Report on Industrial Visit

To

RELIANCE THERMAL POWER PLANT, DAHANU

Submitted By:

Gokul Mohandas (112A6007)

Third Year Mechanical Engineering,

SIES Graduate School of Technology,

Sri Chandrasekarendra Saraswathy Vidyapuram,

Plot 1-C, D, E, Sector V, Nerul, Navi Mumbai - 400706

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INTRODUCTION TO THE COMPANY:

Reliance Power Limited, a part of the Reliance Anil Dhirubhai Ambani Group, was established to develop, construct and operate power projects in the domestic and international markets. Reliance Energy Limited, an Indian private sector power utility company along with the Anil Dhirubhai Ambani Group promotes Reliance Power. It ranks among India's top listed private companies on all major financial parameters, including assets, sales, profits and market capitalization.

A constituent of the Reliance -Anil Dhirubhai Ambani Group,Reliance Energy is India 's foremost private sector utility with aggregate estimated revenues of Rs 9,500 crore (US$2.1 billion)and total assets of Rs 10,700 crore (US$2.4 billion). Reliance Energy distributes more than 21 billion units of electricity to over 25 million consumers in Mumbai, Delhi, Orissa and Goa, across an area that spans 1,24,300 sq.kms. It generates 941 MW of electricity, through its power stations located in Maharashtra, Andhra Pradesh, Kerala, Karnataka and Goa.

Reliance Energy is currently pursuing several gas, coal, wind and hydro-based power generation projects in Maharashtra, Uttar Pradesh, Arunachal Pradesh and Uttaranchal with aggregate capacity of over 12,500 MW. These projects are at various stages of development.

INTRODUCTION TO RELIANCE THERMAL POWER PLANT, DAHANU:

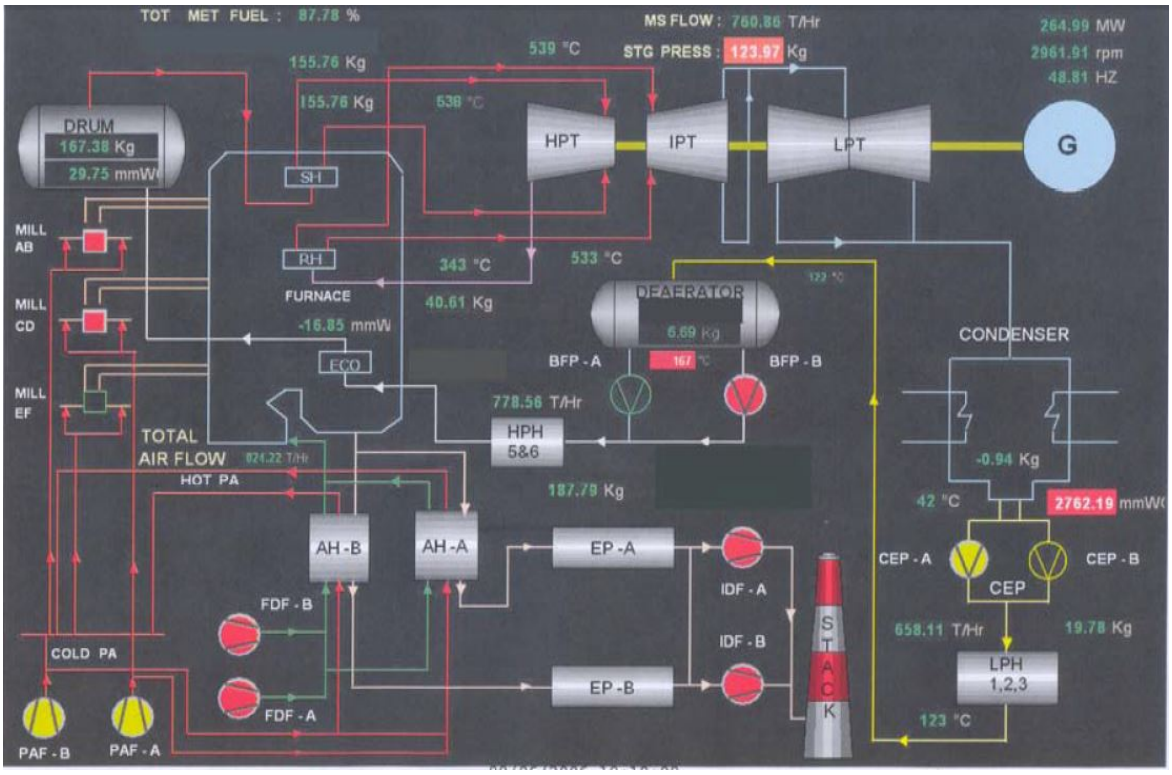
Dahanu Thermal Power Station (DTPS) started its commercial operations in January 1996. As fuel, the plants use a mix of Indian washed coal and imported coal. The general blending ratio is 80: 20. The indigenous fuel is supplied from SECL (Korba) which is located about 1400 Kilometers from the plant site. Imported coal is received from various countries like Indonesia, South Africa. The plant has a generation capacity of 500 MW and supply power to suburban Mumbai. The company claims that it supply power at the cheapest tariff of Rs 2.45 per unit compared to other power utilities. The plant has got many awards for its distinctive features in terms of performance, technological innovation and sustainability. The plant is the first Power Company to be certified ISO 14001 for its environmental management system & ISO 9001for its quality management System.

