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[illegible]

used to transfer Liquid From suction to discharge with the help of rotational energy. The centrifugal Pump operates on a rotodynamic principle. 1. Single Stage2.Two-stage3. Multi-stage4. is a mechanical device which is used for transferring liquids from one place to another by increasing its pressure.Priming is the process in which the suction pipe , casing, and delivery pipe up to the delivery valve is filled completely with liquid to be raised, from outside source before starting the pump. Centrifugal pumps are widely used for fluid transport in a wide range of industries including wastewater treatment, water supply, chemical processing, oil and gas transport, food and beverage processing and HVAC's systems.DC shunt motor because it runs at constant speed. As a result, it is employed for operating centrifugal pumps, lathes, constant speed line shafts, tiny printing presses, and other machinery.A pump is a device used to move fluids (liquids or gases) from one place to another, while a centrifugal pump is a specific type of pump that uses a rotating impeller to increase the velocity of a fluid and then transfer it to a another location. Essentially, all centrifugal pumps are pumps, but not all pumps are centrifugal pumps. Other types of pumps are positive displacement pumps, axial flow pumps, and mixed flow pumps.The term centrifugal in the name of the pump refers to the centrifugal force that is generated by the rotation of the impeller. Rotation of the impeller creates a centrifugal force that creates a pressure differential, which in turn causes the fluid to move through the pump and out of the discharge port. Check Out Other Important Topics Centrifugal pumps are one of the most commonly used pumps on the earth with ever growing applications. They are simple and reliable machine of any machinery space. On ship they are the simplest of machinery installed in the engine room. They are unique for its high flow rate at variable dynamic head with less repairs. Allowing operating personnel to throttle flow rate without building pressure on pipeline.Each centrifugal pump comprises of components such as shaft, bearing, structure and sealing arrangement. It converts energy of a prime mover to kinetic energy and then to pressure energy with help of volute casing. The impeller is the rotating components that converts shaft energy to kinetic energy of fluid. Diffuser or volute casing is that stationary part of the pump that converts these kinetic energy to pressure energy.Is Centrifugal Pump a Type of Positive Displacement Pump?No it is not, you wont believe but many nontechnical but curious people asked me whether these pumps are of positive displacement type? Even having a long list of differences these pumps have; They are often misunderstood similar to other positive displacement pumps.What makes a centrifugal pumps unique is that it can be run in either direction with its radial and axial flow designs. Other major features that makes it different than that of a positive displacement pumps are; performance, fluid viscosity and working.The impeller suck in water creating a minor vacuum by adding kinetic energy to the water or fluid. It is then converted to pressure energy with the help of volute casing or diffuser. On other hand a positive displacement pump force a limited amount of liquid trapped in the system towards discharge port.While in positive displacement pumps the flow rate remains same irrespective of pressure, flow rate do change with pressure in centrifugal pump. The problem with centrifugal pumps is that it cant handle high viscous fluids while the positive displacement pumps have no problem pumping them out.Where are Centrifugal Pumps used on Ship and Shore Industries?These pumps are among the top used pumps in various industries for transferring fluids. They are undisputed champions for transferring low viscous fluids from one place to another across industries. They are mostly used for their advantage of caring large quantity fluid, high flow rate with dynamic head. Above all the freedom to change flow-rate without dangerously pressurizing the system make it the top choice.They are used on shore for boiler feed applications, irrigation, waste management, as a booster pump, refineries, mining, air conditioning, fire fighting, food production and power generation. These pumps are used on ships for bidge, boiler feed, fire fighting, sea water suction and general service pump. They are one of the simplest machinery in engine room.Different Components of Centrifugal Pumps?Basically a centrifugal pump has two major components; rotating and stationary. While rotating components comprises of parts like impeller and shaft; stationary components have parts such as casing, cover and bearing with other small components such as impeller seal, motor, coupling, volute, stuffing box and wear ring.A) Primary ComponentWhen an impeller rotates in a liquid at certain speed; transfer of energy took place from moving blades of impeller to the fluid. Kinetic energy is generated in the fluids as it moves forcing itself towards the volute casing. As the impeller moves; centrifugal force moves the liquid from near the hub towards the tip of impeller blades. An Impeller is mounted on the shaft made of stainless steel. A shaft