



SNS COLLEGE OF TECHNOLOGY



DEPARTMENT OF MECHANICAL ENGINEERING

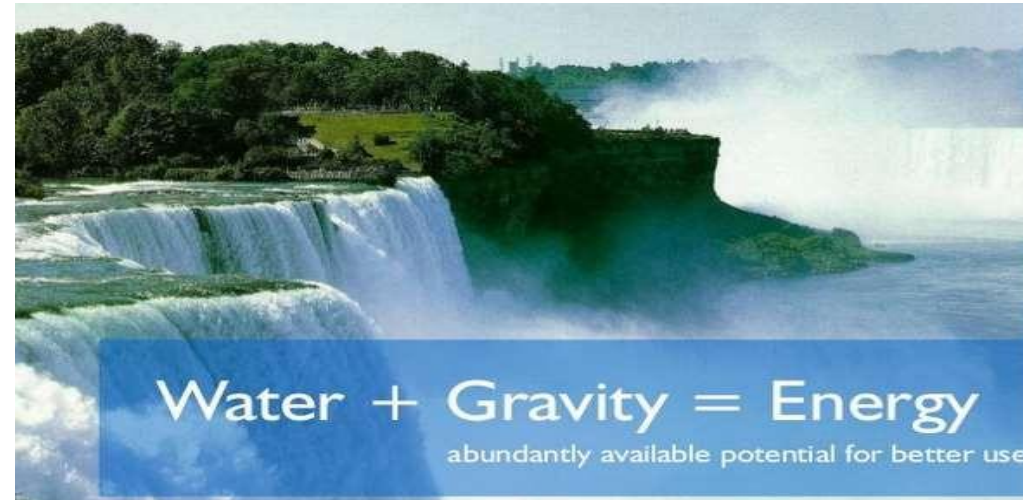
UNIT IV HydroElectric Power Plant

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Introduction

The energy of water utilized for generation of power using KE and PE of water by motion and position respectively.

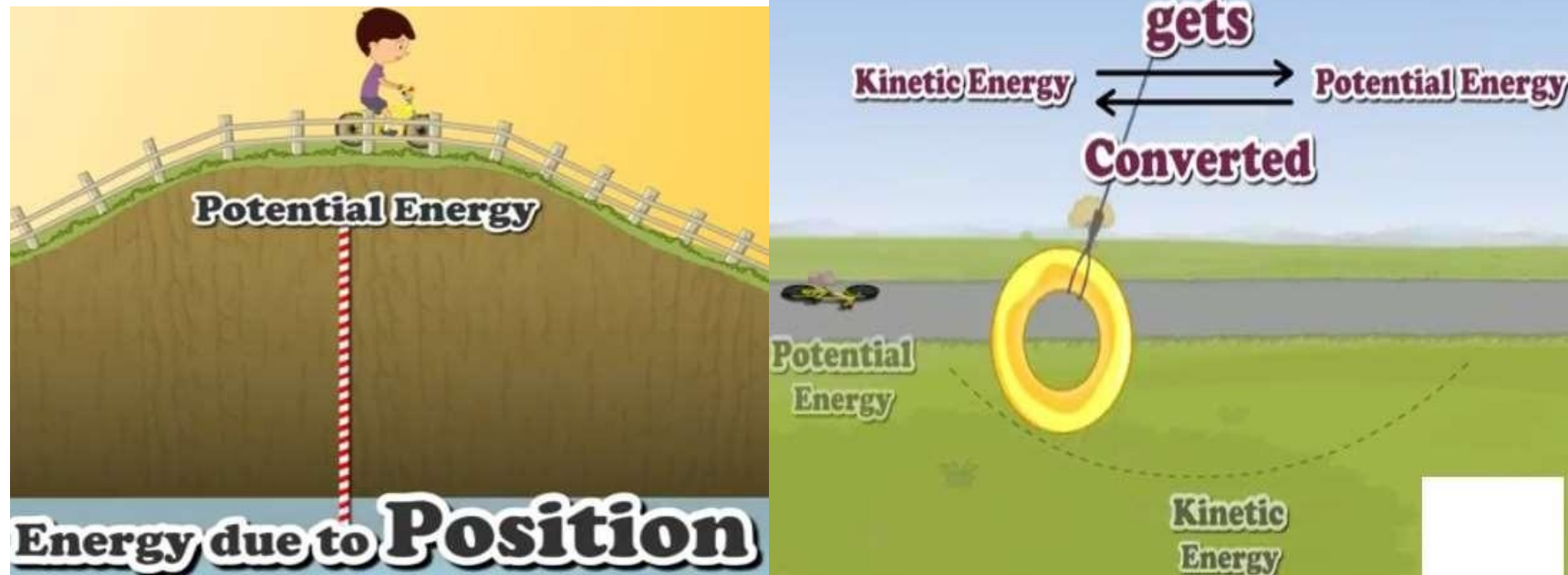
- Hydro power is considered as one of the most **economic** and **non polluting** sources of energy.
- Power generated from water is termed as **Hydroelectricity**.
- Hydro electricity means electricity generated by hydropower or from the use of the gravitational force of falling or flowing water.



