Surface Instrumnet main functions

❖ Calibration Lab for Meteorological Sensors

❖ Workshop

INTRODUCTION

- Surface Laboratory of the SI Division mainly deals with the testing, calibration and standardization of surface meteorological instruments for the measurement of various meteorological parameters. Various standards and calibration equipments are available in this laboratory for calibration of all type of meteorological instruments/ sensors.
- Calibration certificate or Lab Test Report being issued with tolerance limit (as per BIS) of instrument performance.
- Lab Standard Instruments for Pressure is PACE 1000, Paroscientific and for temperature PT-100 sensor both are of secondary standards which are being calibrated yearly from NPL, New Delhi.

1. CALIBRATION FACILITIES FOR TEMPERATURE

The liquid used in the Bath is varied according to the temperature ranges of calibration:

Distilled water : +5 ºC to +60 ºC

Methyl alcohol / Ethyl alcohol : -65 ºC to + 5 ºC

Silicon oil : for temperatures above + 70ºC up to 200 ºC

Environmental Test Chamber for Digital Temperature Humidity Sensors :

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2. CALIBRATION FACILITIES FOR PRESSURE :-

Standards for calibration of barometers

3. CALIBRATION FACILITIES FOR WIND

Wind Tunnel Range: 0 to 35 mps

Wind Tunnel Range: 0 to 70 mps

4. CALIBRATION FACILITIES FOR RAINFALL :-

Standard Burette-pipette apparatus

SRRG Calibration

TBRG Calibration

❖ Other Calibration facility available in SID Pune Lab:

- Wind direction and speed : Optical Anemometers, Ultrasonic, CCA, Hot wires, Handheld wind sensors etc.
- Rainfall Calibrations: ORG, SRRG, TBRG
- Radiations Sensors: Pyranometers, Pyrheliometers & Pyrgeometers.

WORKSHOP

History

Ms Mani established surface instruments manufacturing unit at Pune, is the first manufacturing indigenous unit after independence. She joined India Meteorological Department (IMD) in 1948 and worked on an ambitious program that made India self-sufficient by designing and manufacturing its own weather instruments. Her first job was to construct recording rain gauges, hygrographs, thermographs, barographs, barometers, anemographs and so forth. Thanks to her leadership in the field, India was in the forefront of countries where meteorological data, especially of solar radiation and wind, were used for studies of alternative sources of energy.

Introduction

The Surface Instrument Division (SID) was conceived and established at Pune after India becomes an independent country. Conventional surface Meteorological instruments are manufactured at SID Workshop. Earlier upper air Ozonesonde and Radiosonde instruments were manufactured at SID Workshop. These instruments are manufactured at well- equipped and self-sufficient worship which is ISO 9001-2008 certified in 2010 and maintained by the division. All manufactured instruments are tested and calibrated in an in-house calibration laboratory. Workshop also carries out research and development in instrumentation and brings out new designs. The division maintains the detailed instruction manuals and engineering drawings for all the instruments. The division established and maintains a large network of Automatic

Weather Station (AWS), Radiation Observatories, Airport Meteorological Instruments, etc. These activities have contributed towards the Indian Meteorological Department (IMD), Pune being designated as the Regional Training Centre for instruments by the World Meteorological Organization. The Division is headed by the Head (Surface Instruments Division).

Workshop division cited at Pune is the unique, vital, and nodal section available IMD and intended for the manufacturing of conventional meteorological instruments. This office is responsible to manufacture, calibrate, maintain all meteorological instruments and then after supply to departmental and non-departmental networks of agromet, upper air, automatic weather section, airports, marine stations, seismological stations, etc. These instruments are also been provided to various governmental sectors viz. defence organizations (such as Air-Force and Navy) airlines, scientific and research institute, colleges, universities, private sectors, etc

1) Machine Section No 1

Making of the initial parts like instruments base or lids are initiated in this section which includes Wind Vane MK-II (direction rod/arm, the balanced weight, bearing support, dust cover), Cup Counter Anemometer (box/lid, rod), Potentiometric Wind vane (base, fin bore, tapper, adjustable weight), Hair Hygrometer (base, tension adjust bracket, pen arm spindle bracket, side plate), Bimetallic Thermograph (Base, side plate), Self Recording Rain-Gauge (Chamber shaping, siphon)

2) Machine Section No 2

A small part of Cup Counter Anemometer, Optical Anemometer, Thermograph, and Hair Hygrograph and their fitting has been done. Which also includes, three semi-conical copper cups and gear assembly for Cup Counter Anemometer, opto coupler for Optical Anemometer, bimetallic coil for Thermograph, and the making of hair bundle (element used for humidity measurements) for hair hygrograph. After fixing they have been sent to the painting section and then to calibrate the instrument for mounting in the field.

