STUDY ON PUMP

A pump is a mechanical device used to move gases, liquids, or slurries. A pump moves liquids or gases from a lower pressure to a higher pressure and is responsible for this difference in pressure.

Manual pump used to obtain water

How it works

Pumps work by using mechanical forces to push the material, either by physically lifting, or by the force of compression.

History

The earliest pump was described by Archimedes [[1]] in the 3rd century BC and is known as the Archimedes screw pump.

Types

Pumps fall into two categories: positive displacement pumps, which force fluid from one sealed chamber to another with little leakage, and dynamic pumps, which use the momentum of the fluid to move it across an unsealed chamber.

Positive displacement pump

This type of pump forces the fluid from one chamber to another by reducing the volume of the first chamber while increasing the volume of the second. Such a pump produces a constant flow regardless of intakepressure or outlet pressure, unless the intake pressure drops below a certain limit, causing cavitation, or the outlet pressure exceeds the capacity of the pump, causing pump failure.

These pumps often have a relief valve to prevent the latter problem. The heart of animals is a natural example of this type of pump.

Reciprocating positive displacement pump

Hydraulic ram

Pumpjack

Stirrup pump

Inductive Pumps

Piston pumps

Diaphragm pump, sometimes also called Membrane pump

Rotary positive displacement pump

Screw (or progressing cavity) pump

Vane pumps (with flexible or rigid vanes)

Gear pumps (internal and external)

Lobe pumps

Peristaltic pump [[2]] (uses a process similar to peristalsis [[3]] in animals)

Circumferential piston pump

progressive cavity pump : pumps fluid by the rotation of a helical steel rotor inside a rubber pump body with a helical aperture

Roots blowers

Dynamic pump

The dynamic pump causes the fluid to move from inlet to outlet under its own momentum. This type tends not to need a release valve, because as the outlet pressure rises the pump simply becomes less efficient. Fluid motion can be rotary, as in centrifugal pumps, or linear, as in reciprocating dynamic pumps.

Rotary dynamic (centrifugal) pump

This type of pump contains a rotating part called the impeller inside a stationary cavity. The cavity may be avolute, diffuser, or ring type. The impeller forces the fluid to rotate, and thereby to move from inlet to outlet under its own momentum. As the fluid travels through the impeller passage its absolute velocity increases. In the volute, diffuser, or ring type cavity the fluid velocity is reduced and its energy converted to pressure energy.

Examples:

turbopump: the fluid is moved by the blades of a high-speed turbine.

submersible pump : the fluid is moved by a pump joined to a sealed motor and submerged in the fluid to be pumped.

split case centrifugal pump : the fluid is pumped by a horizontal or vertical pump with a split volute to allow maintenance access.

axial flow pump : the fluid is pumped by a propeller type impeller inside a section of pipe.

Linear or reciprocating dynamic pump

The Vortec Transvector is one example of a no-moving-parts dynamic air pump. A film of fast moving air formed by releasing high pressure air through a slit is discharged adjacent a surface, and drags ambient air along with it. The higher the pressure of the primary air supply, the worse the efficiency.

It is an example of an ejector pump. Steam ejectors are used to cool bleach water so it will retain the chlorine. They simply discharge a boiler into a tube, sucking water vapor out from above a sealed tank. The water inside slowly cools. Not very efficient, but it does something useful with waste steam, simply.

Steam ejectors are also used in Thermal power stations to maintain continuous vacuum in condensers, but this is not waste steam.

A well pump is also a dynamic pump. Since water will boil if any attempt is made to "suck" it more than about thirty feet high. Therefore high pressure water from the discharge of the pump itself is injected below water level in the well into the suction pipe of the pump, forcing the well water to flow upwards, much more than thirty feet. This arrangement gives positive head to the pump suction. This is also called deep well pump or jet pump.

Ejectors are used to augment the flow in turbojets, near the aft end.

The Coanda effect is the tendency of such a moving stream to cling to a surface, even when the surface deflects the stream away from its original direction. The surface seems to pull the stream. It is a manifestation of Bernoulli's principle: since energy is conserved, a moving fluid has a lower pressure than a static fluid. The ambient fluid is moving more slowly, and so has a higher pressure; it forces the moving stream toward the surface.

The USPTO issued a patent to Henri Coanda for the design of a jet engine using high pressure fuel vapor as the primary fluid supply. The Transvector patent references Coanda's patent. Such engines can be made light in weight but are not very efficient.

Centrifugal Pump Components Pump Casing - To keep the fluid in the pump.

Impeller - The component that drives the fluid to a higher pressure

Shaft - The rod that connects the motor to the impeller

Motor - The part that powers the pump

Mechanical Seal, labyrinth seal, gasket or Packing - To keep the fluid from leaking out to the atmosphere. There are some magnetically driven centrifugal pumps that do not need such seals or packing.

Bearing - To keep the shaft rotating freely in place.

Outboard bearing - Bearing at motor end of shaft

Inboard bearing - Bearing at impeller side of pump. Need 2 bearing to hold shaft in place

Oiler - To provide oil to lubricate the bearing so it will not jam. May use grease also, if so, grease gun inject grease through nipple to provide lubrication (A nipple is a type of joint with female threads in plumbing practice, but a grease nipple is mushroom shaped male fitting mating with a grease gun head.)

Jet Pumps

Jet pumps (such as eductors, eductor-jet pumps or air ejectors) use convergent/divergent nozzles and a feeder stream to create a point of low pressure. At this low pressure point, a line goes to the fluid to be pumped. The fluid is drawn into the eductor by the differential pressure and then entrained in the feeder stream.

Jet pumps are exceedingly easy to use, because they have no moving parts and simply rely on their fluid dynamics. On the other hand, their use is limited to applications where a feeder steam is already available; such as on condensing steam turbines to maintain continuously vacuum in condenser by removing air and other gases from it.

They are also commonly used to remove water, rather than supply it. Also, they have to be lit off in the right order, otherwise the feeder stream enters into the area being pumped, instead of drawing from it.

One of the most common examples of the jet pump is the eductor. This pump is often used on board ships for dewatering and pumping bilges. In this application, the feeder stream is always available in the form of the firemain system that already exists for fire fighting. But it must be operated correctly, as suggested above, or else flooding could result. The simple phrase "Dumb Freaking Sailor" (or less sanitized versions thereof) is self-mockingly used as a reminder: Discharge, Firemain (motive force), Suction (bilge).

In system such as PDX, steam is accelerated to supersonic speed, and use the resulting shockwave to create a vacuum.

Source : http://engineering.wikia.com/wiki/Pump