

MODULE 3

1. Compare centrifugal pump with reciprocating pump.

CENTRIFUGAL	RECIPROCATING
Suitable for large discharge and smaller heads.	Suitable for less discharge and higher heads
Air vessels are not required Needs priming.	Air vessels are required. No need of priming.
Its delivery is continuous.	Its delivery is pulsating.

2. What is meant by pump?

A pump is a device which converts mechanical energy into hydraulic energy. The mechanical energy is delivered through a prime mover such as electric motor. Due to mechanical action, the pump creates a partial 'Vacuum' at its inlet which permits atmospheric pressure to force the fluid through inlet line and into the pump. The pump then pushes the fluid into the hydraulic system.

3. Define Volumetric efficiency and mechanical efficiency.

Volumetric efficiency of a pump is defined as ratio of quantity of liquid discharged per second from the pump to the quantity passing per second through the impeller.

Mechanical efficiency is defined as ratio of the power actually delivered by the impeller to the power supplied to the shaft.

4. Why is the reciprocating pump called a positive displacement pump?

Reciprocating pump is called a positive displacement pump because it discharges a definite quantity of liquid during the displacement of its piston.

5. Classify Reciprocating pumps. Reciprocating pumps are classified as follows:

Based on action of pump

Single Acting pump, Double acting pump.

Based on No. of cylinder

Single cylinder pump, Double cylinder pump, Multi cylinder pump.

According to existence of Air vessels

With air vessels and without air vessels pumps.

6. What are the major components of reciprocating pump?

Major components of reciprocating pump are:

1. Piston and cylinder
2. Suction and delivery pipe
3. Crank and connecting Rod.

7. What is difference between single acting and double acting reciprocating pump?

In single acting pump, the liquid acts on one side of piston only. whereas in double acting pump, the liquid acts on both sides of the piston.

8. Define slip of reciprocating pump.

The difference between the theoretical discharge and actual discharge of pump is called slip of reciprocating pump.

Slip = theoretical-Actual Discharge

Percentage slip = $\frac{Q_{th}-Q_{act}}{Q_{th}}$

Some times $Q_{act} > Q_{th}$, so slip is negative, called negative

Negative slip occurs when delivery pipe is shorter than suction pipe and when running at high speed.

9. What is a indicator diagram?

Indicator diagram is diagram drawn for a reciprocating pump in such a way that the pressure head in the cylinder is marked in y-axis (ordinate and stroke length of piston from inner dead centre for one complete revolution of crank along x-axis (abscissa).

10. What is air vessel? List the objectives that would be fulfilled by the of air vessels?

An air vessel is a closed chamber opening on bottom side fitted to the suction and delivery pipe. Compressed air is filled up inside the air vessel. The purpose of air vessel is to give uniform flow of liquid.

Objectives of Air Vessels

- (i) To get uniform flow of fluid.
- (ii) To save the power required to the run the pump.
- (iii) To be free from separation during high speed.

working principle of Air vessel.

During first half of the delivery stroke, the piston accelerates to force the water into delivery pipe with more velocity than average velocity. The excess flow of water flows into the air vessel compressing the air inside the air vessel. During second half of the delivery stroke, the piston moves with deceleration, forcing the water into the delivery pipe with a less velocity than the average velocity. Now the water stored in the air vessel starts flowing into the delivery pipe to make up the deficiency of flow. So the discharge in the delivery pipe above the air vessel becomes uniform. Similarly on the suction side, the water flows from the suction pipe into the air vessel during first half of the suction stroke and then from air vessel to cylinder during second half of the suction stroke. This makes velocity of flow uniform in suction pipe.

Important Problems and topics

20.1,20.2,20.3,20.4,20.5,20.6,20.7,20.8,20.9,20.10,20.11,20.12,20.13