3) Tool room section

A tool room is a room where tools are stored which are used for fixing all sorts of instruments. Tools room is also capable of customizing the existing tools with greater systemization and with great efficiency and accuracy in output products of IMD. Here tools are made, repaired, inventoried, and distributed for use within the institution.

4) Foundry section

Cup counter anemometer (box & lid), Pot wind vane (top & base), Optical anemometer (top & base), MK-II wind vane, Hair hygrograph, Thermograph and Self- Recording Rain-Gauge (chamber & siphon) are made of Aluminium been done in the Foundry section. As per the requirement of the scientific equipments and based on work order Aluminium is melted in a furnace at 1200 ^{0}C poured in molds and kept for cooling for 2-3 days. Necessary precautions were taken while pouring liquid Aluminium in the mould pots.

5) Carpentry section

The carpentry deals with the constructional work such as making Stevenson's screen (double, single and 10"), OPE wooden stand, Antarctica boxes, Wind vane boxes, new dew-gauge employing wood (Teak) with the help of carpentry tool. Cutting and fixing of Stevenson's screen of different sizes are done with the skillful staff at IMD.

6) Painting section

Before the job work is completed, it comes to the final stage of painting. Painting is done using air compressor spray on wood, fiber, and metal surfaces. On wood, white primer is used as an initial coat after it dried up it has given final finish paint again with white. Similarly, on metals like Brass and Copper, initial it is coated with brown as a primer and then with smoke grey for brass and with rubber white for copper. On fiber surfaces, oppline green shade is used. The stepwise procedure for painting on wood and metal surface is shown in the below figure.

7) Packaging and forwarding section

Before the instrument is dispatched to the concerned station, it is packed in different ways for wooden, metal, and glass surfaces; thermocol sheets are used for internal packing followed by carton sheets. After testing and calibration, instruments manufactured at IMD then packed for dispatched

8) Clock section

Readings of the weather sensors are recorded on a graph set to run parallel with a regular clock fixed on each instrument. These clocks are regularly checked for precession and accuracy to get an accurate reading of the temperature, RH, Rainfall, etc. These graphs are placed on round shaped drum rotate according to the Earth's rotational period (i.e., 24 hours cycle). After every 24 hours cycles, the graphs are sent to the respective sections for further study.

9) Sheet and metal cutter section

Some of the instruments part like OPE tank, wire mess, measuring bucket, AWS mast, BIWS mast (presently discarded), hair hygrograph cover, thermograph cover and Stevenson screen (big and small) are done. Major part of this section involve in the manual work carried with very well trained staff. New as well as old parts are being manufactured/repaired depending upon the requirement at AWS station in India. With very limited man power, this section does huge metal sheet cutting as well.

10) Welding section

Welding is a process that joined material of different kinds by using high heat comment parts together building is distinct from lower temperature metal joining technique such a brazing and soldering which do not melt the base metal building is done on gun metal brass metal and mild steel used in gas welding and arc welding in gas welding acetylene gas and oxygen is used whereas in arc welding and DC current is used for different thickness.

11) Electroplating

Electroplating is a process that uses an electric current to reduce dissolved metal cations so that they form a thin coherent metal coating on an electrode. This section consists of three major tanks i.e., cleaning, nickel, and copper which are used to coat the metal parts to avoid rusting in the long term conditions. In electroplating, the mandrel (patterned substrate) will be removed from the product. After the outer layer is removed, the object that remains is entirely created through electro-deposition and coated with copper. DC Power supply of 12V, 10A uses for thisprocess.

13) Powder Coating Machine

The new age powder coating gun based on concept of low energy generation. It gives enriched charging while making it safer for use. The unique external path leads to uniform powder flow. All moulded parts of modern polymer make the gun lightweight, well balanced. This equipment provides up to 40% more paint saving against any conventional gun. It you can spray metallic powder without changing Nozzle and Reduced sprays consumption. Fatigue free operation and safe as the gun triggers only if operator is earthed.

14) CNC Machine

Computer Numerical Control (CNC) is a subtractive manufacturing process which typically employs computerized controls and machine tools to remove layers of material from a stock piece—known as the blank or workpiece—and produces a custom-designed part. it submits machine commands dictating the tooling's actions and movements to the machine's integrated computer, which operates and manipulates the machine tooling.