Report on Industrial Tour 2019

Electrical Engineering department

Date of Tour: 07/12/2019

Umiam Stage-1 Power Station

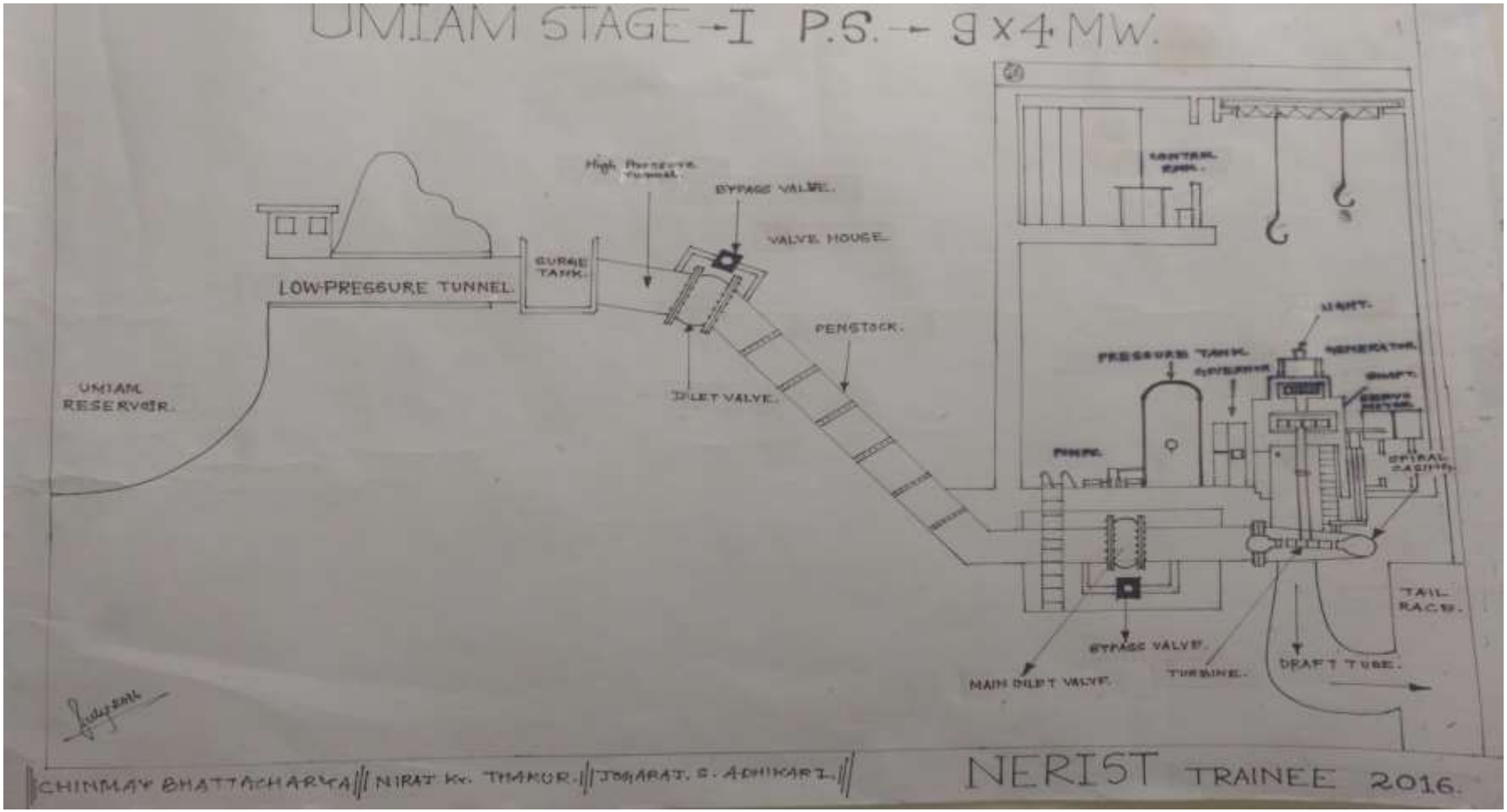
OVERVIEW

The industrial tour 2018 for the electrical engineering department was organized at Umiam Power Plant, Sumer. The power station was four staged and had four generators which produced 9MW each. The substation consisted of generators, step up transformers, current transformers, potential transformers, relays circuit breakers, isolators and other protecting devices.

