

Micro Hydro Power

LECTURE 5:

ELECTROMECHANICAL COMPONENTS OF MICRO HYDRO

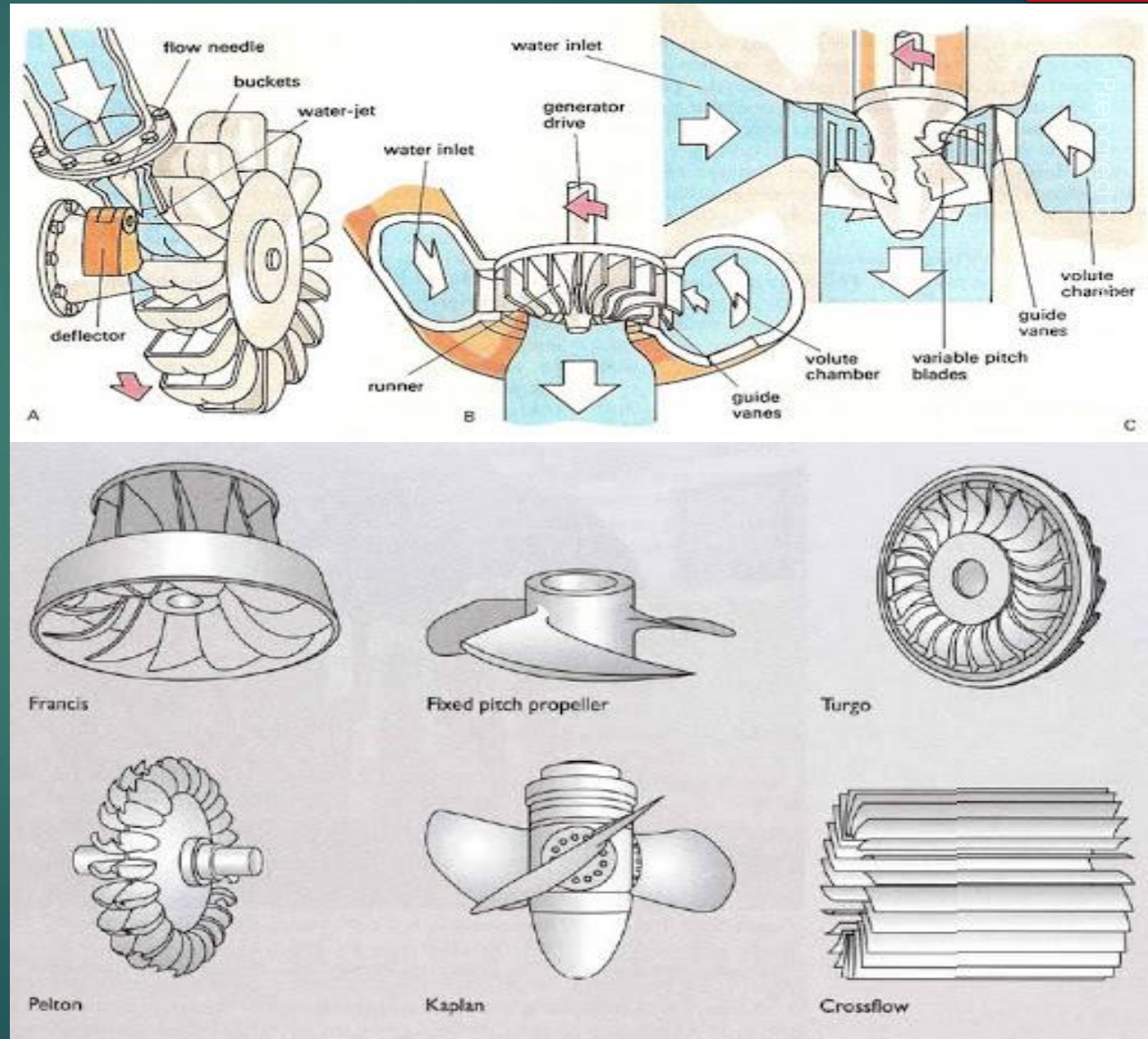
Turbines and Valves

- ▶ a rotary mechanical device that extracts energy from a fluid flow and converts it into useful work
- ▶ In hydropower turbines are coupled to electric generator
- ▶ A valve is a device that regulates, directs or controls the flow of a fluid (gases, liquids, fluidized solids, or slurries) by opening, closing, or partially obstructing various passageways

