for IS 1489 (part 1)

1. Chemical Tests

1.1 Loss on Ignition (LOI)

Purpose: To determine the amount of organic matter and carbon dioxide from carbonates.

Method: A sample of cement is heated to a specified temperature until constant mass is achieved. The weight loss is recorded as LOI.

1.2 Insoluble Residue

Purpose: To determine the non-reactive impurities.

Method: The sample is treated with hydrochloric acid and filtered. The residue is washed, ignited, and weighed.

1.3 Sulphuric Anhydride (SO3)

Purpose: To determine the sulphate content.

Method: The sample is dissolved in acid, and barium chloride is added to precipitate barium sulphate, which is then weighed.

1.4 Magnesia (MgO)

Purpose: To ensure the magnesia content is within limits to avoid unsoundness.

Method: The sample is treated with acid, and magnesia is determined using complexometric titration.

1.5 Available Alkalis

Purpose: To check for alkali-aggregate reaction potential.

Method: The sample is treated with water and the extract is analyzed for sodium and potassium content.

2. Physical Tests

2.1 Fineness

Purpose: To determine the particle size distribution.

Method: The Blaine air permeability method or sieve analysis can be used. The Blaine method measures the specific surface area, while sieve analysis involves s ieving the cement through a specified sieve size.

2.2 Setting Time

Purpose: To determine the time taken for the cement paste to set.

Method: The Vicat apparatus is used to measure the initial and final setting times. The initial setting time is the duration for the paste to start losing its plasticity, and the final setting time is when the paste has completely hardened.

2.3 Soundness

Purpose: To check for volumetric stability.

Method: The Le Chatelier method is used where a cement paste is prepared, and the expansion is measured after boiling. The Autoclave expansion test can also be used for more stringent requirements.

2.4 Compressive Strength

Purpose: To determine the strength of cement.

Method: Mortar cubes made with standard sand are cured and tested for compressive strength at 3, 7, and 28 days.

2.5 Consistency

Purpose: To determine the water required to achieve standard consistency.

Method: The Vicat apparatus is used to determine the amount of water needed to achieve a paste of standard consistency.

2.6 Heat of Hydration

Purpose: To determine the heat released during the hydration process.

Method: The heat of hydration is measured using calorimetric methods at specific intervals (7 days and 28 days).

● VISIT TO INDUSTRIES WHO HAVE OPTED BIS LICENSE

1. **VISIT TO IRCTC RAIL NEER PLANT**

IS 14543:2016

Packaged Drinking Water (Other Than Packaged Natural Mineral Water) - Specification

The plant is using about 1 lakh 90 thousand of raw water which is finally packed in 85 thousand carton(12 bottle each) which comprises of 1 lakh 2 thousand of final water.

The water treatment and bottle filling process at the IRCTC Rail Neer plant in Danapur involves several critical steps to ensure the production of safe and high-quality packaged drinking water. Here's a detailed overview of the process:

● **Water Treatment Process:**

1) Water Sourcing:

i. Source Selection: Water is sourced from borewell through pumps as per IS 10500.

ii. Quality Check: Incoming water undergoes initial testing to ensure it meets regulatory standards for drinking water.

2) Preliminary Treatment:

i. Screening: Water is first passed through screens to remove large particles, debris, and sediments.

ii. Coagulation and Flocculation: Chemicals are added to the water to bind small particles together into larger clumps (floc), which can then be easily removed.

3) Filtration:

i. Sand Filtration: Water passes through layers of sand and gravel beds to remove finer particles and impurities.

ii. Activated Carbon Filtration: This step further removes organic compounds, chlorine, and other chemicals that can affect taste and odor.

4) Disinfection:

Chlorination or Ozonation: To kill any remaining bacteria, viruses, and other microorganisms, chlorine or ozone is added to the water. Chlorine is effective for residual disinfection throughout the bottling process.

5) Reverse Osmosis (RO):

i. Membrane Filtration: The plant use RO to remove dissolved salts and minerals from water, improving its purity and taste. This step is critical for ensuring the water meets stringent quality standards. [Figure 5a]

6) UV Treatment:

i. Ultraviolet Radiation: Water passes through UV chambers to kill any remaining microorganisms that may have survived earlier treatments. UV light disrupts the DNA of bacteria and viruses, rendering them inactive.

7) Micro-filtration:

i. Final Polishing: Water undergo micro-filtration to remove any remaining particles and ensure it is crystal clear and safe for consumption [Figure 5b].

- **Bottle Filling Process:**

1) Preparation:

i. Bottle Blowing: PET (Polyethylene Terephthalate) preforms are blown into bottles using the stretch blow molding process.

ii. Bottle Inspection: Empty bottles are inspected for cleanliness and integrity. Defective bottles are rejected.

iii. Rinsing: Bottles are thoroughly rinsed with treated water to remove any dust or contaminants.

2) Filling:

i. Automatic Filling Machines: Clean, rinsed bottles are transferred to filling machines equipped with multiple filling heads.

ii. Filling Process: Each bottle is filled with the treated water, ensuring accurate fill levels and preventing spillage [Figure 5c].

iii. Capping: After filling, bottles are capped and sealed to prevent contamination and ensure freshness.

3) Labeling and Coding:

i. Label Application: Labels containing product information, batch numbers, and expiration dates are applied to each bottle.

ii. Coding: Bottles are date-coded for trace-ability and quality control purposes.

4) Packaging:

i. Cartoning: Filled and labeled bottles are packed into cardboard cartons or crates suitable for transportation and storage.

ii. Palletizing: Cartons or crates are stacked on pallets for easier handling and distribution.

5) Quality Control:

i. Sampling and Testing: Regular sampling of water and finished products ensures they meet regulatory standards for purity, safety, and taste.

ii. Batch Recordkeeping: Detailed records are maintained for each batch of production, including test results and quality assurance measures.

6) Distribution:

i. Storage: Finished products are stored in a controlled environment within the plant until they are dispatched to railway stations or distribution centers.

ii. Transportation: Bottled water is transported under controlled conditions to ensure product integrity and freshness.

7) Environmental Considerations:

i. Waste Management: Proper disposal or recycling of packaging materials and waste generated during the production process is managed in accordance with environmental regulations.

Figure 5: (a) Reverse osmosis machines; (b) Micro filtration and storage tank; (c) Water is filled inside the bottle automatically.

2. VISIT TO DEO PLASTICS PRIVATE LIMITED

IS 14735 : 1999

Unplasticized Polyvinyl Chloride (UPVC) Injection Moulded Fittings for Soil and Waste Discharge System for Inside and Outside Buildings Including Ventilation and Rain Water System - Specification

- **PROCESS:**

1. Raw Material Handling and Preparation

   i. uPVC Resin and Additives: The primary raw material for fitting pipes is uPVC resin, which is combined with additives such as stabilizers, lubricants, and impact modifiers.

   ii. Compounding: The uPVC resin and additives are mixed and compounded together in precise ratios in a compounding extruder. This ensures uniform distribution of additives throughout the resin.

2. Extrusion Process

   i. Extrusion: The compounded uPVC material is fed into an extrusion machine. This machine melts the material and forces it through a die to form the desired profile of the fitting pipe.

   ii. Cooling and Sizing: As the uPVC profile exits the extrusion die, it passes through a cooling tank or chamber to solidify. Sizing tools and calibrators ensure the fitting pipe achieves the correct dimensions and shape according to IS 14735 specifications.

3. Molding and Forming

   i. Injection Molding: Some types of fittings, such as elbows, tees, and reducers, are manufactured through injection molding. In this process, molten uPVC resin is injected into molds under high pressure. The molds are designed to shape the uPVC resin into the specific fitting design as per IS 14735 requirements.

   ii. Cooling and Ejection: After injection, the molded fittings cool and solidify within the molds. They are then ejected from the molds once they have sufficiently cooled and hardened.

