SPECIFY THE RIGHT HOT OIL PUMP FOR YOUR APPLICATION

Hot oil pumps are used in a range of industries, with their main user being the heat transfer oil customer. Often, oil temperatures will exceed 500°F (260°C), and temperatures of 600-700°F (315-370° C) are more and more common.

Heat transfer oils have many advantages over the steam that was formerly used in heat transfer applications, including no boiler blowdown, no deaeration heat loss, uniform temperature over a large processing area, ability to heat and cool with the same system, and less corrosion in the system.

Of course, there also can be challenges when using a hot oil system—a main issue is that of leakage. Because of the low viscosity at higher temperatures, the transfer fluid is going to try to find a way out of the system. One particular area of concern is with the hot oil pump used to circulate the heat transfer fluid through the system.

To save money up front, users might install a standard process pump with an extra seal in the hopes of keeping the fluid from leaking. *But, when it comes to pumping thermal oil, you will want to specify a pump made for this purpose.* You want to choose a pump that is made for pumping thermal oil—whether that pump has a seal or whether it is sealless. Dickow offers both types. First, let's look at the pumps with seals.

The Right Seal

Dickow offers medium-duty centrifugal pumps that are made for pumping thermal oil through a system. The NKX model offers dimensions and performance ranges according to DIN EN 733, which means range is subdivided into different pump sizes to achieve best efficiency for all service conditions inside the envelope.

The NKX is used as a circulation pump for hot

oils in industrial heating plants/units. The performance range covers capacities up to 400 m3/h and differential heads up to 90 m in 50 Hz services; and capacities up to 2500 gpm and differential heads up to 400 ft in 60 Hz services.

The bearing bracket with additional air cooler is specially designed to handle heat transfer oil. With this design, the application range of the pump is now extended to 662°F (350°C), without water cooling. This means the pump can be used in applications that earlier required double acting metal bellow seal systems.

An advantage of this pump's design is that the mechanical seal chamber does not require manual, external filling and venting. As the pump is self-venting, there is no need to collect and dispose any spilled oil, and no operating personnel may be harmed or injured during venting of the hot pump.

Even at high mechanical seal temperatures, the danger of oil carbon deposits is greatly minimized through the lack of oxygen. The cooling coil allows operation of the pump up to 3500 rpm.

Model NCX is a medium-duty pump designed for handling liquids in the chemical and petrochemical industry, in refineries, and for heat transfer fluids.

Dimensions and performance range are developed in accordance to EN 22858 (ISO 2858). The whole range is so subdivided that for all service conditions the best efficiency is guaranteed. The maximum capacity goes up to 3960 gpm (900 m^3/hr).

Depending on your application and the size of your system, seal wear may be a concern. Potential problems may occur by the formation of dangerous and explosive mixtures, which become worse when toxic or malodorous gasses and vapors endanger plant personnel. To prevent the vaporization of liquids between seal faces, additional cooling is required when the media's vapor pressure is greater than atmospheric pressure at operating temperatures. So, when a pump with seals just won't do, what kind of pump for hot oil heat transfer applications should you consider?

Sealless for Safety, Reliability

Sealless pumps—such as the NMWR model from Dickow—offer zero leakage, i.e., no connection of the media to the environment due to the absence of a seal. Many of Dickow's earliest customers installed sealless magnet drive pumps for their zero-leakage feature, but quickly realized that their mean times between failures also greatly improved as downtime due to seal replacement was

eliminated. The containment shell forms a closed system with a hermetically sealed liquid end. Their dead-ended back design keeps the hot oil away from the back of the pump, which keeps coking articles out of the drive area and improves the reliability of the pump.

Specifications for these pumps include a maximum operating temperature without water cooling of 750°F (400°C); maximum transmissible power of 132 kW at 2900 rpm (225 hp at 3500 rpm); and a maximum capacity (flow rate) of 4400 gpm at 60 Hz.

CONTAINMENT INFORMATION

Containment Shell, Disassembly

The containment shell is designed as a pressure vessel to separate the pumpage from the atmosphere only, and is not used as an additional bearing holder. No dynamic stress occurs. The containment shell is bolted to the bearing housing in a manner that allows removal of the bearing bracket including outer magnets and ball bearings without exposing the pumped liquid to the atmosphere.

Containment Shell Protection

The different clearances between the rotating outer magnets and stationary containment shell, and the rotating magnet holder and bearing bracket adapter, respectively, prevent rubbing of the magnets on the containment shell in case of ball bearing failure. Ball bearing monitoring devices are available as an option.