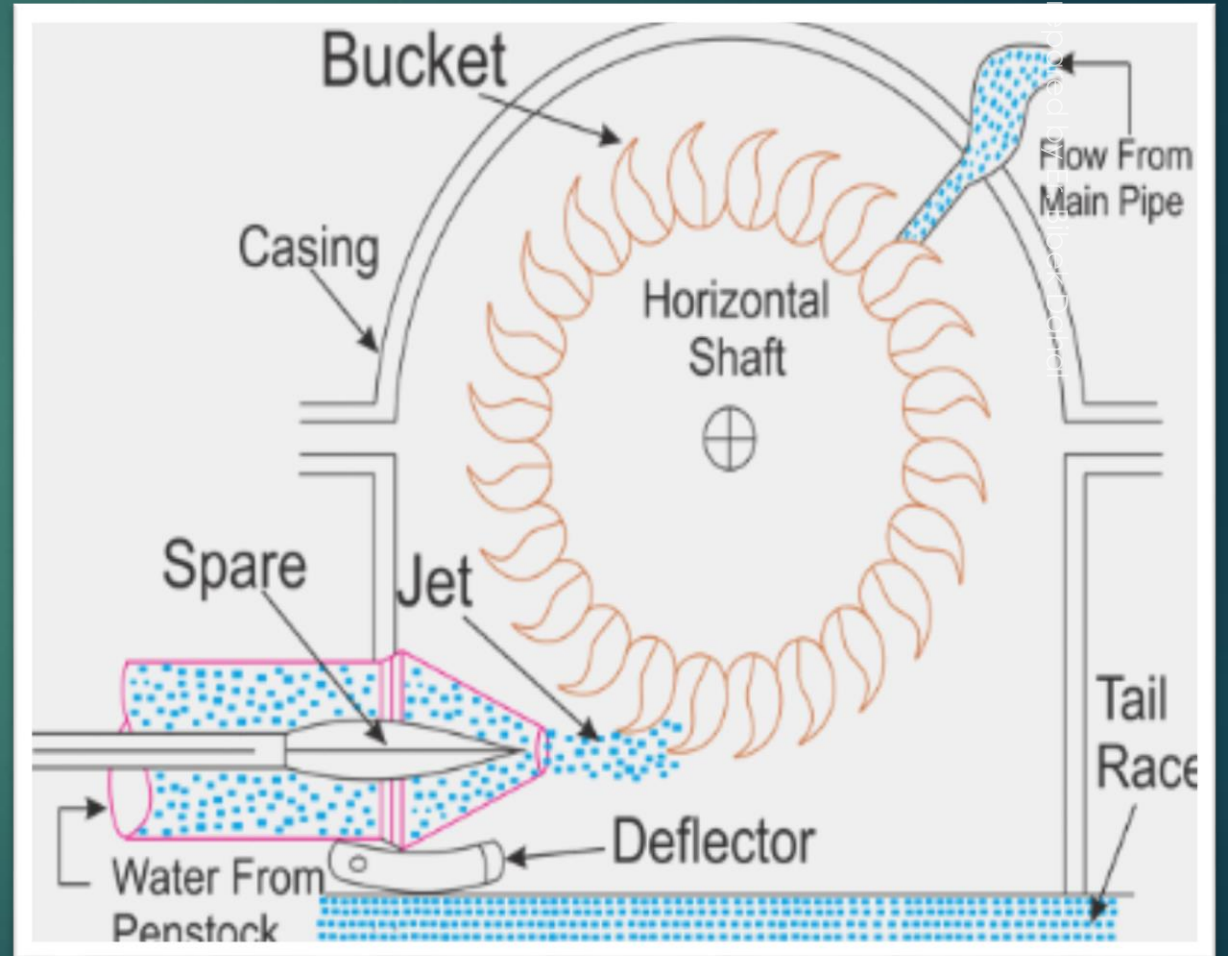
Types of Turbines

- ▶ Impulse turbine
 - ▶ Pelton turbine
 - ▶ Crossflow turbine
 - ▶ Turgo-impulse turbine

- ▶ Reaction Turbine
 - ▶ Francis Turbine
 - ▶ Propeller Turbine
 - ▶ Kaplan Turbine
 - ▶ Diagonal mixed floe
 - ▶ Tubular flow
 - ▶ Straight flow turbine



