

Canned magnetic bearings prove cost-effective

In 2002, a leading oil and gas customer approached Waukesha Magnetic Bearings with the challenge of developing a bearing for a hermetically-sealed integral motor compressor. Availability and reliability were the customer's primary objectives. The end user could achieve a significant cap-ex savings on the installation if the motor compressor could be located outdoors, with no building or enclosure required.

The sealed characteristic the Waukesha bearings and electrical connectors delivered in the end did eliminate the requirement for a costly enclosure for the motor compressor and the end user real-



ized a significant project cap-ex savings. The site operating license placed limits on hydrocarbon emissions from the plant and the hermetic sealing of the bearings and motor compressor ensured the emis-

sion limits were not exceeded. Having created an integral motor compressor with greater availability and reliability, the customer delivered and installed its machine in 2006, outdoors, with no building or enclosure.

Magnetic bearings were the ideal solution for this application because they could be immersed in process gas. WMB's experts engineered a canned magnetic bearing with metallic lined stators to segregate the electrical connections and windings from the corrosive gas. Canned magnetic bearings and sensors require high corrosion-resistant metal encasement; special alloys ensure

that the bearings will not corrode thereby protecting the inside of the machine from serious degradation. With canned AMB designs, the metallic can separates the pressurized volume inside the machine from the cavity pressure and ambient pressure and provides the first level of protection against leakage to the exterior of the machine.

Because the metallic can will see a differential pressure equal to the maximum internal pressure of the machine, this component is required to withstand the maximum pressure inside the machine. A proper design of the metallic can and backing system is hence crucial to survive all the temperature and pressure conditions the AMBs will encounter during operation.

WMB has received positive feedback from the end user for its collaboration with the OEM on the integral motor compressor. After its 2006 installation, not only did WMB meet the customer's primary goals, but the system proved to operate safely in its environment. 25,000 hours later, the units' operation provides 99.9 percent availability to its end user. In addition, WMB's canned bearings temperature ratings reached 165 degrees C.

A key advantage of canned magnetic bearings and corrosion-resistant auxiliary bearings is the ability to be immersed in the process gas. Canned bearings allow for the placement of the magnet core and windings behind a pressure-rated, impervious barrier constructed of corrosion-resistant alloy (e.g. Inconel) or other non-metallic material.

Canned magnetic bearings are not susceptible to chemical attack by the process gas and condensates. Thus, electrical components are not exposed to the process conditions. This allows the motor compressor to eliminate the use of dry gas seals, avoiding natural and sour gas damage to the environment.

Magnetic bearings are being deployed in applications with the right design to immerse bearings directly in the process gas with all of the simplifications in design that entails.

WMB, based on documented corrosion rates and other factors, has determined that sealed and canned designs may be applied while still expecting a reasonable service life. The dividing line corresponds to a concentration of about 600 ppm of chlorides.

The placement of the rotor system inside a pressure vessel also has implications for cooling of motor and bearings, along with provisions for electrical connections penetrating the pressure vessel.

It is important to consider the risks of erosion and corrosion with the potential for costly damage to the machine internals. Increasing regulation begs for environmental consideration in the oil and gas industry, giving canned bearing and corrosion-resistant auxiliary bearings a priceless benefit. Waukesha Magnetic Bearings can be applied in the manufacturing of integral motor compressors, in addition to other machines, such as conventional, externally driven compressors as well as turbo expanders.

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