

INTERNSHIP REPORT ON
KERALA STATE ELECTRICITY BOARD LTD.
PORINGALKUTHU LEFT BANK ADDITIONAL EXTENSION (24MW)

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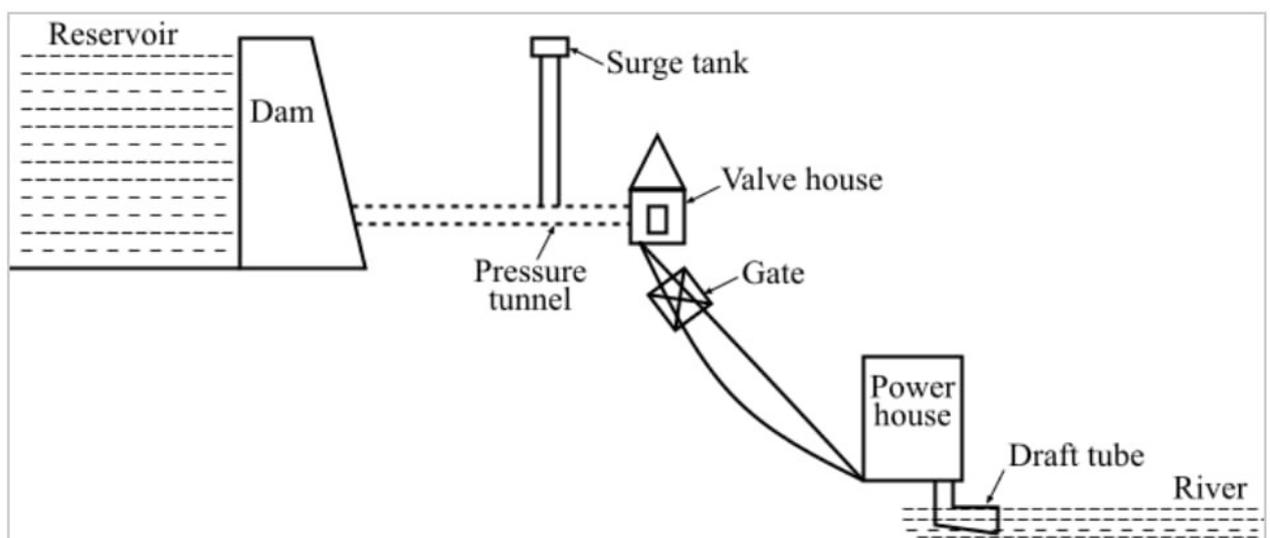
INTRODUCTION

The Poringalkuthu Power House, also known as the Poringalkuthu Hydroelectric Power Station, is a prominent hydroelectric power plant located in the Thrissur district of Kerala, India. It is situated near the scenic Poringalkuthu Dam, which forms the reservoir for the power generation. It utilizes the water flow from the Poringalkuthu Dam to generate electricity through its turbines and generators. Consist of 3 power houses, The total installed capacity of the entire project is 76MW.

- (i) Poringalkuthu old power house (4x9 MW)
- (ii) Poringalkuthu left bank extension (16MW)
- (iii) Poringalkuthu left bank additional extension (24MW).

HYDROELECTRIC POWER PLANT

A hydroelectric power plant, also known as a hydroelectric station or hydroelectric facility, is a type of power generation plant that converts the potential energy of flowing or falling water into electricity. It harnesses the kinetic energy of water to drive turbines, which in turn rotate generators to produce electrical power. Hydroelectric power plants offer several advantages, including a renewable and clean source of energy, long operational lifespans, and the ability to adjust power output based on demand. They also provide benefits such as flood control, irrigation, and recreational activities around the reservoirs.



DAM

Dams are structures built over rivers to stop the water flow and form a reservoir. The reservoir stores the water flowing down the river. This water is diverted to turbines in power stations. The dams collect water during the rainy season and stores it, thus allowing for a steady flow through the turbines throughout the year.



Poringalkuth Dam

The gross storage capacity of the dam is 32 million cubic meters.