Pelton turbine



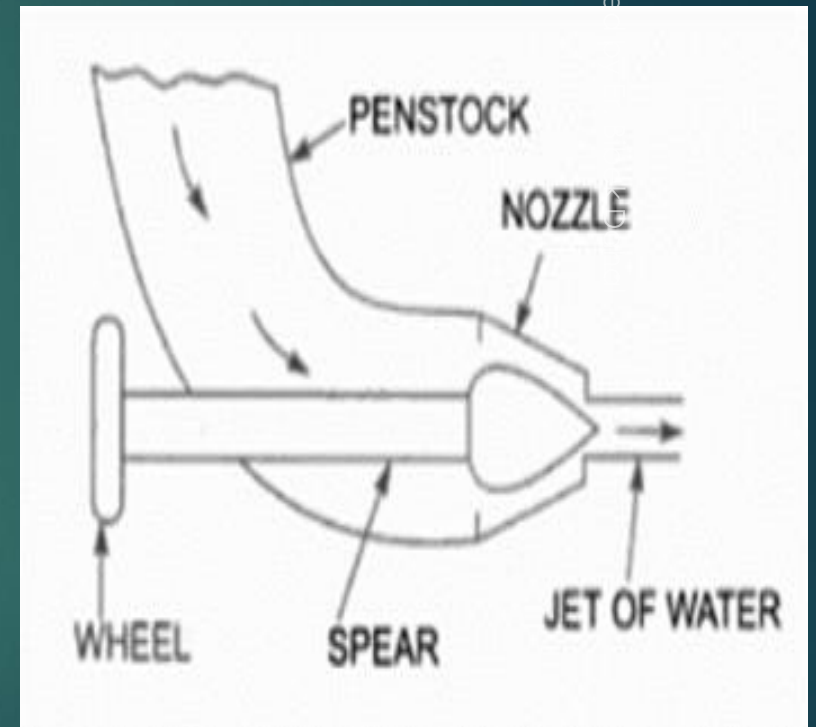
Principles of Turbines

Pelton turbine

- ▶ This is tangential flow impulse turbine which rotates when jet of water strikes the buckets located along the periphery
- ▶ The buckets are divided into two parts by a splitter
- ▶ The nozzle directs the jet of water towards the buckets and also controls the flow of water
- ▶ Pelton turbines are connected horizontally to the alternator
- ▶ The casing of the turbine has no hydraulic function and is present to prevent splashing of water and to guide water to the tailrace

Nozzle

- ▶ It is a small piece of pipe tapered at one end and connected to the penstock manifold at the other end
- ▶ It discharges the jet of water at high speed (hence high kinetic energy) which strikes the bucket to cause rotation. It can be disassembled or reassembled to suit for seasonal variation of discharge when needed



