School of Engineering & Technology

Department of Mechanical Engineering

Academic Year 2024-25

Industrial Visit Report

Industrial Visit- Visit to Ring Plus Aqua Ltd, Sinnar, Nashik

1. Event Title: Industrial Visit Organized by Mechanical Engineering Department, SOET, Nashik, Ring Plus Aqua Ltd, Sinnar, Nashik.

2. Event Date: 12th March 2025

3. Event Conduction Duration: 11:00 am to 2:00 pm

4. Event Mode: Field Visit

5. Event Resource Person Details:

Name of Event Coordinator with contact details:

- Dr. Amit Adhaye, Assistant Prof., MED, SOET, Nashik
- Mr. Akshay Tajane, Assistant Prof., MED, SOET, Nashik

6. Event Outline & Outcome of the event:

Generalities

Industrial zone: A-16/17, STICE, At post – Musalgaon, Tal-Sinnar, Dist. Nashik – 422112,

Country: India

County / Zone: Maharashtra

Objective of Program:

Ring Plus Aqua Ltd., a subsidiary of Raymond Group, is a leading manufacturer of automotive and industrial components, including ring gears, flexplates, and water pump bearings. The visit aimed to understand the company's manufacturing processes, quality control measures, and operational efficiency.

Starter Gear Division

Ring Plus Aqua's Starter Gear Division is specialized in the manufacture of Flywheel Starter Ring Gears for petrol, diesel, gas, flex & hybrid engines. The starter gear division is well equipped with in-house manufacturing set-up including heat treatment to meet the stringent quality requirements.

Starter gear division has 2 units, located nearby & together it has an installed capacity of manufacturing 8.2Mn pc per annum. Further the capacity expansion by 1Mn pcs is in progress.

The State-of-the-art technology used for manufacturing process and measurement systems ensure the highest quality products to meet the demands of our esteemed customers. Our ring gears are in operation world over and working satisfactorily, beyond the rated life in passenger cars, trucks, earth moving equipment, power generators, tractors, marine engines, Lawn movers & Robotics

Ring Plus Aqua, Nashik, is equipped with the latest high-speed 7-axis hobbing machines, ensuring precision and efficiency in manufacturing. The facility incorporates induction normalizing technology, which enhances process control while reducing carbon, SOx, and NOx emissions, contributing to a sustainable environment. To optimize productivity and maintain high-quality standards, value stream lines are implemented for runners. Additionally, the plant features online integrated CNC hardening and tempering equipment for superior heat treatment processes. With world-class precision measuring equipment and advanced measurement systems, quality assurance is a top priority. The company has also embraced

Industry 4.0, leveraging smart manufacturing technologies to improve productivity, enhance operational control, and support green energy initiatives.

Manufacturing Process of Starter Gear

The production of a starter gear involves multiple precision engineering steps to ensure durability, accuracy, and high performance. Below is the step-by-step manufacturing process:

1. Raw Material Selection & Preparation: High-quality alloy steel (e.g., SAE 8620 or SCM420) is commonly used for its strength and wear resistance. The raw material is cut into required lengths using a band saw or circular saw.

2. Forging & Pre-Machining: The cut steel pieces are heated in an induction furnace to a suitable forging temperature (about 1200°C).The material is forged into a rough gear shape using a drop hammer or press forging process. Flash removal and basic surface cleaning are performed. Pre-machining on CNC lathes ensures dimensional accuracy before gear cutting.

3. Gear Cutting (Hobbing/Shaping): Gear teeth are cut using CNC hobbing or shaping machines to achieve precise tooth profiles. Advanced 7-axis CNC hobbing machines ensure high accuracy and consistency. The gear is then chamfered and deburred to remove sharp edges.

4. Heat Treatment (Induction Hardening & Tempering): The gear undergoes induction hardening to enhance wear resistance.A controlled heating and quenching process ensures the teeth surface becomes hard while the core remains tough. Tempering is done in a continuous mesh belt furnace to reduce internal stresses and improve toughness.

5. Grinding & Superfinishing: After heat treatment, gears are hard ground using CNC internal and external grinders to achieve precise dimensions and smooth tooth surfaces. Superfinishing machines further refine surface quality to reduce friction and noise.

6. Balancing & Inspection: CNC-controlled static balancing ensures even weight distribution, minimizing vibrations during operation. Each gear undergoes stringent quality checks using advanced inspection systems, including: Coordinate Measuring Machines (CMM),Gear Profile Testers, Hardness Testers, Noise and Runout Testing

7. Assembly & Final Testing: The starter gear is integrated with other starter motor components.100% online noise testing ensures smooth and silent operation. The finished gear undergoes reliability testing in an in-house validation lab to ensure compliance with industry standards.

8. Packaging & Dispatch: Once approved, the starter gears are coated with rust-preventive oil and packed securely. They are shipped to automotive manufacturers or spare parts suppliers.

