1. COMPANY PROFILE

1.1 Introduction

TRW AUTOMOTIVE, headquarters in Livonia, Michigan is an American global supplier of automotive systems, modules, and components to automotive original equipment manufacturers and related aftermarkets. In 2015, TRW Automotive was acquired by German ZF Friedrichshafen and subsequently has been renamed ZF TRW Automotive Holdings Corp.

TRW formally stood for "Thompson Ramo Wooldridge", it was formed when Thompson Products merged with Ramo-Wooldridge in 1958. The company operated primarily surrounding the design, manufacture, and sale of safety systems. It operated approximately 200 facilities with 66,100 employees in 26 vehicle-producing countries.

1.2 History

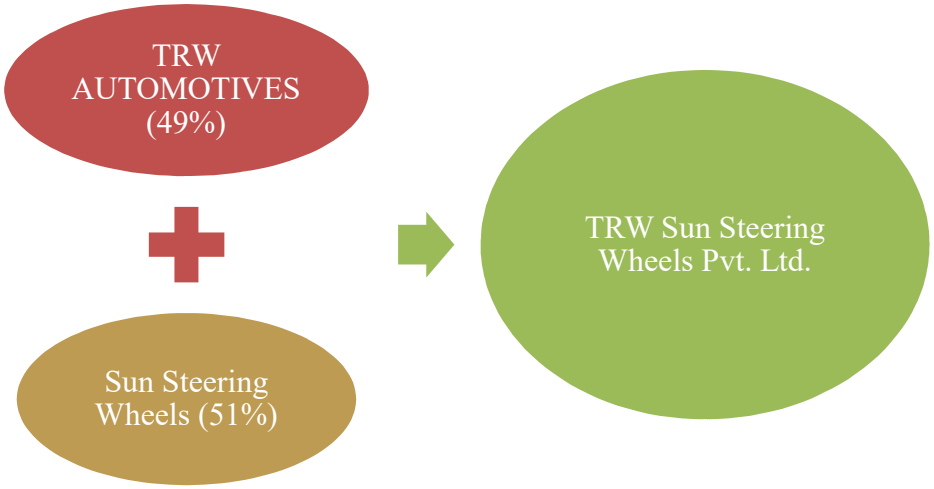
When aerospace company Northrop Grumman purchased competitor TRW in 2002, it sold TRW's automotive division to private equality firm Blackstone Group. TRW Automotive went public in a February 2004 initial public offering (IPO), after which Blackstone held a 56.7% interest in a TRW, Northrop Grumman, 17.2%, and TRW management, 1.7%. The company can trace its history back to TRW Inc's beginnings in 1901, but was founded as TRW Automotive in 2002.

On September 15, 2014, it was announced that German car parts maker ZF Friedrichshafen would buy TRW Automotive for approximately $13.5 billion including debt. The takeover was completed on the 15th May 2015, and TRW Automotive now operates as part of ZF Friedrichshafen AG, as Division 'Active & Passive Safety Technology'.

1.3 TRW SUN STEERING WHEELS PVT.LTD.

TRW Sun Steering Wheels Private Limited is a joint ventured formed by two companies name as Sun Steering Wheels Private Limited and TRW Automotives. Sun Steering Wheels Private company and is registered at Registrar of Companies, Delhi.

In 2007 TRW Automotives succeeded Sun steering Wheels Private Limited.



Head office of TRW Sun Steering Wheels is located in Gurgaon, Haryana. Manufacturing plants are located in Pune, Maharashtra and Gurgaon, Haryana.

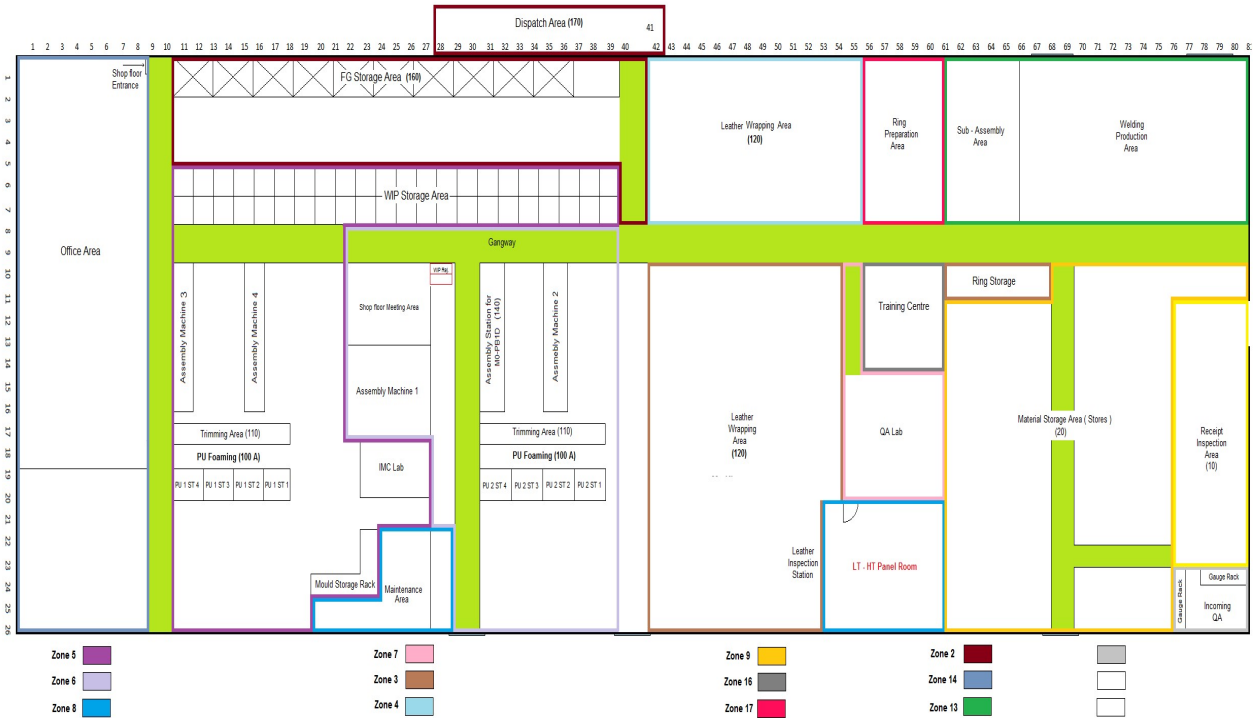
1.4 KEY HIGHLIGHTS OF COMPANY

Company manufactures full range of Steering Wheels, from Base Version to Top-of-the-line. It also manufactures Leather wrapped version with Multifunction Switches and Decorated Bezels. Total manufacturing capacity of TSSW is 1.5 Million Steering Wheels per year and TSSW can wrap approximately 2,80,000 Leather Wheels per year. TSSW also have extensive Leather Wrapping experience.

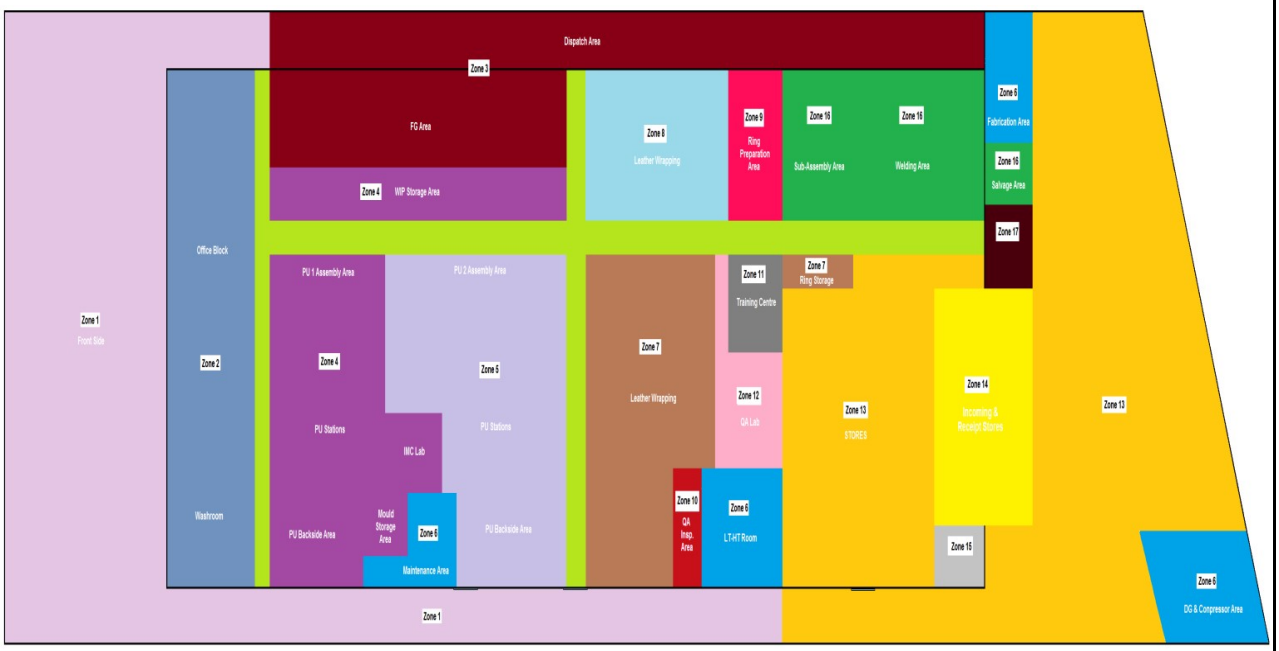
1.5 PLANT INFORMATION

Total area of Pune plant is 67,005 square feet in that 27,846 square feet area is built up. There are 267 employees in the company.

1.6 Plant Layout



5S Plant Layout:-



2. ENDORSEMENTS TO COMPANY

TUV SUD global leader in management system solutions, gives different endorsement to company such as:-

ISO/TS 16949:2009 is an ISO technical specification aimed at the development of a quality management system that provides for continual improvement ,emphasizing defect prevention and the reduction of variation and waste in the automotive industry supply chain.

ISO 14001:2015 is a family of standards related to environmental management that exist to help organization to minimize how their operations negatively affect the environment and stands with laws, regulations, and other environmentally oriented requirements.

OHSAS 18001:2007 is an Occupational Health and Safety Management Certification is an International standard which provides a framework to identify, control and decrease the risks associated with health and safety within the workplace.

2.1 Customer Recognition & Awards

FORD Quality Award for achieving Q1

MAHINDRA MSES (Mahindra Supplier Evaluation Standard) “B” Ranked

VOLKSWAGON Best Quality Supplier – 2013

Also different Endorsement like

Quality Award (2015-2016)

Spares Performance (2014)

Overall Excellence Award (2011)

Vendor Performance Award (2005-2006) & (2009-2010)

Kaizen & MPS Award (2004-2005)

GM Excellence Award (2012 & 2014)

3. CUSTOMERS OF TSSW

Following are the different customers of TRW Sun Steering Wheels Pvt. Ltd.

- FORD India Pvt. Ltd.
- RENAULT Motors
- NISSAN Motors
- TATA Motors Ltd.
- GENERAL Motors India
- MAHINDRA & MAHINDRA Ltd.
- VOLKSWAGON India Pvt. Ltd.
- FIAT India Automobile Pvt. Ltd.

4. STEERING WHEEL

4.1 Introduction

A Steering Wheel is a type of steering control in automobile. Steering wheels are used in most modern land vehicles, including all mass production automobiles, as well as buses, light and heavy trucks, and tractors. The Steering Wheel is the part of steering system that is manipulated by the driver; the rest of the steering system responds to such driver inputs.

4.2 History

The first automobiles are steered with a tiller. But in 1894, Alfred Vacheron had fitted a steering wheel in Panhard Car 4 hp model. That is believed to be one of the earliest vehicles.

From 1898, with the benchmark of above Charles Rolls introduced the first car in Berlin fitted with steering wheel. He imported a 6 hp Arthur Constantine Krebs replaced the tiller with an inclined steering wheel for the Panhard car he designed for the 1898 Paris-Amsterdam-Paris race which ran between 7-13 July 1898.