of optimum size is required for better performance as a longer shaft will increase unnecessary costs while smaller shafts can cause troubles like vibration, shaft breakage and lower pump life. Made of cast iron, casing converts kinetic energy into pressure energy due to its volute like structure.An impeller is fitted inside the volute with its outer diameter closest to the casing at the time of discharge. It converts converts kinetic energy to pressure energy by providing increasing area around the impeller before leaving for discharge. A mechanical seal is provided in between the gaps of stuffing box and shaft. A stuffing box is the position in centrifugal pumps where shaft pass through the casing.B) Secondary ComponentA mechanical seal is provided to protect the system with three main parts like gland, spring, rotating and stationary faces. A gland fits around the shaft onto the pump casing. The stationary and rotating sealing rings are sealed to the gland and shaft respectively. Now the space in between these rings are compressed with springs; to make it possible for fluids to pass.Finally these pumps are equipped with wear rings to avoid possible wear of casing and impeller saving costs of maintenance. A wear ring is a kind of replaceable-wearable copper alloy rings placed in between the impeller and casing. They are designed to be replaced several times during a life time of centrifugal pumps. They provide a small clearance in between the impeller and the casing for problem free operation.Operating Principle of Centrifugal PumpsWorking on the principle of centrifugal force, these pumps explains how centrifugal head is generated when a fluid is rotated by a rotating impeller throwing fluid away from its central axis. Finally sudden change in area across impeller and changing angular momentum build pressure.First step in operating a centrifugal pump is to prime ensuring its suction, casing and a part of discharge is filled with water/fluid. It can be achieved by placing the pump itself at lower level or using a secondary priming pump specially for the work. Once it is ensured that there is no air in the system, motor or prime mover is started. If there is air pockets left in the system the pump wont discharge.The impeller rotates throwing fluids on the walls of the casing. The casing is specially designed in the form of volute which converts major part of fluid kinetic energy to pressure head. Now fluid leaves the impeller under pressure creating vacuum behind the impeller eye. The vacuum will pull water/fluid from the suction line to continue the above process.Efficiencyofcentrifugalpumpscanbegivenby(η)=WQ(Hs+Hd)ShaftPowerHere,Q = DischargeW = Specific WeightHd = Head at the dischargeHs = Head at the suctionThis can be represented on graph as:The above Graph stats that discharge head is inversely proportional to the flow rate. At operating point we get the maximum efficiency for pump at minimum power consumption.Q What are Different Centrifugal Pump Types Used?While there are different types of pumps used on ship, centrifugal pumps being one of them. But only few will know the different types of centrifugal pumps used on and outside of ship i.e on board and shore industries. The major classification are:-Axial Flow Single StageAxial Flow MultistageMixed FlowRadial Flow Single SuctionPeripheral MultistageRadial Flow Double SuctionPeripheral Single StagePeripheral Single or Multi Stage Self Priming PumpQ. Why Centrifugal Pump Requires Priming?Centrifugal pumps are the sub class of dynamic pumps which convert Roto-kinetic energy to the pressure energy of fluid to transport fluid from one place to another. This roto-kinetic energy is generated from impeller mounted on shaft running by an engine or motor. It is not a positive displacement pump; so cannot pump gas as it restricts with its ability to create necessary pressure difference.Primming is a process of submerging pump casing, suction and a part of discharge to insure there is no air trapped in the system. This is one of the major requirement during starting; but only required for pumps having elevation of suction lower than elevation of pump. More importantly the head developed by these pumps depends upon the speed and diameter of impeller.Now as the head generated is proportional specific weight of the liquid. This states that the pressure difference created with air would be 1/800 times that with water. This low pressure difference would be impossible to maintain steady suction; so centrifugal pumps do require priming.Q. Why Discharge Valve are Closed During Starting?A large part of centrifugal pumps are generally started with discharge valves shut. When examining the properties of centrifugal pump by operating characteristic curve it is clearly found that; when the amount of water delivered is zero, the power available is at minimum. So discharge valves are kept shut during the start to maintain low power demand by the pump on its motor having low power output at the start.This helps stabilizing pumps at the starting. When the pump is stabilized the discharge valves are opened and high power availability meets the high power demand; which would be impossible for the motor to meet for the starting 4-5 seconds.Common Problems Associated with Centrifugal PumpsA centrifugal pump is one of the simplest installations of any