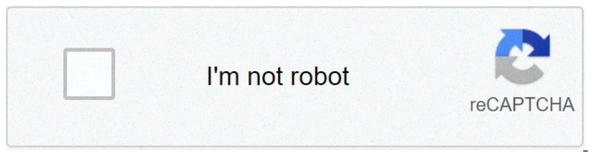

Continue

Plan 32 mechanical seal

The AESSEAL FLOWTRUE® is a robust and adjustable flow meter that controls the amount of water flowing to the mechanical seal for cooling purposes. The unique and advanced FLOWTRUE® design means that of all the flow meters available it is the least likely to clog. This is due to large internal clearances within the design. There are three models of the FLOWTRUE® available, which enables the product to be used on packing applications, single seals and double mechanical seals. Features: Flow cartridge has a tapered design, which gives larger internal clearances to reduce clogging Use of segmental valves to control flow provides large clearances to reduce clogging Innovative flow tube cleaning mechanism enables the FLOWTRUE to be cleaned without interruptions to flow or pressure Non-return valve as standard protects the integrity of plant water line Modular design enables application specific ordering and for the FLOWTRUE to be updated and repaired Allen key flow and pressure adjustment restricts operator error Every rotating equipment in process industry consist of a rorating part called as rotar and stationary part called as stator. In case of pump the rotating part is called as rotar or impeller and stationary part called as pump casing. As fluid is in contact with impeller as well as casing all the time, and impeller must rotate inside the casing, there must be some arrangement which prevents the fluid from leasking from the clearance nbetween impeller and casing but also provide freedon for impeller rotation. This arrangement is called mechanical seal or shaft seal. Mechanical seal is the most commonly used shaft sealing devices for centrifugal pump in any service. For domestic water transfer service pumps, gland packing, and stuffing box seals are used. The main function of the any mechanical seal is to retain the pumped fluid inside the casing at the point where the impeller shaft penetrates the pump body. Mechanical seals consist of a stationary and a rotating face. Seal faces may need cooling and lubrication arrangement due to heat generating of rotating faces. A detailed information is given in API Std 610 regarding various seal flush systems used to cool the seal faces and remove foreign material. The rotating seal face is attached to the shaft, while the stationary seal face is held fixed to the equipment case. Mechanical seals can be categorized by certain design characteristics or by the arrangement in which they're used. Figure 3 outlines these classifications Single inside seal: The single inside seal is the most common and preferred seal arrangement used. The important characteristic of this arrangement is that the seal faces are lubricated by the sealed fluid itself. Hence, the fluid must be compatible with the environment. Toxic or hazardous fluids cannot be handled using a single seal. Single Outside seal: The single outside seal is not the preferred arrangement; certain situations dictate its usage. When equipment is having very limited seal chamber area, single outside seals are used. To avoid the use of very expensive materials in highly corrosive applications, outside seals are sometimes employed. Because in this arrangement, only the seal faces and secondary sealing members are exposed to the corrosive fluid. Dual Seals: Dual or Double seals are used when the pumping fluid being handled is incompatible with a single-seal design. Highly corrosive, Toxic or hazardous fluids like hydrocarbons etc must be handled with a multiple-seal arrangement. The primary function of the double seal is to isolate the pumping fluid from the atmosphere and create an environment in which a mechanical seal can sustain. This is achieved by employing two seals that operate in a different fluid, the other fluid used is called a barrier fluid. The barrier fluid used must be clean and provide noncorrosive lubrication to the seal faces. The pressure of the barrier fluid is maintained higher than the pumping fluid in the seal chamber. The dual seals can have either back to back arrangement or face to face arrangement. Tandem Seals: Tandem seals are applied when a single seal design is compatible with the pumping fluid, but environmental emissions of VOCs need to be contained. As the name suggest, The arrangement of a tandem seal is two seals in series. The primary seal functions just like a single seal. The secondary seal serves as a backup seal and is lubricated by a non-pressurized barrier fluid. The secondary seal also serves as a second "defense" for containing environmental emissions of VOCs. In the event of failure of the primary seal, the secondary seal contains the pressure, and the pumping fluid, until the equipment is safely shut down. The only difference between the double and tandem seal, is that the double seal has a pressurized barrier fluid and the tandem seal has a non-pressurized barrier fluid. As discussed earlier, different seal designs are used in various arrangement to suit the particular service