Old Type of Steering Wheel

1913 FORD Model T rigid steering column and safety four spoke wooden steering wheel

1974 Citroen DS Single Spoke Steering wheel

1970 AMC Matador Adjustable 3-spoke Steering Wheel

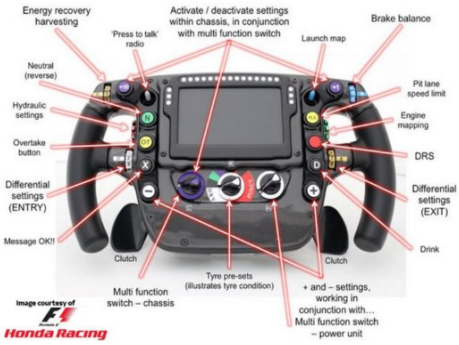
1958 Plymouth Savoy 2-Steering Wheel with horn ring

Latest Type of Steering Wheel

Mahindra Steering Wheel

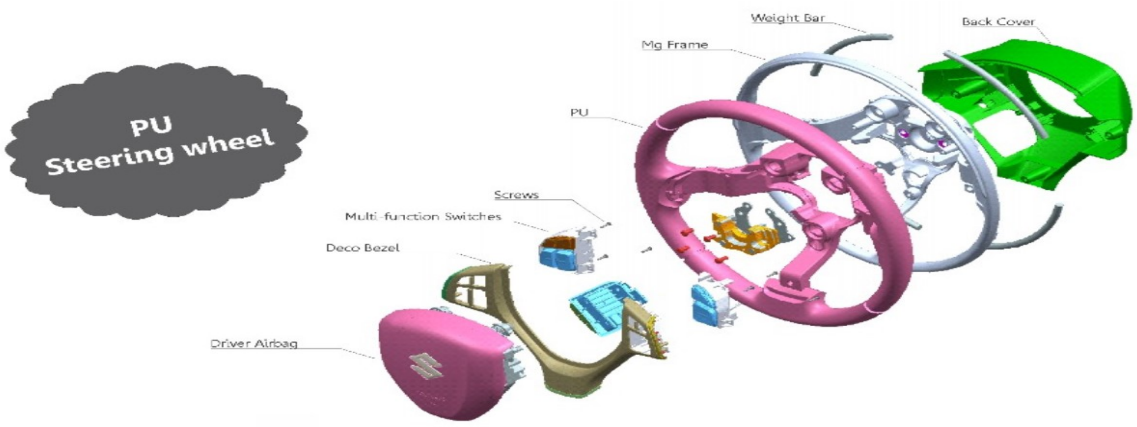
New Generation Renault Steering Wheel

Ford with Air Bag Steering Wheel



Formula one racing car steering wheel

4.3 STEERING WHEEL SEGMENTS



Typical family of Steering Wheel produced:-

Low Segment:-

It is made up of Steel Armature, Polypropylene (PP) Injection molded grip, Unpainted Horn Pad, and this NAB type.

Mid Segment:-

It is made up Steel, Aluminum Hybrid and Magnesium Armature, Polyurethane foamed grip, Painted or Unpainted Garnish type Horn Pad and this is AB and NAB type.

High Segment:-

It is made up of Magnesium Armature, Polyurethane foamed molded grip, Genuine Leather grip, attached with Multifunction switches, Painted Chrome garnish bezels.

5. IN-HOUSE CAPABILITIES OF COMPANY

Manufacturing

- **Armatures:**
  - Steel Welded (Robotic MIG + Metal Pressing + Ring Coiling)
  - Hybrid (Die cast [Outsource] + Steel)
  - Magnesium [Outsource]

- **Injection Molding:**
  - Polyurethane Grip
  - Polypropylene Grip
  - ABS, PC/ABS DECO Parts
  - PP, PP/EPDM Horn Covers

- **Designing Capabilities**
  - Part Designing
  - Tool / Jig & Fixture Designing

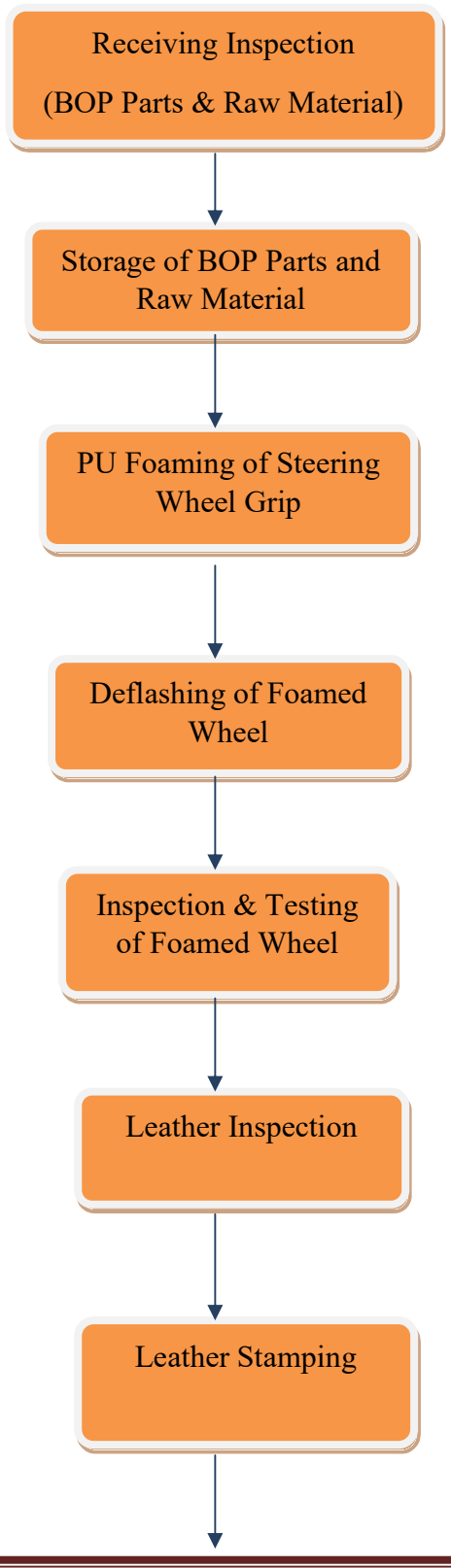
Testing

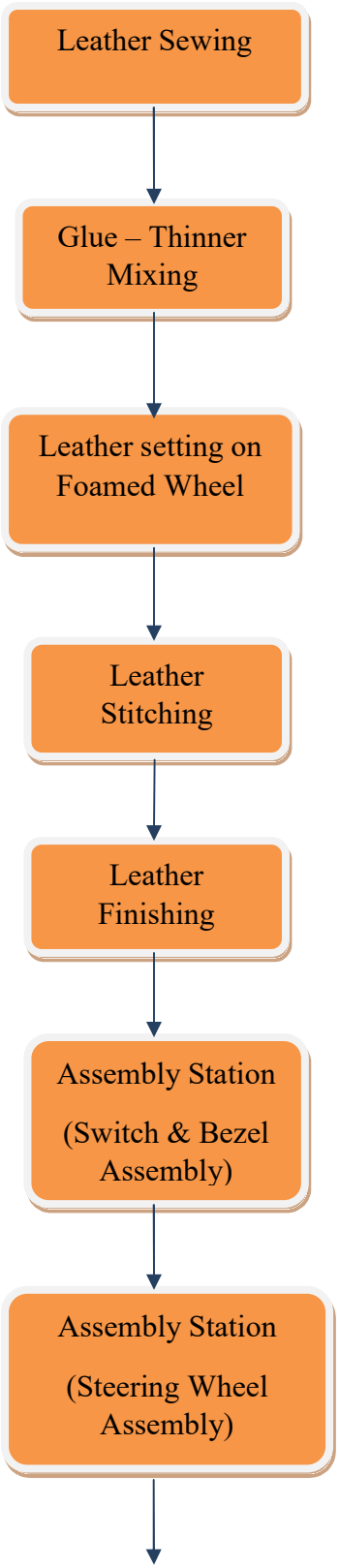
- Mechanical and Durability testing
- Environment related testing
- Wear Rubbing Testing [for Grip]
- Abrasion resistance testing [for painted parts]

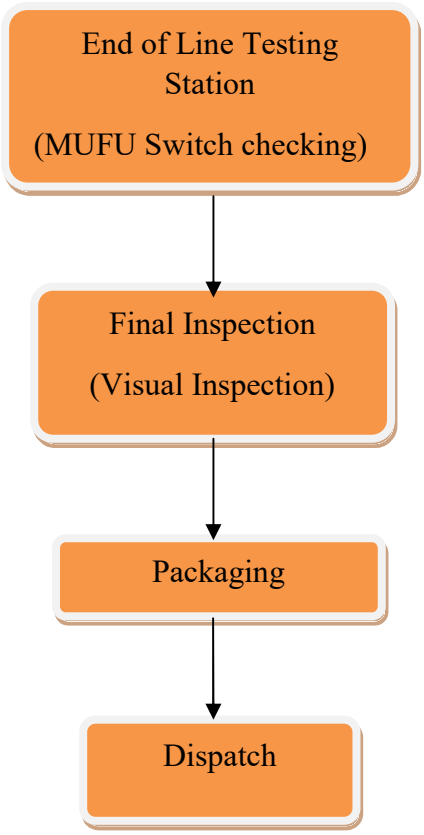
6. ENGINEERING CAPABILITY

- Extensive In-house experience applying low cost design solutions.
- Product Design – 100% capability for Design and Development of Steel Armatures
- Jig Design – Welding Jigs and Assembly Jigs
- Gauge Design- Profile Gauges, Receiver Gauges, etc.
- CAD Systems:
    - Unigraphics NX 9.0 : 06 Nos.
    - Pro - Engineer : 02 Nos.
    - AutoCAD (2D) : 10 Nos.
- Product Level Simulation (NVH, Fatigue, Crash) support from TRW Global Locations.
- Injection Tool Simulation from our Tooling Partner – Sun Alphatec.

7. PROCESS FLOW




Leather Sewing
Glue – Thinner Mixing
Leather setting on Foamed Wheel
Leather Stitching
Leather Finishing
Assembly Station (Switch & Bezel Assembly)
Assembly Station (Steering Wheel Assembly)


End of Line Testing Station
(MUFU Switch checking)
Final Inspection
(Visual Inspection)
Packaging
Dispatch

8. KEY PROCEESES IN COMPANY

8.1 WELDING:-

When Steel armature is used for Steering Wheel, Welding is required for make armature. In company there is Spot Welding Machine, Arc Welding Machine and 2 Robotic MIG Welding machine.

8.1.1 Robotic MIG Welding:-

(Make: - OTC-DIAHEN) (Model No. - AX CANI J000)

Robotic Metal Inert Gas (MIG) Welding, also known as Gas Metal Arc Welding (GMAW), is a common high deposition rate process that involves feeding a wire continuously toward the heated weld tip. It is considered a semi-automatic welding process.

MIG Welding is one of the most popular forms of welding in industrial applications and is an easy process to integrate to a robot system. MIG welding provides a faster process than other forms of welding, especially when robots are incorporated.

MIG Welding robots are capable of all position, adding flexibility to the welding system. Safety from dangerous fumes, higher quality welds and more efficient processes are just some of the advantages that companies see following MIG operations.

A MIG Welding robot integrates new and refurbished MIG welding and Pulsed MIG welding robot options from FANUC, MOTOMAN, ABB and KUKA. Whether you need just a robot, or a complete work cell, every new or reconditioned MIG welding system is fitted to your specifications.

Applications of MIG Welding Robot:-

These robots are used to automate applications throughout your production line to save time and money. Also these robots reduce waste and produce higher quality products with continuous precision. Robots can also handle the most tedious and dangerous manufacturing applications to keep your workers safe, healthy and motivated.

Historically, robotic welding has been a complex process that required four key factors to be profitable for a company:

- A high volume of parts
- A highly repetitive welding task
- An in-house programming expert to set the application
- In-house welding knowledge to fine tune the robot welding settings

8.1.2 Arc Welding Machine:

(Make- TECHNOCRAT)

Arc welding is a welding process that is used to join metal to metal by using electricity to create enough heat to melt metal, and the melted metals when cool result in a binding of the metals. It is a type of welding that uses a welding power supply to create an electric arc between a metal stick ("electrode") and the base material to melt the metals at the point of contact. Arc welders can use either direct (DC) or alternating (AC) current, and consumable or non-consumable electrodes.

The welding area is usually protected by some type of shielding gas, vapor, or slag. Arc welding processes may be manual, semi-automatic, or fully automated.

Applications of Arc Welding

For more rugged applications that involve thicker metal dimensions, arc stud welding provides the control and effectiveness necessary o firmly bond heavier pieces together. In the automotive industry, arc welds bond heat shields, exhaust systems and hydraulic lines to the chassis. Metal furniture pieces like office desks, file cabinets and shelving units are often welded. Heating, ventilation and air conditioning units are usually constructed using welding processes.

