



**SNS COLLEGE OF TECHNOLOGY, COIMBATORE-35**  
**DEPARTMENT OF AGRICULTURAL ENGINEERING**

Fluid Mechanics and Machinery –

**UNIT IV PUMPS**

Topic - Reciprocating pump- working principle



Reciprocating pump is a positive displacement pump where certain volume of liquid is collected in enclosed volume and is discharged using pressure to the required application. Reciprocating pumps are more suitable for low volumes of flow at high pressures.

### Components

The main components of reciprocating pump are as follows:

- |                    |                              |
|--------------------|------------------------------|
| 1 . Suction Pipe   | 6 . Piston and Piston Rod    |
| 2 . Suction Valve  | 7 . Crank and Connecting Rod |
| 3 . Delivery Pipe  | 8 . Strainer                 |
| 4 . Delivery Valve | 9 . Air Vessel               |
| 5 . Cylinder       |                              |

#### **1. Suction Pipe**

Suction pipe connects the source of liquid to the cylinder of the reciprocating pump. The liquid is suck by this pipe from the source to the cylinder.

#### **2. Suction Valve**

Suction valve is non-return valve which means only one directional flow is possible in this type of valve. This is placed between suction pipe inlet and cylinder. During suction of liquid it is opened and during discharge it is closed.

#### **3. Delivery Pipe**

Delivery pipe connects cylinder of pump to the outlet source. The liquid is delivered to desired outlet location through this pipe.

#### **4. Delivery Valve**

Delivery valve also non-return valve placed between cylinder and delivery pipe outlet. It is in closed position during suction and in opened position during discharging of liquid.

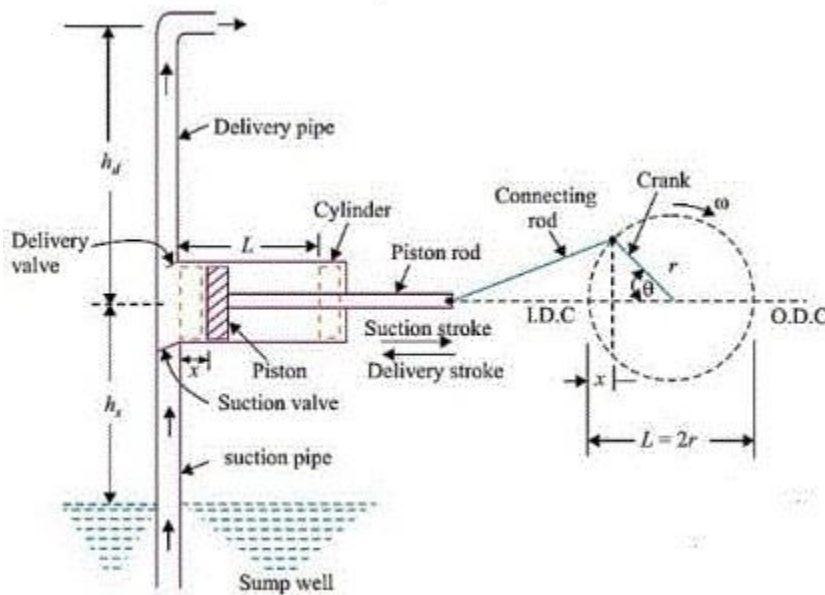
#### **5. Cylinder**

A hollow cylinder made of steel alloy or cast iron. Arrangement of piston and piston rod is inside this cylinder. Suction and release of liquid is takes place in this so, both suction and delivery pipes along with valves are connected to this cylinder.



### 6. Piston and Piston Rod

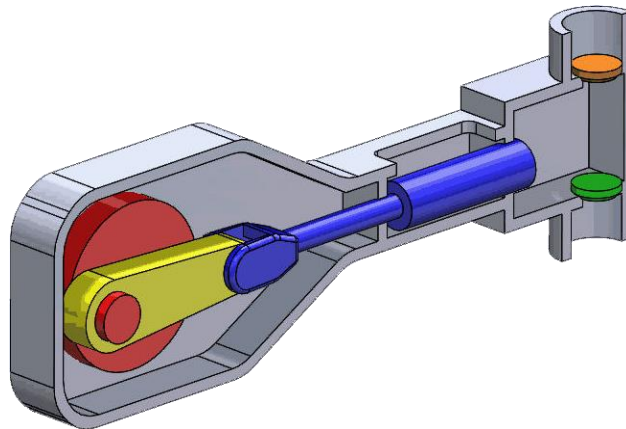
Piston is a solid type cylinder part which moves backward and forward inside the hollow cylinder to perform suction and deliverance of liquid. Piston rod helps the piston to its linear motion.



