



CE 3372 WATER SYSTEMS DESIGN

PUMPS AND LIFT STATIONS –PART 1 (FALL 2020)

PUMPS

- A mechanical device that transfers mechanical energy into a liquid; used to
 - Lift from lower to higher elevation
Lift stations
 - Increase pressure
Booster stations
- Gas phase equivalent
 - Compressor

Motor

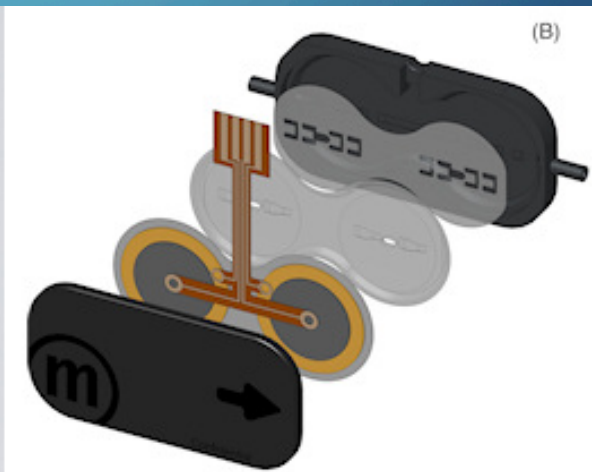


discharge

Pump

suction





PUMPS

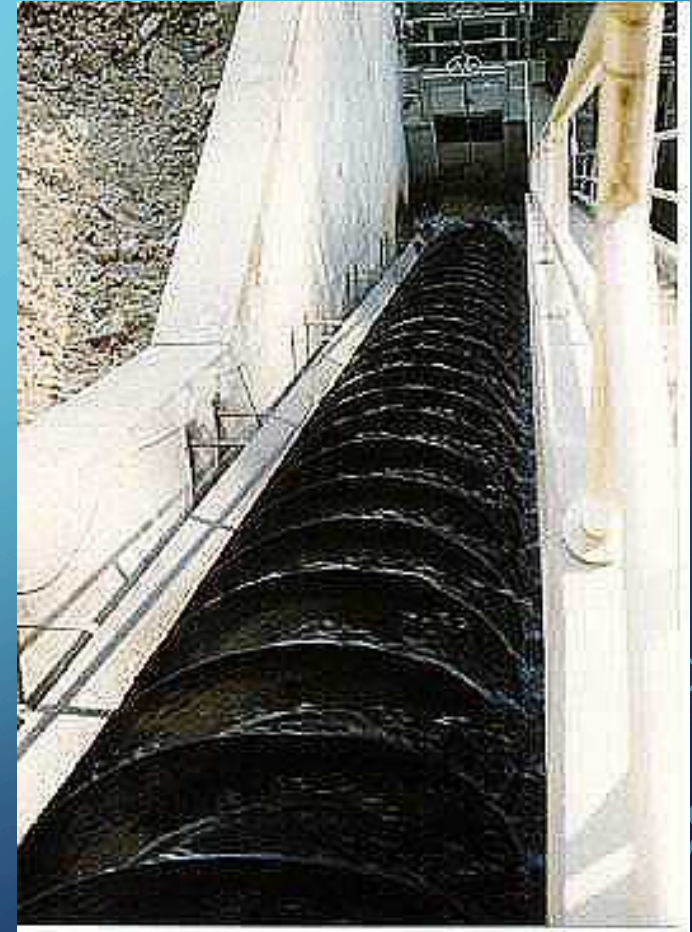
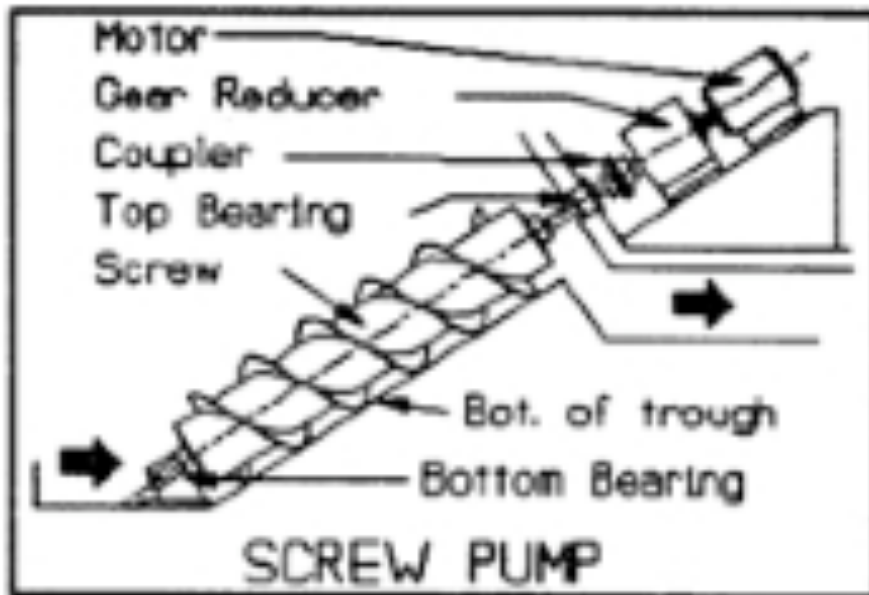
- Positive (Fixed) Displacement Pumps
 - Fixed volume of fluid is displaced each cycle regardless of system static head/pressure
 - Lower flow rates and higher head than non-positive pumps
- Variable Displacement Pumps
 - Varying volume of fluid is displaced dependent on system static head/pressure (back pressure)