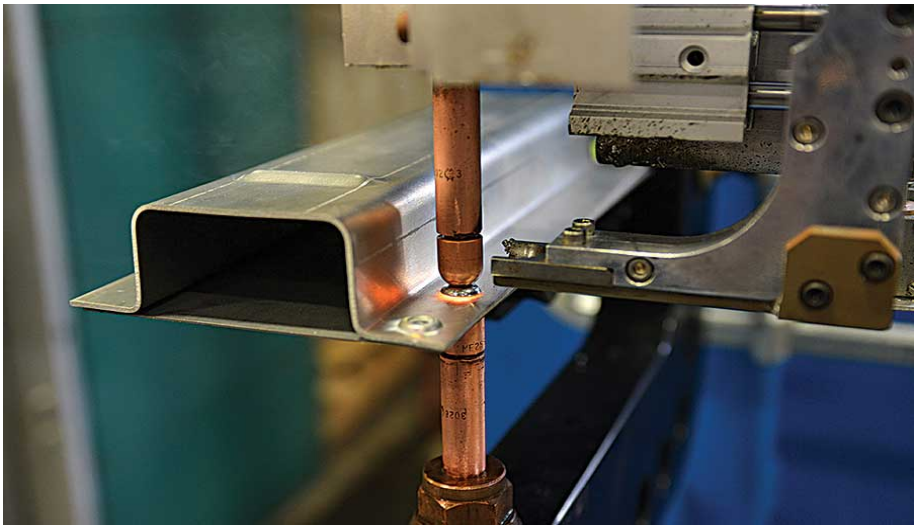
Most, if not all, of today's industries rely on properly functioning equipment, and welding processes are vital to the success of those machines.

8.1.3 Spot Welding Machine:-

Spot welding is a process in which contacting metal surface points are joined by the heat obtained from resistance to electric current. It is subset of electric resistance welding.

Work pieces are held together under pressure exerted by electrodes. Typically the sheets are in the 0.5 to 3 mm (0.020 to 0.118 inch) thickness range. The process uses two shaped copper alloy electrodes to concentrate welding current into a small “spot” and to simultaneously clamp the sheets together. Forcing a large current through the spot will melt the metal and form the weld. The attractive feature of spot welding is that a lot of energy can be delivered to the spot in a very short time (approximately 10-100 milliseconds). That permits the welding to occur without excessive heating of the remainder of the sheet.

The amount of heat delivered to the spot is determined by the resistance between the electrodes and the magnitude and duration of the current. The amount of energy is chosen to match the sheets material properties, its thickness, and type of electrodes. Applying too little energy will not melt the metal or will make a poor weld. Applying too much energy will melt too much etal, eject molten material, and make a hole rather than a weld. Another feature of spot welding is that the energy delivered to the spot can be controlled to produce reliable welds.



Application of Spot Welding

Spot welding is typically used when welding particular types of sheet metal, welded wire mesh or wire mesh. Thicker stock is more difficult to spot weld because the heat flows into the surrounding metal more easily. Spot welding can be easily identified on many sheet metal goods, such as metal buckets. Aluminum alloys can be spot welded, but their much higher thermal conductivity and electrical conductivity requires higher welding currents. This requires larger, more powerful, and more expensive welding transformers.

Effect of Spot Welding

The spot welding process tends to harden the material, causing it to wrap. This reduces the material's fatigue strength, and may stretch material as well as anneal it. The physical effects of spot welding include internal cracking, surface cracks and a bad appearance. The chemical properties affected include the metal's internal resistance and its corrosive properties,

8.1.4 DEFECTS AND TROUBLESHOOTING IN WELDING:-

Welding defects are something that manufactures want to try to avoid at all costs. When a robotic welder produces defects during the welding process, it can be cut down on the integrity of the weld, which can take away from the quality of the product. That is why troubleshooting is important to understand.

Porosity is one of the most common welding defects. It can be caused by a shielding gas leak or a clogged welding gun nozzle. This can cause welds to be made from undercut r cold roll material, causing defects in the weld. There are many different steps you can run through to check for porosity issues and other welding defects in your robotic welding system:

Check for Shielding gas leaks and flow – When checking for a shielding gas leak, use soap bubbles, and make sure all fittings are tight. The shielding gas flow should feel like it is coming out of the gun, but not enough to cause any turbulence or disruption.

Check for spatter – A welding nozzle can get bogged down with spatter over time. Remove the weld nozzles from the robot system, inspect them, and clean any weld spatter before replacing them.

Replace welding Tips and Liners regularly: Welding contact tips should be replaced daily to ensure that the wire feed is smooth and consistent during each welding cycle. Welding liners need to be replaced weekly in shops that run three shifts per day.

Check welding wire: The welding wire should feel strong as it exits the welding gun. To prevent "bird nests", a tangle of wire that halts the wire from being fed, flip the drive roll and pull the wire back out of the gun.

Check stick out Height and Push Pull angles: The typical stick out height for welding robot, the distance from the end of the welding gun nozzle and tip of the weld joint, is 5/8 inches to 3/4 inches. Ensure that the measurement is correct, and check all the push angles of the system.

Once you have completed all these steps, you should be able to correct the welding defects, like porosity, and return to a strong, durable welding application that will be high quality and consistent.

8.2 PU MOULDING MACHINE:-

In company we have 2 PU machines with 8 Foaming carriers and all these are control through PLC.

Polyurethane was invented by Dr. Otto Bayer. It was first used as a replacement for rubber and also used as a coating to protect other common materials at the time such as metals and wood.

8.2.1 Polyurethane Foaming:-

Polyurethane polymers are traditionally and most commonly formed by mixture of isocyanate and polyol. Both the isocyanate and polyol used to make polyurethane contain, on average, two or more functional groups per molecule.

Polyurethane are used in the manufacture of high resilience foam seating, rigid foam insulation panels, microcellular foam seals and gaskets, durable elastomeric wheels and tires (such as roller coaster, escalator, shopping cart, elevator and steering wheels)

Polyurethane foam used for packing, shipping, mattress topper, dog beds, costumes. Thick pieces will develop “sink” area after a short time. Polyurethane foam is our lowest quality of foam, and will often not return to its original form. We cannot guarantee the foam will maintain its original shape during shipping.

Benefits of using Polyurethane foam for Steering Wheel:-

- Polyurethane first made waves due to its unprecedented light weight when compared with metal, wood, and even other plastics in polymers. Some of our LFI-molded polyurethane products are up to 60-80% lighter when compared with traditional metals such as steel and aluminum. Its light nature also makes polyurethane shapeable and flexible, perfect for use in the manufacture of foam products such as chairs and insulation panels as well as elastomeric wheels and tires.

- However, polyurethane is more than light: it's strong. Tough, durable, load bearing and impact resistant, it performs extremely well in crash tests even when compared with more "solid" materials such as metal. At Romeo RIM, all of our polyurethane-molded vehicle and machinery parts are impact tested according to established standards.
- It can also be painted in the mold, which creates a high or low gloss Class A finish without necessitating an expensive, time-consuming post mold painting process. Painted polyurethane can easily mimic the finest and most detailed of textures, such as stone and wood grain. The in-mold painting process also creates a superior adhesion between the paint and the surface; the result is a long-lasting paint job that resists cracking, flaking and chipping even if exposed to extreme temperatures and elements.
- Polyurethane itself is extremely resistant to abrasion and wear. Wood rots, plastic warps, metal rusts, but polyurethane stands the test of time. It retains its shape at high and low temperatures – even continuing to function when approaching its melting point. This makes polyurethane ideal for machinery and other products that will be used in extreme climates.
- Finally, polyurethane is highly cost-, labor- and time-efficient. It produces no harmful styrene fumes, lowering the health risk for those who work with the material during the molding process. It also has a shorter in-mold curing time than any other product, allowing our customers to quickly and efficiently product large amounts of the products they need.

PU Moulding Machine:-

(Make- TRW SUN STEERING WHEELS)

For Steering Wheel manufacturing purpose we use 55% Polyol, 42% Isocyanate and 3% Color Paste.

Process:-

PU Injection molding uses a ram or screw-type plunger to force molten plastic material into a mould cavity; this solidifies into a shape that has conformed to the contour of the mould. It is the most commonly used to process both thermoplastic and thermosetting polymers, with the volume used of the former being considerably higher. Thermoplastics are prevalent due to characteristics which make them highly suitable for injection molding, such as the ease with which they may be recycled, their versatility allowing them to be used in a wide variety of applications, and their ability to soften and flow upon heating. Thermoplastics also have an element of safety over thermoses; if a thermosetting polymer is not ejected from the injection barrel in a timely manner, chemical cross linking may occur causing the screw and check valves to seize and potentially damaging the injection molding machine.

Injection molding consists of the high pressure injection of the raw material into a mould which shapes the polymer into the desired shape. Moulds can be of a single cavity or multiple cavities. In multiple cavity moulds, each cavity can be identical and form the same parts or can be unique and form multiple different geometries during a single cycle. Moulds are generally made from tool steels, but stainless steels and aluminum moulds are suitable for certain applications. Aluminums moulds are typically ill-suited for high volume production or parts with narrow dimensional tolerances, as they have inferior mechanical properties and are more prone to wear, damage, and deformation during the injection and clamping cycles; however, aluminum moulds are cost-effective in low-volume applications, as mould fabrication costs and time are considerably reduced. Many steel moulds are designed to process well over a million parts during their lifetime and can cost hundreds of thousands of dollars to fabricate.

Specifications:-

Tank air pressure = $3.5 \pm 0.5\ kg/cm^2$

Polyol Temperature = 30 ± 5 ℃

Isocyanate Temperature = 30 ± 5 ℃

Polyol Working Pressure = 180 ± 20 bar

Isocyanate Working Pressure = 190 ± 20 bar

Color Paste Pressure = 30 ± 25 bar

MTC Temperature = 75 ± 15 ℃

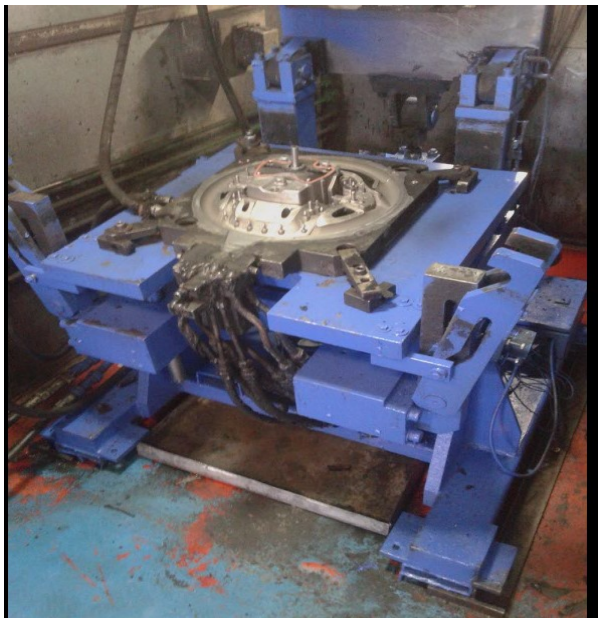
Machine Output = 220 gm/sec

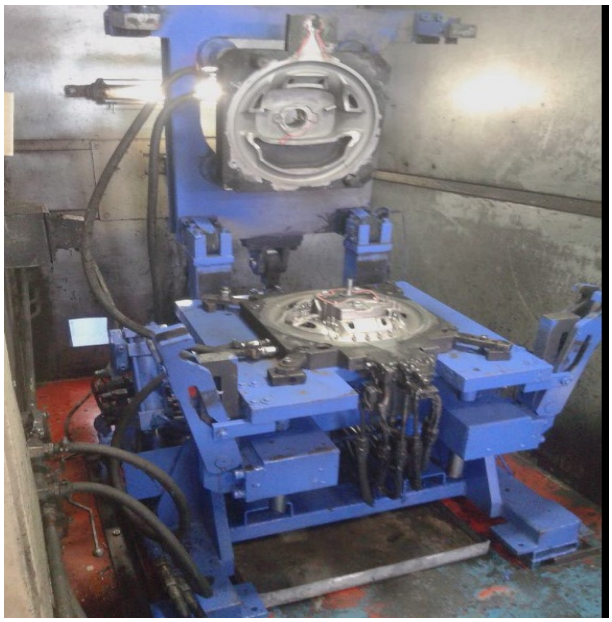
Foam Removal Time = 60 ± 10 second

Mould Work angle = 8 ± 3 Degree

Removal Foam angle = 15 ± 3 Degree

Hardening Time = 80 ± 10 second





8.2.2 MTC:-

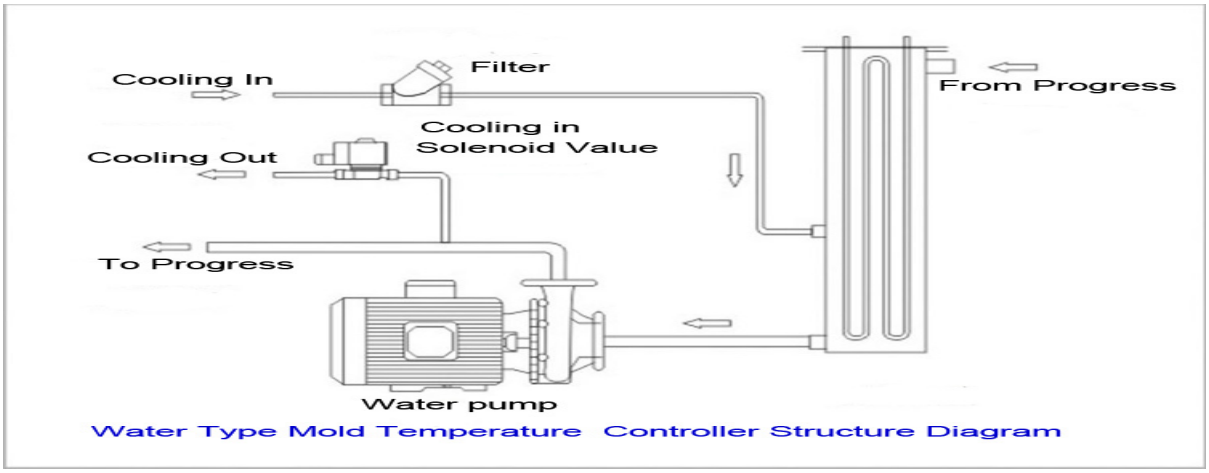
MTC is a Mould Temperature Controller. In the process of PU molding thermoplastics, hot melt is periodically injected into a cold mold. Without mold temperature control, the cavity surface would be heated up unevenly due to the constant supply of heat through

the melt. Through mold temperature control a uniform temperature level is reached on the mold surface relatively quickly. An even temperature distribution over the entire surface of the cavity is a major prerequisite for the desired molding cavity.