MAJOR MILESTONES & ACHIEVEMENTS:

- The land development commenced in the year 1990
- The main plan contract got finalized in the year 1991
- Unit #1 was synchronized on 6th January 1995 and Unit No. 2 was synchronized on 29th March 1995.
- The power station commercially commenced its operation in 1996.

OVERVIEW OF THE PLANT:

In a coal based power plant coal is transported from coal mines to the power plant by railway in wagons or in a merry-go-round system. Coal is unloaded from the wagons using wagon tippler units, to a moving underground conveyor belt. This coal from the mines is of no uniform size. So it is taken to the Crusher house and crushed to a size of 20mm. From the crusher house the coal is either stored in dead storage (generally 40 days coal supply) which serves as coal supply in case of coal supply bottleneck or to the live storage(8 hours coal supply) in the raw coal bunker in the boiler house. Raw coal from the raw coal bunker is supplied to the Coal Mills by a Raw Coal Feeder. The Coal Mills or pulverizer pulverizes the coal to 200 mesh size. The powdered coal from the coal mills is carried to the boiler in coal pipes by high pressure hot air. The pulverized coal air mixture is burnt in the boiler in the combustion zone. Generally in modern boilers tangential firing system is used i.e. the coal nozzles/ guns form tangent to a circle. The temperature in fire ball is of the order of 1300˚C. The boiler is a water tube boiler hanging from the top. Water is converted to steam in the boiler and steam is separated from water in the boiler Drum. The saturated steam from the boiler drum is taken to the Low Temperature Superheater, Platen Superheater and Final Superheater respectively for superheating. The superheated steam from the final superheater is taken to the High Pressure Steam Turbine (HPT). In the HPT the steam pressure is utilized to rotate the turbine and the resultant is rotational energy. From the HPT the out coming steam is taken to the Reheater in the boiler to increase its temperature as the steam becomes wet at the HPT outlet. After reheating this steam is taken to the Intermediate Pressure Turbine (IPT) and then to the Low Pressure Turbine (LPT). The outlet of the LPT is sent to the condenser for condensing back to water by a cooling water system. This condensed water is collected in the Hotwell and is again sent to the boiler in a closed cycle. The rotational energy imparted to the turbine by high pressure steam is converted to electrical energy in the Generator.



PLANT FEATURES:

- Plant Capacity : 2X250 MW
- Land for Plant : 351.58 Hectares
- Land for ash disposal area : 370.00 Hectares
- Total Coal (Washed + Imported) : 2.1 Million tons
- Sea water (Condenser cooling) : 84,000 (M3/Hr)
- Sweet Water : 300 (M3/Hr)

MAJOR COMPONENTS SPECIFICATIONS:

(I) Steam Turbine:

Steam turbines have been used predominantly as prime mover in all thermal power stations. The steam turbines are mainly divided into two groups: -

- Impulse Turbine
- Impulse-reaction Turbine OR Reaction Turbine

The turbine generator consists of a series of steam turbines interconnected to each other and a generator on a common shaft. The turbines are in 3 stages of High Pressure Turbine, Intermediate Pressure Turbine & Low Pressure Turbine.

(a) **High Pressure Turbine:** It consists of a total of 19 stages out of which 1st stage is Impulse Type while remaining 18 stages are of Reaction type. The inlet conditions are, 520 ˚C temperature & 150kg/cm2 pressure. The outlet conditions are, 340 ˚C temperature & 40kg/cm2 pressure.

(b) **Intermediate Pressure Turbine:** It consists of 17 Reaction Turbine stages. The inlet conditions are 533 ˚C temperature & 37kg/cm2 pressure.

(c) **Low Pressure Turbine:** It consists of 16 Reaction Turbine stages.

The specification of Steam turbine used in the plant is:

Make	: BHEL, Kraft Work Union Design
Rated Load	: 250MW
Max Load under valve wide open	: 262MW
Construction	: Three Cylinder Reheat Condensing Turbine

(II) Boiler:

A Boiler or steam generator essentially is a container into which water can be fed and steam can be taken out at desired pressure, temperature and flow. This calls for application of heat on the container. For that the boiler should have a facility to burn a fuel and release the heat.

