Brief Report on

Exposure and field visit for problem identification

(16th February 2023)

Organized by

Institution's Innovation Council (IIC) & MSME-Business Incubator,

KITS Warangal

in association with

Centre for Innovation, Incubation, Research & Entrepreneurship (C-I²RE),

KITS Warangal,

Brief Report

Department of Mechanical Engineering assist an industrial visit for students with an objective of providing functional opportunity in different sectors which help them to combine the theoretical knowledge with industrial knowledge. Industrial realities are opened to the students through industrial visits. Industrial visits provide an excellent opportunity for the students to interact with industries and know more about industrial environment. With an objective to go beyond academics, industrial visit provides student a practical perspective on the world of work. Following the same stream line, under the direction of committed and dynamic leadership of Dr. K. Raja Narender Reddy, Head of the Department of Mechanical Engineering, students of B. Tech (Mechanical Engineering) 27 students from IV Semester, accompanied by faculty members Sri S. Anil Kumar, Asst. professor of ME, Dr. E. Ramesh Asst. professor of ME and Smt. P. Anitha, Asst. professor of ME got an opportunity to visit Kakatiya Thermal Power Station (KTPP), Chelpur, Jayashankar-Bhupalpally, Warangal. As per kind approval from Dr. K. Ashoka Reddy, Principal – KITSW, one day industrial visit to Kakatiya Thermal Power Station (KTPP), Chelpur, Jayashankar-Bhupalpally, Warangal planned on 28.01.2023 (Saturday).

All the students and faculty reached the campus of Kakatiya Institute of Technology and Science sharply at 7 : 30 AM and we started a journey which is going to be an apprentice journey for all the students who are with us.

The Journey and industrial visit ....

Finally we arrived from the campus and we had a delicious breakfast at a tiffin center and then we continued the journey and we reached the destination at 9 : 30 AM.

After some security inspections we entered the Thermal power plant and there we met our proud Alumni of KITSW Mr. Krushival sir and also Mr. Ratnakar sir who were the guides of the industrial visit.

The first half section of morning was taken by Kurishival sir and the second half of the afternoon session was taken by Ratnakar sir.

What did we learn from the Industrial Visit?

Mr. Krushival sir thought us how the actual power plant works in reality he thought us about the following things:

- **Coal handling plant,**
- **Stages in KTPP**
- **Coal bunkers**
- **Boiler**
- **Turbine**
- **Condenser**
- **Electricity Generator**
- **Pump**
- **Chimney**
- **Cooling Tower**

Let us look at everything in brief:

Coal handling plant:

In coal handling plant the coal is stored and also the coal is loaded into conveyer belts from the same place and then this coal is taken by the conveyer belt to the coal crusher which crushes the coal into small pieces of about 20 mm and then the coal is carried to the coal bunkers and then the coal is dumped into the coal bunkers and these coal bunkers are the source of coal for boiler to take coal to generate or produce heat required to produce steam.

The coal plays an Important role in the design of boiler and the coal is analyzed in two methods the first is Ultimate analysis (based on the chemical properties of coal) and the second is Proximate analysis (based on the energy produced by the coal).Based on the analysis of coal the boiler is designed. In KTPP the coal used is Bituminous coal of Grade 4.

Fig. Coal handling plant

Stages in KTPP:

KTPP is divided into two stages of power generation they are :

STAGE – I : 1X500 MW

STAGE – II: 1X600 MW

Coal Bunkers:

The coal from the coal storage area is brought ot coal bunkers and dumped in the coal bunkers. These coal bunkers are like the temporary containers of coal and the coal from these coal bunkers is then sent to the pulverizers and there the coal is crushed into fine powder.

After crushing the coal the coal is then taken to the boiler in the pipeline provided for it and the coal is now carried by primary air which drives the coal into the boiler and then the secondary air is introduced into the boiler after dumping of coal into the boiler which helps in combustion.

