



# Koneru Lakshmaiah Education Foundation

(Category -1, Deemed to be University estd. u/s. 3 of the UGC Act, 1956)

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Campus: Green Fields, Vaddeswaram - 522 302, Guntur District, Andhra Pradesh, INDIA.

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## DEPARTMENT OF MECHANICAL ENGINEERING

### INDUSTRIAL VISIT REPORT - Kusalava International Ltd., Adavinekkalum, and G S Alloy Castings Pvt. Ltd., Surampalli

The III B.Tech students of the Mechanical Engineering Department visited Kusalava International Ltd., Adavinekkalum, and G S Alloy Castings Pvt. Ltd., Surampalli, for an industrial visit on 14.03.2025. The purpose of the visit was to gain practical exposure to industrial operations. As part of the visit, 40 students and 2 faculty members observed the foundry and machining shops, where they received a brief overview of the processes.

**Kusalava International Ltd**, established in 1964, is a prominent manufacturer of critical engine components, notably cylinder liners, catering to both original equipment manufacturers (OEMs) and aftermarket clients in India, the USA, and Europe. The company's headquarters are located in Vijayawada, Andhra Pradesh, India.





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## Products Manufactured:

At the Adavinekkalum plant, Kusalava specializes in producing cylinder liners for a diverse range of applications, including:

- Heavy Commercial Vehicles (HCV) and Light Commercial Vehicles (LCV): Supplying to prominent manufacturers such as Ashok Leyland, Tata Motors, and Volvo.
- Tractors: Catering to brands like John Deere and Mahindra.
- Passenger Cars: Providing components for various car models.
- Industrial and Off-Highway Vehicles: Serving companies like Kirloskar and V.S.T. Tillers.
- Two-Wheelers and Racing Vehicles: Supplying high-performance liners for motorcycles and racing applications.



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## The plant's manufacturing capabilities encompass:

- Inner Diameter: 20 to 180 mm
- Outer Diameter: 22 to 200 mm
- Total Length: 65 to 400 mm
- Weight Range: 1 to 50 kg
- Materials Used: Grey Iron, Ductile Iron, Bainitic Iron, and Steel

## Manufacturing Process Steps

The production of cylinder liners at Kusalava's Adavinekkalum plant involves several meticulous steps:

- Melting: Raw materials are melted using Inductotherm induction furnaces to achieve the desired chemical composition.



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- Centrifugal Casting: The molten metal is poured into rotating molds, ensuring uniform distribution and minimizing defects.



- Heat Treatment: Processes such as normalizing, annealing, and hardening are employed to enhance mechanical properties and relieve internal stresses.
- Machining: Precision machining operations, including turning, boring, and honing, are performed to achieve exact dimensions and surface finishes.
- Surface Treatment: Techniques like phosphating and deep rolling are applied to improve corrosion resistance and enhance flange strength.
- Inspection and Quality Control: Comprehensive inspections are conducted at various stages to ensure adherence to stringent quality standards.

### Equipment and Automation

Kusalava's commitment to technological advancement is evident in its state-of-the-art equipment and automation:

- Induction Furnaces: Utilized for efficient and controlled melting of raw materials.



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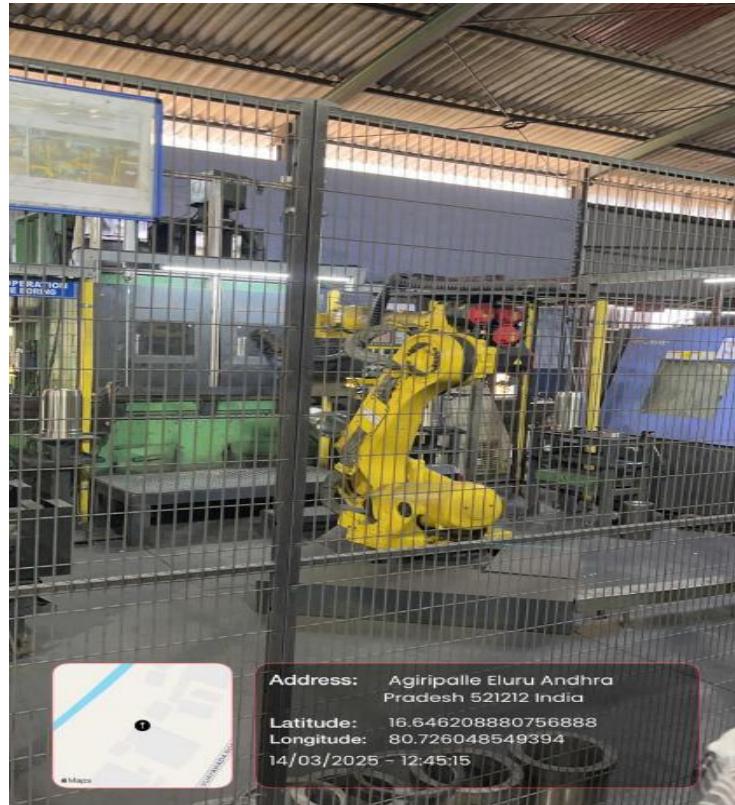
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- Automated Carousel Machines: Employed for consistent and precise casting operations.