SURGE TANK

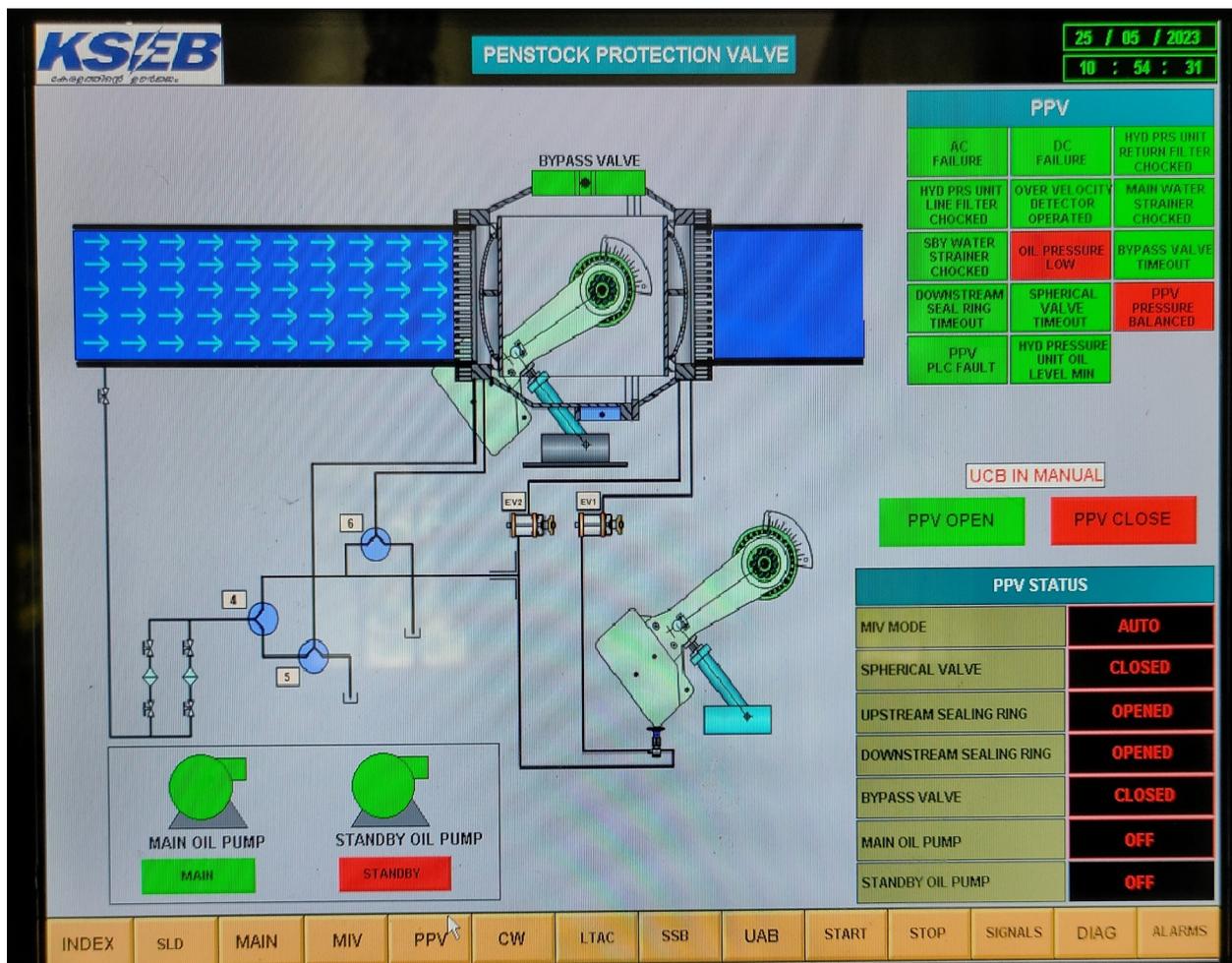
The main function of surge tank is to reduce the water hammering effect. When there is a sudden increase of pressure in the penstock which can be due sudden decrease in the load demand on the generator. When there is sudden decrease in the load, the turbine gates admitting water to the turbine closes suddenly owing to the action of the governor. This sudden rise in the pressure in the penstock will cause the positive water hammering effect. This may lead to burst of the penstock because of high pressures. When there is sudden increase in the load, governor valves opens and accepts more water to the turbine. This results in creation of vacuum in the penstock resulting into the negative water hammering effect. Therefore the penstock should have to withstand both positive water hammering effect created due to close of governor valve and negative water hammering effect due to opening of governor valve. In order to protect the penstock from these water hammering effects, surge tank is used in hydroelectric power station,

VALVE HOUSE

At the start of the penstock there is a valve house which contains main Butterfly Valves for controlling the water flow. In addition to this there are also provided automatic isolating valves which come into operation when the penstock bursts, which cuts off further supply of water. In PLBAE the valve house is located near to power house.

PENSTOCK PROTECTION VALVE (PPV)

These specialized Butterfly valves are installed to protect hydro-electric installations against the possibility of penstock rupture. These valves act as isolating devices for inspection of penstock without dewatering entire head race tunnel failure of which can cause disastrous floods. Valves, by virtue of their design and robust construction, close down automatically and instantaneously in the event of the downstream pipeline failure.