application. However, it's of the prime importance that the seal must be provided with a clean lubricating fluid to function properly. This fluid can be the actual service fluid, a barrier fluid, or an external injected fluid from a different source. All these options require a different flushing or piping schemes for various types of seal arrangements. The popular standard API Std 682 describes in detail about various Shaft Sealing Systems for Centrifugal and Rotary Pumps. Some of the most commonly used seal flushing plans are given below for the general understanding of process engineers. Process engineers must have basic knowledge of various pump seal plans and the utilities required for its proper functioning. Plan-01 Internal seal chamber flush from pump discharge, operate similar to Plan 11. Generally used for clean, moderate temperature fluids. This plan may useful with liquids that thicken or solidify at normal ambient temperatures to minimize the risk of freezing the fluid in flush piping. All image credit Flowserve: Dead-ended seal chamber with no flush fluid circulation needed. Generally used in cooling jacket seal chamber in high temperature services, top entry mixture / agitators with dry seal, cool clean fluid with high specific heat in relatively low speed pump. The API Plan 11 is by far the most commonly used and a default single seal flush plan for most services. The seal is lubricated by the pumped fluid, which is recirculated from the pump discharge nozzle through a flow restriction orifice and injected into the seal chamber. General application in clean, non-polymerization fluids. The API Plan-13 is very similar to the Plan-11 but uses a different recirculation path. Recirculation is from seal chamber to pump suction through orifice. Generally used for vertical pumps, moderate temperature fluids with moderate solids, non-polymerizing fluids and also where seal chamber pressure is greater than suction pressure. Seal flush from pump discharge and recirculation to pump suction with orifices. This plan is the combination of Plan 11 and Plan 13. Generally used for vertical pumps, non- polymersation fluids at moderate temperature. This plan is used when the pumped fluid is hot and cannot provide good lubrication to the seal faces. A heat exchanger or cooler is added in the piping to reduce the fluid temperature before it is introduced into the seal chamber. Seal flush is from pump discharge through orifice and cooler . Generally used in high temperature service,(temperature not more than 180 oC), for clean, non-polymerizing fluid. The API Plan-23 is similar to API plan-21 but uses more economical approach for cooling flushing fluid. The flushing fluid passes through the cooler one time before it is injected into the seal chamber and then introduced back into the pumping stream. The Plan-23 recirculates only the fluid that is in the seal chamber. For this purpose, an internal circulating device is incorporated into the seal, which circulates flushing fluid out of the seal chamber through a cooler and back to the seal. This arrangement greatly reduces the amount of heat removal necessary to achieve a certain flush temperature. This flush plan is primarily used in boiler feed water applications. Plan-23 is a standard flush plan in hot water services. This flushing plan is generally used in high temperature service, hot hydrocarbon, boiler feed water & hot water over 80 C, clean non-polymerizing fluid. In this seal plan, Seal flush fluid is taken from pump discharge through cyclone separator. Solids and particles present in pumped fluid are centrifuged and returned to pump suction. This plan is specified only for services containing solids with a density at least twice that of the pumped fluid. This plan is not very common is hydrocarbon industry. A typical use of plan-31 is water service to remove sand or pipe slag. In API Plan-32, a clean, cool, compatible seal flush is taken from an external source and introduced into the seal chamber. Plan-32 is used in applications where pumped fluid is containing solids or contaminants. In such applications a suitable cleaner and cooler external flush will improve the seal environment. Plan-32 is also used to reduce flashing or air ingress (in vacuum services) across the seal faces by providing a flushing fluid that has a lower vapor pressure or that will raise the seal chamber pressure to an acceptable level. Plan-32 type of seal flush arrangement is primarily used in abrasive slurry applications. In API plan-41, seal flushing fluid is taken from pump discharge and sent through a cyclone separator and cooler. This plan is a combination of Plan 21 and Plan 31. Plan-41 is generally used for high temperature service, (Temperature less than 180°C), Dirty or contaminated fluids, water with sand or pipe slag, Non-polymerizing fluids. API plan-52 consists of Tandem seals or two mechanical seals. The primary, or inboard, seal always operates in the pumped fluid, and therefore utilizes the same seal flush plans as the single seals. The secondary, or