plant / Engine room with the most commonly used equipment in the world. Their application is continuously expanding, and with this expanding new problem associated with centrifugal pumps are manifesting. However, it is not possible to predict any problem that may occur in the future but having the in-depth knowledge about the different factors which may affect the centrifugal pumps performance is a smart thing to do. Read our 11 major problems with possible cause for centrifugal pumps!Maintenance and Repairs of Centrifugal PumpsEnvironment and operating condition have an great impact on pumps efficiency and life specially when it is subjected to run through the year. In such conditions, routine or preventive maintenance are done to prolong the life of the centrifugal pump. In general we routinely inspect bearing and lubricant condition, pump vibration, discharge pressure and shaft sealing.Bearing temperature, vibration and lubricant temperature are monitored to avoid imminent failures. Mechanical seals are inspected for any signs of crack/Leakage. It is considered acceptable to have minor leakage but anything above 30 to 40 drops is seriously NO-NO. Many a times overall pump vibration is also monitored for signs of failure. Any sudden increase in vibration can be sign of resonance due to improper alignment.Pressure difference in centrifugal pumps are considered to be the important factor stator pump condition. Difference between suction and discharge pressure is carefully monitored and logged down for years of operation. Any sudden decrease is an indication of widening impeller clearance. To maintain operation and integrity of these pumps; preventive maintenance are done on board ship.Similar maintenance are also done on shore industries which includes steps like-Inspecting Impeller clearance, impeller blades, shaft and volute casing for signs of pitting, erosion and wear.Erosion are fixed by using ally epoxy putty.Check all bearings for wear and change if necessary Using feeler gauge check for wear ring clearance.Clean all the physical parts of centrifugal pump.Check all the windings of motor with help of a megger.Check for uneven or excess longitudinal or axial movement of the shaft.Assemble all the system and put the date of maintenance.Clearance Taken in Centrifugal Pump>Packing and stuffing Box ConclusionUnlike all other positive displacement pumps; a centrifugal pump converts the rotational energy of impeller into kinetic energy of fluid and then to pressure energy. Water or fluid enters through the eye of the impeller thrown towards the edge of the blades radially outwards. Then major part of kinetic energy is converted to pressure head thanks to the volute design in the pump casing.Also Read: OrWhy not Request your own Topic ! WHAT IS THE PRINCIPLE OF WORKING OF A CENTRIFUGAL PUMP? The principle used for centrifugal pump is the centrifugal force in the form of dynamic pressure which is generated by rotary motion of one or more rotating wheels called the impellers.SKETCH LAYOUT OF A CENTRIFUGAL PUMP INSTALLATION AND LABEL IT.STATE THE APPLICATION / FEATURES OF A CENTRIFUGAL PUMP On most tankers, the main cargo pumps are centrifugal pumps, located at the bottom of a pump room at the after end of the cargo tanks. These may have rated capacities of 1000m3/hour on medium size tankers. These are powered by a drive shaft from a turbine or electric motor located in the engine room. Some smaller tankers and particularly chemical or product carriers are fitted with deep well centrifugal pumps in some or all cargo tanks. While both of these pump types operate on centrifugal force principles, their operation is quite different.STATE THE PRECAUTIONS TO BE OBSERVED WHILE USING A CENTRIFUGAL PUMP The pumps must be carefully checked before starting to ensure that their chambers are full of cargo. Keep discharge valve fully shut before starting the pump. Increase the rpm gradually and open the discharge valve. Confirm no unusual rise in the temperature of pump or its casing. Also Confirm no vibrations. As discharge proceeds, it is important to maintain a good trim by the stern so that the pump inlet remains below the cargo suction inlet. Cargo officer must know the height of the ship's bottom framing and slow down the pump while there is still a meter of cargo above that level. The pump speed control and the pump discharge valve can then be manipulated to maintain pump suction and cargo flow until the tank is nearly empty. Main cargo pumps should not be used to drain the tank. The stripping pumps are provided for that purpose. Vapour/air extraction device, if fitted, should be operational when the cargo level is low and continued till Cargo pump is finally stopped or changed over to next tank. Deep well pumps are centrifugal pumps designed to be mounted in the cargo tank. They have a special application in product/chemical carriers, where each tank is fitted with a dedicated pump. This improves the flexibility of the chemical/product carrier and minimizes the possibility of contamination. Because the number of pumps is larger, the individual pumps themselves are smaller and individually require less power. With a deep well pump installation, the need for a pump room is eliminated, along with the hazards and complications of that space. The more common method of evacuating the deep well