PENSTOCK

Penstock is a pipe between the surge tank and the prime-mover. The structural design of the penstock is same as for any other pipe except it has to bear high pressure on the inside surface during sudden decrease in the load and increase in the load. Penstocks are made of steel through reinforced concrete. Penstocks are usually equipped with the head gates at the inlet which can be closed during the repair of the penstocks, A sufficient water head should be provided above the penstock entrance in the forebay or surge tank to avoid the formation of vortices which may carry air in to the penstock and resulting in lower turbine blade efficiency.

MAIN INLET VALVE(MIV)

Main inlet valve or MIV is a valve which is installed before water enters into spiral casing of the hydro turbine. Water from the dam goes to the penstock and before water enters the turbine, MIV is a equipment in between that stops the water for small maintenance purpose in the turbine hall. In PLBAE spherical valve is used.

For the protection of MIV, bypass valve is installed across it to maintain pressure in upstream and downstream. Oil pump is used to operating the valve.



GUIDE VANE AND GOVERNOR

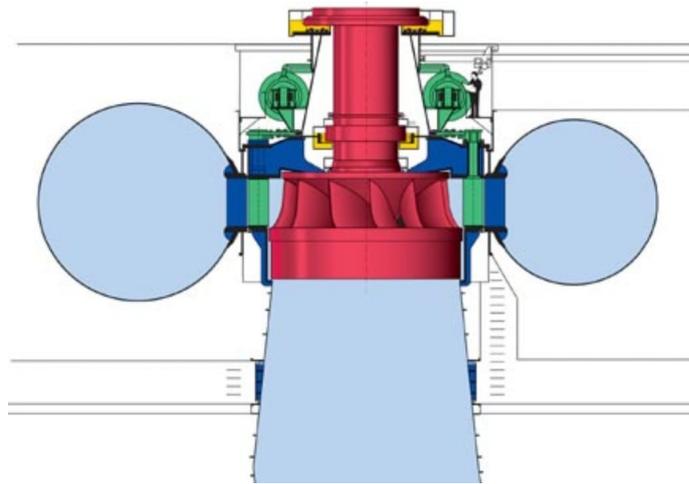
Regulate the flow rate of water into the runner blades thus controlling the power output of a turbine according to the load on the turbine. And governor is used to control guide vane opening and closing. Oil pressure is used for this operation.



TURBINE

The turbine is the heart of the hydro system, where water power is converted into the rotational force that drives the generator. For maximum efficiency, the turbine should be designed to match your specific head and flow. There are many different types of turbines, and proper selection requires considerable expertise.

In PLBAE vertical Francis turbine is used for producing rotation. The Francis turbine is a type of water turbine. It is an inward-flow reaction turbine that combines radial and axial flow concepts. Francis turbine is suitable for medium flow.



STATOR

Stator is the stationary part of an alternator. It contains conductor coils in which emf is induced. In stator coil emf is induced when it cuts rotor magnetic field. The voltage in the main stator is dependent on the electrical load connected and the amount of excitation provided by the excitation system. The output is connected to the terminals and voltage is monitored by the AVR, which can then adjust the excitation to increase or decrease the voltage to the preset level.



ROTOR

The Rotor is also known as the rotating magnetic core, or Flywheel, of an Alternator. Rotors are the moving part in an Alternator that have magnetic fields that move around the Stator's iron plates to generate an Alternating Current (AC). In PLBAE, 12-poled rotor is used for magnetizing.

FIELD EXCITATION

In electromagnetism, excitation is the process of generating a magnetic field by means of an electric current. The magnetic field may be produced by permanent magnets or by field coils.

In PLBAE DC supply is used for field excitation.

- 110KV / 11KV using 30MVA(auxiliary transformer) Transformer
- 11KV is then fed into the feeder .
- Feeder supply is then given to a Station Auxiliary Transformer
- 11 KV/ 415KV using 10MVA Transformer It is then fed into SSB(Station Service Board)
- 415V / 45 V using a transformer and then it is covered into DC Supply using Diodes and SCR