The specification of Boiler used in the plant is:

Manufacturer	: BHEL (C.E. Design)
Type	: Natural circulation, Balance draft, double pass, Single drum, Single reheat, direct pulverized coal fired water impounded bottom. (Gas firing & gas regulating system, provision for future)
Boiler design (Pressure & Temp)	: 182.5 Kg/cm2 & 5400 C
Boiler Designation	: 1524019963.51150614263.5
Type of firing	: Tilting tangential

TECHNICAL SPECIFICATIONS:

- The thermal plant at Dahanu uses a mix of washed coal and imported coal as fuel and the general blending ration is 80:20. The indigenous fuel is received from SECL (Korba), which is located about 1400 Kms from the plant site. Imported coal is received from various countries like Indonesia, South Africa etc.
- The CW Systems are equipped with concrete volute pumps to facilitate the smooth functioning of Cooling Water System.
- Complete automatic control & monitoring of the three cylinders reheat condensing turbine, boiler and auxiliaries by Digital Distributed Control, Monitoring and Information System. (DDC-MIS)
- The Dahanu Thermal Power Station is known for possessing the tallest chimney (275.3 mtrs) in the country for proper emissions dispersion. It has an Advance Air Pollution Monitoring System and an Integrated Management System for Quality, Environment, Occupational Health & Safety and Information Security in position.
- An Electrostatic Precipitator of 99.9% efficiency is used to collect fly ash thereby assisting in prevention of air pollution.
- Highest standards are maintained through the four ambient air quality-monitoring stations to measure SPM, RSPM, SO2 and No2.
- The highly advanced Supervisory Control and Data Acquisition (SCADA) system provides complete centralized control over transmission and distribution.
- The organization has adopted an advanced air pollution monitoring system to ensure minimization of the plant's environmental impact.

PLANT PERFORMANCE:

Following is an insight into the year-on-year performance of the plant:

Parameters	Units	FY 04-05	FY 05-06	FY 06-07	FY 07-08	FY 08-09
PLF	%	101.35	98.7	101.79	101.53	100.99
Availability	%	94.71	94.71	96.79	96.70	96.3

ENERGY CONSERVATION:

The organization's social responsibility towards the environment is evident in the adaptation of clean technology and stringently following the environmental safety guards:

- Use of blended coal with imported low ash coal. FGD installation.
- Use of beneficiated coal.
- Ammonia injection for reduction of Particulate matter.
- Dry fly ash collection system with classification system installation. STP recycling.
- Paper recycling.
- Ash utilization as cement replacement/land filling. Ash bricks manufacturing.
- Mass Tree plantation and Horticulture initiative.

Reliance Infrastructure DTPS has achieved remarkable results since it has consistently maintained its average heat rate of 2300 Kcal/Kwh for the last five years. This is a major milestone considering the Central Electricity Regulatory Commission (CERC) has set a norm of 2500 Kcal/Kwh for a unit of this size

ENVIRONMENT SAFEGUARDS:

1) To prevent Air Pollution
- ESP of 99.9% efficiency for collection of fly ash from flue gases.
- Online monitoring of emission levels of SOx, NOx, and TPM in Flue gas.
- Four Ambient air quality monitoring Stations to measure SPM, RSPM, SOx, NOx, Along with one meteorological station for weather monitoring.
- Mobile Van to monitor Ambient Air quality in remote areas.

2) Ash Disposal
- Four ash ponds for disposal of ash slurry.
- Pond management designed to minimize pollutants in discharge effluent. Dry Fly Ash collection System for maximizing ash utilization.

3) Health and Safety Management
- Health & Safety Policy in place.
- Emergency plan and Disaster Management system is in place. Occupational Health Management and check-ups.
- Advanced fire protection system and equipment.
- A First Coal fired TPS to achieve Four Star in British Safety Council ranking.

4) Green Belt Development:
- To mitigate air pollution levels, a green belt has been developed around the project area. The development plan was devised after detailed studies and the high volume of tree plantations over the years is a credible effort.

CONCLUSION:

The Industrial Visit to the Reliance Thermal Power Plant, Dahanu was highly successful. We received insight of the whole plant right from the raw material (coal) procurement, processing, combustion and generation & transmission of electricity. The whole process was explained in-detail by the representative with detailed description about each equipment with their specifications. A doubt solving session with the Control Room Incharge cleared all our queries. This kind of industrial exposure helped us to absorb the theoretical aspects of Thermal & Fluid Power Engineering more efficiently. We would highly appreciate more such visits in the future.