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Determination of the contact temperature of rotary shaft seals without compromising the tribological system

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Abstract:

Rotary shaft seals often fail due to overheating. To assess the risk of overheating in the contact area it is beneficial to know the contact temperature during operation. The contact temperature cannot be measured directly, whilst keeping the tribological system of a rotary shaft seal unchanged. It is usually predicted with complex simulations or rough approximation methods. The direct measurement of the contact temperature with a sensor inside the contact area will change the tribological system itself. In most cases the temperature is therefore monitored indirectly by taking temperature measurements near the contact area.

The Smart Seal project integrates a temperature measuring system in a shaft sleeve. Shaft sleeves are often used as a counter face for rotary shaft seals. In many cases they are special inner rings of needle roller bearings, where the surface is plunge ground and lead free. A suitable counter face for the sealing system can thus be purchased. This can simplify production and makes it possible to replace the entire sealing system, including the counter face.

The Smart Seal sleeve can be used instead of a regular shaft sleeve. It includes one ore multiple temperature sensors and enables the prediction of the temperature distribution inside the shaft as well as the contact temperature.

The sealing system Smart Seal can be seen in **Figure 1**. It consists of a special inner ring with a sensor system, a rotary shaft seal and the fluid to be sealed. The sensor system is mounted in a cavity inside the inner ring and consists of an energy unit, a temperature sensor, an analysis unit and a transmission unit. Since the shaft sleeve is ring shaped it is difficult to realize the sensor system with a PCB. However, the system can be realized using MID technology.

Keywords: Sealing Technology, rotary shaft seals, contact temperature, frictional torque, heat generation, overheating, SmartSeal, temperature measurement, MID, Mechatronic Integrated Device

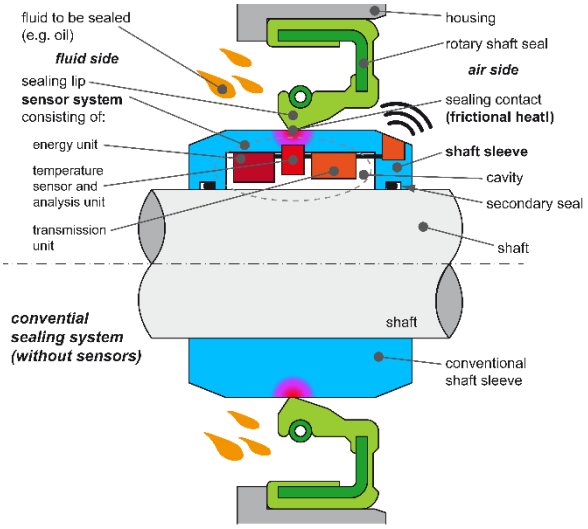

Figure 1: Functional principle of the SmartSeal consisting of a special inner ring with a sensor system, a rotary shaft seal and the fluid to be sealed.