Non-Contact Labyrinth Seals Protect Rotating Equipment

Shaft seals in motors or pumps at high speeds wear out quickly and often leak. Non-contact labyrinth seals from Inpro/Seal solve the problem. They are maintenance-free, do not run hot and can be supplemented with sealing air or grounding rings.

Shafts in machine tools, turbines and gearboxes, as well as motor spindles, pose a major challenge to sealing technology. This is because the rotary motion exposes conventional, contacting bearing insulators to rapid wear, while the use of non-contacting variants usually means that compromises have to be made in terms of sealing performance. In addition, the installation of complex and massive bearing isolators is often very complicated and they are simply not suitable for many specific or space-saving applications.

The difficulties with shaft seals are evident in industry: According to studies by the Institute of Electrical and Electronics Engineers (IEEE), bearing failure caused by unreliable seals is the most common cause of industrial motor and pump failures in machine tools, process pumps or on motor spindles.

To avoid this dilemma, the U.S. company Inpro/Seal developed the patented concept of non-contact labyrinth seals (*Figure 1*). These consist of two to three components, are wear-free, and at the same time seal 100 % against foreign bodies and water in horizontal position from the inside and outside in both static and dynamic operating states according to protection class IP66. In the case of particularly high dust or pressure levels, an additional sealing air support can be integrated, while optional grounding rings ensure safe operation even with electric motors.

Design from two to three components

The bearing isolators are so-called centrifugal seals. This means that lubricants, liquids, and dust that have penetrated are pressed into chambers inside the seal by the interaction of the complex structure with the centrifugal force and are then guided back into the system via grooves or flung away to the outside. Between the two components of the labyrinth seal, which do not touch each other, there is an O-ring made of VBX that rests against the rotor and stator and thus seals the gap 100 % in the motionless state. Lubrication of the surfaces can be dispensed with entirely, so that the application is also not restricted by the properties of the lubricants and the permissible temperature range. In addition to eliminating the need for maintenance compared to conventional bearing protection seals, a major advantage of non-contact systems is that they do not run hot. Thus, there is no heat input into the spindle and therefore no materi-

Figure 1 > The labyrinth seals are wear-free and 100 % foreign body and waterproof

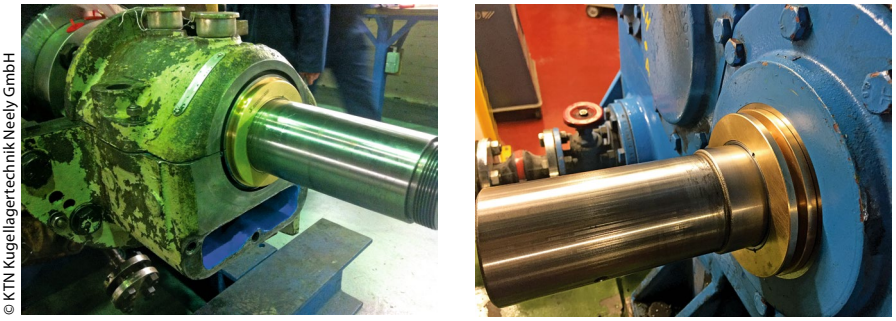

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Figure 2 > For installation, the seals can be installed by screwed, pressed in or glued

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Figure 3 > For particularly high dust or pressure levels, an additional sealing air support can be integrated

al expansion in the system or dimensional changes in the production.

As standard, the labyrinth seals are made of bronze, which is characterised by its high strength and corrosion resistance. However, the material can vary depending on the individual application such as high-speed spindles, particularly strong temperature peaks, explosive atmospheres (ATEX) or food areas, and for high lightweight design requirements. Thus, in addition to bronze or brass, aluminium, stainless steels, titanium, special O-ring materials, or combinations of those are also possible. For example, at high speeds, the rotor material must be adapted and made of special steel, so that it does not expand during operation. For installation the seals can be screwed, pressed, or glued (*Figure 2*).

Integration of sealing air and protective grounding rings

If the seal is under great pressure from outside, sealing air can also be integrated into the system (*Figure 3*). This is done by means of a radial hole which can be closed with a plug when not in use. For effective sealing air support 0.3 bar above atmospheric pressure are required. In addition, special Current Diverter Rings (CDR) can be fitted, particularly for operation on electric motor spindles; either as retrofit from the outside or integrated into the compact design of the seal as a so-called Motor Grounding Seal (MGS). The CDR maintains a continuous grounding contact and thus reliably diverts any shaft currents that occur; motor bearings and coupled machines remain protected from destructive rolling bearing damage such as damage to gear teeth caused by discharges. The carbon pins, which are the only components subject to wear, are accessible from the outside and can be replaced via a screw connection. //

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