

Centrifugal Pumps

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Abstract

The hydraulic machines which convert the mechanical energy into hydraulic energy are called hydraulic pumps. The hydraulic energy is the form of pressure energy. A pump is a device is used to force a liquid in particular direction. In the world hydraulics, the most preferred pumping devices are centrifugal pumps because this is due advantages like simple in construction, cheap, maintenance costs are lower, high efficiency, etc. Centrifugal pumps are used to transport fluids by the conversion of rotational kinetic energy (via motor) to the hydrodynamic energy of the fluid flow. The most important parts are included in the centrifugal pumps are Casing, Impeller, Suction pipe with a foot valve and strainer and delivery pipe. We will discuss the more detail information given below.

Keywords: Efficiency, Power, Rotational per minute (R.P.M), Fluid flow

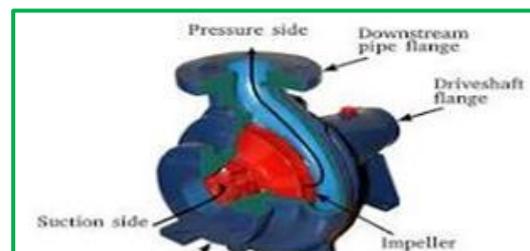
Introduction

We will talk about a little bit about the history of centrifugal pumps. The first true centrifugal pump was developed by Denise Pepin in 1687. After that, there are various modifications and design changes that have gone through the years. In 1849, first all metal centrifugal pump was manufactured. In 1851 the design of the pump started to change to make them more efficient. The curved vane pump as it is in operation today was created by British inventor John Appold in 1851.

Working of centrifugal pump

As the name implies, centrifugal pumps use centrifugal force to pump liquids from one place to other. They are designed to transform provided rotational energy into work to raise a liquid from a low level to high level. Centrifugal pump uses only two main parts for its conversion of energy- Impeller and Casing. The impeller is the part of the pump that rotates, and the casing forms an airtight passage around the impeller. When fluid enters the casing it hits the impeller blades .from there it is whirled tangentially and radially outward the diffuser part of the casing. The Fluid picks up both pressure and velocity as it acted upon by the impellers. The doughnut-shaped diffuser decelerates the flow and further increases the pressure. The process then repeats as the impeller.

Components of centrifugal pump→



Applications of centrifugal pump

1. Chemical industry – Centrifugal pumps are commonly used in chemical plants to move fluids around. The fluid is typically moved from one tank to another. Centrifugal pumps can also pump chemicals from one place to another, such as from a storage tank to a reactor.
2. Irrigation systems – Centrifugal pumps are used extensively in agricultural applications. They are used for irrigation, transferring water from reservoirs lakes or fields, and powering farm equipment of tractors. Centrifugal pumps are also used to spray pesticides and fertilizers on crops. Centrifugal pumps are very useful to the farmers.
3. Paper mills – Paper mills use centrifugal pumps to move paper stock through the pulping process. The paper stock is fibrous slurry full of water and other liquids. The centrifugal pumps help to separate the solid fibres from the liquid and then move the pulp through the system.
4. Shipbuilding industry – Centrifugal pumps are used for bilge pumping, fire fighting, water supply and fuel transfer tasks. It can also be used to transfer sewage and other waste materials from one location to another.

Advantages of centrifugal pumps

1. High Efficiency – Centrifugal pumps are designed with impellers that create a centrifugal force, which imparts energy to the liquid. This hydraulic design allows for efficient fluid transfer with minimal energy losses. Due to their high efficiency, centrifugal pumps require less power consumption compared to the other types of pumps. This results in significant energy savings, reducing operational costs and environmental impact.
2. Simple and Compact design – A simple design consisting of an impeller, a casing and inlet, outlet connections. This simplicity makes them easier to manufacture, install and maintain. The compact size of centrifugal pumps allows for easy installation in confined spaces. They require less floor area, making them suitable for applications where space is limited, such as compact industrial facilities
3. Ability to handle different pressures – Centrifugal pumps can handle both low and high pressure operations. By adjusting impeller size, rotational speed, and design features, centrifugal pumps can be optimized to meet specific pressure requirements, offering flexibility in different applications.
4. Low maintenance Requirements – Centrifugal pumps benefit from a simple design with few moving parts, resulting in lower maintenance requirements and costs.

Disadvantages of centrifugal pumps

1. The main disadvantage is that they use rotation instead of suction to move water and therefore have almost no suction power. This means that a centrifugal pump must be put under water, before it will move water. Centrifugal pump can also develop a phenomenon called “cavitation”.



Conclusion

Centrifugal pumps are the most commonly used for irrigation. They work by using a rotating impeller to create a flow of water. Centrifugal pumps are generally less expensive and easier to maintain than other types of pumps, but they may not be as efficient at moving water long distances or up hills. Hence, farmers can make use of these types of pumps. So that they can be more benefitted.

References

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