4. Quality Control and Testing

   i. Dimensional Checks: Fittings undergo dimensional inspection to ensure they meet specified tolerances for diameter, wall thickness, and overall dimensions.

   ii. Physical Properties: Samples are tested for physical properties such as tensile strength, impact resistance, and hardness to ensure they meet IS 14735 requirements.

iii. Hydraulic Testing: Some fittings may be subjected to hydraulic pressure testing to verify their strength and integrity under pressure.

5. Finishing

i. Trimming and Finishing: After molding or extrusion, fittings may require trimming of excess material and finishing touches to ensure smooth surfaces and proper fit.

ii. Marking and Labeling: Fittings are marked with essential information such as size, manufacturer's name, and IS 14735 compliance markings.

- **TEST METHOD:**

1. Visual Inspection

Method: Visually inspect the fittings for any defects such as cracks, bubbles, inclusions, and surface irregularities.

Requirement: The fittings should be free from visible defects that could affect their performance or durability.

2. Dimensional Verification

Method: Measure the dimensions of the fittings using appropriate gauges and measuring tools.

Requirement: The dimensions should conform to the specified tolerances as per relevant standards (e.g., diameter, wall thickness, socket depth).

3. Impact Resistance Test

Method: Conduct the test at a specified temperature (usually 0°C) by dropping fitiing from a specific height.

Requirement: The fitting should not show any signs of cracking or significant deformation after the impact.

4. Hydro-static Pressure Test

Method: Subject the fitting to internal water pressure at a specified level for a defined period.

Requirement: The fitting should withstand the pressure without any leakage or failure.

5. Stress Relief Test

Method: Tested by the method described in IS 12235 (Part 6).

Requirement: The test specimen shall not show blisters, excessive delamination or cracking or signs of weld line splitting.

6. Leakage Test

   Method: Connect the fitting to a pipeline system and subject it to water flow and pressure.

   Requirement: The fitting should not leak at any joint or connection under specified conditions.

7. Vicat Softening Temperature Test

   Method: Determine the temperature at which the fitting begins to soften using a Vicat apparatus.

   Requirement: The Vicat softening temperature should meet the specified minimum value, indicating suitable thermal stability.

- **FAILURE: -**
  - Thickness was at its minimum limit; the reason might be to lower down their cost to save the material.
  - Stress Relief Test- the test fails as the fitting cracks from the point the runner is detached.

  POSSIBLE REASONS-

  - less pressure given during taking die shape
  - Proper heating is not given,
  - Shape of the die may have some issues,
  - Proper cooling is not done especially at the joint
  - VST- Test fails as the dial gauge rotates a full circle of 1mm at 72.6 C only, but it should have rotated at atleast after 78 C.

Reasons behind it may be due to the use of less stabilizers.

Figure 6: Storage area and transportation of pipes.

3. VISIT TO SBW BUILDTECH PVT. LTD.

IS 2185 (Part 3) : 1983

Concrete Masonry Units Part 3 Autoclaved Cellular Aerated Concrete Blocks

- **RAW MATERIAL-**

  • Cement – gives strength

  • Fly ash- main material, lightest material that can be used

  • Lime- reacts with aluminum

- **PROCESS-**

1. Material Selection:

   Use high-quality cement, fly ash, lime and water. The materials should conform to the relevant standards for construction materials.

2. Mix Proportioning:

   Proportion the mix to achieve the desired strength, durability, and work-ability. Common mix ratios are used, adjusted based on the type of block and specific requirements. Cement and lime are mixed. A slurry of Fly ash with water moves to the hopper. All are mixed in tank for 5 minutes. Aluminum is mixed at the end for hardness.

3. Batching and Mixing:

   Measure the materials accurately and mix them thoroughly to ensure a uniform mixture. Mixing can be done in a concrete mixer.

4. Molding:

   Pour the mixed concrete into molds to form the desired shape and size of the blocks. Vibrate the molds to remove air pockets and ensure proper compaction. After that prequel is done in presence of steam for 40 minutes.

5. Curing:

   Cure the blocks to achieve the desired strength. Curing can be done by steam curing, water curing, or by keeping the blocks in a humid environment for a specified period.

6. De-molding and Storing:

   Followed by demolding and cutting in horizontal and vertical direction after 2.5 hr. [Figure 8] so that blocks are not in sticky state. Remove the blocks from the molds after

they have set. Finally, it is autoclave at 205 C [Figure 7b] and held for 7 days before dispatch. Store them properly to prevent damage and to allow further curing if necessary.

- **TEST METHOD-**

1) Dimensional Tolerance Test:

Method: Measure the dimensions (length, width, height) of the blocks using a calibrated scale or caliper.

Requirement: The dimensions should conform to the specified tolerances in IS 2185.

2) Compression Strength Test:

Method: Test the blocks using a compression testing machine. Place the block in the machine and apply load uniformly until failure occurs.

Requirement: The compression strength should meet or exceed the specified values for different types of blocks (load-bearing, non-load-bearing).

3) Water Absorption Test:

Method: Immerse the block in water for 24 hours, then remove, surface dry, and weigh it. Calculate the water absorption percentage based on the weight difference before and after immersion.

Requirement: The water absorption should not exceed the specified limits (usually around 10% by weight).

4) Drying Shrinkage Test:

Method: Measure the linear dimensions of the block before and after drying it in an oven at a specified temperature for a defined period.

Requirement: The drying shrinkage should be within the specified limits.

5) Density Test:

Method: Weigh the block and measure its volume to calculate the density.

Requirement: The density should conform to the specified values for different types of blocks (lightweight, medium weight, normal weight).

6) Block Density Test:

Method: Calculate the density by dividing the mass of the block by its overall volume, including holes and cavities.

Requirement: The block density should meet the specified values.

- **FAILURE POSSIBILITY-**

1. Failure may occur during lime testing as lime is a 3rd party product. Lime content is increased 20% in winter.
2. During cutting cracks can be developed until they are not dried completely.

Figure 7: (a) Molds in which concrete mixture is filled; (b) Autoclave at 205 C.

Figure 8: Cutting in horizontal and vertical direction of required sizes.

Week 2

Visits to Industries to ascertain Standards on Good Practices/SOPs being Followed

1. VISIT TO CRESTIA POLYTECH PVT. LTD

• The brand trademark used by the industry is "TOPLINE".

• Types to pipes manufactured: -

1. UPVC - cold type
2. CPVC- hot and cold type (95 C)
3. PVC-

SWR- drainage at terrace, small works

CASING- 0mm to 100mm; 100mm to 250mm (RMS filter)

Column pipes

UGD (underground drainage)

Plumbing pipes

Fitting pipes

• IS 15778 : CHLORINATED POLYVINYL CHLORIDE (CPVC) PIPES FOR POTABLE HOT AND COLD WATER DISTRIBUTION SUPPLIES

- **RAW MATERIAL-** PVC resin, CaCo3, Stabilizers, TiO3, Wax

  Calcium chloride gives strength

  Wax gives lubrication. Increasing the amount of wax increases the flow rate.

  Tin trioxide protects from UV rays.

- **PROCESS:**

  i. At 125 C mixing of raw material takes place in a prepared composition so that all are under quality parameters.

  ii. Hooper- raw material is initially in solid form.

  iii. Heat Monitoring instrument (HMI) - has all the information related to the various quality parameters like MOD, length, density and is programmed accordingly.

iv. Extruder- then raw material in viscous form passes through the extruder where barrel (temp inside the barrel is 125 C) is present that performs screw motion to push the pipe forward and eliminates bubbles.

v. Die, mandrel and sizer- gives the required size to the pipe.

vi. Cooling tank: The whole plant is connected to a chiller which works as a heat exchanger which again solidifies the pipes.

vii. Haul up- maintains density, weight, length and thickness.

viii. Cutter machine- according to required length pipes are cut into different sizes.

ix. MPT machine – ball and socket making in respective pipes end according to the male and female type.

