

INDUSTRIAL VISIT REPORT

Maharashtra State Power Generation Company Ltd. (MAHAGENCO)

1. Introduction

Industrial visits provide students with practical exposure to real-world industrial operations. The visit to Maharashtra State Power Generation Company Ltd. (MAHAGENCO) was organized to help students understand power generation through Gas Turbine and Steam Power Plants.

This visit aimed to bridge the gap between theoretical learning and industrial applications by giving students first-hand exposure to power plant operations, efficiency measures, environmental considerations, and advanced industrial techniques such as Gas Cladding.

2. Industry Details

- **Name of Industry:** Maharashtra State Power Generation Company Ltd. (MAHAGENCO)
- **Location:** VXJC+Q57, Bhendkhal Rd, Navi Mumbai, Maharashtra 400702
- **Date of Visit:** April 3, 2025
- **Industry Type:** Power Generation (Gas Turbine and Steam Power Plant)
- **Duration:** 4-5 hours
- **Accompanying Faculty:** Prof. Amruta Karwe
- **Number of Students:** 26

3. Plant Layout

A power plant layout consists of various sections, each playing a critical role in power generation. Below is an overview of the MAHAGENCO plant layout observed during the visit:

Main Sections of the Plant:

1. **Fuel Storage & Handling Unit** – Stores coal, natural gas, and other fuels used for power generation.
2. **Boiler Section** – Where fuel combustion takes place to generate steam for turbines.
3. **Turbine Section** – Converts steam or gas energy into mechanical energy.
4. **Generator Section** – Converts mechanical energy into electrical energy.
5. **Cooling System** – Includes condensers and cooling towers to manage heat dissipation.
6. **Water Treatment Plant** – Ensures high-quality water is used in the boilers and cooling systems.
7. **Gas Cladding Unit** – Used for protective coating of turbine and boiler components.
8. **Control Room** – Monitors and controls power generation operations.
9. **Transmission Unit** – Transfers generated electricity to the grid for distribution.

10. **Safety & Emission Control Units** – Houses pollution control measures like electrostatic precipitators and gas treatment units.

This layout ensures smooth operation, **maximizing efficiency and minimizing environmental impact.**

4. Objectives of the Visit

The main objectives of the visit were:

- **To understand the working principles** of Gas Turbine and Steam Power Plants.
- **To compare power generation techniques** using gas turbines and steam turbines.
- **To observe and study key components** such as boilers, turbines, generators, and cooling systems.
- **To learn about Gas Cladding technology and its applications** in power plants.
- **To gain knowledge about automation, efficiency optimization, and grid management.**
- **To understand environmental impacts and safety measures** in power generation.

5. Summary of Activities

5.1 Introduction and Briefing Session

The visit began with an **introductory session by MAHAGENCO officials**, where they provided an overview of:

- **MAHAGENCO's role in Maharashtra's power sector.**
- **Working principles of Gas Turbines and Steam Turbines.**
- **Power plant capacity, efficiency, and energy management strategies.**
- **Environmental impact, emission control measures, and Gas Cladding technology**

5.2 Plant Tour and Observation

The students were guided through different sections of the **Gas Turbine Plant, Steam Power Plant, Water Treatment Plant, and Gas Cladding section** to gain an in-depth understanding of power generation and resource management.

A. Gas Turbine Power Plant

This plant operates on the **Brayton Cycle**, where compressed air is mixed with fuel, ignited, and expanded to drive a turbine.

- **Air Intake & Compression** – Observed the filtering and compression of air before combustion.
- **Combustion Chamber** – Studied the **fuel-air mixture burning process** to produce high-energy exhaust gases.

- **Gas Turbine Section** – Understood how expanding gases rotate turbine blades to generate mechanical energy.
- **Heat Recovery Steam Generator (HRSG)** – Examined the waste heat recovery process for efficiency improvement.
- **Emission Control** – Learned about NOx reduction technologies and gas treatment techniques.

B. Steam Power Plant

The **Steam Power Plant** follows the **Rankine Cycle**, where water is heated to produce steam, which drives turbines.

