A sealless pump package for downstream installations

No seals required

A downstream petrochemical refinery chose magnetic sealless pumps for the many benefits they bring to the refining process

Sealless pump containment shells

As part of a continual upgrade process and to ensure the highest levels of health and safety, a refining and petrochemical company in the Far East has recently upgraded several pump installations to meet current American Petroleum Institute (API) standards. The existing single mechanical seal pumps, operating on downstream hydrocarbon processes, were reviewed for suitability against a double mechanical seal upgrade or an entire sealless pump replacement.

The pump applications that were to be upgraded included debutaniser reflux, reformer stabiliser reflux, and pre-treater stripper reflux duties. The liquids included mixed liquefied petroleum gas (LPG) and hydrocarbons. These liquids typically feature low viscosities, low densities, and are of a volatile nature, making them ideal candidates for properly applied magnetic drive pump technologies. Some of the process liquids also featured low levels of H_2S, and thus wetted components of the pumps needed to feature materials that comply with NACE requirements for sour service.

The process plant is an experienced user of sealless pump technology, with an installed base in excess of 50 magnetic drive pumps. The user has enjoyed the benefits of magnetic drive pumps on a variety of applications for over 15 years, such as the complete elimination of fugitive emissions, reduction of initial installation cost, reduced cost of ownership, and full site serviceability. It was these reasons, and the proven health and safety benefits provided by a sealless pump, that led to the user choosing API compliant magnetic drive sealless pumps to upgrade its existing sealed pump installation.

Reviewing the options

A magnetic drive pump package containing six vertical inline pumps and two horizontal pumps was supplied in accordance to API 685 2nd Edition. This API standard, applicable to sealless centrifugal pumps for petroleum,

Sealless pump condition monitoring instrument

petrochemical, and gas industry process service, is based on accumulated knowledge and experience from users, engineering companies, and manufacturers of sealless pumps. Its intent is to facilitate the manufacture and procurement process of sealless pumps and it provides the reader with minimum design requirements, safety features, and application guidance needed to successfully use sealless technology.

During the process of evaluation for the upgrade, the latest magnetic drive pump technologies and designs were reviewed, ensuring that the eventual solution reflected the most recent technological advancements available to magnetic drive sealless pumps. Such technologies and designs include condition monitoring of the pumps' internal flow regime, high efficiency composite containment shells, and vertical inline pump design. It was these features that helped the user choose sealless magnetic drive pumps for its upgrade project.

Condition monitoring of the internal flow regime

Condition monitoring instruments utilise non-intrusive ultrasonic technology to constantly monitor the state of the fluid inside the pump. The device detects the early presence of gas in the internal cooling and lubrication circuit from outside the confines of the pump pressure boundary, and provides an early warning of adverse conditions that are likely to impact internal bearing lubrication and the cooling of the magnetic coupling. One of the key features of the device is that it is measuring and reacting to the primary cause of a potential problem and not the secondary, which is the case when monitoring power or temperature.

Some of the benefits of condition monitoring systems include providing real time condition monitoring of the internal fluid, detecting the early presence of gas, ensuring correct priming and venting, and eliminating the potential for dry running. The instrument features a 4-20mA output signal, on-board data logging via microSD card, local visual indicators, and is IECEx/ATEX/cUL compliant. It can be retro-fitted to many existing magnetic drive pump installations, providing increased peace of mind to existing end users.

High efficiency, engineered composite containment shells

Composite containment shells feature a non-magnetic material that virtually eliminates all induction losses (eddy current losses) associated with metallic containment shells. By eliminating the induction losses, several benefits are realised, including significantly reduced heating of the pumped product that is circulated to lubricate the internal bearings of the magnetic drive pump, improved handling of volatile and heat sensitive liquids, and an enhancement in overall pump efficiency, when compared to a similarly sized pump featuring a metallic containment shell.

A further, and often overlooked, benefit is that the shells also provide a more robust design for magnetic drive pump installations that might experience system upset conditions. It is these features that make engineered composite containment shells ideal for use on hydrocarbon installations. The containment shells are produced to comply with the 40 bar (580 psi) API 685 design pressure requirements and feature a highly chemical resistant composite material that is tough, durable and robust.

David Clark, senior engineering manager at Sundyne HMD Kontro

API compliant vertical inline pumps

Vertical inline pumps have all the features of a horizontal magnetic drive sealless pump combined with the benefits of a vertical inline configuration, such as a streamlined footprint and minimal requirements for piping modifications when upgrading from other inline designs. The hydraulic designs feature radial diffusers, ensuring hydraulic optimisation, and, dimensionally, the pumps comply with the requirements of BS4082. The design pressure is 40 bar (580psi) and such pumps are suitable for operating temperatures up to 205°C. A wide variety of material options is available, including stainless steel (A8), carbon steel (S5), and duplex stainless steels (D1 and D2).

Another benefit when choosing magnetic drive pump technology is one of a commercial nature. Because a sealless pump installation does not require all the ancillaries and support systems typically associated with a pressurised double mechanical seal installation (particularly if the seal installation is to API standards), an entire sealless pump solution is often a more economical design solution.

When the pump package that featured the above technologies and design features was compared to the double mechanical seal upgrade option, it was found to be more cost effective, as well as providing the already mentioned benefits associated with magnetic drive sealless pumps. This, coupled with the dedicated service and support provided by the pump manufacturer's local in-territory representative, enabled the user to make a decision based on commercial and technical compliance.

For more information:
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