- **REQUIREMENT ACCORDING TO THE STANDARD:**

1. DIMENSIONAL CHARACTERISTICS:

   i. Outside Diameter at any Point – measured vernier calipers

   ii. Mean Outside Diameter (MOD) - measured with a pie scale

   iii. Mean Wall Thickness- measured with screw gauge

   iv. Effective length- measured with measuring tape

2. CHEMICAL CHARACTERISTICS:

   i. Opacity- The wall of the plain pipe shall not transmit more than 0.1 percent of the visible light falling on it.

   ii. Reversion Test- the length of pipe shall not alter in length by more than 5 percent.

   iii. Vicat Softening Temperature- Vicat softening temperature of the specimen shall not be less than 110°C.

   iv. Density- the density of the pipes shall be between 1450 kg/m3 and 1650 kg/m3.

3. MECHANICAL PROPERTIES:

   i. Hydrostatic Characteristics- pipe shall not fail during the prescribed test duration.

- **CONCLUSION:**

The chances of failure of the cpvc pipes increases as the composition of the material is changed. In vicat softening temperature test fails when it penetrates 1mm thickness before reaching temp 110 C . This indicates the material is not thermally stable and changes in composition and extrusion parameters are needed. Standards followed by them for various processes/practices were IS 15778 and ASTM for plumbing. Indian Standard does not exist on the plumbing subject.

2. VISIT TO JMD ALLOY PVT. LTD.

The brand trademark used by the industry is “CAPTAIN”.

IS 13620: 1993; Fusion Bonded Epoxy Coated Reinforcing Bars - Specification

- **RAW MATERIAL-** Black TMT bar
- **PROCESS-**

Fusion Bonded Epoxy Coated Reinforcing Bars (FBECR) are designed to provide enhanced corrosion resistance for steel reinforcing bars used in concrete structures. The process of manufacturing these bars involves several steps, each critical to ensuring the quality and durability of the coating. Here is an overview of the process:

1. Surface Preparation

The first and most crucial step is to prepare the surface of the steel bars:

Cleaning: The bars are cleaned to remove any dirt, oil, grease, or other contaminants that might interfere with the adhesion of the epoxy coating. This is typically done using an abrasive blast cleaning process.

Surface Profiling: The cleaned bars are then subjected to abrasive blasting to create a rough surface profile. This roughness is essential for ensuring a strong bond between the steel and the epoxy coating.

2. Heating

Once the surface is prepared, the bars are heated to a specific temperature, typically between 230°C to 240°C (450°F to 465°F). This heating is usually done in a furnace and is critical for ensuring that the epoxy powder will melt and adhere uniformly.

3. Epoxy Powder Application

While the bars are still hot, epoxy powder is applied using electrostatic spray guns. The electrostatic charge helps the powder adhere uniformly to the heated surface of the steel bars.

4. Curing

The heat from the bars melts the epoxy powder, forming a uniform coating around each bar. The coating is then allowed to cure, forming a hard, continuous, and durable layer. This curing process typically occurs at room temperature, though some processes may involve additional heating to accelerate curing.

4. Cooling

After curing, the bars are cooled, usually by air or water quenching [Figure 8]. This cooling step solidifies the epoxy coating, ensuring it adheres firmly to the steel surface.

Figure 9: The epoxy coated bars are water cooled.

• IS 1786 : 2008; High Strength Deformed Steel Bars and Wires for Concrete Reinforcement - Specification (Fourth Revision)

RAW MATERIAL – Billet/Bloom/Slab as per IS 14650:2023

PROCESS-

Step 1: Iron Ore to Steel

Raw materials for manufacturing the TMT Bar are iron ore, coal, and dolomite. In this process raw materials are piled, recovered and mixed in the required proportion and billets are formed.

Step 2: Making TMT bars form Billets

In a reduction mill the heated billet goes through three stands roughing, intermediate and finishing stands, where the rolling mill reduces the thickness and extends the overall length.

The process is controlled by monitoring devices, in an all-mechanized technical operational environment. This enables the production of rebars with perfect shape, uniform thickness and equal standard length. The rolling mill operating in tandem with the continuous casting machine cools the billet temperature to help reduce the material and within 40 seconds, these billets are made into TMT bars.

Step 3: Thermo Mechanical Treatment

Quenching – Once the hot rolled bars release from finished mill it enters to the water spray system that is known as 'Thermex System'.

Self-Tempering – Once the rebars is out of the Thermex Quenching box, the core remains hot compared to the surface allowing heat to flow from the core to the surface causing Tempering of the outer Marten-site layer thus forming a structure called 'Tempered Martensite'.

Atmospheric Cooling – Once the self-tempering is over the bars get ready for atmospheric cooling. This is done on a cooling bed at normal temperature. In this step the austenitic core turns into a ferrite-pearlite structure. Thus, the final structure consists of a strong outer layer with ductile core. This process increases the tensile strength that makes it highly ductile and weldable.

Figure 10: Raw material storage.

Figure 11: Dropping and shifting of bars.

Figure 12: Rolling process to decrease the diameter with a speed of 15.5 m/s.

3. VISIT TO AMRAPALI CYLINDERS

IS 3196 (part 1):2013; Welded low carbon steel cylinders exceeding 5 litres water capacity for low pressure liquefiable gases: Part 1 cylinders for liquefied petroleum gases (LPG) - Specification

- **RAW MATERIAL-** low carbon steel sheet
- **PROCESS:**

  Step 1:

  Then deep drawing the sheet into hemispherical shape. Then trimming for smooth edge. One half is holed for valve fitting and the other half is kept plane. The hemispheres are washed.

  Step 2:

  In Upper part the knob is fitted in the hole through MIG welding. Foot Ring is attached then lower and upper parts are fixed together by welding. Valve protecting ring is attached, then the cylinder is numbered, and heat treated for 21minutes at 680 C. The cylinder is now shot blast which gives surface finish. Followed by hydrostatic test to check any type of leakage.

  Step 3:

  The outer surface is then metalized, primered and painted. Then valve fitting is attached. Leakage test is done with 12 kg/cm^2 of air.

- **TESTING METHODS FOR LPG CONTAINERS:**

1. Material Testing:

   Chemical Composition: Test the chemical composition of the steel used for the containers to ensure it meets the specified requirements.

   Mechanical Properties: Test the mechanical properties (tensile strength, yield strength, elongation) of the steel.

2. Dimensional Inspection:

   Measurement: Measure the dimensions of the container (diameter, length, thickness) to ensure they conform to the specified tolerances.

3. Non-Destructive Testing (NDT):

   Ultrasonic Testing (UT): Inspect the weld seams for internal defects using ultrasonic testing.

Radiographic Testing (RT): Use radiographic testing to detect any welding defects such as cracks, porosity, or inclusions.

Magnetic Particle Testing (MPT): Detect surface and near-surface defects in the welds and base metal.

4. Hydrostatic Pressure Test:

   Method: Fill the container with water and pressurize it to a specified test pressure (usually 1.5 times the working pressure) for a specified duration.

   Requirement: The container should not show any signs of leakage or permanent deformation.

5. Burst Test:

   Method: Subject the container to increasing internal pressure until it bursts.

   Requirement: The burst pressure should be at least four times the design pressure of the container.

6. Tensile Test:

   Method: Perform a tensile test on samples cut from the container to verify the tensile strength and elongation.

   Requirement: The tensile strength and elongation should meet the specified values.

7. Impact Test:

   Method: Conduct an impact test on samples cut from the container to assess the material's toughness at low temperatures.

   Requirement: The impact energy should meet the specified minimum value.

8. Leak Test:

   Method: Perform a pneumatic leak test by pressurizing the container with air or gas and checking for leaks using soap solution or other leak detection methods.

   Requirement: The container should be leak-free at the specified test pressure.

9. Coating Adhesion Test:

   Method: Check the adhesion of the coating by applying and removing adhesive tape or using a cross-cut test.

   Requirement: The coating should adhere firmly to the container without peeling or flaking.

10. Valve and Fitting Inspection:

Method: Inspect the valves and fittings for proper installation, functionality, and compliance with the relevant standards.