Fig. Coal bunkers

Boiler:

The boiler used in KTPP falls under the category of Sub-critical boiler and it is a water tube boiler in which the water flows in the tubes and the tubes are surrounded by fire. The combustion of coal in the boiler takes place at 1400 degrees centigrade and then the water in the tubes will absorb heat from the coal combusting in the surroundings and then starts converting into steam and then it is sent to the turbine. The boiler in KTPP works on around 190 bar pressure and 320 degree centigrade.

Turbine:

The turbine used in KTPP is divided into three turbines based on their operating pressure. The steam first comes through the pipeline provided in to the control valve and this control valve is movable or adjustable and this control valve literally acts as steam nozzle and the steam is let in to the High pressure turbine and then after expanding in the high pressure turbine the steam is then let into the Intermediate pressure turbine and then finally into the low pressure turbine and then after expansion of steam in the low pressure turbine the steam is allowed to leave the turbine and enter into the condenser.

The turbine in KTPP rotates at fixed rpm which is decided by the frequency of the electricity used in our India which is 50Hz frequency. The rpm is calculated based on this frequency only and by using a formula for the turbine rpm is: **N = 120F/P**

As our Indian frequency of electricity is 50 Hz and the number of poles in the generator are 32 in KTPP the rpm of the turbine is 3000 rpm.

The resonance frequency or the critical speed of the turbine in KTPP is around 1200-1300 rpm and when there is a need to turn off the turbine the operators should take care that the turbine should not rotate constantly at this rpm if it does so the turbine will blast and a disaster may occur in the plant premises due to it.

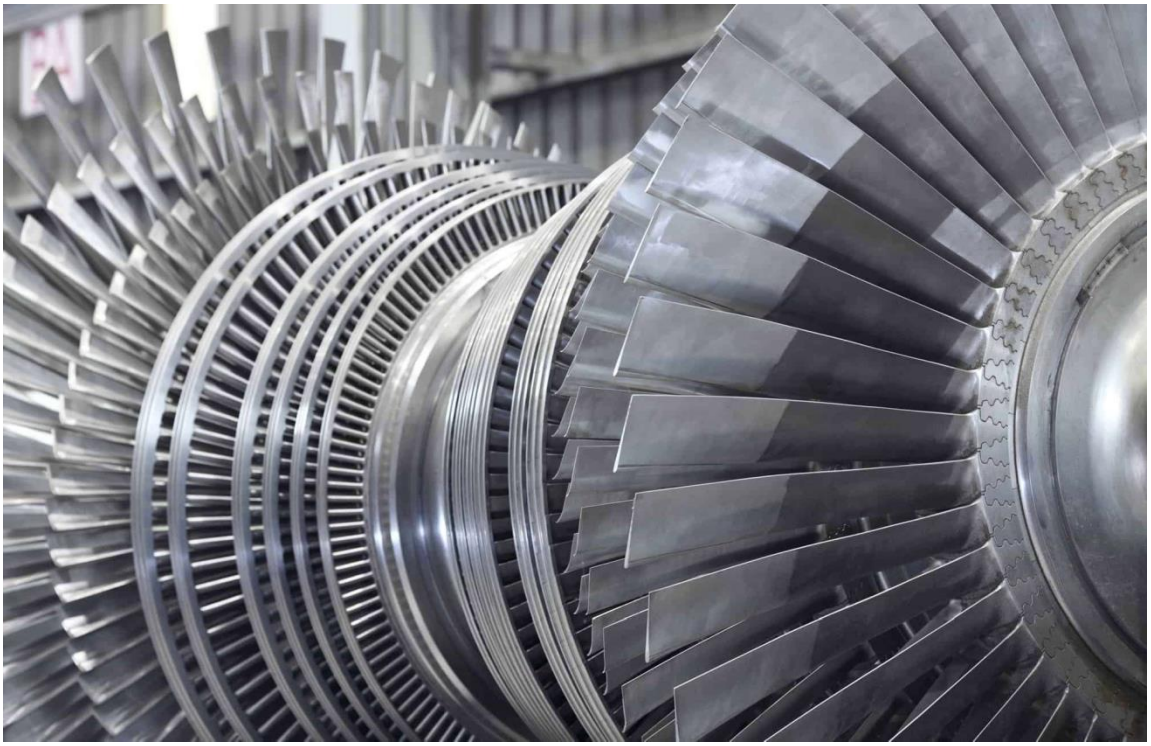

Fig. Turbine

Condenser:

The steam enters the condenser after passing through some heat exchangers in way to condenser and then the steam is cooled in the condenser by the help of cooling water and the steam is converted into water and then this water is again sent into the boiler with the help boiler feed pump.