PUMPS

- Fixed Displacement Pumps
 - Screw Pumps
 - Reciprocating Pumps
- Variable Displacement Pumps
 - Centrifugal (Radial-Flow) Pumps
 - Propeller Pumps (Axial-Flow)
 - Jet Pumps (Mixed-Flow)

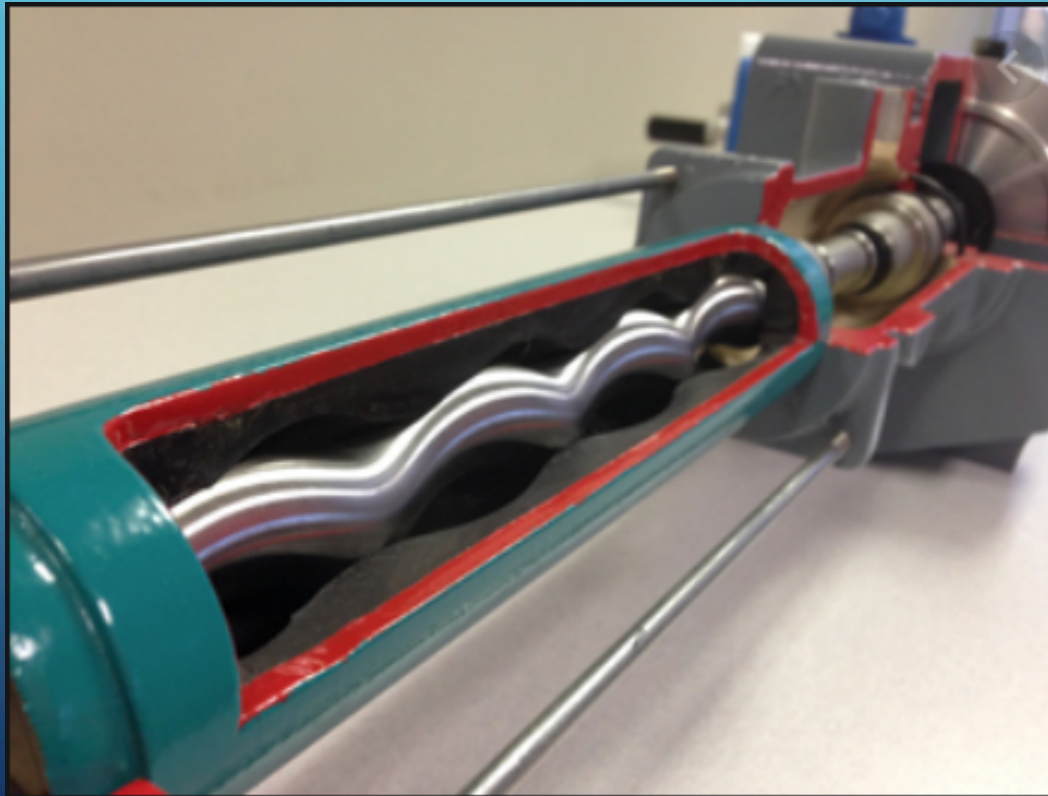
POSITIVE DISPLACEMENT PUMPS

- Screw Pump
 - A revolving shaft with blades rotates in a trough at an incline and pushes water up