BEARING INFORMATION

Outer Ball Bearings

The pumps carry the drive shaft in oil-bath lubricated antifriction bearings, which are L10-rated for more than 25,000 hours. The oil bath is protected against the atmosphere by labyrinth seal, and the oil level is controlled by a constant level oiler and additionally by a bull's-eye sight glass. Oil mist lubrication is available as an option.

Double Sleeve Bearings

The double internal bearings are of the sleeve type, positioned in the pumpage and located centrally in the common bearing housing, which grants proper alignment for true running. Standard material is Silicon Carbide, highly resistant against corrosion and wear. The stationary sleeve bearings, the shaft sleeves, and the start-up rings have elastically beared SiC parts to avoid any thermal stress at operating temperature; they can meet any temperature swing.

ADDITIONAL INFORMATION

Construction

Pumps are single-stage volute casing pumps with closed impellers and back-pull-out design, with end suction and top centerline discharge flange. Foot-mounted casings are provided as standard, and centerline mounted design is available as an option. Performance data and flange-to-flange dimensions comply with EN 22858 (ISO 2858).

Magnetic Coupling

The single elements of the multipolar magnetic coupling are manufactured of a permanent magnet material "Cobalt-Samarium Rare Earth," which offers an unlimited magnetic lifetime. The magnets in the internal rotor are completely encapsulated; no contact with liquid occurs. Energy is transmitted to the hermetically sealed liquid end by the outer drive magnets, passing motive force through the containment shell to the internal drive magnets. Inner and outer magnets are locked together by the magnetic field lines and are working synchronously without any slip.

The inner magnet ring transmits the required torque directly to the impeller. Overload of the magnetic coupling and slipping will not effect demagnetization if a reliable monitoring device prevents overheating of the magnets. During operation, the rotating field lines pass through the metallic containment shell and generate magnetic losses.

The magnetic couplings are sized for direct-on-line starting of the electric motors. Additionally, the transmissible power of a coupling depends on the axial magnet length. The couplings are sized for the maximum power consumption of the rated impeller at the end of performance curve, but the rated coupling power can be increased by mounting an additional series of magnets. This would be required, for example, when installing a larger impeller and, respectively, motor.

Internal Clearances

The internal clearance between inner magnets and containment shell depends on the wall thickness of the containment shell. However, a minimum clearance of 0.039 to 0.078" (1 to 2 mm) is provided in any case. This, together with wear-resistant sleeve bearings, allows handling of fluid with solids.

Monitoring

Temperature monitoring, power monitoring, dry-running protection devices, and leakage detection systems are available. Ask Dickow engineers for further details.

NPSH-Conditions, Inducer

To avoid cavitation, the impellers of these pumps are designed to achieve

low NPSH values. For pumps with discharge above 2" (50 mm), optional inducers are available for further improvement of NPSH-required conditions. The inducers are designed such that NPSH improvement is given from minimum flow up to BEP. Retrofit of inducers on site is possible by re-machining the volute casing, without changing the suction pipe.

Drain Connections

The volute casing and magnet end have separate drain connections.

Venting System

During start-up and filling of the system with an open suction valve, the pumped liquid enters the magnet end through holes in the sleeve bearings and the gap between the pump shaft and bearing housing. Remaining air in the containment shell will be vented by the two-valve venting system, according to the manual instructions.

Balanced Thrust Loads

The thrust loads of the closed impellers are balanced by wear rings, balance holes in the impeller hub, and back vanes. Residual forces on the impeller are acting in the suction flange direction and will be balanced by the rotor design. The difference between the constant pressure at the rear rotor area and the variable pressure at the front side creates a counter force acting in direction to the containment shell. The value of this reaction force depends on the variable gap S, meaning that the internal rotor floats until the forces at impeller and rotor are balanced. The thrust bearings work as start-up rings only.

DICKOW'S MESSAGE

If you are looking for a hot oil pump for your heat transfer application, there is a safe and reliable option out there. With Dickow, you'll get equipment that has been performing in the industry for years. Dickow offers experience as well as references, access to parts 24/7, and top-notch customer service. If you want to invest in a pump that will serve you for the long haul, don't cut corners with an inferior pump not designed for your application. That will cost money, time, and effort in the long run due to downtime, maintenance, and ultimately equipment failure. With a regularly scheduled maintenance program, which Dickow provides upon purchase, your Dickow hot oil pump can last for decades.

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