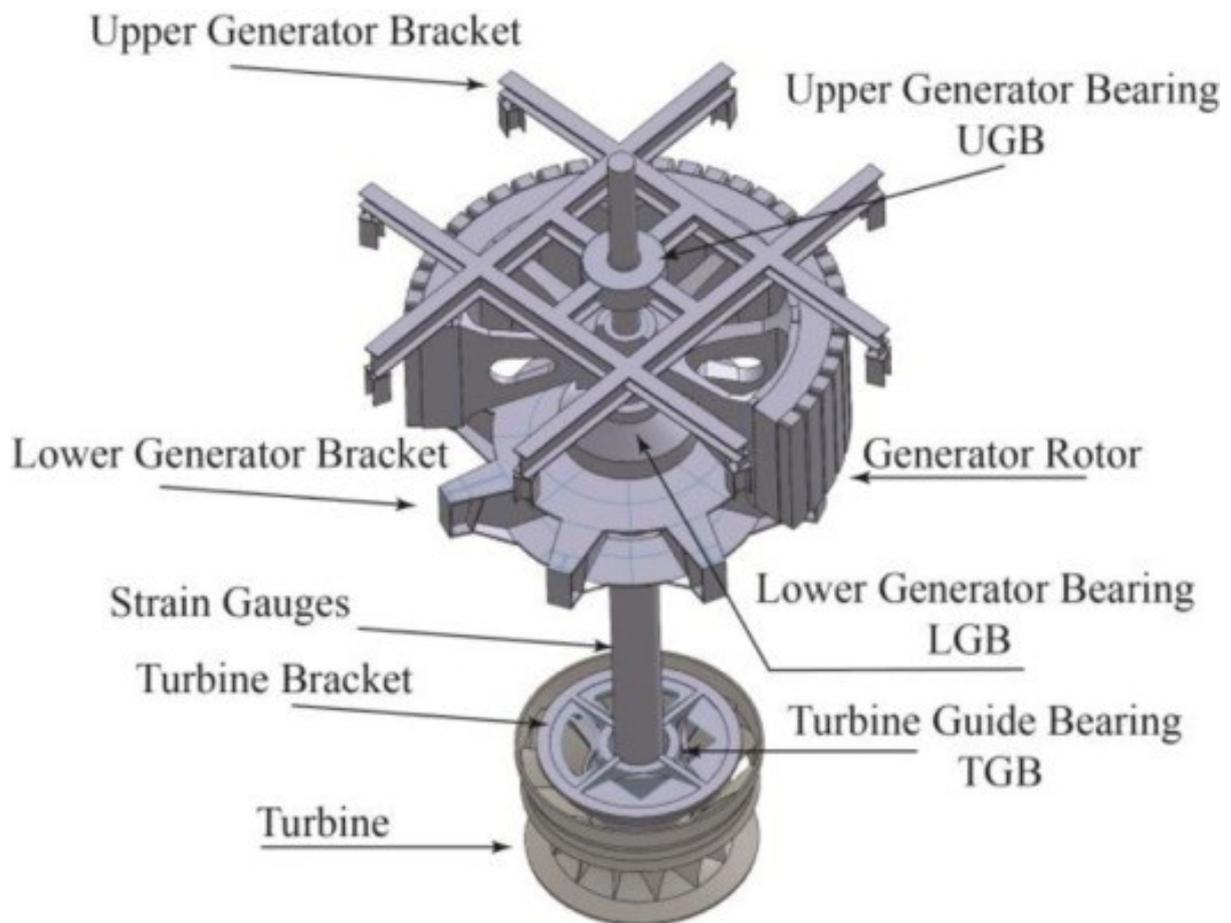
SLIP RINGS AND BRUSHES

Collector rings, commonly known as slip rings, are part of an alternator rotor that allows electrical field currents to pass through while rotating. The brushes within the alternator ride on the slip rings. The slip ring brushes, made of graphite, are connected to a resistive device, such as a rheostat. As the slip rings turn with the rotor, the brushes maintain constant contact with the rings and transfer the resistance to the rotor windings.



BEARINGS

Conventional alternators comprise of top-mounted thrust and guide bearing supported on heavy brackets, capable of supporting total weight of generator. A guide bearing is a p



lain bearing used to guide a machine element in its lengthwise motion, usually without rotation of the element.

UPPER GUIDE BEARING

Upper guide bearing is located above the thrust bearing on a journal surface machined on the periphery of the thrust collar. Oil cooling is used in this region.

LOWER GUIDE BEARING

Lower guide bearing is located on a journal integrally forged with the shaft

TURBINE GUIDE BEARING

Located at lower region to withstand turbine.

THRUST BEARING

Thrust bearings hold the axial position of the rotor in rotating machinery, transmitting the axial load from the rotor to the stationary structure.

Thrust bearings transmit axial load by floating the rotor on a thin film of fluid and are often referred to as fluid film bearings. A suitable lubricant must always be present between the rotating collar and thrust bearing surface for hydrodynamic bearings to operate safely and efficiently. HP oil system is used as lubricant in PLBAE. It uplift the axial from the thrust bearing surface.



HP SYSTEM

COOLING SYSTEM

The cooling is realized by a closed system that circulates the cooling medium (water or oil) over the components



YARD



CONCLUSION

Through this internship we were able to get to know more about generating station and different components used in the power house. This provides many practical knowledge in accordance with technical and commercial aspects. This industry gives us an overview of production, transmission of electricity, management of the plant and real life working conditions. This encourages us to develop more interest towards the electrical engineering.

Here we would like to thank KSEBL, PSHEP, ASHEP & AHEP Poringalkuthu and staffs and workers who helped us through this internship.

The last day of internship, we attended a viva section and evaluation test to measure the knowledge and concepts we attained through in this internship.