Uniform reproduction of a structured surface requires a uniform temperature level on the mold surface. The hotter the mold surface is, the better the melt can reproduce the fine structures of a grain.

The shrinkage behavior is also clearly related to the mold temperature. Rapid solidification hinders crystallization of the thermoplastic and leads to less shrinkage. If the temperature distribution in the mold varies, shrinkage differences occur that influence the dimensional stability of the component.

Not only the component quality, but also the feasible cycle time and thus the production costs are clearly related to mold temperature control. Only after demolding temperature has been reached, can the mold be opened and the component removed from the mold. If sections of the plastic molding cool down more slowly due to inadequate temperature control, the cycle time is prolonged.



Water Type Mold Temperature Controller Structure Diagram

8.3 LEATHER WRAPPING:-

Different steps in leather wrapping section

I. Leather Inspection: - Different defects are search in leather inspection and defective leather is separated from leather stock.

II. Leather Stamping: - By using different dies on stamping machine leather is cut into four parts.

III. Leather Sewing: - These four parts are sewing by different threads on sewing machine.

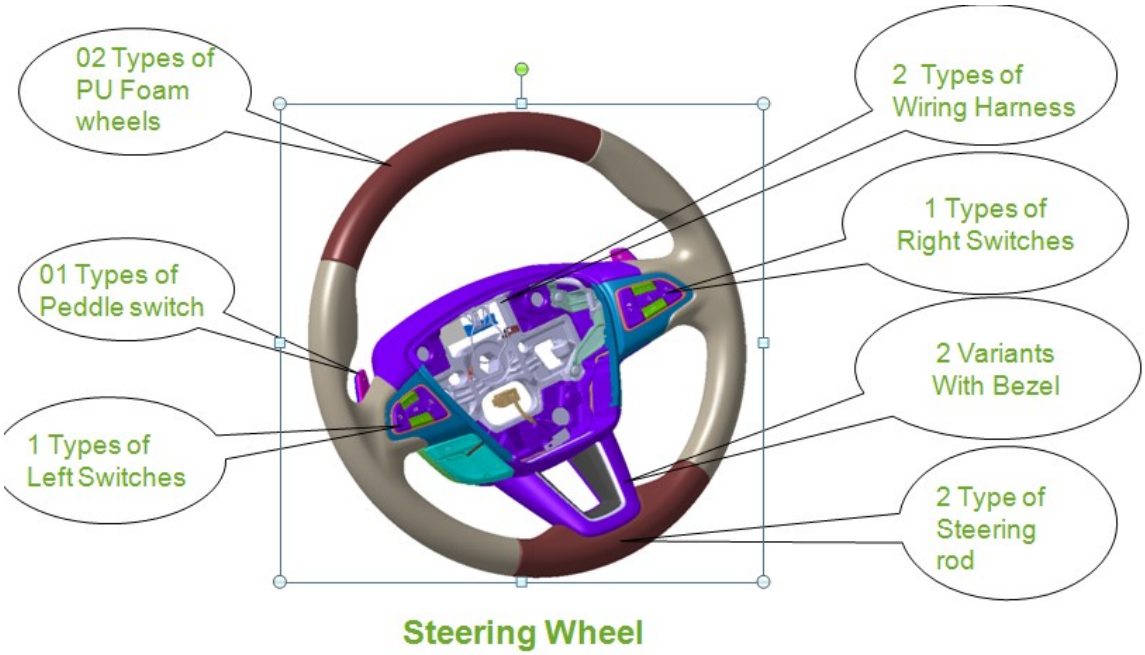
IV. Glue Thinner mixing: - Glue thinner is mixed in appropriate mixture.

V. Leather setting on foamed wheel: - Leather is set on steering wheel by different tools.

VI. Leather Stitching: - Leather stitching is done by needles and threads.

VII. Leather Finishing: - Leather wheel is going to finishing station where air gun is press on wheel to soften and removing layers from layer and also solved different defects in wheel.

8.4 ASSEMBLY LINE:-



Steering Wheel

There is different assembly line for different products. On assembly line input trolley from leather wrapping section is come

Station no.1:-

Operation – 1

Locate the steering wheel on the assembly line fixture.

Operation – 2

Select the Steering wheel part Number on Screen as per plan.

Operation – 3

Press the cycle start push button to check for the correct version of foam wheel and Presence of rod, If correct version then First and second POKA yoke hole on PLC will show OK then green signal will come, then release of bar code.

Operation - 4

Pest the internal barcode on steering wheel at defined location, Then Scan the sticker, HMI will display “Ready to start" green light.

Operation – 5

Take the Paddle switch RH &LH and then scan it then Screen will show RH&LH Paddle OK- with Green signal.

Operation – 6

Screwing of paddle switch, Steering wheel mounting fixture tilt to 41 degree to enable the screw tightening.

Operation – 7

Paddle switch Screw Tightening - Pull the screw driver for screw operation, take M4 x 12 mm screw-01 no. and tight the paddle switch with help of electric screw driver. Screw driver set torque is 1.5 +/- 0.2 N.M After screw operation HMI screen will display.

Operation – 8

Wiring Harness Scanning - Take the wiring harness and scan it, HMI Screen will show "Wiring harness OK" green signal for correct part number.

Operation – 9

Fixing of Wire harness with Paddle Switch (LH & RH) - Snap the wiring harness connectors to Right and Left Paddle switch.

Operation – 10

Paddle Switch Screw Presence - Press the Screw test button, Pneumatic slides will come forward, sensors will check for Screw presence, If OK, Screen will show " ALL SCREW PRESENT / SNAP CHECK " and green signal.

Station no.2:-

Operation – 1

Part Presence of Wheel - Locate the steering wheel on the assembly line fixture.

Operation – 2

Wheel Bar code scanning – Scan the internal barcode on steering wheel, If Ok, HMI screen will display "Ready to start" green light will display.

Operation – 3

Part Presence of LH & RH Switches by scanning Barcode - Take the Switch RH &LH and then scan it. If OK, HMI Screen will show RH&LH Switch OK-Green signal will display.

Operation – 4

Manual Assembly of LH & RH Switches - Locate and press fit the RH/LH Side switch on Steering wheel, While location the switch guide the locator and snap lug on the switch into the hole and groove provided on foamed wheel.

Operation – 5

Screw Tightening of LH & RH Switches - Pull the screw driver for screw operation, takes M4 x 8 mm screw-02 nos. and fix the Switch RH with help of electric screw driver. Screw driver set torque= 2.4 +/- 0.3 N.m., After screw operation HMI screen will display actual torque value& Angular rotation of screw and green signal - RH Screw tight.

Operation – 6

Wiring Harness Scanning - Connect the wiring harness to switch RH and LH , Then route the wiring harness properly in the groove provided on wheel

Operation – 7

Bezel Part Scanning - Take the Bezel from the bin and scan it, HMI screen will display the Bezel OK, Green light display

Operation – 8

Ensure the complete process - Press the Cycle complete push button to declamp the part from fixture and then keep the part in WIP trolley.

Declamp will be released only after all operation completed

8.5 EOL TESTING:-

Operation – 1

Locate the steering wheel on the assembly fixture.

Operation – 2

Internal Bar code Scanning, If correct variant, HMI screen will show "Ready to start"

Operation – 3

Resistance checking for Switches continuity; Connect wiring harness connector to EOL connector to check the continuity.

Operation – 4

Resistance check for Switches continuity - Press Start Push button to start the auto cycle, Pencil cylinders will operate to press individual switch buttons of LH Switch, RH Switch, Paddle Switch LH & Paddle Switch RH (depending on the Steering Wheel Assembly variants) and at the same time sensors will operate to detect the LH Switch & RH Switch screws and bezel presence.

Operation-5

After part confirms Switch resistance values as per specifications then only final barcode gets generated.

Paste the finished barcode at defined area on wheel

Operation – 6

Disconnect the EOL connector and pick the part from fixture and keep it on trolley.

9. QUALITY INSPECTION FACILITY:-

9.1 UNIVERSAL TESTING MACHINE:-

(Make: - Fine Testing & Machinery)

A universal testing machine (UTM), also known as a universal tester, materials testing machine or materials test frame, is used to test the tensile strength and compressive strength of materials. An earlier name for a tensile testing machine is a tensometer. The "universal" part of the name reflects that it can perform many standard tensile and compression tests on materials, components, and structures (in other words, that it is versatile).

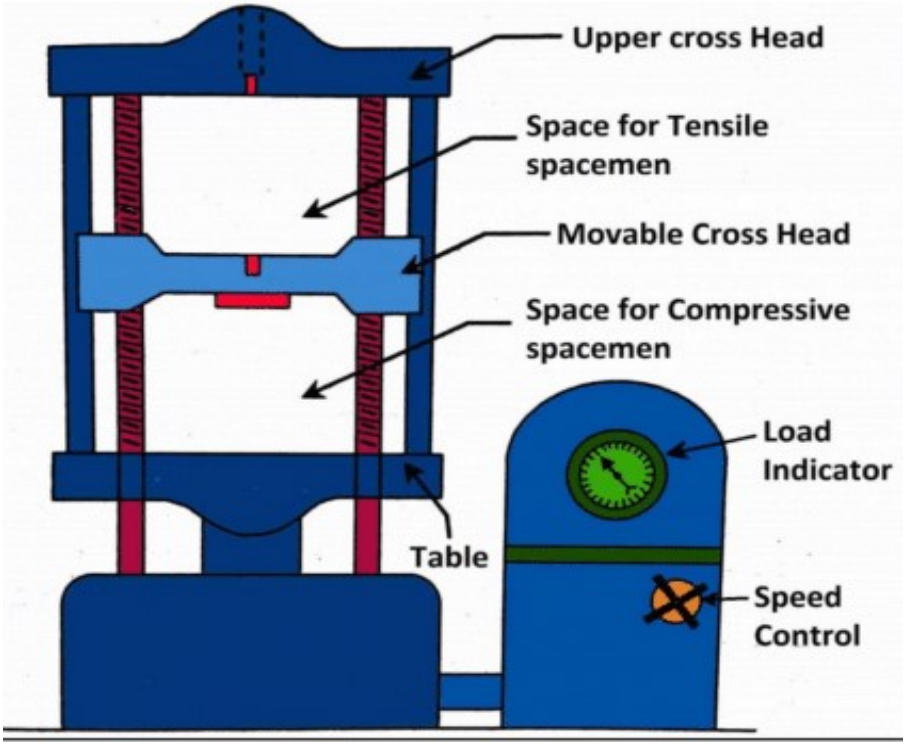
The primary use of testing machine is to create Stress-Strain diagram. Once the diagram is generated, a pencil and straight edge or computer algorithm can be used to calculate Yield strength, Young's Modulus, Tensile Strength or Total elongation.

According to purpose there is a different ranges UTM machines available. For Steering Wheel manufacturing industry 100KN range UTM machine is use.

