

9.WEEK

CHE 212 FLUID MECHANICS

Assoc.Prof. Dr. Ayşe Karakeçili

**Ankara University
Chemical Engineering Department**

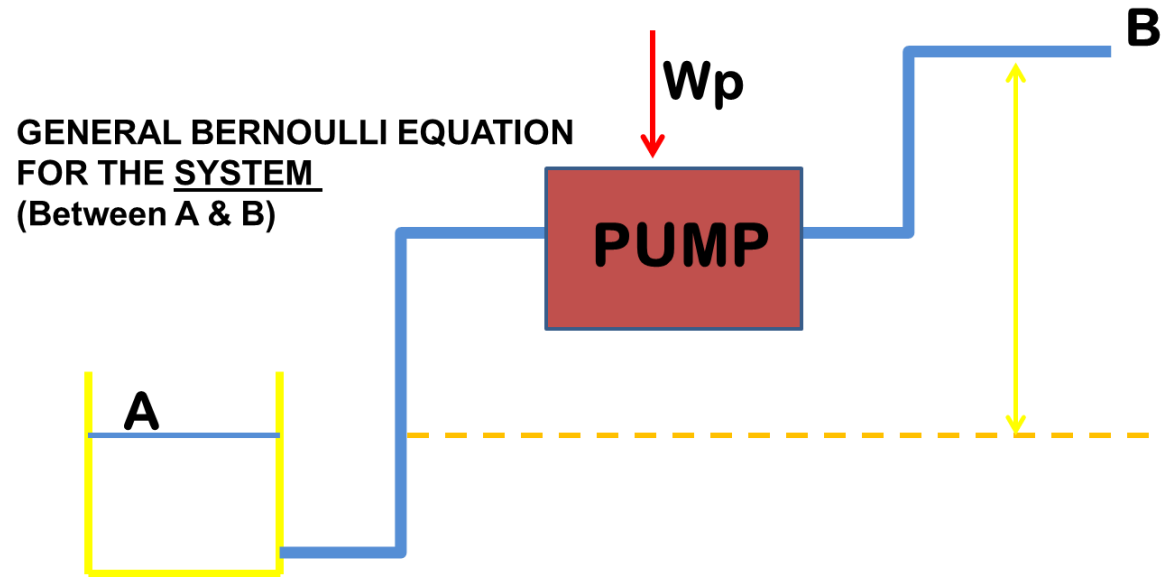
PUMPS and PUMPING SYSTEMS

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



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

POWER REQUIREMENT

$$P = \dot{m} W_p$$

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

DIAPHRAGM 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.

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.**

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.**

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 casing called the volute and leaves the pump through a tangential discharge connection