Requirement: The valves and fittings should operate correctly and meet the specified standards.

Figure 13: (a) Cylinders kept together after series marking; (b) Painting process of cylinder

Figure 14: Cylinders after burst test.

4. VISIT TO K2K CYLINDER PVT. LTD.

IS 8737: 2017; Valve fittings for use with liquefied petroleum gas (LPG) cylinders for more than 5 litre water capacity - Specification (Second Revision)

Raw material- brass rod (25 mm dia,12 feet length)

Process:

Brass rod is cut into 60 mm length sizes. Then put in 700 C electric furnace, after that it is close forged. Machine finishing it to remove the flash then shot blast for surface finishing. Threads are formed through CNC machine. Supporting parts such as upper spindle, lower spindle, gasket, spring, cage etc. are assembled.

- **MANUFACTURING PROCESS FOR VALVE FITTINGS**

1. Material Selection:

   Materials: Use high-quality brass, bronze, stainless steel, or other suitable materials specified in the standard, ensuring they conform to the required chemical composition and mechanical properties.

2. Forging and Machining:

   Forging: Forging the raw material into the required shapes and sizes using appropriate forging techniques.

   Machining: Machining the forged parts to the precise dimensions and tolerances using CNC machines or other suitable equipment.

3. Assembly:

   Components: Assembling the valve components, including the body, stem, bonnet, spindle, and other internal parts.

   Threading: Cutting threads on the valve body and other components as per the specified thread standards.

4. Heat Treatment:

   Stress Relieving: Subjecting the components to heat treatment to relieve internal stresses and ensure uniform mechanical properties.

5. Surface Treatment:

   Cleaning: Cleaning the valve components to remove any contaminants, oils, or residues.

   Coating: Applying surface coatings if required, such as nickel plating or other protective coatings, to enhance corrosion resistance.

- **TESTING METHODS FOR VALVE FITTINGS:**

1. Dimensional Inspection:

   Method: Measure the dimensions of the valve components using calibrated measuring tools like vernier calipers, micrometers, and gauges.

Requirement: The dimensions should conform to the specified tolerances in the standard.

2. Hydrostatic Test:

   Method: Subject the assembled valve to hydrostatic pressure testing by filling it with water and applying pressure to a specified level for a defined duration.

   Requirement: The valve should withstand the test pressure without any signs of leakage or structural failure.

3. Pneumatic Test:

   Method: Test the valve with compressed air or inert gas at a specified pressure to check for leakage and operational integrity.

   Requirement: The valve should be leak-free under the specified test conditions.

4. Leakage Test:

   Method: Perform a leakage test on the valve using a leak detection method such as soap solution or electronic leak detectors.

   Requirement: The valve should not exhibit any leakage under the specified pressure conditions.

5. Torque Test:

   Method: Apply a specified torque to the valve stem to test its resistance and ensure it operates smoothly without any deformation or damage.

   Requirement: The valve should operate within the specified torque range without any issues.

6. Seat Leakage Test:

   Method: Pressurize the valve and check for leakage at the valve seat by applying a specified pressure on one side of the seat and checking for leaks on the other side.

   Requirement: The valve seat should be leak-free under the specified test pressure.

7. Endurance Test:

   Method: Operate the valve through a specified number of cycles (opening and closing) to test its durability and operational reliability.

   Requirement: The valve should perform satisfactorily through the specified number of cycles without failure.

Week 3

Visit to Industries who have not opted for BIS Certification for Products under Voluntary Certification

1) CRESTIA POLYTECH PVT. LTD

Blow Moulded HDPE Water Tank

- **MANUFACTURING PROCESS FOR WATER STORAGE TANKS:**

1. Material Preparation:

   Resin Selection: High-density polyethylene (HDPE) is commonly used due to its durability and resistance to weather conditions.

   Plastic Melting: The plastic resin is melted in an extruder, turning it into a molten state.

2. Parison Formation:

   Extrusion of Parison: A parison, which is a hollow tube of molten plastic, is extruded. The parison length and thickness are controlled according to the desired size of the water tank.

3. Mold Clamping:

   Mold Design: The mold consists of two halves that form the shape of the water tank.

   Parison Placement: The parison is positioned between the open halves of the mold.

   Clamping the Mold: The mold halves are closed around the parison, sealing the ends.

4. Blowing:

   Air Insertion: Compressed air is blown into the parison through a blow pin or needle, expanding the molten plastic to fill the mold cavity.

   Forming the Shape: The plastic conforms to the shape of the mold, forming the hollow structure of the water tank.

5. Cooling:

   Cooling the Mold: The mold is cooled to solidify the plastic. This can be done using water or air cooling systems integrated into the mold.

   Cooling Time: The cooling time depends on the thickness of the tank walls and the type of plastic used.

6. Mold Opening and Ejection:

Opening the Mold: Once the plastic has solidified, the mold halves are opened.

Ejecting the Tank: The formed water tank is ejected from the mold, often with the help of ejector pins or plates.

7. Trimming and Finishing:

Trimming Excess Material: Excess plastic (flash) around the seams is trimmed off.

Quality Inspection: The tank is inspected for defects, ensuring uniform wall thickness, proper shape, and absence of air bubbles or weak spots.

Figure 15: Tank comes out after demolding from the automatic machine.

Figure 16: Mixing of raw material like Polyethylene Resin, color additives, UV stabilizers into the hopper.

- **SURVEY:**

a. Whether the product is being produced according to the concerned Indian Standard or any other standard (international/other country/company standard)?

Answer: Product has been produced according to their own internal standard.

b. Whether the product is meant for export or domestic market.

Answer: Product is meant for domestic market only.

c. In case of production for domestic market, who are their major customers, Government or private institutions or retail consumers including their names and details?

Answer: Retail consumers are their major customers. They modify the tank according to the customer's requirement and have their own star grade system. Example 7-star tank, 9-star tank etc. The stars represents number of layers in the tank.

d. In case a standard other than Indian Standard is being followed, what is the reason for preferring that standard?

Answer: The Indian Standard existing for the tank IS 12701 uses rotational moulding as the manufacturing process. Rotational molding can cost several times as much as blow molding just in terms of tooling. It's possible to produce far more products for the same investment if blow molding is selected. Rotational molding is a very slow process.

e. Gap areas between the standard being followed and the corresponding Indian Standard.

Answer: Blow moulding process in Indian Standard exist only for small quantity containers like IS 15473 : 2004 Blow moulded HDPE containers for packaging of edible oils and IS 10840 : 1994 Blow moulded HDPE containers for packing of vanaspati.

f. What changes in the BIS certification process would encourage them to obtain BIS certification voluntarily?

Answer: Firstly, there should be an IS for blow moulded water tank and if the customers start to ask for bis certification then they will have to go for the certification from BIS. Customers should be well aware and interested in buying bis certified products only.

1. CONTROL PANELS

ANAND STEEMENTS PVT. LTD.

- **PROCESS OF MANUFACTURING:**

1. Design and Engineering

Requirements Analysis: Determine the specific requirements and functionalities of the control panel based on the application.

Schematic Design: Create electrical schematics and wiring diagrams that outline the connections and components within the control panel.

Component Selection: Select appropriate components such as circuit breakers, relays, contactors, PLCs, HMIs, switches, and other control devices.

Panel Layout: Design the physical layout of the control panel, including the arrangement of components, wiring paths, and space considerations.

2. Material Procurement

Enclosure: Procure the panel enclosure, which can be made of metal (such as steel or aluminum) or non-metallic materials (such as polycarbonate or fiberglass) depending on the application and environmental requirements.

Components: Order all necessary electrical and electronic components, ensuring they meet the required specifications and standards.

Wiring and Accessories: Acquire wiring, terminals, DIN rails, cable ducts, connectors, and other accessories needed for assembly.

3. Fabrication and Preparation

Enclosure Modification: Modify the enclosure as needed, including cutting holes for switches, indicators, cable entry points, and ventilation. This can be done using tools like CNC machines, laser cutters, or hand tools.