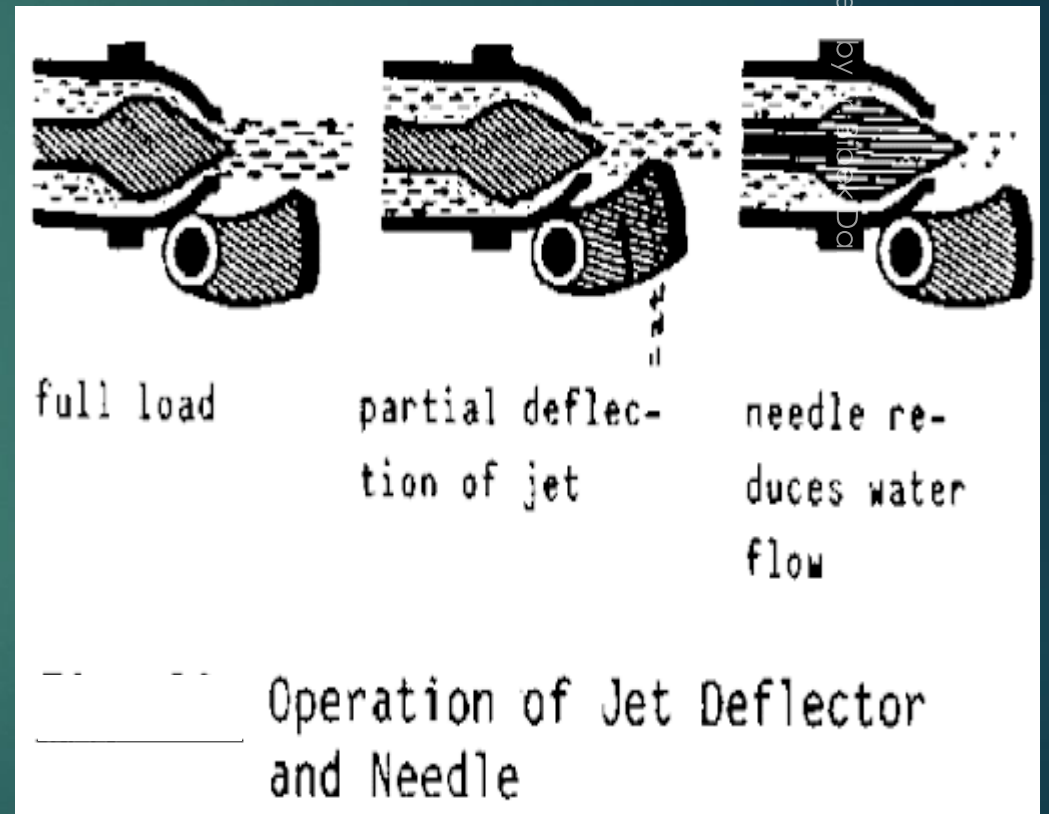
Shut-off valve

- ▶ A shut off valve is usually a gate valve or a butterfly valve in turbine manifold
- ▶ It should be fully open when the turbine operates
- ▶ A shut off valve should be closed very slowly
- ▶ If closed abruptly, surge pressure created by high head can lead even to bursting of pipes
- ▶ It should not be used for flow regulation as the valve can be damaged due to cavitation effects



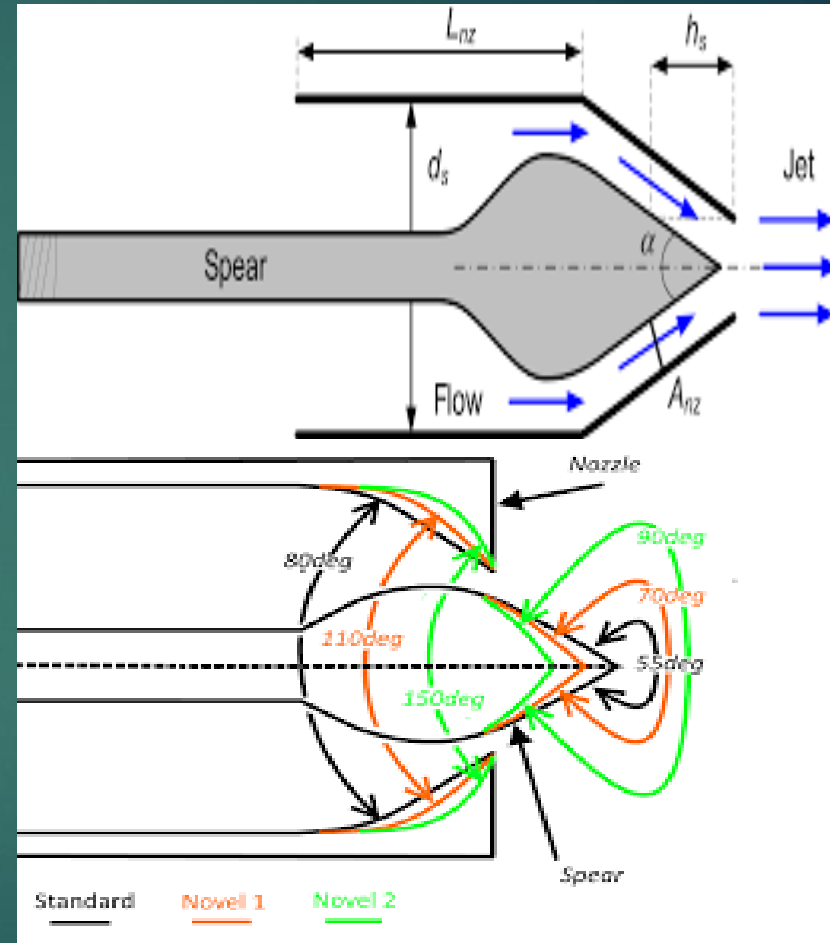
Deflects

- ▶ A deflector is used to deflect the water jet away from the buckets when made to rotate into the water path
- ▶ It is a useful device to stop the turbine without shutting off the penstock flow
- ▶ It is also used for emergency shut down



Spear valve

- ▶ It consists of spear head arranged to move within the nozzle, allowing variation in effective orifice cross sectional area without introducing energy losses
- ▶ The spear can be moved either by turning a thread manually or automatically by a mechanical speed governor
- ▶ It is essential when continuous flow regulation is required
- ▶ Its use is decreasing due to invention of ELC as speeding governor



THANK YOU