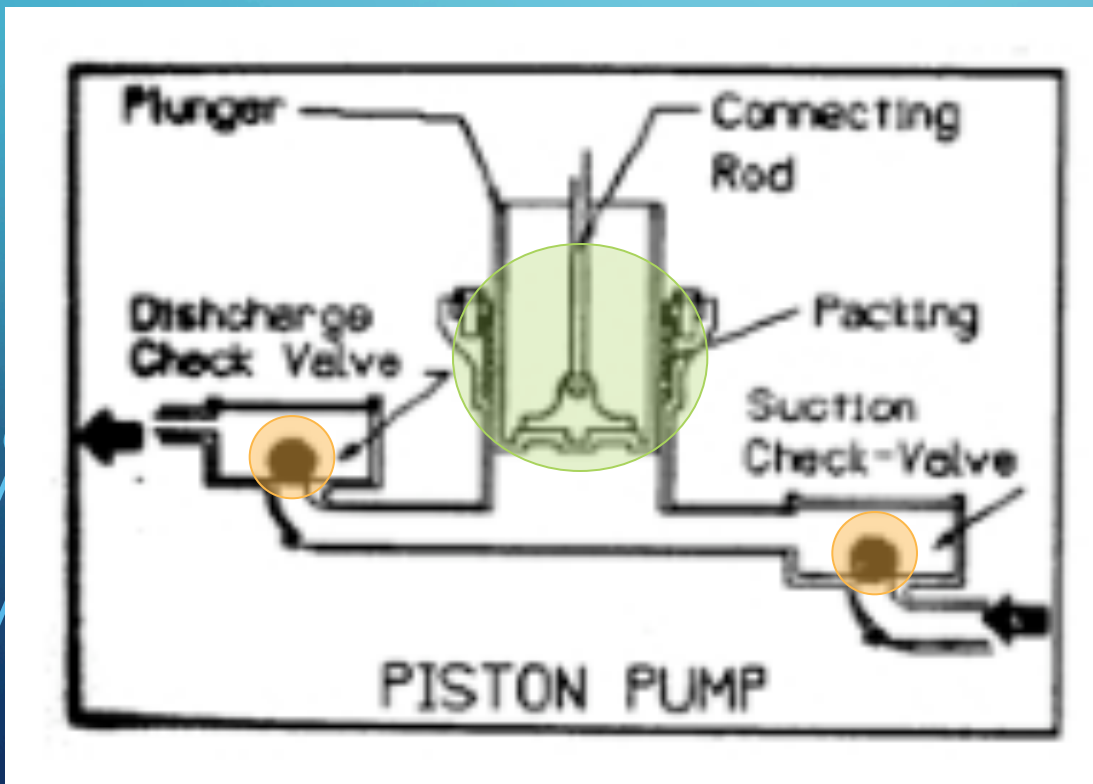
POSITIVE DISPLACEMENT PUMPS

- Progressive Cavity Pump
 - A revolving shaft (rotor) with rotates in a trough (stator)



POSITIVE DISPLACEMENT PUMPS

- Reciprocating Piston Pump
 - A piston sucks the fluid into a cylinder and then pushes it out

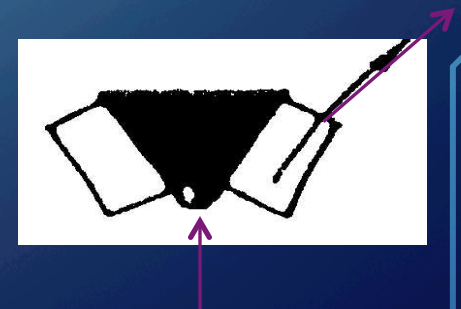
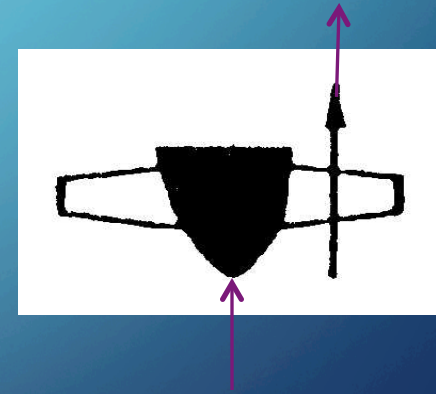
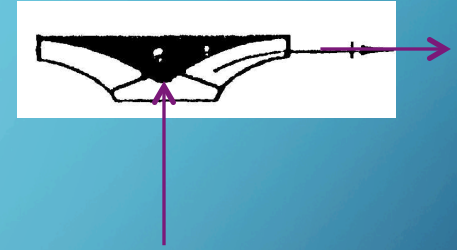