Mounting Plate: Prepare the mounting plate, which serves as the base for attaching components. This may involve drilling holes and mounting DIN rails, cable ducts, and other support structures.

4. Component Mounting

Mount Components: Securely mount all components on the mounting plate or directly inside the enclosure according to the panel layout design. Use screws, brackets, or other fasteners as appropriate.

Labeling: Label components, terminals, and wiring paths for easy identification and maintenance. This can be done using adhesive labels, engraving, or other marking methods.

5. Wiring and Interconnection

Wire Cutting and Stripping: Cut wires to the required lengths and strip the insulation from the ends.

Crimping and Termination: Crimp terminals onto the wire ends and connect them to the appropriate terminals on components.

Routing and Securing: Route the wires through cable ducts and secure them using cable ties or clamps to ensure a neat and organized layout.

Point-to-Point Wiring: Connect wires according to the wiring diagram, ensuring correct connections and proper insulation.

6. Inspection and Quality Control

Visual Inspection: Conduct a thorough visual inspection to check for proper assembly, correct wiring, and secure connections.

Continuity Testing: Use a multimeter to test the continuity of all connections and ensure there are no open circuits or shorts.

Component Testing: Verify the functionality of individual components, such as relays, contactors, and switches.

7. Functional Testing

Power On Testing: Apply power to the control panel and test its functionality in a controlled environment.

Simulated Operation: Simulate the actual operating conditions and test the control panel's response to various inputs and scenarios.

Troubleshooting: Identify and rectify any issues or malfunctions that arise during testing.

8. Final Assembly and Documentation

Enclosure Sealing: Seal the enclosure with gaskets, screws, or other sealing methods to ensure it is protected against environmental factors.

Documentation: Prepare detailed documentation, including wiring diagrams, component lists, operating instructions, and maintenance manuals.

Certification and Compliance: Ensure the control panel meets all relevant standards and regulations, such as UL, CE, or IEC, and obtain the necessary certifications.

Figure 17: Ready to dispatch control panel.

- **SURVEY:**

a. Whether the product is being produced according to the concerned Indian Standard or any other standard (international/other country/company standard)?

Ans. There is no dedicated IS for control panels, but they are using IS for their component.

b. Whether the product is meant for export or domestic market.

Ans. The product is meant for domestic government organization.

c. In case of production for domestic market, who are their major customers, Government or private institutions or retail consumers including their names and details?

Ans. In the domestic market, government institution are their major consumers. Like Building Construction Department.

d. Are their customers seeking any kind of certification or compliance to any other standard as a condition of purchase? If yes, the intern should make an attempt to collect the copies of such tender specifications, and details of those standards from the firm.

Ans. The required testing is done from Central Power Research Institute (CPRI) Bangalore. No copies on tender specification were available.

e. Suggestions for changes that may be required in the standard for making it amenable?

Ans. Any dedicated Indian standard do not exist for control panels they use a combination of standard. IS/IEC 60947-2 for safety of component at low voltage and IS/IEC 61439-2: 2020 for material of body of the control panel. So, there should be dedicated IS for the same.

f. In case Indian Standard is being followed, what is the reason for not opting for BIS certification?

Ans. Indian Standard do not exist for control panels. Also, the customer is not seeking certification from BIS as the testing requirements are fulfilled by CPRI.

g. What changes in the BIS certification process would encourage them to obtain BIS certification voluntarily?

Ans. If the customers start to ask for bis certification then they will have to go for the certification from BIS. Customers should be well aware and interested in buying BIS certified products only.

h. In case third party certification by some other body against the adopted standard has been obtained, what are the reasons for selecting that body and in what ways their process is different from BIS Certification process?

Ans. They were seeking certification from CPRI. CPRI certification do not involve factory inspection. They do not provide any mark to the product. Certification is valid until revision in specific standard or change in product design. BIS do regular surveillance and monitoring of product to ensure compliance of given standard.

Week 4

Visit to Manufacturing Units that follow Product Standards other than Indian Standards

1. HINDUSTAN COCA COLA PVT. LTD.
Product- Carbonated Beverages

- **MANUFACTURING PROCESS OF CARBONATED BEVERAGES:**

1. Ingredient Preparation

   Water Treatment:

   Filtration: The water used in the beverage is filtered to remove impurities.

   Softening: The water is softened to remove hardness that can affect taste and quality.

   Purification: Additional purification steps, such as reverse osmosis or UV treatment, ensure the water meets strict quality standards.

   Syrup Preparation:

   Sugar Solution: Sugar is dissolved in water to create a sugar solution. High fructose corn syrup (HFCS) may also be used.

   Mixing: The sugar solution is mixed with other ingredients like flavorings, acids (such as phosphoric acid or citric acid), colorants, and preservatives to create the beverage syrup.

2. Carbonation

   CO_2 Injection: Carbon dioxide (CO_2) is injected into the water under high pressure to dissolve the gas and create carbonated water. This is done using carbonation equipment that ensures the correct level of CO_2 is maintained.

3. Blending

   Mixing Syrup and Carbonated Water: The prepared syrup is mixed with the carbonated water in precise proportions. This mixture process is carefully controlled to ensure consistency and quality.

Homogenization: The blended beverage is homogenized to ensure uniform distribution of all ingredients.

4. Filling and Packaging

Bottle Preparation:

Cleaning: Bottles and cans are thoroughly cleaned and sterilized to ensure they are free of contaminants.

Inspection: Cleaned containers are inspected for defects.

Filling:

Filling Machines: The carbonated beverage is filled into bottles or cans using automated filling machines that maintain the correct pressure to retain carbonation.

Sealing: Bottles are capped, and cans are sealed immediately after filling to prevent loss of carbonation and contamination.

5. Quality Control

On-Line Testing: During the filling process, on-line testing is conducted to monitor carbonation levels, fill levels, and overall quality.

Sampling: Regular sampling and testing of the product are done to ensure it meets quality and safety standards. Tests include checks for carbonation, taste, pH levels, and microbial contamination.

6. Labeling and Packaging

Labeling: Bottles and cans are labeled with brand information, nutritional information, and expiration dates.

Secondary Packaging: Labeled bottles and cans are grouped into packs and placed into larger packaging such as cartons or trays for distribution.

Palletizing: The packages are stacked on pallets and wrapped for stability during transportation.

7. Distribution

Warehousing: Finished products are stored in warehouses under controlled conditions to maintain quality.

Logistics: The products are distributed to retailers, wholesalers, and vending machines through an extensive logistics network.

- **SURVEY:**

a. Standard(s) that are followed (international/other country/company standard) for the product requirements and methods of test.

Ans. They follow their own standard [KORE] established in 1886. This standard is followed across 200 countries all over the world. Coca cola standard system fulfill their product requirements and testing of the product. They test for pesticides, heavy metals, microbes, sugar etc. They are also following IS 14543 and WHO norms.

b. Are they aware of Indian Standards pertaining to the product?

Ans. No, they were not aware about the existing Indian standard IS 2346:1992.

c. Is the firm getting their product certified against that standard?

Ans. Product was Certified under FSSAI standard as it is mandatory to get.

d. Are the products meant for export or domestic use?

Ans. Product are meant for domestic use only.

e. List of their major customers (Government or private institutions or retail consumers).

Ans. Product is sent to nearby distributor who further sent to the the shopkeepers.

f. Whether there is any demand from the customers for compliance and certification against any standard other than the Indian Standard. If yes, the intern should make an attempt to collect such tender specifications and details of those standards from the firm.

Ans. No, there is no such demand from their consumers.

g. Manner and extent to which the standards adopted by them deviates from the requirements given in the Indian Standards.