Components:-

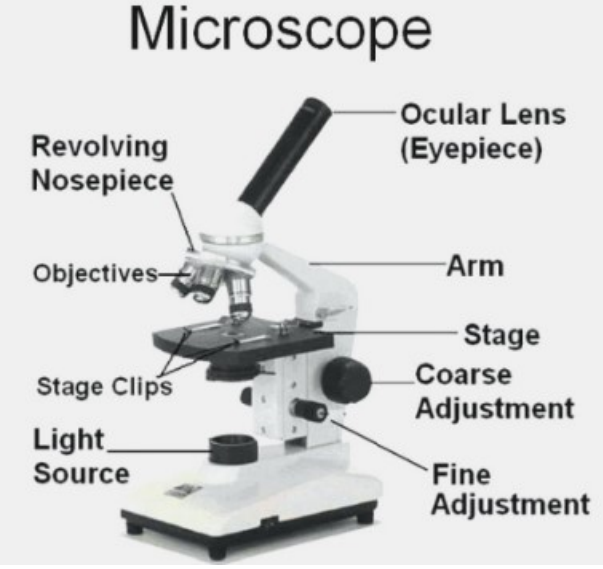
- Load frame - Usually consisting of two strong supports for the machine. Some small machines have a single support.
- Load cell - A force transducer or other means of measuring the load is required. Periodic calibration is usually required by governing regulations or quality system.
- Cross head - A movable cross head (crosshead) is controlled to move up or down. Usually this is at a constant speed: sometimes called a *constant rate of extension* (CRE) machine. Some machines can program the crosshead speed or conduct cyclical testing, testing at constant force, testing at constant deformation, etc. Electromechanical, servo-hydraulic, linear drive and resonance drive are used.
- Means of measuring extension or deformation - Many tests require a measure of the response of the test specimen to the movement of the cross head. Extensometers are sometimes used.

- Output device - A means of providing the test result is needed. Some older machines have dial or digital displays and chart recorders. Many newer machines have a computer interface for analysis and printing.
- Conditioning - Many tests require controlled conditioning (temperature, humidity, pressure, etc.). The machine can be in a controlled room or a special environmental chamber can be placed around the test specimen for the test.
- Test fixtures, specimen holding jaws, and related sample making equipment are called for in many test methods.



9.2 MICROSCOPE WITH PC:-

(Make:- Vardhan Works PVT. LTD.)



A **microscope** is an instrument used to see objects that are too small to be seen by the naked eye. Microscopy is the science of investigating small objects and structures using such an instrument. Microscopic means invisible to the eye unless aided by a microscope. There are many types of microscopes, and they may be grouped in different ways. One way is to describe the way the instruments interact with a sample to create images, either by sending a beam of light or electrons to a sample in its optical path, or by scanning across, and a short distance from the surface of a sample using a probe. The most common microscope (and the first to be invented) is the optical microscope, which uses light to pass through a sample to produce an image. Other major types of microscopes are the fluorescence microscope, the electron microscope (both the transmission electron microscope and the scanning electron microscope) and the various types of scanning probe microscopes.

Purpose: - To measure the microstructure of welding.

9.3 SPECTRUM COLOR MATCHING CABINET:-

(Make: - Presto Stantest Ltd.)

Purpose: - To evaluate color in D65 light.

Color matching cabinet booth used for visual assessment of color under 6 standard lights. Color matching cabinet measure the color differences between two samples.

Color looks different under different lighting condition. When one uses a Color Matching cabinet it helps in marking the differences. Color viewing cabinets is equipped with most accurate light cabinet for visual evaluation of fabrics, garment, cloth, textiles, and leathers and so on. It checks matching under a standard light source in a closed environment to minimize the interference of external lights.

How It Works:-

The equipment offers a wide viewing area equipped with multiple light sources or lamps to detect the phenomenon of Metamerism, where samples appear to match under one light source but is distinctly different another. In order to reach the final approval the fabric has to go through the various light sources which include: artificial daylight, cool white light, tungsten filament light, ultra violet black light, triphosphor fluorescent light.

The sample to be tested and the original sample are to be kept in the viewing cavity.

After switching ON the D65 light closely check the original specimen and the specimen to be tested.

9.4 HARDNESS TESTER:-

(Make: - Bareiss)

Purpose: - To measure foam hardness. Range: - 0-100 Shore L.

The Foam hardness measurement is used for the comparative assessment of the material hardness on steering wheel for PU foam with or without leather. Shore hardness is understood to mean the resistance to penetration by a body with a specific shape under a defined spring force.

The sore durometer is a device for measuring the hardness of the polymers, elastomers, and rubbers. Higher number on the scale indicates a greater resistance to indentation and thus harder material. Lower numbers indicate less resistance and softer materials. The term is also used to describe a materials rating on the scale, as in an object having a "shore durometer" of 90."

The scale was defined by Albert Ferdinand Shore, who developed a suitable device to measure hardness in the 1920s. It was neither the firs hardness tester nor the first to be called a durometer (ISV duro- and –meter; attested since the 19th century), but today that name usually refers to Shore hardness: other devices use other measures, which return corresponding results, such as a Rockwell Hardness.

10.AUXILIARY MACHINES IN COMPANY

10.1 BROACHING MACHINE:-

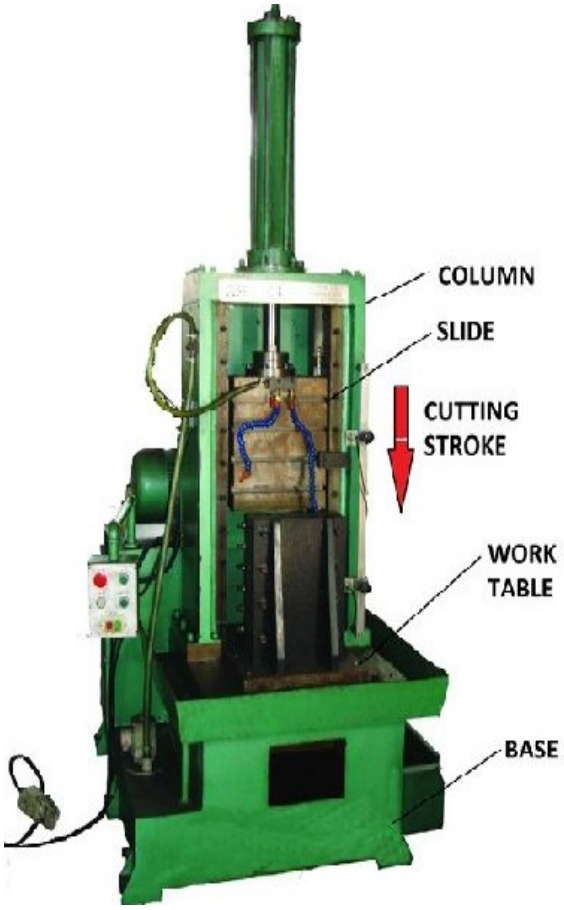
In steering wheel manufacturing company broaching machine is used to broach Boss of steering wheel.

Broaching is a machining process that uses a toothed tool, called a broach, to remove material. There are two main types of broaching: linear and rotary. In linear broaching, which is the more common process, the broach is run linearly against a surface of the work piece to effect the cut. Linear broaches are used in a broaching machine, which is also sometimes shortened to *broach*. In rotary broaching, the broach is rotated and pressed into the work piece to cut an axisymmetric shape. A rotary broach is used in a lathe or screw machine. In both processes the cut is performed in one pass of the broach, which makes it very efficient.

Broaching is used when precision machining is required, especially for odd shapes. Commonly machined surfaces include circular and non-circular holes, splines, keyways, and flat surfaces. Typical work pieces include small to medium-sized castings, forgings, machine parts, and stampings. Even though broaches can be expensive, broaching is usually favored over other processes when used for high-quantity production runs.

Broaches are shaped similar to a saw, except the height of the teeth increases over the length of the tool. Moreover, the broach contains three distinct sections: one for roughing, another for semi-finishing, and the final one for finishing. Broaching is an unusual machining process because it has the feed built into the tool. The profile of the machined surface is always the inverse of the profile of the broach. The rise per tooth (RPT), also known as the *step* or feed per tooth, determines the amount of material removed and the size of the chip. The broach can be moved relative to the work piece or vice versa. Because all of the features are built into the broach, no complex motion or skilled labor is required to use it. A broach is effectively a collection of single-point cutting tools arrayed in sequence, cutting one after the other; its cut is analogous to multiple passes of a shaper.

Broaching Machines:-



Broaching machines are relatively simple as they only have to move the broach in a linear motion at a predetermined speed and provide a means for handling the broach automatically. Most machines are hydraulic, but a few specialty machines are mechanically driven. The machines are distinguished by whether their motion is horizontal or vertical. The choice of machine is primarily dictated by the stroke required. Vertical broaching machines rarely have a stroke longer than 60 in (1.5 m).

Vertical broaching machines can be designed for push broaching, pull-down broaching, pull-up broaching or surface broaching. Push broaching machines are similar to an arbor press with a guided ram; typical capacities are 5 to 50 tons. The two ram pull-down machine is the most common type of broaching machine. This style machine has the rams

under the table. Pull-up machines have the ram above the table; they usually have more than one ram. Most surface broaching is done on a vertical machine.

Horizontal broaching machines are designed for pull broaching, surface broaching, continuous broaching, and rotary broaching. Pull style machines are basically vertical machines laid on the side with a longer stroke. Surface style machines hold the broach stationary while the work pieces are clamped into fixtures that are mounted on a conveyor system. Continuous style machines are similar to the surface style machines except adapted for internal broaching]

Horizontal machines used to be much more common than vertical machines; however, today they represent just 10% of all broaching machines purchased. Vertical machines are more popular because they take up less space.

Broaching is often impossible without the specific broaching or keyway machines unless you have a system that can be used in conjunction with a modern machining centre or driven tooling lathe; these extra bits of equipment open up the possibility of producing keyways, splines and torx through one-hit machining.

10.2 RIVETING MACHINE:-

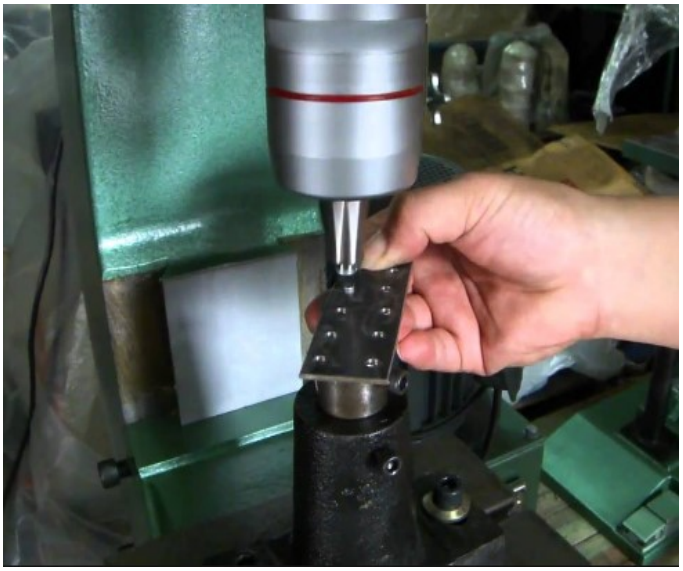
In steering wheel manufacturing company riveting machine is used to riveted the child parts together.

A riveting machine is used to automatically set (squeeze) rivets in order to join materials together. The riveting machine offers greater consistency, productivity, and lower cost when compared to manual riveting.

Types of Riveting Machine:-

Automatic feed riveting machines include a hopper and feed track which automatically delivers and presents the rivet to the setting tools which overcomes the need for the

operator to position the rivet. The downward force required to deform the rivet with an automatic riveting machine is created by a motor and flywheel combination, pneumatic cylinder, or hydraulic cylinder. Manual feed riveting machines usually have a mechanical lever to deliver the setting force from a foot pedal or hand lever.



Riveting machines can be sub-divided into two broad groups — impact riveting machines and orbital (or radial) riveting machines.

Impact riveting

Impact riveting machines set the rivet by driving the rivet downwards, through the materials to be joined and on into a forming tool (known as a rollset). This action causes the end of the rivet to roll over in the rollset which causes the end of the rivet to flare out and thus join the materials together. Impact riveting machines are very fast and a cycle time of 0.5 seconds is typical.

Orbital riveting

Orbital riveting machines have a spinning forming tool (known as a peen) which is gradually lowered into the rivet which spreads the material of the rivet into a desired shape depending upon the design of the tool. Orbital forming machines offer the user

more control over the riveting cycle but the trade off is in cycle time which can be 2 or 3 seconds.

There are different types of riveting machines. Each type of machine has unique features and benefits. The orbital riveting process is different from impact riveting and spiral form riveting. Orbital riveting requires less downward force than impact or spiral riveting. Also, orbital riveting tooling typically lasts longer.

Radial (Spiral form) riveting

Radial riveting is subtly different from orbital forming. In most cases however, where high-quality joints are demanded, the radial riveting technology is the appropriate procedure due to the low cycle time, the little force needed and the high quality results obtained.

The riveting peen describes a rose-petal path. The rivet is deformed in three directions. Radially outwards, radially inwards and overlying also tangentially.

Excellent surface structure of the closing head: With the Radial riveting process, the tool itself does not rotate. The friction between tool and work-piece is thus at a minimum. The result is an excellent surface structure.

