



# Subject : Design of Pumping Machinery

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# Introduction & working principle

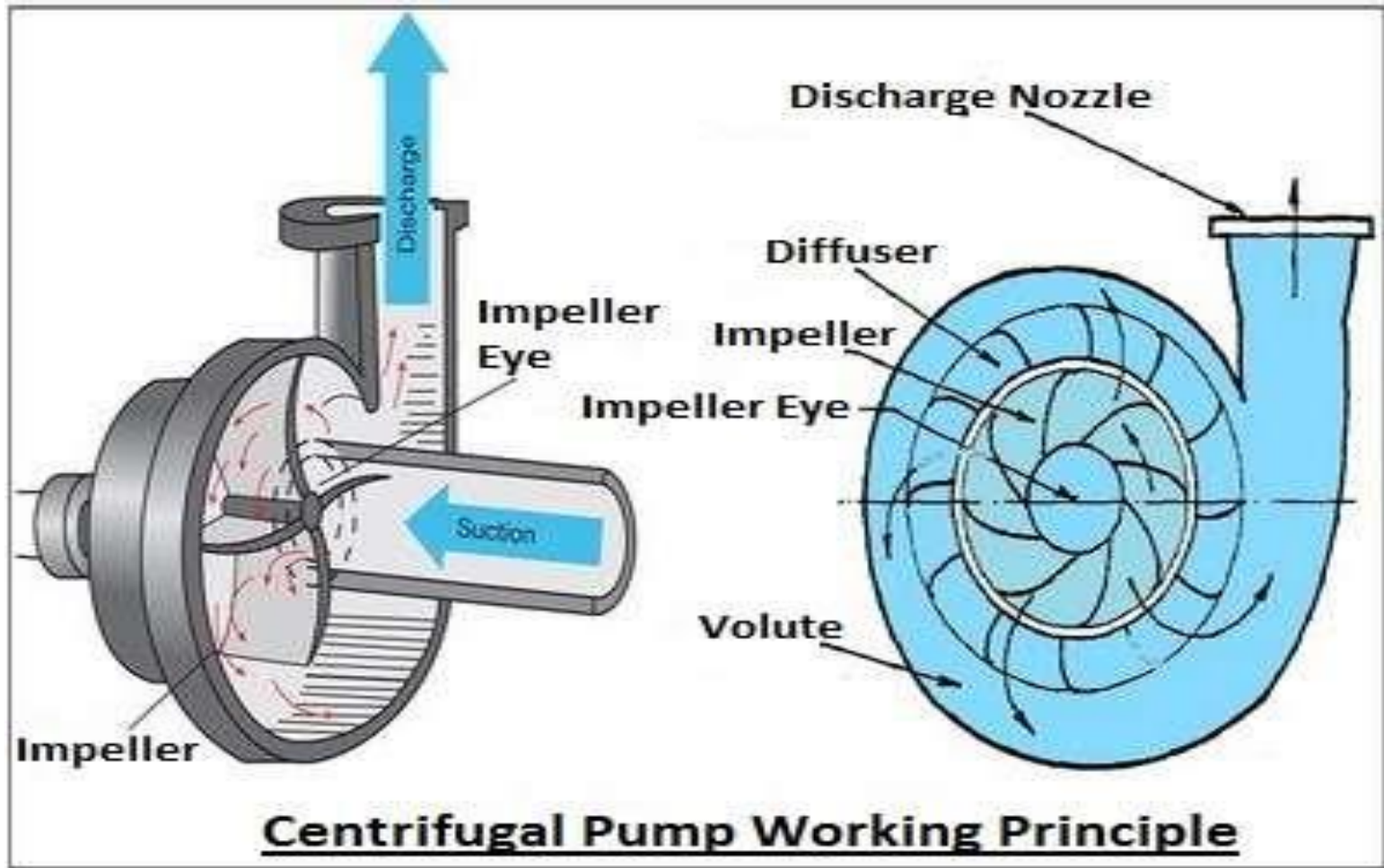
➤ **Pump** is a mechanical device used to transmit water from a region of low pressure to a region of higher pressure.