Ans. We studied product standard, standard of ingredients, and testing standards for both Indian Standard and KORE and got some notable differences –

i. Water is major component of carbonated drinks. IS 2346 has not mentioned that water used should be according to IS 14543.

ii. In Indian standard nothing was mentioned for pesticide such as it's relevant tests. KORE standard is having particular mentioning of all the parameters and testing requirement of pesticides contrary to Indian Standards.
iii. In Indian Standard, it was advised to use no artificial sweetener except saccharin but they were using aspartame as per their Standard.
iv. Testing methods used in KORE standard were updated as per recent technology while Indian standard lacks it. For example- For testing purity of CO2 – KORE mentions Zahm method as per CGA/EIGA/ISBT while traditional method according to IS 307 clause – 3.2 is mentioned for it.
v. Maximum sugar content used by them is 13gm/100gm whereas in Indian Standard minimum sugar content of 8gm/100gm is mentioned.

h. Suggestions for changes that may be required in the Indian Standards for making them amenable for use.

Ans. There is a need of revision in the current standard IS 2346:1992 addressing current industrial and consumer needs. Some of the suggested changes are-

i. Reference of standard of water as raw material i.e. IS 14543: 2024 is needed in IS 2346:1992.
ii. Standard of Fructose, Invert sugar and Lactose should be made.
iii. In IS 2346:1992 standard for sugar mentioned is withdrawn and replaced by IS 1151:2021. Updated standard of refined sugar, IS 1151:2021 needs to be mentioned in IS 2346:1992.
iv. Minimum requirement of sugar mentioned should be replaced with a range of sugar content.
v. Traditional testing methods should be replaced by modern methods (like Zahm method for testing purity of CO2) in IS 2346:1992 and referred standards.
vi. Parameter specifying pesticide should be mentioned in IS 2346:1992.

i. What can be done by BIS to lay the emphasis of buyers on compliance and certification to Indian Standards rather than these standards?

Ans. Strengthening the certification process so that genuine manufacture can only opt for it.

j. Any change in the BIS certification process required to enable easy adoption and certification against the Indian Standards.

Ans. Expanding reach to the industry and explaining them importance and benefits of opting BIS certification.

2. BANSHI MEDICARE PVT. LTD.

Product- Disposable Surgical Rubber Gloves

1. Compounding:
   Raw Materials: Natural or synthetic latex, curing agents, accelerators, stabilizers, antioxidants, and other additives are used.
   Mixing: The raw materials are mixed to form a latex compound. This involves the dispersion of various chemicals in the latex to achieve the desired properties.

2. Dipping:
   Formers: Ceramic hand-shaped formers are cleaned and dipped into a coagulant solution.
   Dipping in Latex: The coagulant-coated formers are dipped into the latex compound. The thickness of the gloves is controlled by the duration and speed of dipping.

3. Beading:
   Rolling: The cuff area of the glove is rolled to form a bead, which enhances the strength and helps in donning the gloves.

4. Leaching:
   Initial Leaching: The dipped formers are immersed in a leaching tank filled with water to remove excess coagulant and water-soluble impurities.
   Secondary Leaching: After the initial leaching, gloves undergo another leaching process to ensure the removal of residual chemicals.

5. Vulcanizing:
   Curing: The latex-coated formers are then placed in an oven to vulcanize (cure) the latex. This process cross-links the rubber molecules, providing strength and elasticity to the gloves.
   Temperature and Time: The curing is done at specific temperatures and times as per IS 13422 standards.

6. Stripping:
   Removal: The gloves are removed from the formers. This can be done manually or using automated machinery.

Powdering: If powdered gloves are required, a light dusting of corn starch or a similar substance is applied to prevent the gloves from sticking together.

7. Sterilization:

Sterilization Methods: Gloves are sterilized using autoclaving to ensure they are free from microorganisms.

Packaging: Sterilized gloves are packed in sterile packaging to maintain their sterility until use.

8. Packaging and Labeling:

Packaging: The gloves are packed in boxes or pouches, depending on the type and intended use.

Labeling: Labels with information such as size, lot number, manufacturing date, and expiration date are applied according to IS 13422 requirements.

Figure 18: (a) Ceramic hand-shaped formers; (b) Packed Gloves

- **SURVEY:-**

a. Standard(s) that are followed (international/other country/company standard) for the product requirements and methods of test.

Ans. For the product Disposable surgical rubber gloves they were using IS 13422, ASTM D3577 and EN455.

b. Are they aware of Indian Standards pertaining to the product?

Ans. Yes and they are already following Indian Standard (IS 13422 & IS 4148)

c. Is the firm getting their product certified against that standard?

Ans. No, they are not certified for any foreign standards. They test their product against those standards from the lab and submit the conforming lab report to the buyer.

d. Are the products meant for export or domestic use?

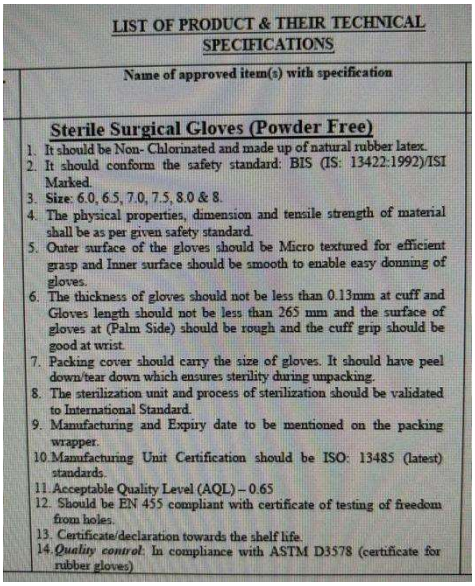
Ans. Products meant for both domestic & export use.

e. List of their major customers (Government or private institutions or retail consumers).

Ans. Government and private consumers like AIIMS Patna, Pushpanjali hospital, Samarpan.

f. Whether there is any demand from the customers for compliance and certification against any standard other than the Indian Standard. If yes, the intern should make an attempt to collect such tender specifications and details of those standards from the firm.

Ans. Yes there is a demand from the customers for compliance and certification against any standard other than the Indian Standard.



LIST OF PRODUCT & THEIR TECHNICAL SPECIFICATIONS

Name of approved item(s) with specification
Sterile Surgical Gloves (Powder Free) 1. It should be Non- Chlorinated and made up of natural rubber latex. 2. It should conform the safety standard: BIS (IS: 13422:1992)/ISI Marked. 3. Size: 6.0, 6.5, 7.0, 7.5, 8.0 & 8. 4. The physical properties, dimension and tensile strength of material shall be as per given safety standard. 5. Outer surface of the gloves should be Micro textured for efficient grasp and Inner surface should be smooth to enable easy donning of gloves. 6. The thickness of gloves should not be less than 0.13mm at cuff and Gloves length should not be less than 265 mm and the surface of gloves at (Palm Side) should be rough and the cuff grip should be good at wrist. 7. Packing cover should carry the size of gloves. It should have peel down/tear down which ensures sterility during unpacking. 8. The sterilization unit and process of sterilization should be validated to International Standard. 9. Manufacturing and Expiry date to be mentioned on the packing wrapper. 10. Manufacturing Unit Certification should be ISO: 13485 (latest) standards. 11. Acceptable Quality Level (AQL) – 0.65 12. Should be EN 455 compliant with certificate of testing of freedom from holes. 13. Certificate/declaration towards the shelf life. 14. *Quality control*: In compliance with ASTM D3578 (certificate for rubber gloves)

Figure 19: Tender Specifications

g. Manner and extent to which the standards adopted by them deviates from the requirements given in the Indian Standards.

	IS 13422	ASTM D3577	EN 455
Material	Natural or synthetic rubber	Any rubber polymer	Any material which fulfills the criteria of standards
Powder and Non	No such	Classified	Classified

powder gloves	classification in standard		
Biological testing	No such testing	-Protein content test -Antigenic protein Content test	-Bacterial endotoxin test -Powder residue test -Leachable Protein test
Shelf-life determination testing	No mention	No mention	-Shelf life of rubber product calculated based on Arrhenius principle to determine rate constant -Time required for physical properties deterioration is inversely proportional to rate constant -Product must satisfy all testing requirements in the claimed shelf life
Strength	-Material based criteria mentioned (Type I and Type II)	-Material based criteria mentioned (Type I and Type II)	-Material based criteria is not mentioned -Criteria for force at break for given shape and size of sample is mentioned

h. Suggestions for changes that may be required in the Indian Standards for making them amenable for use.