outboard, seal must operate in a self-contained, nonpressurized barrier fluid. The API Plan 52, shown in Figure 37, illustrates the piping scheme for the barrier fluid. An integral pumping device is used to circulate the barrier fluid from the seal chamber up to the reservoir. Here, the barrier fluid is typically cooled and gravity- fed back to the seal chamber. The reservoir is generally vented to a flare header system to allow the primary seal weepage to exit the reservoir. Plan 52 is unpressurized buffer fluid circulation through reservoir. Fluid is circulated by a pumping ring in the dual seal assembly. Generally used with dual unpressurized seals. Plan 52 works best with clean, non-polymerizing, pure products that have a vapour pressure higher than the buffer system pressure. Double seals also consist of two mechanical seals, but in this case, both seals must be lubricated by the barrier fluid. For this reason, the barrier fluid must be pressurized to 15 to 25 psi above the seal chamber pressure. The API Plan 53 (Figure 38) is very similar to Plan 52, with the exception of the external pressure source. This pressure source is typically an inert gas, such as nitrogen. This plan is pressurized barrier fluid circulation through reservoir. Fluid is circulated by a pumping ring in the dual seal assembly. Used with dual pressurized seals. General application in High vapor pressure fluids, light hydrocarbons, hazardous/toxic fluids, Heat transfer fluids, dirty/abrasive or polymerizing fluids, mixers/agitators and vacuum service. Plan 53B is pressurized barrier fluid circulation with bladder accumulator. Fluid is circulated by a pumping ring in the dual seal assembly. General application in high vapor pressure fluids, light hydrocarbon, hazardous / toxic fluids, and heat transfer fluids, dirty / abrasive or polymerization fluids. Plan 53C is pressurized barrier fluid circulation with piston accumulator. Fluid is circulated by a pumping ring in the dual seal assembly. General application in high vapor pressure fluids, light hydrocarbon, hazardous / toxic fluids, heat transfer fluids. Mechanical seal is installed in between rotating shaft and the stationary pump casing to stop the leakage in a structure which contains pressure. Mechanical seals are generally used for flammable, toxic, service containing slurry, high temperature services etc. however, Mechanical seal can be applied to virtual any services and are used in many application where packed stuffing box are not suitable. Refer Annexure-1 for seal plans generally used for mechanical seal. Some of primary characteristics follow; ▪ Very low leakage and longer life than packing ▪ No periodic adjustment as with packing ▪ Capable of sealing at higher pressure and shaft speeds than packing ▪ Barrier Fluids in Mechanical Seals Pressurized dual seals (Plan 52, 53, 55) use barrier fluid, which isolates the pump process liquid from the rest of the system. An ideal buffer fluid should have following properties; ▪ Safe to use, handle and store ▪ Good flow qualities at operational temperature ▪ Good heat Transfer properties ▪ Inexpensive ▪ Compatible with the process fluid & seal material ▪ Remain stable at operating range ▪ Non-foaming and low solubility of gas Following are the fluid generally used for as barrier fluids in mechanical seal; ▪ Water + Glycol mixture ▪ DM / Service water ▪ Alcohols ▪ Kerosene & diesel fuels ▪ Lube oil ▪ Heat transfer fluid (Aromtics-1, Dowtherm HT) Utility or buffer fluid required for mechanical seal plan (Plan 32, 52, 53, 62 etc.) is varying with the size of mechanical seal and should be provided by vendor. As a general engineering practice, 8 to 10 lit/min utility or buffer fluid flow rate can be considered for initial calculation. However, these values to be confirmed after final vendor information. Refer Annexure 3 for barrier fluid generally used for pumping fluid in chemical industry for respective chemical. The API Plan 54 (Figure 39) uses a pressurized, external barrier fluid to replace the reservoir arrangement. This piping arrangement is typically used for low-pressure applications where local service water can be used for the barrier fluid. Plan 54 is pressurized barrier fluid circulation by external system, used with pressurized dual seal. General application in high vapor pressure fluids, light hydrocarbon, hazardous / toxic fluids, heat transfer fluids. Dirty / abrasive or polymerization fluids, mixers / agitators. External quench on atmospheric side of seal. Quench fluids typically steam, nitrogen, or water. Plan 62 used with single seal. General application in oxidizing fluids or fluids that code, hot hydrocarbon, crystalizing fluids or fluids that salt out, caustic, cold fluid less than 0 C. Auxiliary piping (cooling, seal flushing and lubrication) is a small but extremely important item. API Standard 610, "Centrifugal Pumps for General Refinery Service," or applicable national standard should be followed. Provisions for piping of stuffing box leakage and other drainage away from the pump should be provided.