is with an air or nitrogen purge system. The gas is piped through a small-bore line at the base of the pump and pushes the contents up the main discharge riser. When a cargo tank is being stripped (or drained) with a deep well pump, the pump cycles as its self-priming function is activated, dropping speed and pitch as it fills with liquid and then increasing in speed and pitch as it loses suction and drops the contents of its discharge column back into the well to re-prime itself. Pump speed should be reduced when stripping (if speed control is available). If the pump is powered hydraulically, it can be regulated to any speed desired to permit maximum cargo recovery. Reciprocating pumps are those which cause the fluid to move using oscillating pistons, plungers or diaphragms. These pumps are also called positive displacement pumps because they are fitted with a system of suction and discharge valves to ensure that the fluid is displaced in a positive direction. These are small capacity (say 100 to 250 m3/hour capacity) pumps which are used for stripping of lines, pumps and tanks. Though rated capacity is less, they can handle very high pressures.The working principle can be explained by considering below the cargo suction inlet. Assume that the intake side of the pump is connected to a supply of liquid. When we move the piston to the right, lower pressure is created in the chamber formed by the piston. Higher pressure on the fluid outside the chamber forces fluid in through the inlet port and fills the chamber. Moving the handle forward in the opposite direction forces the fluid out. A check valve at the inlet port prevents flow there and, since the fluid must find an outlet somewhere, it is forced out through the discharge port. The check valve at the discharge port prevents the entrance of fluid into the pump on the subsequent suction stroke. The back-and-forth movement of the piston in the pump is referred to as reciprocating motion and this type of pump is generally known as a reciprocating-type piston pumpPRECAUTIONS WHILE USING A RECIPROCATING PUMP The pump should be started against partially open delivery valve. The pump should never be started or operated against closed delivery valve. Close monitoring of strokes must be done to prevent damage to the pump. Pump must not be operated above its rated discharge pressure Pump shafts must be regularly lubricated if auto lubrication system is not functional. OOW must be standby to stop the pump when stripping operation is nearing completion.COMPARISION BETWEEN THE CENTRIFUGAL AND RECIPROCATING PUMP.Centrifugal Pump Reciprocating Pump1. Flow is smooth 1. Flow is intermittent2. Compact and 2. Comparatively needs Need less space more space3. Initial cost is less 3. Initialcost is 4 to 54. Easy Installation 4. Instal lation is5. Low maintenance 5. High Maintenance6. Requires Priming 6. Does not require The Eductor works on Bernoullis principle.OPERATION/FEATURE OF EDUCTOR Eductor is operated by the drive fluid entering through the pressure nozzle, producing a high velocity jet. Drive pressure is normally between 8 to 10 kg/cm2. This jet action creates a vacuum in the suction line, which causes liquid to flow up the body of the Eductor where it gets mixed with the drive fluid. Eductor are used to empty tanks, pumps and pipelines. Medium size tanker are fitted with educator of rated capacity of 100 to 300m3/hour. When shutting down an Eductor, the suction valve should remain open as this prevents the Eductor creating a vacuum on the suction line. If the Eductor drive pressure falls below the designed operating pressure, the Eductor suction valve should be closed to prevent any backflow of the driving liquid into the tank. Eductors have a low initial cost Eductors are self-priming Eductors have no moving parts Eductors are easy to install Eductors require little or no maintenance A screw pump is a positive displacement pump that use one or several screws to move fluids or solids along the screw(s) axis. Screw rotates in a cylindrical cavity, thereby moving the material along the screw's spindle. There may be single, double or triple screw type pumps but each screw pump operates on the same basic principal of a screw turning to isolate a volume of fluid and convey it. The individual turns of the screw seal a set volume of fluid by direct contact, with the stator. The stator has a shape that corresponds to the outside surface of the screw. The interference fit between the screw or pumping element and the flexible stator create a unique pump design that can handle a variety of fluid characteristics, including high levels of solids and variable viscosities. However, the interference fit creates a need for lubrication and cooling of the stator material.COMPARISION BETWEEN SCREW PUMP & CENTRIFUGAL PUMP Compared to centrifugal pumps, positive displacements (PD) pumps have several advantages. The pumped fluid is moving axially without turbulence which eliminates foaming that would otherwise occur in viscous fluids. They are also able to pump fluids of higher viscosity without losing flow rate. Also, changes in the pressure difference have little impact on PD pumps compared to centrifugal pumps.

Centrifugal pump ship. What is the working principle of a centrifugal pump. Pump centrifugal.

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