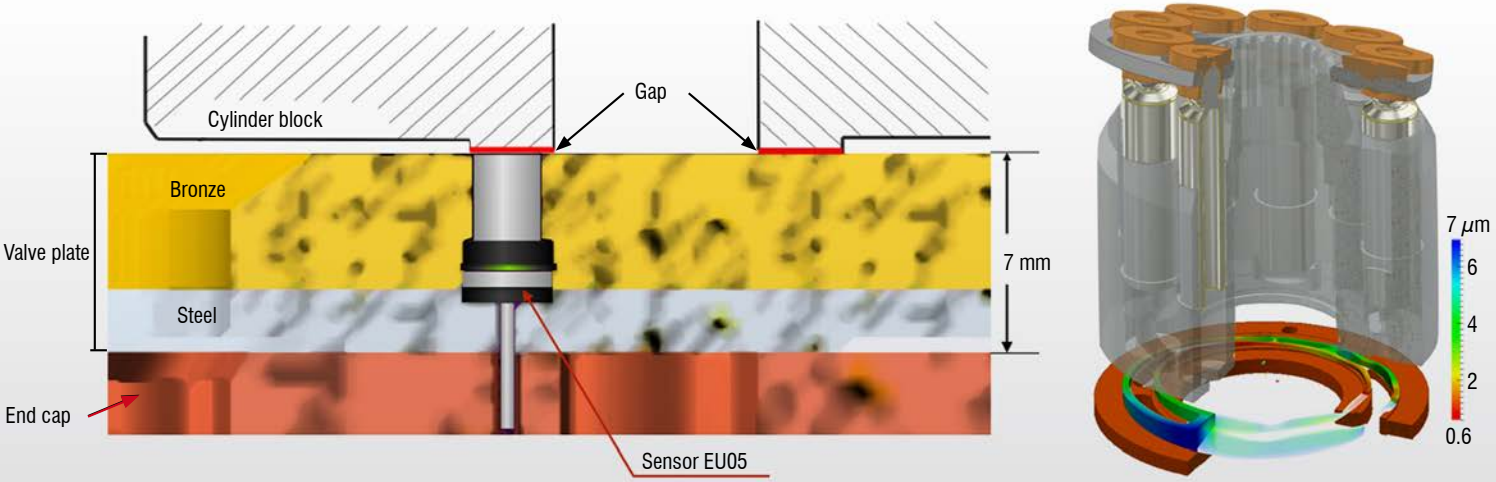
A323

Inductive sensors based on eddy currents
eddyNCDT



Gap analysis in axial piston pumps

Axial piston pumps convert mechanically generated kinetic energy into hydraulic energy. Frequently, these pumps are therefore used in slow-moving machines that simultaneously perform, in addition to their movement, hydraulic movements such as lifting, turning or gripping, for example via blades or crane booms. Inside the pump, a cylinder with a piston rotates between two fixed plates in order to build up hydraulic pressure. These plates can be used to control the desired pressure by inclining or regulating the flow opening. To ensure that the connected mechanical parts can rotate optimally and for as long as possible, friction should be minimal. Therefore, as narrow as possible gaps between the components ensure the best sliding properties. Most of these gaps are under 20 microns wide, sometimes even less than 10 microns. In addition to reducing friction, these so-called sealing gaps also have the task of keeping the hydraulic oil in circulation and thus significantly influence the mode of operation of the machines. Changes in the gap can lead to pressure loss or a pump failure. The behavior of the gap is therefore measured during operation on the test rig in order to optimize the design of the pump.

So far, gap measurements inside the pumps were not possible because of the extreme requirements. The sensors must be resistant to high speeds, high pressures up to 1,000 bar and temperatures above 100 °C. Furthermore, the pumps are extremely compact, which significantly limits the space available for integration of sensors. Thanks to the extremely small sensor designs and their high pressure and temperature stability, the eddyNCDT inductive miniature sensors are ideal for this application. The eddyNCDT 3300 eddy current measuring system, which is one of the most powerful systems in the world, is therefore used on the test rig for evaluating the pumps.

As a result, micrometer gap measurements can be achieved from which ultimately analyses can be made in order to optimize the efficiency of axial piston pumps.

Requirements for the measurement system
- Accuracy: ± 0.1 µm
- Frequency response (-3dB): 100 kHz
- Measuring range: approx. 4 x width of measuring head
- 1,800 rpm

Ambient conditions
- Temperatures from +40 °C to +100 °C
- Measurement in hydraulic oil
- High pressures up to 1,000 bar

System design
- Controller: 5 x DT3300
- Sensors: unshielded sensors with 0.5 mm measuring range
- 3 x EU05(65), pressure resistant up to 700 bar (front)
- 2 x EU05(93), pressure resistant up to 2,000 bar (front)
- Cable: miniature coaxial cable

Advantages
- Minimal gap invasion due to special calibration
- Factory temperature compensation for stable measurements
- Real-time capable system

Micro-Epsilon Messtechnik GmbH & Co. KG A member of micro-epsilon group

Tel. +49 8542/168-0 | www.micro-epsilon.com | info@micro-epsilon.com | Modifications reserved / 9781323-A011088OGe