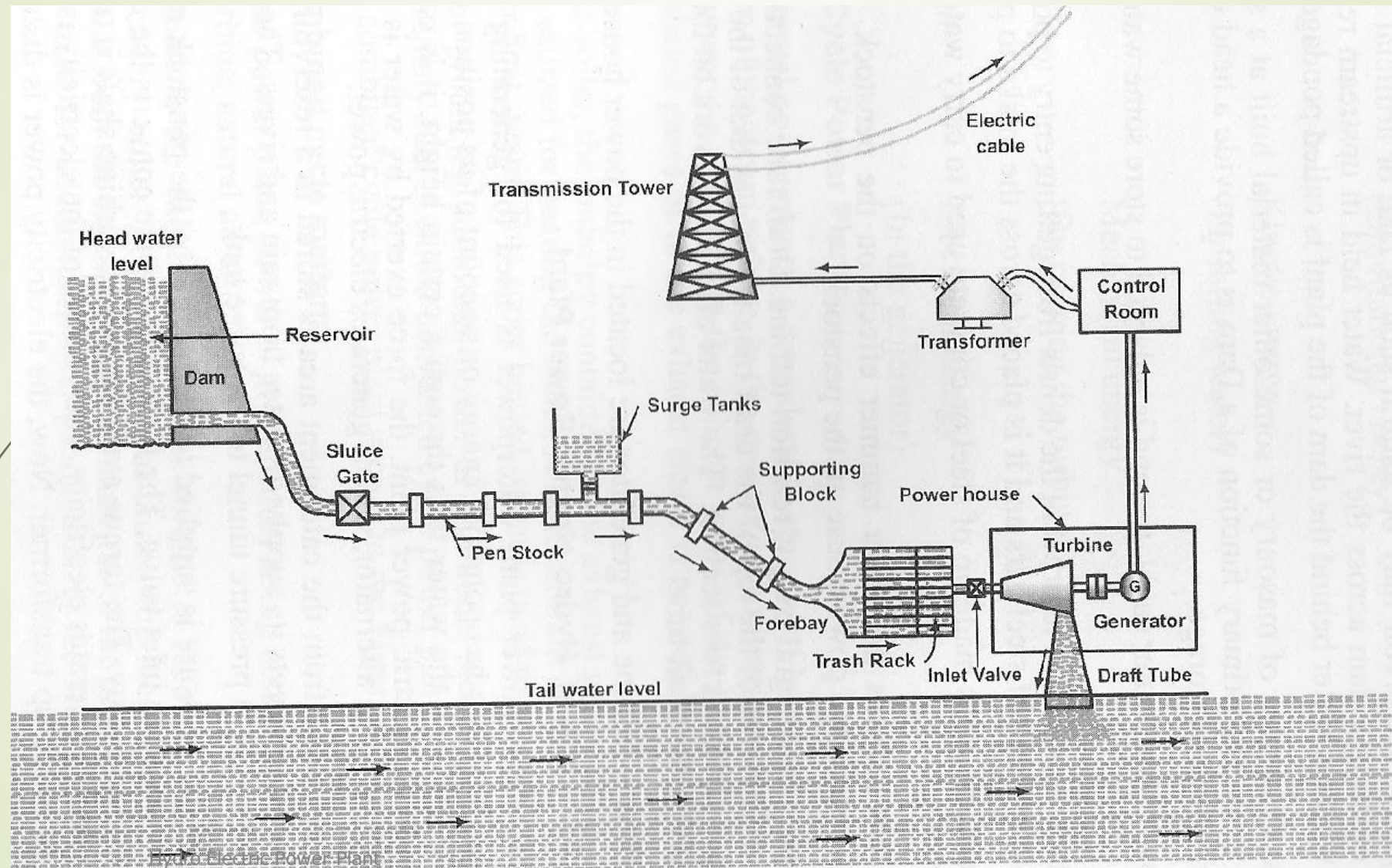
Potential and Kinetic energy

Potential Energy is the stored energy in an object or system because of its position or configuration.

Kinetic energy of an object is relative to other moving and stationary objects in its immediate environment.



Hydro Electric Power Plant



Components of Hydro Electric Power Plant

Reservoir :

- Water is collected during rainy season
- It is stored in the reservoir.
- A dam is built across the river adequate water head.

Penstock :

- It is a passage through which water flows from reservoir to turbine.

Surge Tank :

- It is installed along the penstock (between turbine and reservoir)
- To control or regulate the sudden water over flow and to protect the penstock from bursting.
- It reduces the pressure and avoids damage to the penstock due to the **water hammer** effect.
- When the load on the turbine is decreased there will be a back flow, which causes increase or decrease in pressure. It is known as water hammer.

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Components of Hydro Electric Power Plant

Power House :

- It is building that houses that water turbine, generator, transformer and control room.

Water Turbine:

- Water turbines such as Pelton, Kaplan and Francis are used to convert pressure and kinetic energy of flowing water into mechanical energy.

Draft Tube:

- It is connected to the outlet of the turbine.

Tailrace:

- It refers to the downstream level of water discharged from turbine.

Components of Hydro Electric Power Plant

Generator :

It is a machine used to convert mechanical energy into electrical energy.