Ans. Although Indian standard is fulfilling basic requirement, but some changes will make it amenable for use:

- Manufacture's claim of shelf life of product should be tested and verified by adding some extra clause in Indian standard.
- Powdered and non-powdered gloves should be mentioned specifically along with its relevant test.
- Biological test should be included in IS 13422.

i. What can be done by BIS to lay the emphasis of buyers on compliance and certification to Indian Standards rather than these standards?

Ans. BIS should build trust among medical personals by asking them feedback about ISI certified product.

Week 5

Visits to Organized Consumers

1. BMSICL (Bihar Medical Services & Infrastructure Corporation)

- **SURVEY:**

a. Evaluate if they use products conforming to standards other than Indian Standards, either non-certified or certified by other bodies. If yes, ascertain reasons for the same.

Ans. Yes, they use products conforming to standards other than Indian Standards. They use products from the standard such as USFDA, CE, ISO etc. They believe that Indian Standard do not meet their requirement in medical field. In Indian standard is not specified rather is in more generalized form. Example: if we talk about radiology, any type of machine using the feature of radiology is certified by BIS under one standard only were as in foreign standard each type of machine have a specific standard.

b. If for that product category, they use both BIS certified and not certified products, their views regarding comparison of both the types of products.

Ans. They do not prefer using BIS certified product under critical life saving equipment. Products such as medical furniture, surgical gloves are BIS certified.

c. Feedback regarding quality of BIS certified products.

Ans. Foreign certified products under goes various test, more money is involved, more secure and is more safe. They believe that BIS certified products are good but need to be more detailed and specific in the field of critical life saving equipment.

d. Determine the additional quality checks, if any, performed by them for accepting the BIS certified products.

Ans. They have in-house testing for drugs and visual inspection for machines to re-check quality of the product.

e. Percentage of non-compliance of the ISI marked products; Actions taken by the firm in case of non-compliance of ISI marked products.

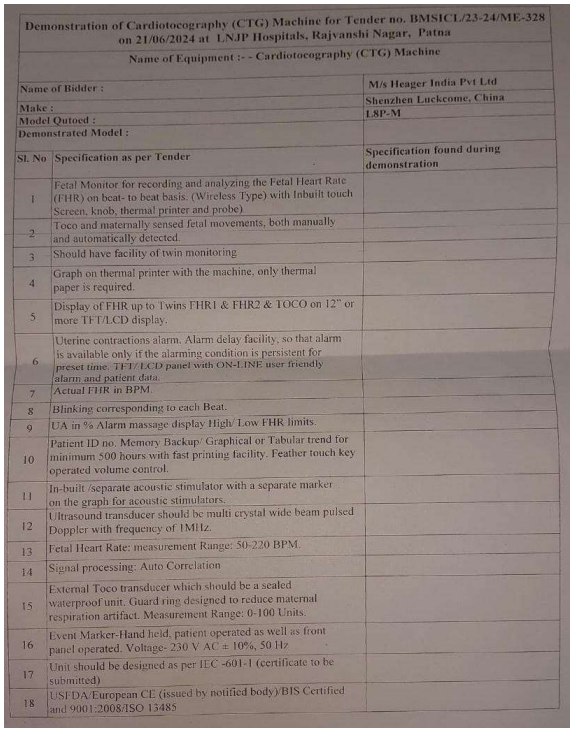
Ans. If the product under ISI certification comes under the case of non-compliance they report it to BIS and return the product lot to the company as soon as possible.

f. Suggestions to BIS for enhancing product compliance and reliability.

Ans. Develop detailed and Complex standards for medical machines which are not yet part of Indian Standard such as CTG (Cardiotocography) machine. Ensure the certification process is thorough, with strict compliance checks to guarantee product quality.

g. Awareness about BIS portals, such as BIS care App, Know Your Standard, etc.

Ans. They were using manak portal for verifying license number. Telling them know about a much easier way to check license number from BIS care app.



Demonstration of Cardiotocography (CTG) Machine for Tender no. BMSICL/23-24/ME-328 on 21/06/2024 at LNJP Hospitals, Rajvanshi Nagar, Patna

Name of Equipment :- - Cardiotocography (CTG) Machine

Name of Bidder :	**M/s Heager India Pvt Ltd**
Make :	**Shenzhen Luckcome, China**
Model Qutoed :	**L8P-M**
Demonstrated Model :	

Sl. No	Specification as per Tender	Specification found during demonstration
1	Fetal Monitor for recording and analyzing the Fetal Heart Rate (FHR) on beat- to beat basis. (Wireless Type) with Inbuilt touch Screen, knob, thermal printer and probe)	
2	Toco and maternally sensed fetal movements, both manually and automatically detected.	
3	Should have facility of twin monitoring	
4	Graph on thermal printer with the machine, only thermal paper is required.	
5	Display of FHR up to Twins FHR1 & FHR2 & TOCO on 12" or more TFT/LCD display.	
6	Uterine contractions alarm. Alarm delay facility, so that alarm is available only if the alarming condition is persistent for preset time. TFT/LCD panel with ON-LINE user friendly alarm and patient data.	
7	Actual FHR in BPM.	
8	Blinking corresponding to each Beat.	
9	UA in % Alarm massage display High/ Low FHR limits.	
10	Patient ID no. Memory Backup/ Graphical or Tabular trend for minimum 500 hours with fast printing facility. Feather touch key operated volume control.	
11	In-built /separate acoustic stimulator with a separate marker on the graph for acoustic stimulators.	
12	Ultrasound transducer should be multi crystal wide beam pulsed Doppler with frequency of 1MHz.	
13	Fetal Heart Rate: measurement Range: 50-220 BPM.	
14	Signal processing: Auto Correlation	
15	External Toco transducer which should be a sealed waterproof unit. Guard ring designed to reduce maternal respiration artifact. Measurement Range: 0-100 Units.	
16	Event Marker-Hand held, patient operated as well as front panel operated. Voltage- 230 V AC ± 10%, 50 Hz	
17	Unit should be designed as per IEC -601-1 (certificate to be submitted)	
18	USFDA/European CE (issued by notified body)/BIS Certified and 9001:2008/ISO 13485	

Figure 20: Tender specifications and details for CTG machine.

2. BCD (Building Construction Department)

- **SURVEY:**

a. Evaluate if they use products conforming to standards other than Indian Standards, either non-certified or certified by other bodies. If yes, ascertain reasons for the same.

Ans. Yes, they were also using products conforming to standards other than Indian Standards. Example: they are using ASCE 7 minimum design load for building and other structure which do not exist in the Indian standard.

b. If for that product category, they use both BIS certified and not certified products, their views regarding comparison of both the types of products.

Ans. They strongly believe in BIS and mostly follow BIS certified products. They prefer Indian product more as compare to foreign products. They only use foreign certified product for which Indian standard is not available.

c. Feedback regarding quality of BIS certified products.

Ans. Quality of BIS certified products are good. The problem arises when material which are not good quality is certified by BIS. Certification should be strong and checked properly before implementing.

d. Determine the additional quality checks, if any, performed by them for accepting the BIS certified products.

Ans. They perform fire testing from CBRI (Central building research institute) . They perform in-house lab testing such as aggregate impact test, flakiness index test, sieve analysis in the lab available in every site. If the machine is not available in lab like UTM they sent the sample to IIT,NIT or any NABL lab.

e. Percentage of non-compliance of the ISI marked products.

Ans. They didn't had any data for Percentage of non-compliance of the ISI marked products. But according to them the percentage is very less.

f. Actions taken by the firm in case of non-compliance of ISI marked products.

Ans. If the ISI marked products are non-compliance when they are performing in-house testing they reject the whole batch and sent is back.

g. Suggestions to BIS for enhancing product compliance and reliability.

