



# Classifications of Pumps

## Selecting between Centrifugal Pumps and Positive Displacement Pumps

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Pumps are in general classified as Centrifugal Pumps (or Roto-dynamic pumps) and Positive Displacement Pumps.

### Centrifugal Pumps (Roto-dynamic pumps)

The [centrifugal or roto-dynamic pump](#) produce a head and a flow by increasing the velocity of the liquid through the machine with the help of a rotating vane impeller. Centrifugal pumps include radial, axial and mixed flow units.

Centrifugal pumps can further be classified as

- end suction pumps
- in-line pumps
- double suction pumps
- vertical multistage pumps
- horizontal multistage pumps
- submersible pumps
- self-priming pumps
- axial-flow pumps
- regenerative pumps

### Positive Displacement Pumps

The [positive displacement pump](#) operates by alternating of filling a cavity and then displacing a given volume of liquid. The positive displacement pump delivers a constant volume of liquid for each cycle against varying discharge [pressure or head](#).

The positive displacement pump can be classified as:

- Reciprocating pumps - piston, plunger and diaphragm
- Power pumps
- Steam pumps
- Rotary pumps - gear, lobe, screw, vane, regenerative (peripheral) and progressive cavity

### Selecting between Centrifugal or Positive Displacement Pumps

Selecting between a [Centrifugal Pump](#) or a [Positive Displacement Pump](#) is not always straight forward.

## **Flow Rate and Pressure Head**

The two types of pumps behave very differently regarding [pressure head](#) and flow rate:

- The [Centrifugal Pump](#) has varying flow depending on the system pressure or head
- The [Positive Displacement Pump](#) has more or less a constant flow regardless of the system pressure or head. Positive Displacement pumps generally gives more pressure than Centrifugal Pump's.

## **Capacity and Viscosity**

Another major difference between the pump types is the effect of viscosity on the capacity:

- In the [Centrifugal Pump](#) the flow is reduced when the viscosity is increased
- In the [Positive Displacement Pump](#) the flow is increased when viscosity is increased

Liquids with high viscosity fills the clearances of a Positive Displacement Pump causing a higher volumetric efficiency and a Positive Displacement Pump is better suited for high viscosity applications. A Centrifugal Pump becomes very inefficient at even modest viscosity.

## **Mechanical Efficiency**

The pumps behaves different considering mechanical efficiency as well.

- Changing the system pressure or head has little or no effect on the flow rate in the Positive Displacement Pump
- Changing the system pressure or head has a dramatic effect on the flow rate in the Centrifugal Pump

## **Net Positive Suction Head - NPSH**

Another consideration is the [Net Positive Suction Head NPSH](#).

- In a [Centrifugal Pump](#), NPSH varies as a function of flow determined by pressure
- In a [Positive Displacement Pump](#), NPSH varies as a function of flow determined by speed. Reducing the speed of the Positive Displacement Pump pump, reduces the NPSH