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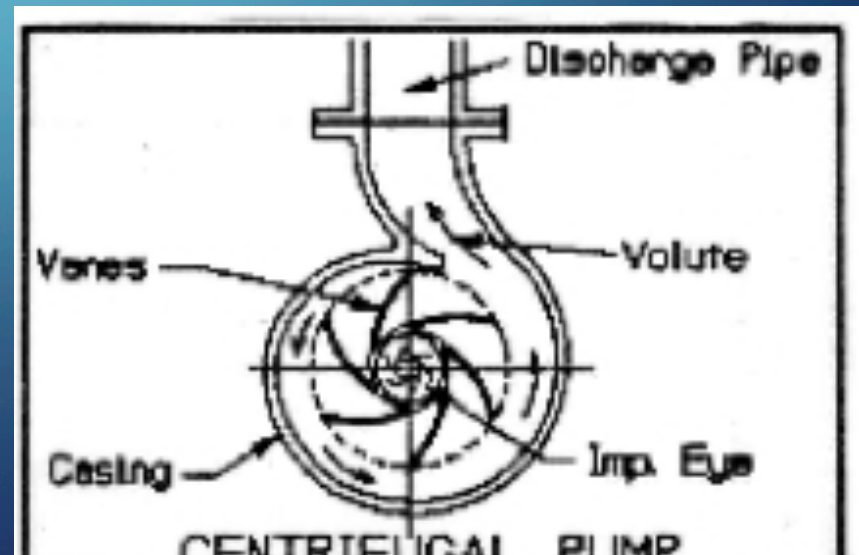
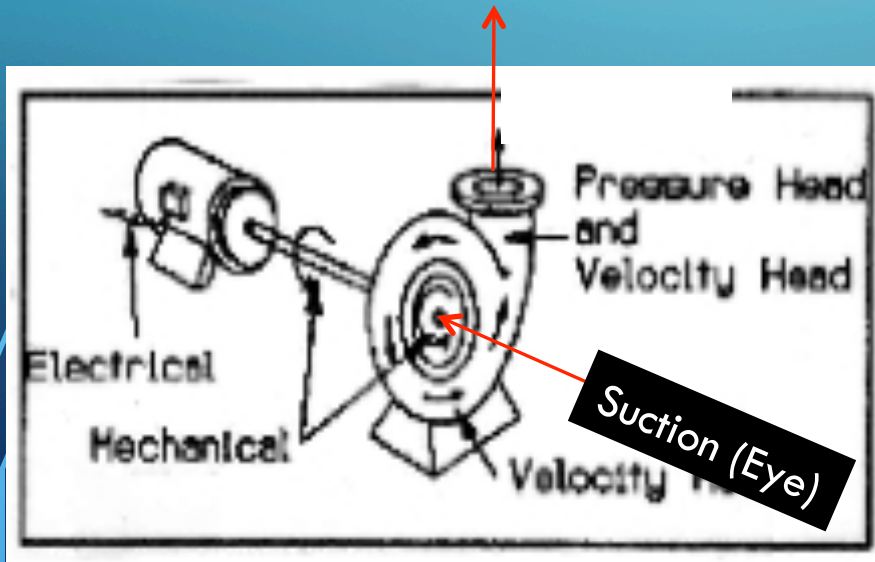
VARIABLE DISPLACEMENT PUMPS

- Classification is based on the way water leaves the rotating part of the pump
 - Radial-flow pump – water leaves impeller in radial direction
 - Axial-flow pump – water leaves propeller in the axial direction
 - Mixed-flow pump – water leaves impeller in an inclined direction (has both radial and axial components)



RADIAL-FLOW PUMPS

- Centrifugal Pump
 - Accelerates water using an impeller
- <https://www.youtube.com/watch?v=BaEHVpKc-1Q>
- https://www.youtube.com/watch?feature=player_detailpage&v=ECv1VwW6RTo#t=122



AXIAL FLOW PUMPS

- Axial flow pumps have impellers whose axis of rotation is collinear with the discharge
- Used in high flow, low head applications