The Power station is divided into rooms based on utility such as Control room from which the Engineers could control the utility of all the equipments electrically, Battery Room where the batteries are stored and used for the excitation of the machines, 11KV room having isolators and circuit breakers, generating room where the generators are placed.

The transformers have been placed outside and the C.T.'s and P.T.'s have been placed in a separate area outside the station building

OVERVIEW



The overview of the entire power station can be seen in the above picture.

THE BASIC PRINCIPLE

The Umiam power station is based on Hydroelectricity. The water is stored in the **Umiam Reservoir**. The turbine used is **Francis Turbine** as the water is of medium height. The water from the reservoir goes to the low pressure tunnel and then to the **surge tank**, which will equalize the pressure. Then the water goes to the **valve house** which acts like a gate followed by the main inlet valve. The water then goes to the **spiral casing**. The area of cross-section of the inlet of the spiral casing is small so that the velocity of the water is reduced to protect the turbines from high velocity water. Then it comes to the **guide vane** after which the water runs the turbine. The generator is connected to an **AC exciter** to start the machine and produce necessary voltage. When the voltage is enough the AC exciter is disconnected. There is an oil pressure unit that can supply oil to different machines. A **governo**r is present which as a speed regulator to synchronize the speed of the machine and speed of the grid. **A draft** tube acts as a passage for the used water to exit the machine. The Entire operation is controlled from the Control Room.

The Control Room

Figure of The Control Room of Umiam Power Station.

The control room contains equipments through which the different equipments can be controlled electrically. The control room has a main bus and auxiliary bus. The auxiliary bus is used when there is maintenance work in the main bus. The controls for an isolator is present to isolate the machines. A circuit breaker and relay is present to protect the equipments in case of faults.

The control room also has controls for a transformer to step up or step down the voltage as well as for power transformers of rating 11.6MVA each for each generator. When the machine is run MDS(Main Disconnecting Switch) is closed to prevent inflow of power from grid to machine.

When the machine is started first the cooling arrangement is run and then the MIV is made open so that the water comes in and the turbine runs. Then from the control room the AC exciter is switched ON till enough voltage is produced and then it is disconnected. Also an oscilloscope is present in the control room.The Control room thus acts as the CPU of the entire station having control over the operation of the entire station

BATTERY STORAGE ROOM

The battery storage room contains a set of batteries used to run the AC exciter to help the generators to Produce enough voltage at the starting.

THE 11 KV ROOM

The 11 KV room contains the actual relays, circuit breakers, isolators, surge arrestors, lightning arrestors etc.

THE TURBINE

The turbine used is Francis Turbine as the water height available in the reservoir is 145m.

THE GENERATOR

The generator is surrounded by cooling arrangements through which oil is passed to cool down the machine during operation. The shaft is connected to the turbine. The turbine is under the ground and rotates when water flows through it. The Umiam Power station has four generators each with a rating of 9MW.

TRANSFORMER YARD

There are four transformers in the transformer yard one for each generator, with each rated 11/132 KV. The transformer can be used both as a Step Up or Step Down Transformer depending on the utility. The ground below the transformer is filled with gravels and stones as soil absorbs moisture but stones do not. Thus they offer better resistance to leakage currents.

CT'S and PT'S

A number of CT's and PT's are present in the Umiam Power Station for measurement purposes.

CONCLUSION

The Industrial tour to Umiam Power Station was really educational and informational. The tour gave us a clear understanding of the way Power is generated at a Power Station and how it is transmitted to the different parts of the state. The tour thus gave us an opportunity to understand the work of Electrical Engineers in a Power Station and brought us closer to understanding electrical machines that are used in Industrial scale