- **Boiler Section** – Studied how coal/natural gas is **combusted** to generate **high-pressure steam**.
- **Steam Turbine Operation** – Observed how steam energy is **converted into mechanical energy** to drive generators.
- **Cooling System** – Understood how hot steam is **condensed and recycled** for continuous operation.
- **Water Treatment** – Examined the **importance of purified boiler feedwater** in preventing corrosion and scaling.
- **Energy Efficiency Measures** – Learned about **heat recovery steam generators (HRSG)** and their role in efficiency improvement.

C. Water Treatment Plant

The **Water Treatment Plant** plays a critical role in maintaining **boiler efficiency and environmental sustainability**. Students learned about:

- **Water Intake & Filtration** – Removing impurities before use in power plants.
- **Chemical Treatment** – Studied how **hardness-causing minerals** like calcium and magnesium are removed.
- **Reverse Osmosis & Demineralization** – Observed the **purification process** for producing **high-quality feedwater**.
- **Cooling Water Treatment** – Examined how cooling water is **treated and recycle**

D. Gas Cladding Technology

Gas Cladding is an **advanced coating technology** used in power plants to enhance the durability and performance of metal components. The students learned about:

- **Purpose of Gas Cladding** – Protects turbine blades and boiler tubes from **high-temperature corrosion and wear**.
- **Process of Gas Cladding** – Studied how a **protective metallic or ceramic coating** is applied to surfaces using a gas-based deposition technique.
- **Benefits** – Improves the **efficiency and lifespan** of power plant components by **reducing oxidation, corrosion, and material degradation**.

5.3 Environmental and Safety Measures

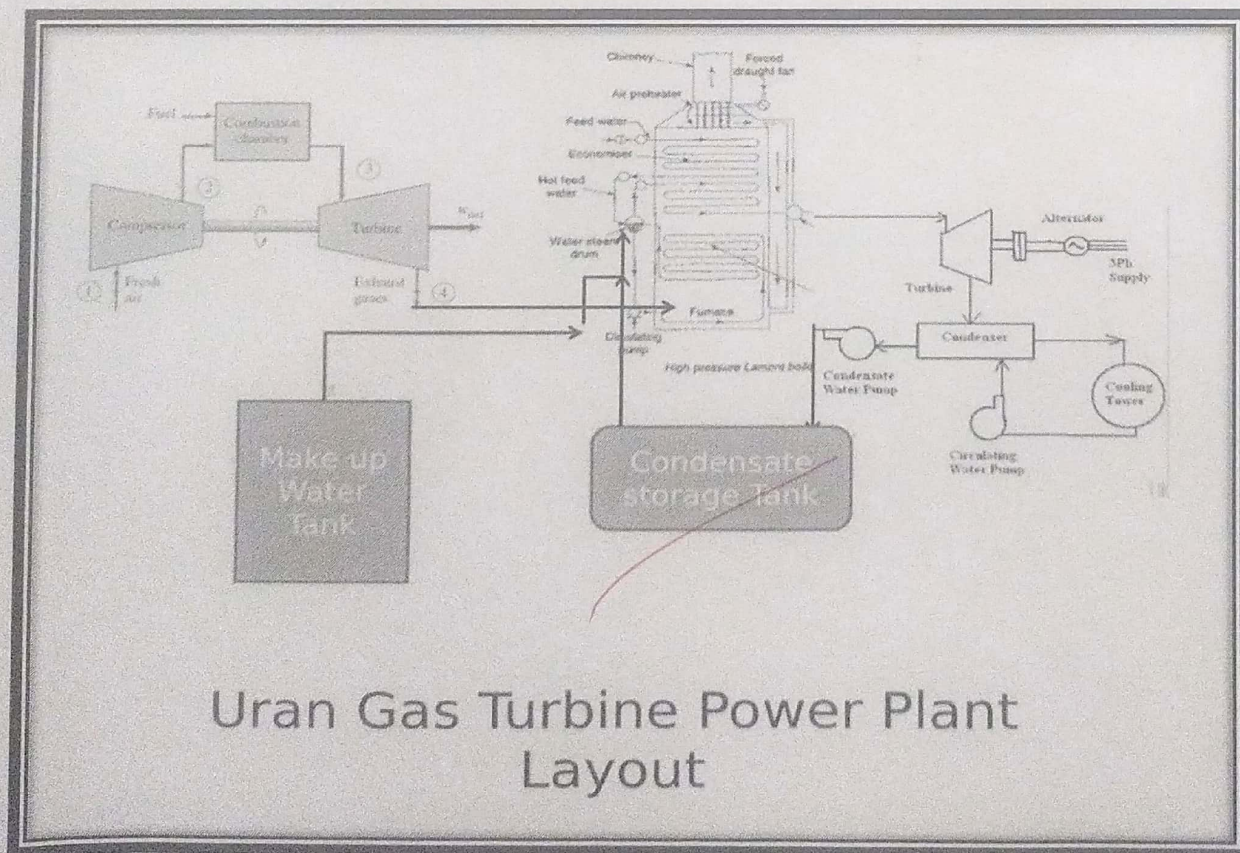
MAHAGENCO follows strict environmental and safety protocols to ensure sustainable power generation. Key measures include:

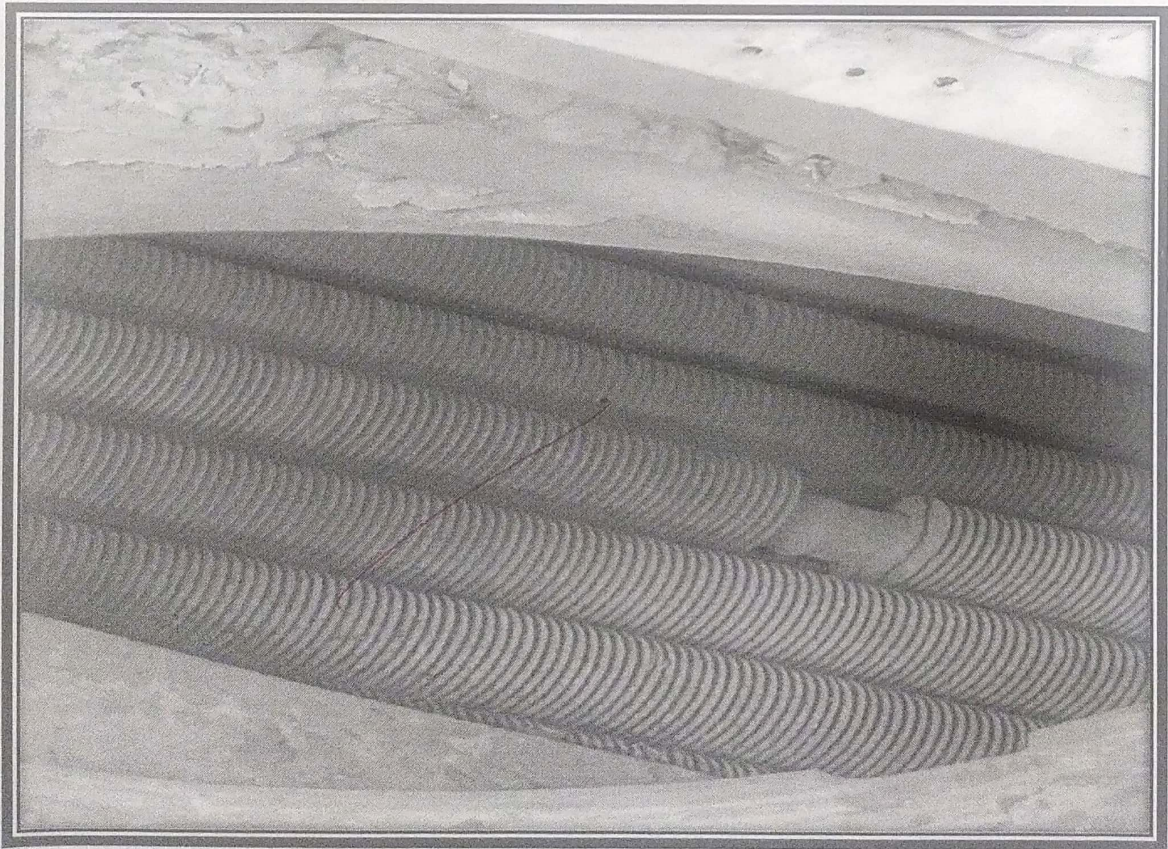
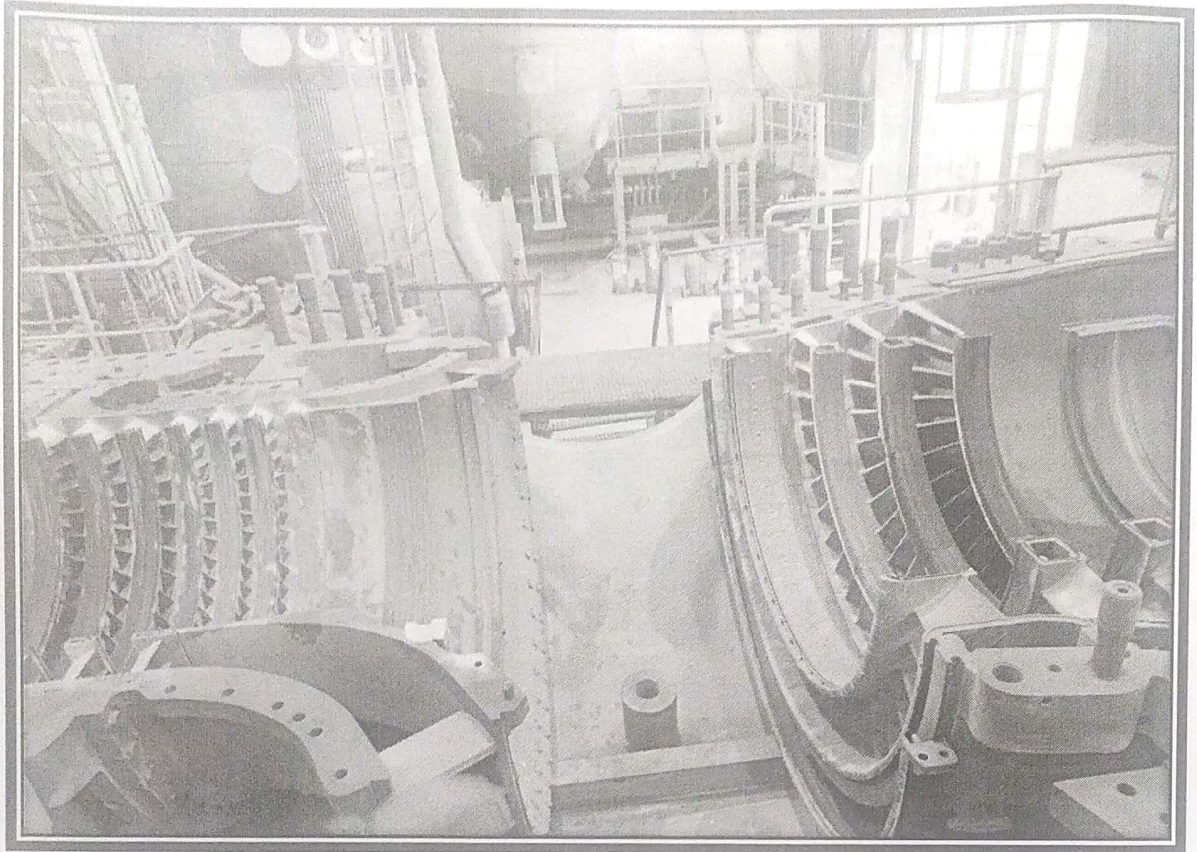
- **Emission Control:** Low-NO_x burners, electrostatic precipitators, and desulfurization units to reduce pollution.
- **Water Conservation:** Recycling of cooling water and efficient wastewater treatment.
- **Waste Management:** Proper handling and utilization of fly ash and bottom ash.
- **Safety Measures:** Use of PPE (Personal Protective Equipment), emergency shutdown systems, and fire safety protocols.

6. Conclusion

The industrial visit to MAHAGENCO (Navi Mumbai Plant) on April 3, 2025, was a valuable learning experience. The addition of Gas Cladding technology and Plant Layout study provided deeper insight into advanced material protection and power plant efficiency.

This educational visit enhanced students' knowledge and industry readiness, making it a highly insightful and informative experience.







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