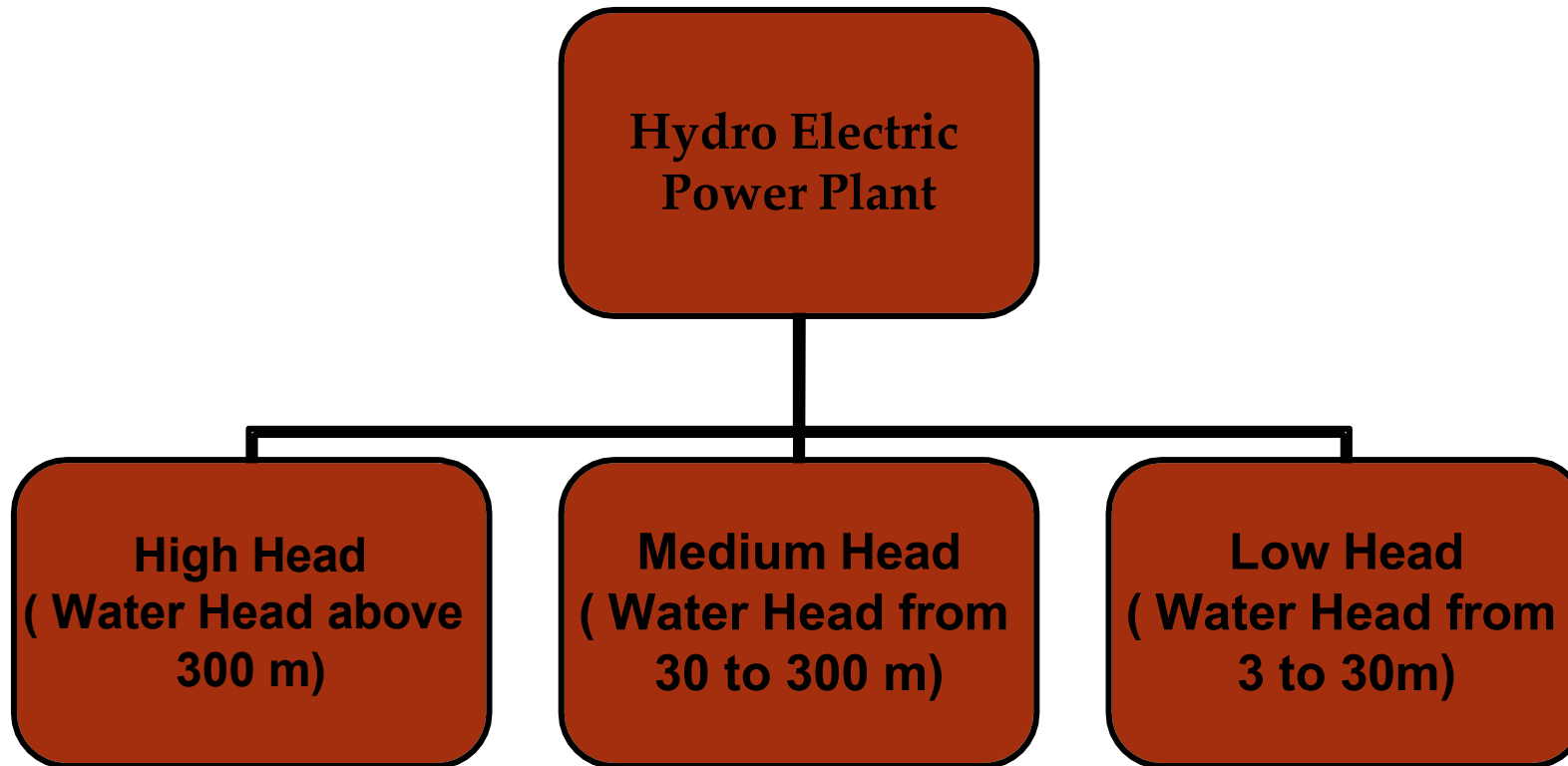
Step up transformer:

It converts the Alternating Current (AC) into high voltage current suitable for transmission.

Working Principle of Hydro Electric Power Plant

- It uses the potential energy of water stored in a reservoir.
- The water from the reservoir flows through a penstock and then forced through nozzle or nozzles before reaching the turbine.
- The hydraulic turbine converts the kinetic energy of water under pressure into mechanical energy.
- The shaft of the turbine is coupled to a generator that generates electricity
- The electricity generated is fed to the step-up transformer to increase its voltage.
- Power is fed to the transmission lines for distribution.
- The output power of Hydel power plant depends on the head of water stored in the reservoir and the quantity of water discharged

Classification of Hydro Electric Power Plant



Factors to be considered for the location of hydro electric Power Plant

Availability of Water:

Adequate water must be available with good head.

Cost and type of Land:

Bearing capacity of the land should be good to withstand huge structures and equipments.

Storage of Water :

A dam must be constructed to store the large quantity of water in order to cope with variations of water availability through out the year.

Factors to be considered for the location of hydro electric Power Plant

- Transportation Facilities :

The site should be accessible by rail and road for easy transportation of equipments and machinery.

- Pumped storage facilities :

The pumping facilities to reuse the water should be possible.

Merits of Hydro Electric Power Plant

- Requires no fuels and hence pollution free.
- Low operating cost.
- Simple in construction and requires less maintenance.
- Very robust and durable.
- The reservoir and dam can also be used for irrigation.

Demerits of Hydro Electric Power Plant

- Very high capital cost
- Skilled personnel is required for construction.
- High cost of transmission as plant is normally required far off from hilly areas.
- Period of delay causes the delay in the commissioning of the plant.
- Construction of new hydel plant may need rehabilitation of people and payment compensation for land acquisition.