Components of Reciprocating pump

### 7. Crank and Connecting Rod

Crank is a solid circular disc which is connected to power source like motor, engine etc. for its rotation. Connecting rod connects the crank to the piston as a result the rotational motion of crank gets converted into linear motion of the piston.



Crank Rotation ( Image Source : [www.powerzone.com](http://www.powerzone.com) )

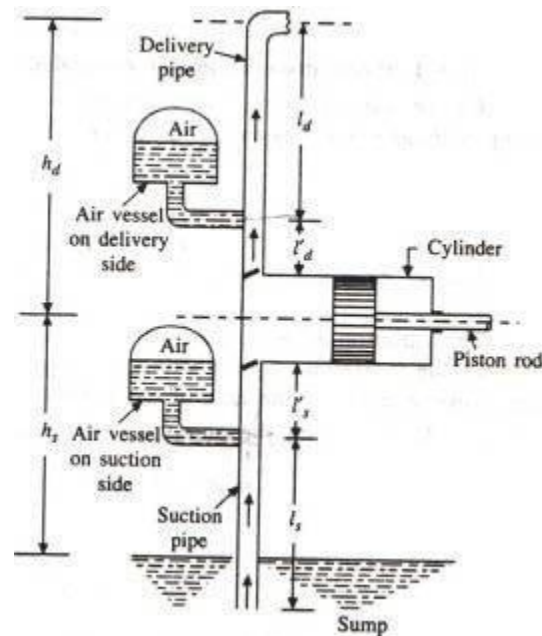


### 8. Strainer

Strainer is provided at the end of suction pipe to prevent the entrance of solids from water source into the cylinder.

### 9. Air Vessel

Air vessels are connected to both suction and delivery pipes to eliminate the frictional head and to give uniform discharge rate.



*Reciprocating Pump With Air Vessels*

### *Working of Reciprocating Pump*

The working of reciprocating pump is as follows:

1. When the power source is connected to crank, the crank will start rotating and connecting rod also displaced along with crank.
2. The piston connected to the connecting rod will move in linear direction. If crank moves outwards then the piston moves towards its right and create vacuum in the cylinder.



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3. This vacuum causes suction valve to open and liquid from the source is forcibly sucked by the suction pipe into the cylinder.
4. When the crank moves inwards or towards the cylinder, the piston will move towards its left and compresses the liquid in the cylinder.
5. Now, the pressure makes the delivery valve to open and liquid will discharge through delivery pipe.
6. When piston reaches its extreme left position whole liquid present in the cylinder is delivered through delivery valve.
7. Then again the crank rotate outwards and piston moves right to create suction and the whole process is repeated.
8. Generally the above process can be observed in a single acting reciprocating pump where there is only one delivery stroke per one revolution of crank. But when it comes to double acting reciprocating pump, there will be two delivery strokes per one revolution of crank.

