Centrifugal pump is basically a hydraulically controlled pumping system, Centrifugal means the rotation.

The centrifugal pump is used to transfer fluid by converting rotational kinetic energy to hydrodynamic kinematic energy.

The rotation of fluid is done by the fan motor inserted into the pump and at a definite RPM (rotation per minute) is done.
Centrifugal Pump

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Centrifugal Pump Introduction:

Centrifugal pumping is the terminology used in the management of water and other fluid. It is done to the transfer of water from one place to another without wasting the water and at appropriate timing high efficiency.

Centrifugal pumping is concerned with the flow of fluid and we use different terminology to get it to happen. In pumping by rotor pump the speed of rotor is maintain at a specific range of rotation per minute or second to get higher rate of the flow of fluid the consideration of pumping is done by evaluation certain factor and made a calculation of the terms such as
efficiency of pump, their RPM, the capacity of pump and various other factors to get the good working of centrifugal pump.

Application or Uses of Centrifugal Pump:
Application or Uses of Centrifugal pump are at various pumping places:

- It is used to pump water at household and industry for pumping of water and used there.
- Used in Agriculture for crops and cultivation of land at definite moisture.
- Petroleum and Petrochemical Industry for pumping of oil and fluid chemicals.
- In Nagar Nigam for putting out the waste in the different ditch and jammed hole.
- Lifting and transferring the lake water in the field of farming.
- In Dental treatment centrifugal pump plays an important role.
Centrifugal Pump Working Principle:
Similarly all other pumps it works to pumping the fluid but methodology in the system is the rotation of fluid into the system.

In the Centrifugal pump, the fluid enters into the casing and strikes the blade of the impeller.

And the impeller rotates the fluid at an rpm and get it into required kinetic energy into the water and transfer the fluid at a required Head (height which required),

In the centrifugal pumping system, the fluid enters at axially whirled tangentially and rotate radial direction until it transfers at the required head.

The Centrifugal Pump has various terminology that is:

- **SUMP**
- **EYE OF PUMP**
- **IMPELLER**
- **FOOD VALVE AND STAINER**
- **DELIVERY VALVE**
- **DELIVERY PIPE**
- **CASING**

\[ H = H_d + H_s \]

Where

- \( H_d \)- Delivery height
- \( H_s \)- Sump Height
- \( H = \)Total height \((H_d + H_s)\)

The above is the term used in the centrifugal pump to lift the fluid in a definite distance and
height.

Centrifugal Pump Parts and Construction:
Centrifugal Pump consists of the following Parts:

- Impeller
- Diffuser
- Casing
- Inlet Pipe
- Delivery Pipe
Impeller:
It is a disc-like structure with grooves in there face to hold water during rotation and provide the kinetic energy to stay pumped. The main function is the conversion of pressure to kinetic energy.

The impeller is of two kind one is single suction and the other is double suction in single-suction the fluid enter on only from one direction and in double suction the fluid enters in both direction of the system.

The impeller is also available based on the direction of flow of water it may be radial flow, axial flow, or mixed flow.
Diffuser:
Few pumping (centrifugal pump) contains diffuser, a diffuser is combination of different vanes, The main use of a diffuser is to enhance the efficiency of pumping system. It increases the area of flowing of fluid in the system and converting rotational energy into pressure energy to get the required head of the pump.

Casing:
The portion which we see from the eye at that the impeller, the motor is bounded to that for which it is working. There is a pipe that is connected to the inlet and outlet of the pump to the inlet and outlet of water from the system. at the lower end, there is a connection of foot valve and ad strainers into the system.

There are three types of casing generally that are the volute casing, vertex casing, guided
blade casing systems.

Inlet and Delivery pipe:
In the centrifugal pumping system, the two pipes are generally used during the working that is inlet and outlet pipes. In inlet and outlet pipes, the required pressure is maintained to get the fluid and deliver the fluid at a defined head which is required.
How Centrifugal pump differs from the reciprocating pumps?

1) In Centrifugal pumping the rotation of impeller into the pump used kinetic energy \((1/2mv^2)\) Reciprocating pumps the displacement of the piston in a positive way.

2) Centrifugal pump discharges the water in a continuous way whereas the reciprocating pump discharge in a non-uniform way.

3) In centrifugal pumping, the flow of fluid is reduced when pressure is increased whereas in reciprocating pump pressure does not play any role in the flow of fluid.

4) Centrifugal pump is mostly used for higher viscosity fluid whereas the reciprocating pump is mostly used for a less viscous fluid.

5) The efficiency of the centrifugal pump is lower when it compares to the reciprocating pump, means the efficiency of the reciprocating pump is higher.

6) Discharge is inversely proportional to viscosity in a centrifugal pump whereas in reciprocating pump viscosity does not affect.

7) In the centrifugal pump, there is a problem of priming whereas in reciprocating pump it doesn’t not any problem during priming.

8) Centrifugal pumping used impeller for transfer the fluid and in a reciprocating pump, it uses a cylinder and piston.

9) The centrifugal pump is lighter as a comparison to the reciprocating pump.

10) It has larger discharging at less head and in reciprocating pump it’s reciprocal.

11) Centrifugal pump is less costly whereas a reciprocating pump is more costly.

12) Centrifugal pump has also required less maintenance as a comparison to a reciprocating pump.
13) Centrifugal pump is used for domestic purposes whereas a reciprocating pump is used for industrial purposes mostly.

What is the priming of the centrifugal pump?

- Priming is an important process to starting up the centrifugal pump but the centrifugal pump is not able to pump the bubble formed by air and vapors.

- In priming the impeller of the centrifugal pump is fully into the water without any air bubble into the system. This is required when the centrifugal pump is starting.

- It is required for positive displacement when the centrifugal pump is start first time.

- Priming means trapping liquid into the system (casing) to remove clearance volume.

- Self-priming is also used in centrifugal pump.
Method Used for Priming:
1. Manually
2. With pumping by vacuum
3. With jet pumping
4. By using separator