CEN 212 FLUID MECHANICS

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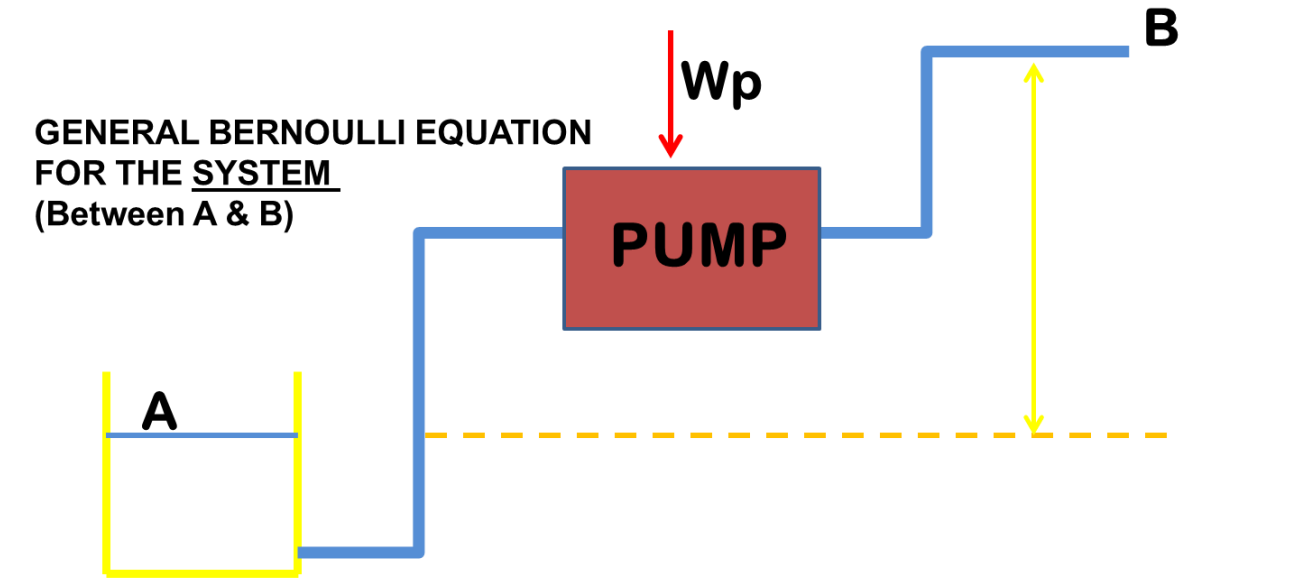
PUMPS and PUMPING SYSTEMS

In order to make a fluid flow from one point to another in a closed conduit or pipe, it is necessary to have a driving force.

Sometimes this force is supplied by gravity where differences in elevation occur.

Usually, the energy or driving force is supplied by a mechanical device such as a pump, which increases the mechanical energy of the fluid.

PUMPS and PUMPING SYSTEMS



$$\frac{P_A}{\rho_A} + \frac{V_A^2}{2\alpha} + g Z_A + \eta Wp = \frac{P_B}{\rho_B} + \frac{V_B^2}{2\alpha} + g Z_B + \Sigma F$$

POWER REQUIREMENT $P = \dot{m} Wp$

PUMPS and PUMPING SYSTEMS

I. POSITIVE DISPLACEMENT PUMPS

A definite volume of liquid is trapped in a chamber which is alternatively filled from the inlet and emptied at a high pressure through the discharge at a constant volumetric flow rate.

PISTON PUMP
PLUNGER PUMP
DIAPHARGM PUMP
ROTARY PUMP

PUMPS and PUMPING SYSTEMS

In a piston pump, liquid is drawn through an inlet check valve into the cylinder by the withdrawal of a piston and then is forced out through a discharge valve on the return stroke.

PUMPS and PUMPING SYSTEMS

For higher pressures plunger pumps are used.
In a plunger pump, the high-pressure seal is stationary and a smooth cylindrical plunger slides through the seal. This makes them different from piston pumps and allows them to be used at higher pressures.

PUMPS and PUMPING SYSTEMS

DIAPHRAGM PUMP

- **Reciprocating member is a flexible diaphragm of metal, plastic or rubber.**

- **The need for seals exposed to the liquid being pumped is eliminated. A GREAT ADVANTAGE.**

- **Used to handle small to moderate amounts of liquid.**

PUMPS and PUMPING SYSTEMS

ROTARY PUMPS

Rotary pumps contain no check valves
Intermeshing gears rotate with close clearance inside the casing.
Liquid entering the suction line at the bottom of the casing is caught in the spaces between the teeth and the casing and forced out the discharge.

PUMPS and PUMPING SYSTEMS

II. CENTRIFUGAL PUMP

• **The liquid enters through a suction connection concentric with the axis of a high speed rotary element called impeller.**

• **Liquid flows outward in the spaces between the vanes and leaves the impeller at a greater velocity.**

• **The liquid leaving the outer periphery of the impeller is collected in a spiral cating called the volute and leaves the pump through a tangential discharge connection**