Roller form riveting

Roller forming is a subset of orbital forming. Roller forming uses the same power head as orbital forming but instead of a peen has multiple wheels that circle the work piece and combine two similar or non-similar materials together with a seamless and smooth gentle bonding via downward pressure as the rollers move downward or inward on the piece.

Automatic drilling and riveting machine

These machines take the automation one step farther by clamping the material and drilling or countersinking the hole in addition to riveting. They are commonly used in

the aerospace industry because of the large number of holes and rivets required to assemble the aircraft skin.

10.3 ICE CLEANING MACHINE

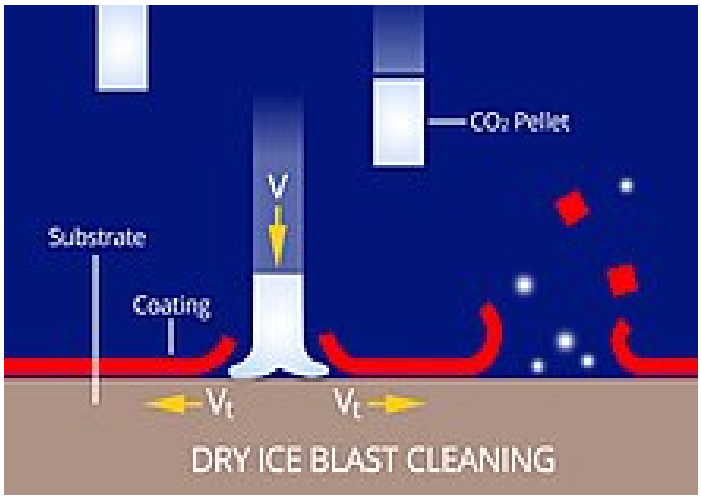
Ice cleaning machine are also known as dry ice blasting machine. Dry ice blasting is a form of carbon dioxide cleaning, where dry ice, the solid form of carbon dioxide, is accelerated in a pressurized air stream and directed at a surface in order to clean it.

The method is similar to other forms of media blasting such as sand blasting, plastic bead blasting, or soda blasting in that it cleans surfaces using a media accelerated in a pressurized air stream, but dry ice blasting uses dry ice as the blasting medium. Dry ice blasting is nonabrasive, non-conductive, nonflammable, and non-toxic.

Dry ice blasting is an environmentally responsible cleaning method. Dry ice is made of reclaimed carbon dioxide that is produced from other industrial processes, does not add additional greenhouse gases to the atmosphere, and is an approved media by the EPA, FDA and USDA. It also reduces or eliminates employee exposure to the use of chemical cleaning agents.

Compared to other media blasting methods, dry ice blasting does not create secondary waste or chemical residues as dry ice sublimates, or converts back to a gaseous state, when it hits the surface that is being cleaned. Dry ice blasting does not require clean-up of a blasting medium. The waste products, which include just the dislodged media, can be swept up, vacuumed or washed away depending on the containment.

Method:-



Dry ice blasting involves propelling pellets at extremely high speeds. The actual dry ice pellets are quite soft, and much less dense than other media used in blast-cleaning (i.e. sand or plastic pellets). Upon impact, the pellet sublimates almost immediately, transferring minimal kinetic energy to the surface on impact and producing minimal abrasion. The sublimation process absorbs a large volume of heat from the surface, producing shear stresses due to thermal shock. This is assumed to improve cleaning as the top layer of dirt or contaminant is expected to transfer more heat than the underlying substrate and flake off more easily. The efficiency and effectiveness of this process depends on the thermal conductivity of the substrate and contaminant. The rapid change in state from solid to gas also causes microscopic shock waves, which are also thought to assist in removing the contaminant.

11.MATERIAL HANDELING EQUIPMENTS:-

Material handling equipment (MHE) is mechanical equipment used for the movement, storage, control and protection of materials, goods and products throughout the process of manufacturing, distribution, consumption and disposal. The different types of handling equipment can be classified into four major categories: transport equipment, positioning equipment, unit load formation equipment, and storage equipment.

11.1 Transport Equipment:-

FORK LIFT:-

A forklift (also called lift truck, jitney, fork truck, fork hoist, and forklift truck) is a powered industrial truck used to lift and move materials over short distances. Forklift hydraulics are controlled either with levers directly manipulating the hydraulic valves or by electrically controlled actuators, using smaller "finger" levers for control. The latter allows forklift designers more freedom in ergonomic design. Forklifts are rated for loads at a specified maximum weight and a specified forward center of gravity. This information is located on a nameplate provided by the manufacturer, and loads must not

exceed these specifications. In many jurisdictions, it is illegal to alter or remove the nameplate without the permission of the forklift manufacturer.

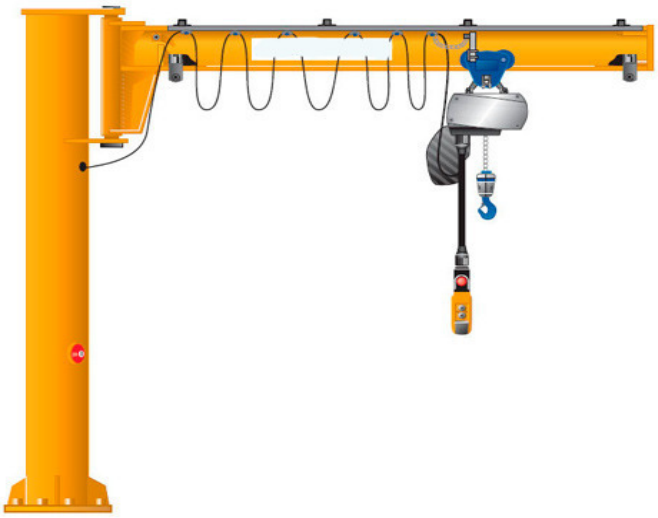
HYDRAULIC DRUM LOADER:-

Hydraulic drum loader is used to lift and move drums of color paste from one place to another.

HAND PALLET TRUCK:-

Hand pallet trucks are customizable, making them suitable for a broad range of material handling applications, including horizontal transport, order picking, loading / unloading and stacking. Designed for ease of use, our long-lasting trucks allow for the safe and efficient movement of goods with very little effort. Suitable for horizontal pallet transport and order picking, the low lifting hand pallet trucks offer a load capacity of up to 3 tones.

CRANES:-



Cranes are used to transport loads over variable (horizontal and vertical) paths within a restricted area and when there is insufficient (or intermittent) flow volume such that the use of a conveyor cannot be justified. Cranes provide more flexibility in movement than conveyors because the loads handled can be more varied with respect to their shape and weight. Cranes provide less flexibility in movement than industrial trucks because they only can operate within a restricted area, though some can operate on a portable base. Most cranes utilize trolley-and-tracks for horizontal movement and hoists for vertical movement, although manipulators can be used if precise positioning of the load is required. The most common cranes include the jib, bridge, gantry, and stacker cranes.

INDUSTRIAL TRUCKS:-

Industrial trucks are used to move materials over variable paths and when there is insufficient (or intermittent) flow volume such that the use of a conveyor cannot be justified. They provide more flexibility in movement than conveyors and cranes because there are no restrictions on the area covered, and they provide vertical movement if the truck has lifting capabilities. Different types of industrial trucks can be characterized by whether or not they have forks for handling pallets, provide powered or require manual lifting and travel capabilities, allow the operator to ride on the truck or require that the operator *walk* with the truck during travel, provide load stacking capability and whether or not they can operate in narrow aisles.

MOULD CHANGING EQUIPMENTS:-

When new type of steering wheel is to be manufacture different molds are required on machine and weight of the mold is very large for this purpose mould changing trolley is used.

11.2 Positioning Equipment:-

Positioning equipment is used to handle material at a single location. It can be used at a workplace to feed, orient, load/unload, or otherwise manipulate materials so that are in the correct position for subsequent handling, machining, transport, or storage. As compared to manual handling, the use of positioning equipment can raise the productivity of each worker when the frequency of handling is high, improve product quality and limit damage to materials and equipment when the item handled is heavy or awkward to hold and damage is likely through human error or inattention, and can reduce fatigue and injuries when the environment is hazardous or inaccessible. In many cases, positioning equipment is required for and can be justified by the ergonomic requirements of a task. Examples of positioning equipment include lift/tilt/turn tables, hoists, balancers, manipulators, and industrial robots. Manipulators act as “muscle multipliers” by counterbalancing the weight of a load so that an operator lifts only a small portion (1%) of the load’s weight, and they fill the gap between hoists and industrial robots: they can be used for a wider range of positioning tasks than hoists and are more flexible than

industrial robots due to their use of manual control. They can be powered manually, electrically, or pneumatically, and a manipulator's end-effectors can be equipped with mechanical grippers, vacuum grippers, electromechanical grippers, or other tooling.

11.3 Unit Load Formation Equipment:-

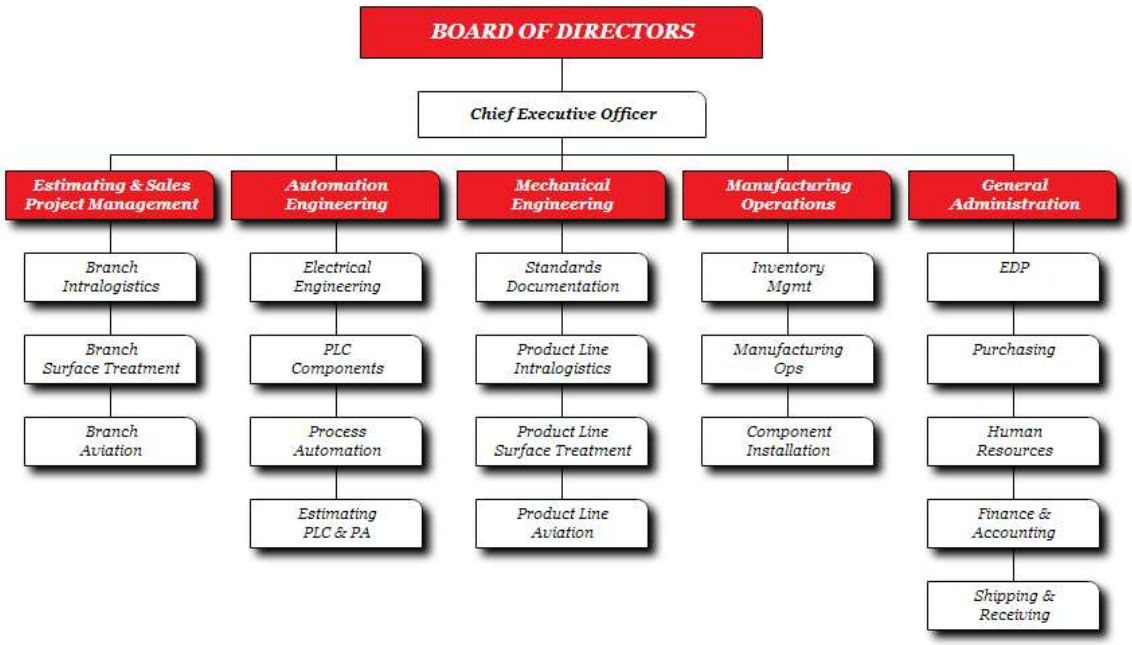
Four-Way Pallet

Unit load formation equipment is used to restrict materials so that they maintain their integrity when handled a single load during transport and for storage. If materials are self-restraining (e.g., a single part or interlocking parts), then they can be formed into a unit load with no equipment. Examples of unit load formation equipment include pallets, skids, slip sheets, tote pans, bins/baskets, cartons, bags, and crates. A pallet is a platform made of wood (the most common), paper, plastic, rubber, or metal with enough clearance beneath its top surface (or face) to enable the insertion of forks for subsequent lifting purposes. A slip-sheet is a thick piece of paper, corrugated fiber, or plastic upon which a load is placed and has tabs that can be grabbed by special push/pull lift truck attachments. They are used in place of a pallet to reduce weight and volume, but loading/unloading is slower.

11.4 Storage Equipment:-

Storage equipment is used for holding or buffering materials over a period of time. The design of each type of storage equipment, along with its use in warehouse design, represents a trade-off between minimizing handling costs, by making material easily accessible, and maximizing the utilization of space (or cube). If materials are stacked directly on the floor, then no storage equipment is required, but, on average, each different item in storage will have a stack only half full; to increase cube utilization, storage racks can be used to allow multiple stacks of different items to occupy the same floor space at different levels. The use of racks becomes preferable to floor storage as the number of units per item requiring storage decreases. Similarly, the depth at which units of an item are stored affects cube utilization in proportion to the number of units per item requiring storage.

12.ORAGANIZATION STRUCTURE:-



12.1 DIFFERENT DEPARTMENT WORKS:-

12.1.1 QUALITY ASSURANCE DEPARTMENT:-

Responsibility:-

- To ensure implementation & maintenance of quality system in the area under his control.
- To organize testing & inspection activities for in process and outgoing materials.
- To prepare trends in products quality parameters during Management Review meeting.
- To ensure calibration of all instruments & gages used in the organization.
- Corrective & preventive actions on internal \ external rejections and customer complaints & its implementation.
- Training of subordinates on quality improvements.
- Effective implementation of statistical techniques in all sections of production / QA.