- Centrifugal Casting Machines: Ensure high-quality, defect-free castings through uniform metal distribution.
- Shot Blasting Machines: Used for surface cleaning and preparation, enhancing the adhesion of subsequent treatments.
- Heat Treatment Facilities: Advanced setups for processes like annealing and hardening to achieve desired material properties.
- Parting Off Machines: Ensure precise separation of castings, maintaining dimensional accuracy.



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### Inspection Facilities

- Maintaining high-quality standards is paramount at Kusalava. The plant is equipped with:
- Spectro Labs: For precise chemical analysis of materials.
- Zeiss Metallurgical Microscope with Photographic Attachment: Allows detailed examination and documentation of microstructures.
- Image Analyzers: Assist in accurate measurement and analysis of material features.
- Nodularity Testing Equipment: Ensures the desired nodular graphite structure in ductile iron castings.
- Universal Testing Machines: Evaluate mechanical properties such as tensile strength and elongation.
- Hardness Testing Machines (Vickers, Brinell, and Rockwell): Determine material hardness levels.
- Flange Strength Checking Machines: Specifically designed to assess the strength and durability of flanges.

Kusalava International Ltd's Adavinekkalum plant exemplifies a harmonious blend of traditional manufacturing expertise and modern technological advancements, ensuring the production of high-quality engine components that meet global standards.



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**G.S. Alloy Castings Private Limited**, established in 1987, operates a state-of-the-art foundry located in Surampalli Village, Gannavaram Mandal, Andhra Pradesh, India. The company specializes in manufacturing a diverse range of ferrous and non-ferrous metal castings, serving various industrial sectors.



### Product Range

The company's product portfolio includes:

- Iron and Steel Castings: Manufacturing various types of iron and steel castings, including grey iron, alloy iron, ductile iron, malleable iron, and steel castings.
- Non-Ferrous Metal Castings: Producing castings using metals such as brass, copper, aluminum, magnesium, nickel, and chromium.
- Specialized Alloy Castings: Developing castings with specific alloy compositions to meet unique industrial requirements.



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### Process Steps

The manufacturing process at G.S. Alloy Castings involves several key stages:

- Pattern Making: Creating precise patterns based on the desired casting design, which serve as molds for shaping the castings.
- Molding: Preparing molds using sand or other refractory materials to form the cavity into which molten metal will be poured.
- Melting: Melting the selected metal or alloy in furnaces to achieve the required temperature and composition.
- Pouring: Carefully pouring the molten metal into the prepared molds to form the castings.
- Cooling and Solidification: Allowing the molten metal to cool and solidify within the mold, forming the final casting shape.
- Shakeout and Cleaning: Removing the solidified castings from the molds and cleaning off any residual molding material.
- Heat Treatment: Subjecting the castings to controlled heating and cooling cycles to achieve desired mechanical properties.
- Finishing: Performing operations such as grinding, machining, and surface treatment to meet specific dimensional and surface finish requirements.

### Equipment

To ensure efficient and precise manufacturing, G.S. Alloy Castings employs advanced equipment, including:



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- **Furnaces:** Utilizing induction and electric arc furnaces for melting various metals and alloys.
- **Molding Machines:** Employing both manual and automated molding machines to create accurate molds.
- **Heat Treatment Furnaces:** Using controlled atmosphere furnaces for heat treatment processes to enhance material properties.
- **Machining Centers:** Equipped with CNC machines and lathes for precise machining and finishing operations.

### Inspection Facilities

Quality assurance is a critical aspect of G.S. Alloy Castings' operations, supported by comprehensive inspection facilities:

- **Chemical Analysis:** Conducting spectrographic analysis to verify the chemical composition of metals and alloys.
- **Mechanical Testing:** Performing tensile, hardness, and impact tests to assess mechanical properties.
- **Non-Destructive Testing (NDT):** Utilizing techniques such as ultrasonic testing, radiography, and magnetic particle inspection to detect internal and surface defects.
- **Dimensional Inspection:** Employing coordinate measuring machines (CMM) and other precision instruments to verify dimensional accuracy.



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### Product Corrections

To address any deviations or defects identified during inspection, the company implements corrective measures:

- Defect Analysis: Investigating the root cause of defects through metallurgical analysis and process evaluation.
- Rework and Repair: Performing necessary rework or repairs on defective castings to meet quality standards.
- Process Improvement: Implementing continuous improvement initiatives to enhance process controls and prevent recurrence of defects.

Through meticulous process control, advanced equipment, and stringent quality assurance practices, G.S. Alloy Castings Private Limited ensures the delivery of high-quality castings that meet the diverse needs of its clientele across various industries.

Finally, Dr. B. Kiran Kumar, Associate Professor, and Dr. P. Raj Kumar, Assistant Professor, expressed their gratitude to the management of Kusalava International Ltd. and G S Alloy Castings Pvt. Ltd. for facilitating the industrial visit.

Prepared by

Dr. B Kiran Kumar

Authorized by

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