Ans. -- explanation of any process or clause is mentioned few lines, it is not mentioned in detail, whereas in foreign standard page long explanation with example is given.

-- some standards are not revised frequently and new amendments are introduced rather than revision of the standard which makes it difficult to handle.

-- strict process for BIS certification so that there is no misuse of the standard.

-- increasing the reach of awareness to smallest industry, organization etc.

Week 6

Visit to Management System Licensees of BIS

1. NALANDA DAIRY (SUDHA DAIRY)

a. Performance of the firm prior to obtaining BIS license.

Ans. They were dedicated towards management of the dairy from the very beginning but had limited market outreach.

b. Enhancement in performance after obtaining BIS licence and parameters in which enhancement is observed.

Ans. Performance Enhanced – They are now able to make Tetra pack products and sterilised milk.

Hygiene improved- Earlier they were unaware of many potential hygiene threats. For example , They installed barricading in manufacturing area to reduce outside air movement to working area.

Business improved - They have unique license which keeps them ahead of their competitors.

c. Increase in market share after obtaining license.

Ans. Yes there is an increase in market share after obtaining license.

d. Reduction in expenditure after obtaining license.

Ans. Yes there is reduction in expenditure after obtaining license.

e. Whether the firm has any other branch who has also obtained the same licence from BIS.

Ans. They have their branches in other districts of Bihar also.

f. Suggestions for improvements in processes of BIS.

Ans. They were very much satisfied by management system of BIS.

g. Any other Management System license being held by the unit from some other certifying body as well as the reasons for the same and the differences in the services provided.

Ans. No, they don't hold any Management System licence from some other certifying body.

h. Any other Management System license being held by other branches/ units of the same firm from BIS or from other certifying bodies.

Ans. No, all COMFED dairy hold FSMS license.

2. USHA WELDS PVT. LTD.

a. Performance of the firm prior to obtaining BIS license.

Ans. Functioning of the industry was slow going and limited customers.

b. Enhancement in performance after obtaining BIS license and parameters in which enhancement is observed.

Ans. By taking ISO 9001 management certification there is a improvement in their working efficiency. Delivery of product on time and smoothness in management observed.

c. Increase in market share after obtaining license.

Ans. Market share has boost up after obtaining license, as certification allow them to participate in various bidding. Their product is also exported to Bangladesh.

d. Reduction in expenditure after obtaining license.

Ans. No much significant change.

e. Whether the firm has any other branch who has also obtained the same license from BIS.

Ans. The firm don't have any other branch who has also obtained the same license from BIS.

f. Suggestions for improvements in processes of BIS.

Ans. They suggested extensive lab network and recognition to private labs. Also, their own lab for making process faster which can further improve supply chain.

g. Any other Management System license being held by the unit from some other certifying body as well as the reasons for the same and the differences in the services provided.

Ans. No, they don't hold any Management System licence from some other certifying body.

h. Any other Management System license being held by other branches/ units of the same firm from BIS or from other certifying bodies.

Ans. No, they don't have any Management System licence being held by other branches/ units of the same firm from BIS or from other certifying bodies.

SUMMARY

- **Challenges faced in the course of internship:**

i. **Contacting Non-Licensee Industries**:

Reluctance to Invite: Many non-licensee industries were unwilling to allow visits, making it difficult to arrange meetings and gather information.

ii. **Limited Industrial Availability in Bihar**:

Fewer Industries: The scarcity of industries in Bihar limited the number of potential sites to visit, reducing the overall exposure and learning opportunities.

iii. **Unsatisfactory Responses to Questionnaires**:

Quality of Information: During visits to various industries, the responses to the questionnaires were often unsatisfactory, leading to incomplete or less useful data for analysis.

iv. **Data Privacy Concerns**: Industries being reluctant to share sensitive or proprietary information, limiting the scope of your research or project.

- **Benefits accrued to BIS:**

i. Meeting non licensees industries and making them aware about the Indian standard existing for that product.

ii. Analyzing where the product failure rate is high and making a report for that same.

iii. Awareness spread in the family and neighbourhood, as many didn't know about ISI mark represents BIS and the role of BIS to maintain quality of products and consumer protection & so on.

iv. Bridging the communication gap between manufacture and BIS.

v. Collecting information like the gap lying between industry and BIS, consumers and BIS, Government bodies and BIS. Lack of communication between other government organizations and BIS.

vi. Studied few standards like IS 2346, IS 13422, IS 12701 and corresponding international like KORE, ASTM, CE. Fond the gaps between them and suggested the required changes.

- **Suggestion for improvement:**

I. Enhanced Inter-Government Communication:

Objective: Strengthen the communication between the Bureau of Indian Standards (BIS) and other government organizations.

Approach: Encourage mutual understanding and willingness to share necessary information for the country's development.

Implementation: Establish regular inter-departmental meetings, shared databases, and collaborative projects to ensure seamless information flow.

II. Wider Reach of Awareness Programs:

Objective: Extend the reach of BIS's awareness programs across the entire country.
Approach: Form a larger team dedicated to organizing and executing these programs.
Implementation: Utilize television advertisements as they are an effective medium to reach every household. Additionally, consider radio, social media, and regional newspapers for a more comprehensive approach.

III. Frequent Revision of Standards:

Objective: Simplify the handling of standards and amendments.

Approach: Regularly revise existing standards instead of just introducing new amendments.

Implementation: Merge new amendments with the old standards to provide users with a single, updated document that clearly highlights the changes made.

IV. Customer Complaint Mechanism:

Objective: Simplify the process for customers to file complaints.

Approach: Provide an easier and more accessible complaint system.

Implementation: Introduce a toll-free helpline number for customers to report any product misuse. This will reduce the complexity of visiting the BIS website and help customers recall and report issues more effectively.

V. Promotional Campaigns:

Objective: Increase public awareness and engagement with BIS and Indian Standards.

Approach: Create a memorable campaign similar to the Swachh Bharat Abhiyan.

Implementation: Develop a catchy song dedicated to BIS and Indian Standards. Partner with local retailers, supermarkets, and distributors to play this song through small speakers, enhancing public familiarity and support.

CONCLUSION

The summer internship at the Bureau of Indian Standards (BIS) Branch Office, Patna, has been an invaluable experience, significantly enhancing my understanding of the various facets of standardization, product certification, and quality assurance. This internship provided me with a unique opportunity to bridge theoretical knowledge with practical applications, thereby deepening my insights into the critical role of BIS in promoting quality and safety standards in India.

Industry Visits

During the internship, I had the privilege of visiting several industries, where I observed firsthand the manufacturing processes of various products. These visits were instrumental in understanding the practical challenges and intricacies involved in adhering to the stringent standards set by BIS. Interacting with industry professionals allowed me to gain a deeper appreciation of the importance of maintaining high-quality standards and the impact of these standards on consumer safety and satisfaction.

Testing and Certification Methods

Observing the testing and certification processes at BIS laboratories was a highlight of my internship. I gained hands-on experience in various testing methods and procedures used to ensure that products meet the specified standards. This practical knowledge was complemented by a thorough understanding of the certification schemes, which play a crucial role in assuring consumers of the quality and safety of products available in the market.

Future Endeavors

The experiences and knowledge gained during this internship will undoubtedly be instrumental in my future academic and professional pursuits. The insights into the standardization process, the practical understanding of product testing and certification, and the exposure to real-world manufacturing practices have equipped me with a solid foundation to contribute effectively to any future endeavors in the field of quality assurance and standardization.

Final Thoughts

In conclusion, the summer internship at BIS Patna has been a transformative experience, providing me with a comprehensive understanding of the standardization and certification processes. It has reinforced my appreciation for the critical role of BIS in ensuring product quality and consumer safety. I am profoundly grateful for this opportunity and look forward to applying the knowledge and skills acquired during this internship to my future career.

THANK YOU

Submitted by:-

TRIPTI SINGH

ROLL NUMBER- 2101046

MECHANICAL ENGEINEERING

NIT, PATNA