- Handling of safety characteristics - Ensure proper process & product control, Ensure proper root cause & corrective action are taken if any NC part observed for safety characteristic.
- Ensure 4M changes are implemented effectively throughout the organization.
- Maintaining of record - daily in-house quality issue in computer at the end of shift.
- Co-ordinate with online inspectors, PDI inspectors & giving feedback to production team.
- Maintain 5S in QA lab.
- Ensure safety characteristics processes are controlled in defined manner.
- Safety instructions are followed while working.
- Conducting layout inspection as per requirement.

Authority:-

- To declare product as scrap & to maintain scrap record.
- To approve quality trend data & maintain all quality records.
- To declare gauges as scrap, if found unusable / unrepeatable.
- To control inspection of material activities at incoming / in process & final inspection stage.
- To identify, record and decide disposition of non-conforming product.
- To ensure effectiveness of preventive actions in coordination with related departments and reporting it to Management.
- To stop the line in case of any non-conformity after communication with HOD QA / Engineer.
- To hold dispatch in case of customer complaint for containment action after instruction from seniors.

12.2.2 PRODUCTION DEPARTMENT:-

Responsibility:-

- To make Production Plan as per requirement.
- To ensure the availability of required Safety Stock at FG area.
- To ensure the Deployment of Manpower as per requirement.
- To solve Quality related issues by coordinating the QA Inspector.
- Ensure the Working of Operators is as per the Work Instruction Sheet.
- Ensure the proper Functioning of Machine in all respects.
- Rejection verification of welding & sub-assembly area.
- Ensure that Maintenance Department is being informed in case of any Breakdown.
- Ensure the availability of Manpower in each Shift as per requirement.
- Ensure the proper filling of Hourly Production Report by Operators.
- Ensure the availability of Child Parts on all Running Stations.
- Measure proper Cleaning of Molds by operators.

Authority:-

- To take corrective action about problems.
- Approve skill matrix for operation.
- To sanction leave of workers.
- To pass the shift schedule of operators.

12.2.3 STORE DEPARTMENT:-

Responsibility:-

- To solve Material related issues by coordinating the purchase & production.
- Ensure the Working of Operators is as per the Work Instruction Sheet.
- To ensure that shelf life of chemical monitored on weekly basis by store operator.
- To ensure that packaging standard is available for all child parts.

- To ensure that stock of development parts are monitored with proper tagging.
- To shift the accepted material to respective storage location.
- To issue material to production lines as per FIFO and transfer in system.
- To ensure that shelf life of chemical monitored on weekly basis by store operator.
- To ensure that stock of development parts are monitored with proper tagging.
- To ensure that shelf life of chemical monitored on weekly basis by store operator.
- Ensure the Working of Operators is as per the Work Instruction Sheet.
- Ensure 5S on all Store.

Authority:-

- If received material found short - debit to supplier short material amount.
- If found damaged material, then inform to purchase as well as supplier.
- If found expired chemical then transfer to scrap yard.
- To take corrective action about problems.
- If material not received as per challan hold the GRN/MRN.
- If material found Damage, hold the material till problem not solved.
- Without Production plan do not issue material to production.

12.2.4 SCM LOGISTIC DEPARTMENT:-

Responsibility:-

- Organize 100 % on time delivery of material to all customers.
- Download schedules from SRM and individual sites and prepare monthly plan based on customer requirement and circulate internally for planning and procurement.
- Prepare weekly Export plan based on customer requirement and circulate internally for planning and procurement.
- Prepare Daily dispatch plan based on customer daily schedule and circulate on daily basis.

- Identify training needs of its employees and develop a skill matrix of the department.
- Planning and Monitoring SPD requirement as per customer schedule.
- Making Packaging standard as per customer requirement.
- To get the FG packed on production lines , put identification label on each trolley / CG box / Bins and get Quality entry done in ERP and store in FG area as per FIFO.
- To handover the invoice , PDI report and returnable challan to vehicle driver.

Authority:-

- To hold consignment due to short quantity , any issue at customer end availability of vehicle.
- Plan to send vehicle against premium freight for commit the customer schedule to avoid line stoppage at customer end.
- To monitor shipments, GRN of every bill at customer end get payment on time.
- If any major changes in schedule it's communicate internally and plan shipment accordingly.
- Do not accept material in non-standard packaging or short quantity from production.

12.2.5 HR & ADMINISTRATION DEPARTMENNT:-

Responsibility:-

- To identify training needs of all employees in consultation with respective department heads and organize training to all its employees.
- To identify skill requirements of all departments in consultation with respective functional heads.
- To provide trained personnel for all manufacturing & verification activities.. To co-ordinate in formulation of personnel policies.

- To co-ordinate for implementation of labor welfare programmed.
- To control administration of security, Housekeeping, Welcoming Guests and providing them required facilities like Hotel accommodations, Conveyance, etc.
- To submit estate and vehicle tax, insurance management and payments of Electricity, Telephone, Water Bills etc.
- To represent the needs of the customers in internal functions in training.
- To ensure that the company's EOHS policy is implemented and maintained in respective area.
- Identifying Operational Control, Compliance to Operational Control.
- To ensure that the company's EOHS policy is implemented and maintained in respective area.
- Will be responsible to keep plant in working conditions by daily PM & timely repair as when required.

Authority:-

- To organize external & internal training programs.
- To stop any activity, process which can leads potential non conformity, hazard to the employees.
- To ensure training effectiveness of all training needs identified of all employees in consultation with HOD's.
- Review hazard, risk assessment sheet & take necessary action to reduce hazards.
- To recruit manpower after approval from Plant head.
- Take appropriate action to comply with legal requirement.
- Review aspect, impact sheet & take necessary action to reduce environmental aspects.
- Conducting training as per training needs.
- To take disciplinary action against defaulters.
- To stop vehicle from entering in company in case of PUC not available or expired.

12.2.6 DESIGN DEPARTMENT:-

Responsibility:-

- Technical presentation to customer.
- SOR (System of Records) study & feedback to customer.
- Costing BOM preparation.
- DFMEA preparation.
- Conduct design reviews.
- ERP BOM preparation & load in system.
- 2D & 3D cad preparation & review.
- Drawing release to concern department.
- Presentation: Internal / Supplier / Customer.

Authority:-

- Maintain all design record.
- ERP BOM change.
- Proposal for Product improvement / Design change.

12.2.7 MAINTENANCE DEPARTMENT:-

Responsibility:-

- Review of Preventive Maintenance schedule plan vs actual.
- To review action plan status on breakdown notifications.
- Check whether the Operators are adequately qualified for Maintenance.
- 'Preventive Maintenance done as per schedule.
- Calibration of instrument & gauges.
- Management of production tooling.
  - Check maintenance record
  - Storage system

- Tool modification record

-Tool identification

- Tool history card life monitoring

Authority:-

- Approve skill matrix for operation.
- Effective implementation of TPM.
- To pass the shift schedule of operators.

12.2.8 PURCHASE DEPARTMENT:-

Responsibility:-

- Organize 100 % on time delivery of material from Supplier as per schedule.
- Monthly delivery rating against monthly & daily Schedules.
- To Review on Min- Max Level of material On Daily basic.
- To solve Material related issues by coordinating the Supplier and TSSW Team.
- Control Freight Cost. And keep eye on premium Freight.
- To take decision on Material related issue on Material HOLD on qulaity and quantity concern.
- To send back rejected material to suppliers and debit the supplier.
- Planning for SPD requirement as per customer schedule and accordingly release the schedule on supplier.
- Identification of New Supplier or New Source as and when required.
- To Monitor Supplier Delivery Performance based on Monthly schedule.
- To plan the activity on Supplier Evaluation dicussing and assessing with the Team.
- If material is on hold due to quality related problem & communicate the concern to the supplier Quality Team for timely action.

- If material found Short, hold the material & communicate the reasons to Supplier and take action.
- Timely communication to Import Supplier well in advance.

Authority:-

- To hold consignment due to short quantity & due to concern with Quality issues.
- Plan Import Shipment against premium freight for commit the customer schedule to avoid line stoppage at customer end.
- If received material found short - debit to supplier short material amount.
- If found damaged material, then inform to Insurance Agent and Transport for reasoning.
- Debit the cost of damaged material to Transporter/ Supplier.

13.MANUFACTURING DEPARTMENT:-

Manufacturing Engineers focus on the design and operation of integrated systems for the production of high-quality, economically competitive products. These systems may include computer networks, robots, machine tools, and materials-handling equipment.

Manufacturing engineer implement Kaizen, Pokayoke, Kanban, etc. tools for continuous improvement in an industry. Department also make SOP (Standard Operating Procedure) and WI (Work Instructions) for production. They also reduce time for doing processes by applying different techniques.

13.1 SOP

A standard operating procedure (SOP) is a set of step-by-step instructions compiled by an organization to help workers carry out complex routine operations. SOPs aim to achieve efficiency, quality output and uniformity of performance, while reducing miscommunication and failure to comply with industry regulations.

The term Safe Work Procedure (SWP) originated in Victoria, Australia, and is predominantly used as a risk management tool by industries throughout Australia, particularly in the mining sector. SWPs are also referred to using other terms, such as Standard Operating Procedure (SOP). A Safe Work Procedure is a step by step description of a process when deviation may cause a loss. This risk control document created by teams within the company describes the safest and most efficient way to perform a task. This document stays in the Health & Safety system for regular use as a template or guide when completing that particular task on site.

13.2 CYCLE TIME REDUCTION

Cycle time reduction is the strategy of lowering the time it takes to perform a process in order to improve productivity.

In addition, cycle time reduction often improves quality. When a cycle time is too close to the takt time, there is little margin for error. If a process is dialed in with very little variation, this is seldom a problem. But most processes have some inconsistency in them, resulting in people falling behind the normal pace on occasion. This leads to them rushing, which, in turn can lead to mistakes. Reducing cycle time is a low cost way to add a bit of a buffer to avoid those sorts of defects.

Standard Work provides the framework to do cycle time reduction. While simply stabilizing a process does not in and of itself reduce cycle time, it provides a foundation upon which to make improvements.

Cycle time reduction is accomplished through a variety of kaizen methods, improving manufacturing fixtures, redesigning parts to make them easier to assembly, improving software, pokayoke processes, and whatever else creative employees can think of.

One important point about productivity that you should remember is Simply reducing cycle time will not improve productivity. There has to be an accompanying change in staffing or increase in output for productivity to improve.

13.3 CONTROL PLAN

A Control Plan is a method for documenting the functional elements of quality control that are to be implemented in order to assure that quality standards are met for a particular product or service. The intent of the control plan is to formalize and document the system of control that will be utilized.

13.4 FMEA

There are numerous high-profile examples of product recalls resulting from poorly designed products and/or processes. These failures are debated in the public forum with manufacturers, service providers and suppliers being depicted as incapable of providing a safe product. Failure Mode and Effects Analysis, or FMEA, is a methodology aimed at

allowing organizations to anticipate failure during the design stage by identifying all of the possible failures in a design or manufacturing process.

14.SAFETY IN INDUSTRY:-

Industrial safety refers to the management of all operations and events within an industry in order to protect its employees and assets by minimizing hazards, risks, accidents, and near misses. Industrial safety covers a number of issues and topics affecting safety of personnel and the integrity of equipment in a particular industry.

The following topics are generally discussed:

- **General Safety** – General aspects of safety which are common to all industries.
- **Occupational Safety and Health** – Particularly associated with the occupation
- **Process and Production Safety**
- **Material Safety**
- **Workplace Safety** – Safety issues directly related to the workplace setting.

- **Fire Safety**
- **Electrical Safety** – Arising from the equipment used.
- **Building and Structural Safety** – Including installations as per existing building code.
- **Environmental Safety** – Concerns the direct and indirect environmental impact of the industry.

15.PROJECT DONE DURING TRAINING:-

I work with my industrial guide for implementing IoT System in an industry.

IoT System:-

The Internet of things (IoT) is the extension of Internet connectivity into physical devices and everyday objects. Embedded with electronics, Internet connectivity, and other forms of hardware (such as sensors), these devices can communicate and interact with others over the Internet, and they can be remotely monitored and controlled.

Introduction and Objective:-

TRW Sun Steering Wheels Pvt. Ltd. wishes to implement Internet of Things (IoT) technology within its Manufacturing Unit located at Pirangut,Pune to help them transform the shop-floor/factory transaction reporting and achieve higher Productivity by connecting Shop-Floor to the Top Floor through near Real-Time Monitoring and Reporting of Machine Performance, Productivity, Downtimes, Production output, etc.