Fig. Turbine

Electricity Generator:

The shaft which rotates in the turbine is inserted into the generator assembly and the electricity is produced in the generator and the electricity is sent to the power storage and distribution plant through wires. This plant then further distributes the current or electricity generated to various substations.

Fig. Powder Distribution Plant

Pump:

The pump in KTPP is usually driven by the turbine, but initially when turning on the power plant the motor driven pump is used which consumes a large quantity of electricity of around 12 MW/Hour and the pumps are classified as:

Raw water pump : The raw water from the reservoir is taken by this raw water pump and then this water is sent to the demineralizing plant where the water is demineralized and then this treated water is taken by the feed water pump.

Feed water pump: The demineralized water from the DM plant is taken by this feed water pump and this pump supplies the water to the boiler.

Cooling water pump : The water which is used to cool the steam in condenser is supplied by this cooling water pump.

Fig. Pump

Chimney:

These chimneys emit the flue gases which are generated in the combustion of coal in the boiler into the atmosphere. The gases are not emitted as it is in to the atmosphere as it is very harmful to the humans as well as nature because it contains ash of the burnt coal. This ash is entrapped in a device called as ESP (Electro Static Prespirator) which stops the ash from going into the chimney and allows harmless gases into the atmosphere.

Fig. Chimney

Cooling Tower:

These cooling towers are used to cool the cooling water which is used in condenser to cool the steam and convert it into water. The cooling towers are in very huge size and are in hyperbolic shape.

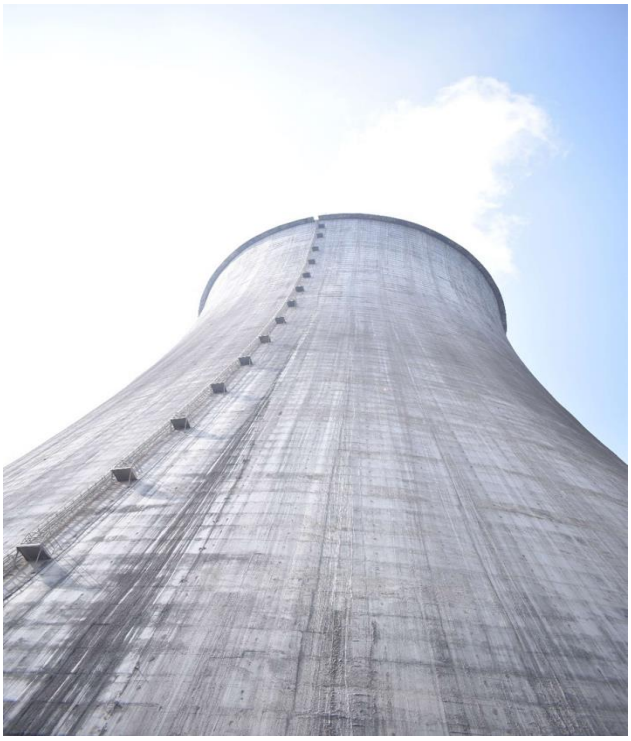

Fig. Cooling Tower

Thanks giving and departure from KTPP:

Finally, we felicitated Mr Ratnakar sir and we thanked sir for putting many efforts and allowing us to visit the Thermal Power Plant and giving us a golden chance to learn about how things work in real world.

End of the Industrial visit:

We left the Kakatiya Thermal Power Plant (KTPP) at 4:30 PM in the evening and reached our homes safely.