***Uses of Reciprocating Pump***

Reciprocating pump is mainly used for

1. Oil drilling operations
2. Pneumatic pressure systems
3. Light oil pumping
4. Feeding small boilers condensate return



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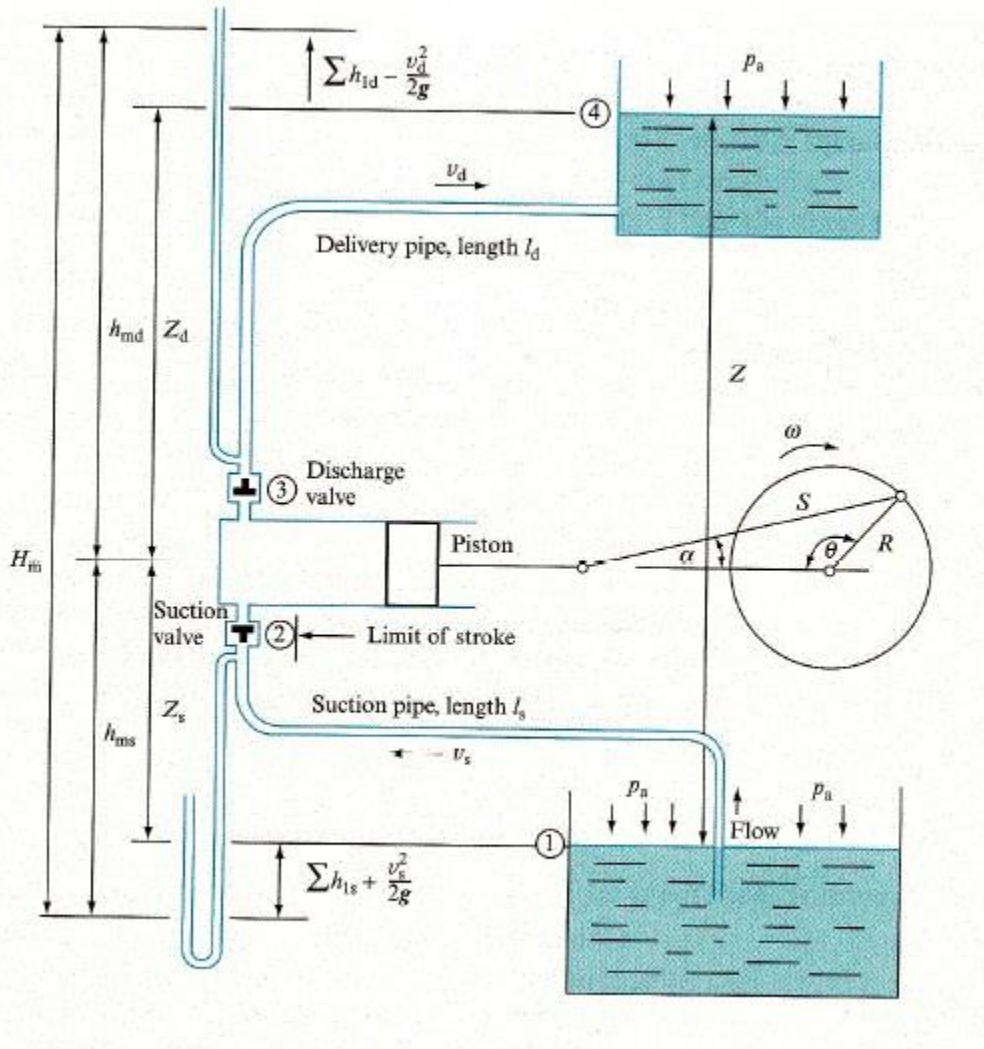


*Reciprocating Mud Pump*

**What is single acting pump and double acting pump?**

If the water is in contact with one side of the piston the pump then it is known as single acting reciprocating pump. For one complete revolution one suction stroke and one delivery stroke occurs.

If the water is in contact with both sides of the piston the pump then it is called double acting reciprocating pump. For one complete revolution two suction strokes and two delivery strokes occurs.



Single acting reciprocating pump

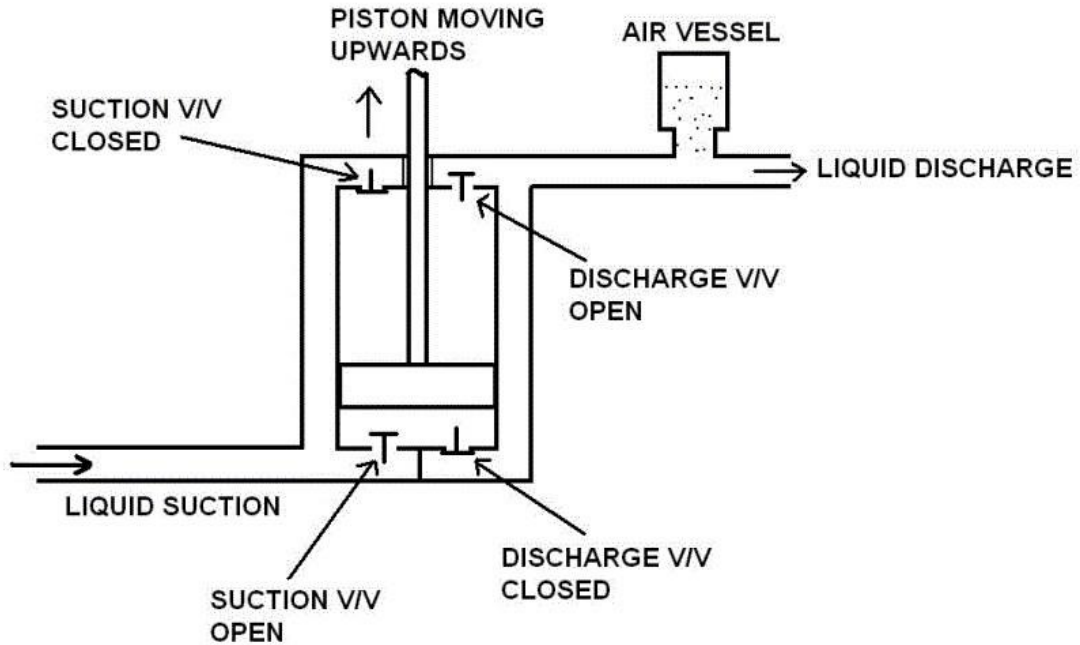


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Double acting reciprocating pump