➤ The **centrifugal pump** defines as a hydraulic machine which converts the mechanical energy into hydraulic energy by means of a centrifugal force acting on the fluid.

➤ In this, the pump uses a centrifugal force acting on the fluid surface to convert the mechanical energy. The centrifugal pump flows in a radial outward direction. therefore the pump acts like a **reverse reaction turbine**.

These pumps are using to raises the water or liquid from a lower level to a higher level.

# Working Principle

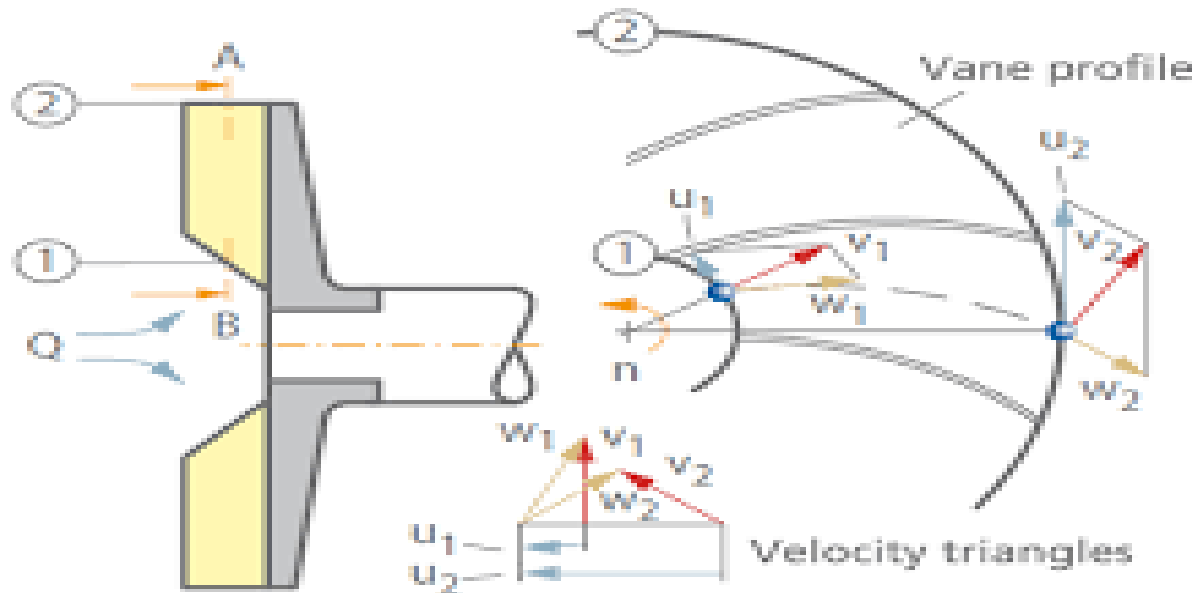


# Classification

- **Centrifugal Pumps** may be classified:
  - in terms of energy conversions (volute type and diffuser vane ring type);
  - in terms of fluid flow through the pump (radial, mixed flow and axial flow);
  - as either single stage or multistage i.e. in terms of number of stages;
  - according to the design of the casing;

# Basic Terminology

➤ **Velocity triangle:** The graphical representation of component velocities of flow through impeller  $V$  = absolute velocity,  $W$  = Relative velocity,  $U$  = peripheral velocity.  $V=U+W$



# Basic Terminology

- Fundamental equation of centrifugal pump :
- Dimensional analysis of centrifugal pump :
- Specific Speed:
- Laws of similitude or Affinity laws:

# Basic Terminology

## ➤ Head :

1.Suction Head(+),Suction lift(-),Static Discharge Head,Total Static Head,velocity head,friction Head,Total Suction Head,Total Discharge/Dynamic Head,Total Head (TDH), Manometric Head

# Basic Terminology

- capacity:
- Power:
- Efficiency:
- General characteristics curves
- The constant or ISO Efficiency curves or Muschel curves
- System head curves
- Series & parallel Operation
- Throttling Operation
- NPSH
- CAVITATION
- VAPOUR PRESSURE
- WATER HAMMER
- PRIMING