The objective of this Project is to get the visibility of Data from Energy meters, DG sets, and Compressors

With the above objective, TRW had appointed Eastro control systems Pvt ltd., to help carry out this Project.

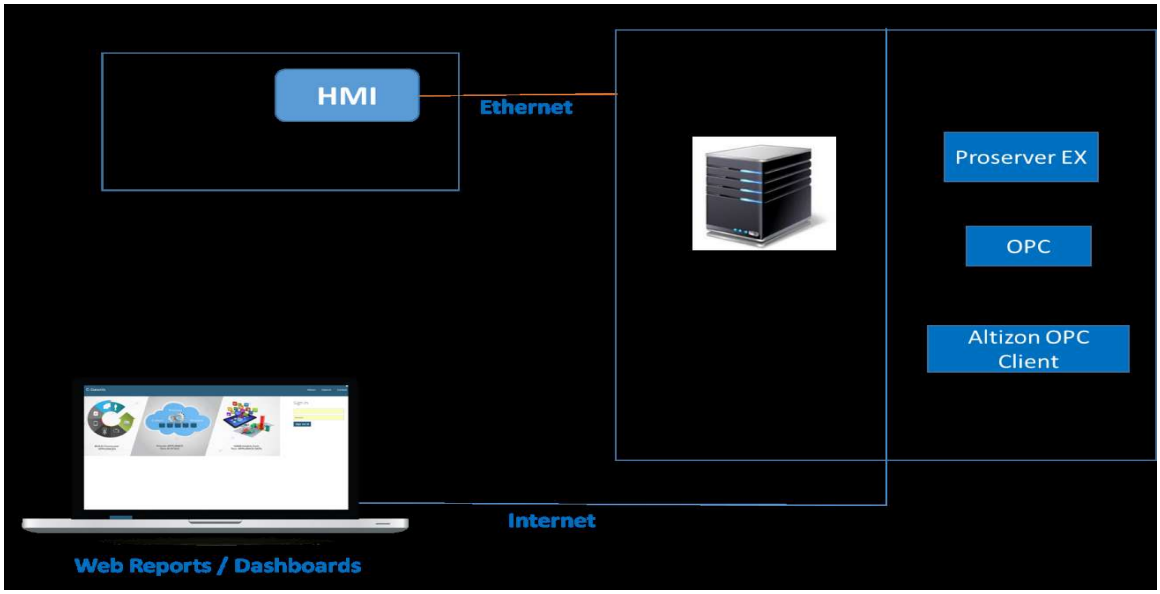
Scope of Work:-

The Scope of work will be to implement IoT at Plant Location for PU1, PU2, B515 MCA, and M & M.

- Equipment / Machine Understanding
- Controllers Analysis for Data Collection
- Understanding number of Tags with help of TRW executives

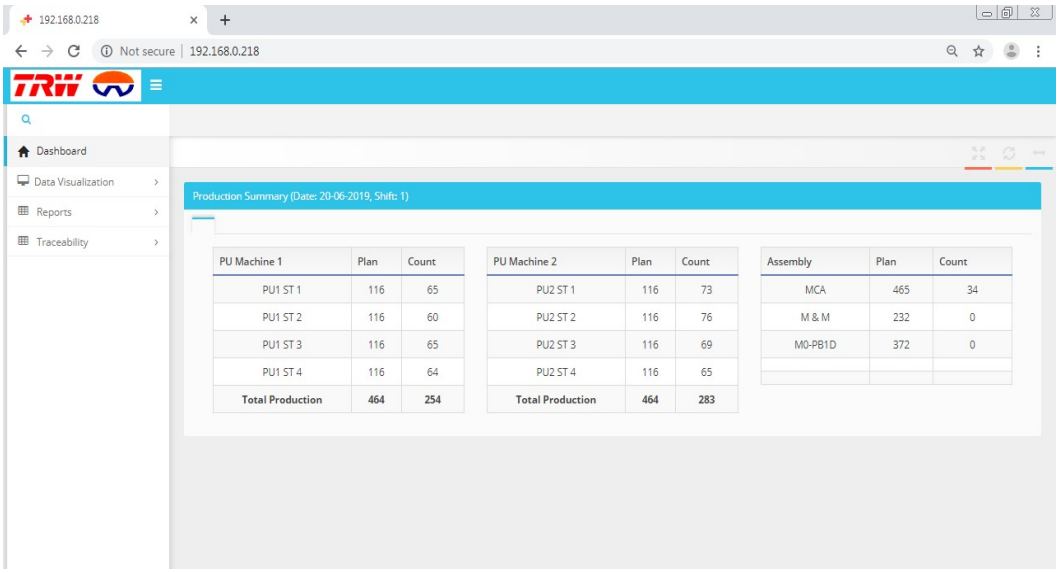
- Data Collection Approach in case of non-availability of Control
- System Understanding Infrastructure Challenges
- Understanding Implementation Challenges
- Compiling Report / Dash Board expectations
- Data collection points shortfall
- Availability of data

Overall Solution Diagram:-

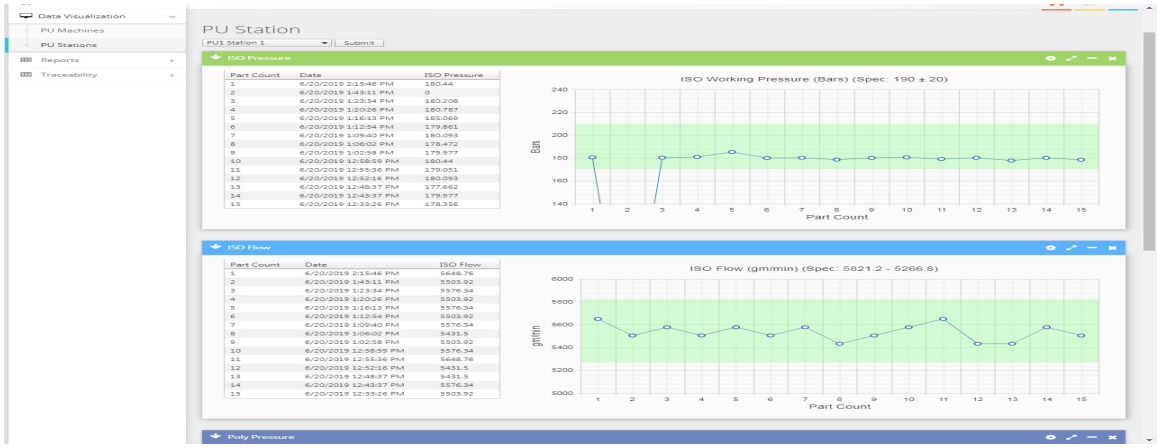


- Proface Data loggers will be connected by Ethernet with the control systems and will send the data to local server
- The Pro-Server EX Software and OPC Server will be installed in the local server
- Pro server will save the data in Excel files.

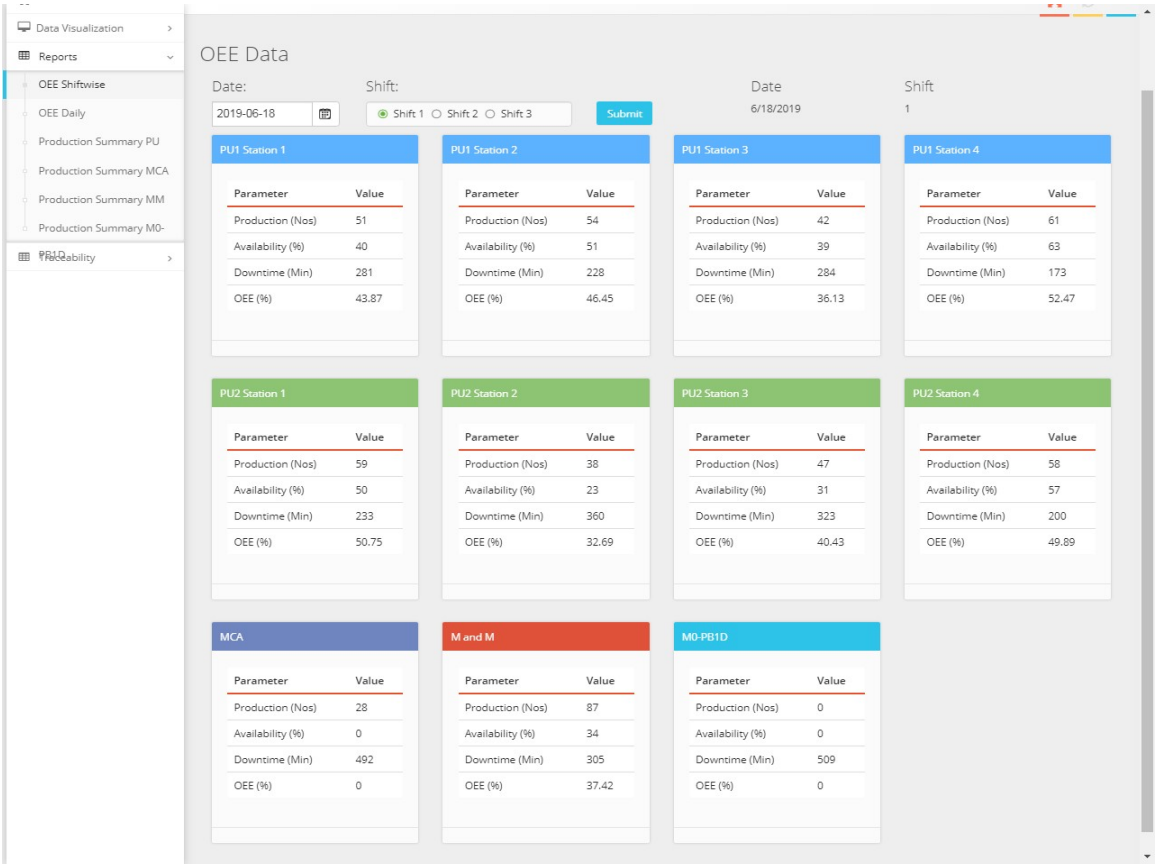
Images of implementation:-



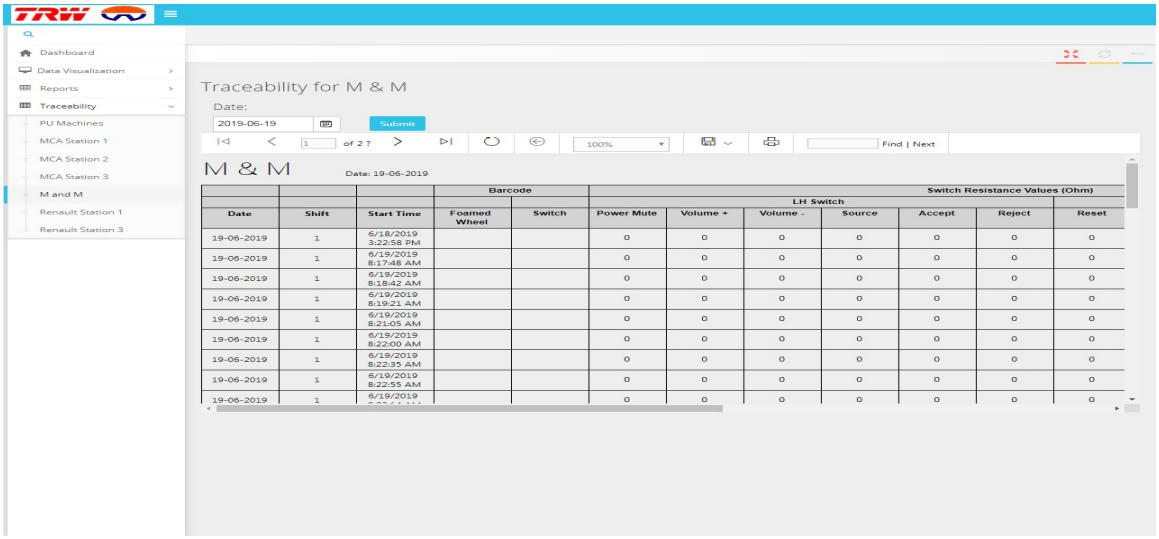
Dashboard



Data Visualization of Different Stations



OEE Data



Traceability of Different Machines

Advantages of Project

- Defects in parts are reduced rapidly, because when machine working specifications is change on IoT system it is immediately shown.
- Productivity is increases rapidly.
- Downtimes is also reduced by implementation of IoT system in an industry.

16.CONCLUSION:-

In my training period I have learned many things and aspects of the company. It was a good experience to work under the guidance of engineer and technicians who shared their profound knowledge with me.

During my training I have practically understood the technical aspects of this organization, the production procedure and have learned about the various problems that arises due to various reasons.

This training will certainly be helpful while problem, which may arise in the working of the organization. Also the various activities like Group Discussion, technical video watch, etc. proved to the medium for the development of profound technical knowledge and my personality.