Shaft Bearing Division

Ring Plus Aqua's Shaft Bearing Division is a specialized bearing unit dedicated solely to the manufacture of Integral Shaft (Water Pump) Bearings in Ball/Ball and Ball/Roller configuration for automotive application. The company started commercial production in March, 1989. It has an installed capacity of manufacturing 3.9 million pieces per annum. Further the capacity expansion by 1.7Mn pcs is in progress.

There is an ever increasing demand for highly durable water pump bearings to meet the growing performance & reliability parameters of modern automotive engines. Having the design engineering capability & sophisticated manufacturing processes, we are capable of delivering wide range of bearings as per OEM specifications. Our integrated design validation test rigs & reliability laboratory only adds to our competency and high quality standards. Today, the Water Pump Bearings of Ring Plus Aqua Limited, not only commands a respectful position in the Indian market, but are also exported to the quality conscious markets of the Europe, Brazil & USA.

1. Raw Material Selection: The process begins with the careful selection of raw materials, primarily high-quality alloy steels such as chrome steel (52100) or stainless steel. These materials are chosen for their excellent wear resistance, hardness, and fatigue strength, which are essential for the durability of bearings

.**2. Bar Stock Cutting:** After selecting the raw materials, cylindrical bars are cut into smaller pieces known as blanks. This initial step is crucial as it sets the foundation for the bearing components

3. Machining Processes: The blanks undergo various machining processes including:

CNC Turning: This process shapes the bearing components to precise dimensions using Computer Numerical Control (CNC) machines.

Grinding: Following turning, grinding is performed to achieve accurate dimensions and surface finishes necessary for optimal performance

Super Finishing: This step ensures that the roughness values of the raceways and rollers are controlled to below 0.16 microns, enhancing performance and longevity

4. Heat Treatment: Heat treatment processes such as hardening, super cooling, and tempering are applied to stabilize the ring structure of the bearings. This treatment significantly increases their lifespan and performance under operational stresses

.**5. Assembly:**Once all components are machined to specification, they are assembled into complete bearing units. This assembly includes press-fitting inner and outer rings onto rolling elements and installing cages or retainers

6. Lubrication: Lubrication is applied during assembly using high-quality grease or oil to reduce friction and protect against wear and corrosion, ensuring smooth operation of the bearings

7. Quality Control: Throughout the manufacturing process, stringent quality control measures are implemented. Each component is visually inspected and tested for dimensional accuracy before assembly. The final products undergo rigorous testing to ensure they meet specified performance standards

8. Packaging: After passing all quality checks, the bearings are packaged in a manner suitable for export, ensuring they remain undamaged during transit

This comprehensive approach allows Ring Plus Aqua's Shaft Bearing Division to produce up to 3.9 million bearings annually, catering to both domestic and international markets with a

focus on quality and reliability.

Ring Plus Aqua boasts a state-of-the-art bearing manufacturing setup, featuring advanced CNC induction hardening, continuous mesh belt furnaces, CNC internal and external grinders, and superfinishing machines to ensure high precision and durability. The facility is equipped with automated assembly lines and conducts 100% online noise testing of bearings to maintain superior quality standards. By utilizing simulation software for sensitivity analysis and virtual product design, the company enhances product development efficiency while significantly reducing lead times. Additionally, its supply chain management (SCM) and vendor-managed inventory (VMI) capabilities enable streamlined operations. The flexible manufacturing setup further allows the company to cater to lower volume production requirements with ease.

Flexplates Division

Flexplates are manufactured in the Starter Gear Division (Unit 1) of Ring Plus Aqua. With sophisticated manufacturing line, stringent process controls & enhanced design validation & testing facility, RPAL has proven its flexplate capability by offering complete design solution with advanced CAE & simulation Software. We have in-house presses & expertise in tool design to develop numerous intricate shapes along with laser & CO2 welding machines. It has an installed capacity 0.6mn pieces per annum

Ring Plus Aqua has developed heavy duty flexplates, which are used in the racing car application, Medium / heavy duty engines which has power output of ~600hp. These flex plates are approved by the SFI, a governing body in the US which ensures that the flexplates are made to satisfy the extremely high standards in terms of safety and durability.

Ring Plus Aqua offers a comprehensive design and development solution, enabling seamless product innovation and optimization. The company utilizes concurrent engineering to accelerate new product development, ensuring faster time-to-market. Its precision press shop, along with state-of-the-art CNC LASER and MIG welding machines, guarantees high-quality manufacturing. Additionally, the facility features a CNC-controlled static balancing process to enhance product performance and durability. With stringent process controls and an advanced inspection system, quality assurance is meticulously maintained at every stage. To further validate product reliability and design integrity, the company operates an in-house reliability lab dedicated to rigorous testing and validation.

Output of Program:

Number Students Attended: 24

Event photos:


RING AQUA
A Subsidiary of raymond Ltd.
RING PLUS AQUA LIMITED
STARTER GEAR DIVISION- UNIT - II
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