Sealing solution for vacuum paddle dryers

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AGSR gas-lubricated mechanical seal

Information **EN07031**

Application and operation characteristics

Equipment: Horizontal paddle dryer with side entry, overhung
Customer: Merck, Darmstadt (Germany)
Manufacturers: Engelsmann, Comber et al.
Seal: AGSR3L-D/160-E3-U
Materials: Q19Q1T71/M5GE (2.4602) - Q1Q19T71/M5GE (1.4122)
Supply system: GSS 4012/A001-D1
Flushing system: GSS 4012/A002-D1
Barrier resp. flushing medium: Dry nitrogen
Barrier pressure: 5 ... 7 bar
Flushing pressure: 2 bar
ATEX: Ex-Zone 1 means II2GDcbT4, temperature class T4

Technical features

- Cartridge unit with integrated bearing
- Suitable for sterile applications: Surfaces in contact with the product are polished and O-ring grooves are designed as open as possible to ensure a good cleanability
- Integrated flush in front of the dynamic O-ring at product side
- Increase of the reliability due to prevention resp. unplugging of deposits at the dynamic O-ring
- Improvement of the cleanability at product side (CIP)
- Large seal faces in combination with corresponding groove design lead to high gas film stability in combination with low gas consumption
- U-grooves which are independent of the direction of rotation
- Proven stationary seal design

At Merck KGaA in Darmstadt, Germany, 16 paddle dryers are equipped with gas-lubricated AGSR mechanical seals from EagleBurgmann. They are mainly used in plants for the production of liquid crystals in order to dry the end products of high purity.

Liquid crystals are very complex organic compounds which are mainly produced in batch processes. Typical applications of liquid crystals are e.g. in the production of so-called LCD (liquid crystals displays) for flat screens.

Operating conditions

Media: Organic, crystalline substances with different solvents, e.g. toluene or methanol
t = 20 ... 100 °C
(max. design temperature 200 °C)
p_1 = 1 mbara ... 1.1 bara
(max. design pressure 4 bara)
n = 2 ... 20 min^{-1}

EagleBurgmann Germany GmbH & Co KG
Aeussere Sauerlacher Strasse 6-10
D-82515 Wolfratshausen / Germany
Phone +49 8171 23 0
Fax +49 8171 23 1214
info@eagleburgmann.com
www.eagleburgmann.com

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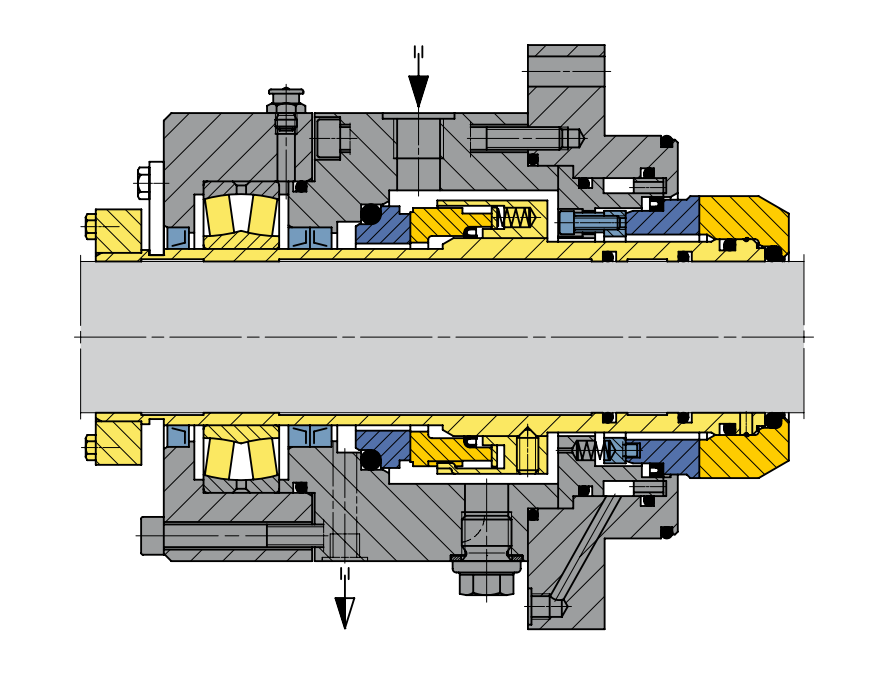

AGSR3L-D

Vaccum paddle dryer in assembly

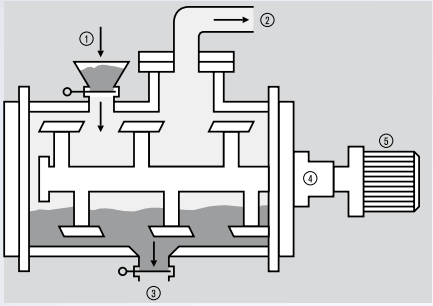

Diagram of a vacuum paddle dryer
1 Wet product
2 Moisture to vacuum pump
3 Dry product discharge
4 Mechanical seal
5 Drive

High purity requirements

The sealing of paddle dryers poses always a challenge for the sealing technology. In horizontal paddle dryers the seal is mostly in direct contact with the product. Mainly double acting seals are used with pressurized barrier medium.

Beyond this, the requirements of the explosion safety regulation resp. the directive 94/9/EG (ATEX 95) have to be considered in most cases. In this specific application also the high purity requirements for the product have to be taken into account. Because no contamination of the product by the barrier medium or wear debris of the seal faces was allowed the customer decided to use a gas-lubricated mechanical seal.

Outstanding service-life

The gas-lubricated mechanical seals reach excellent life times mainly by the permanent supply of barrier and flushing gas (also during shutdown). The implementation of pressure surges during the drying process and a regular CIP-cleaning of the mechanical seal by using the integrated flushing connection further improves the service-life. Beyond this, an intensive support is necessary for example during the seal test run and the first start-up for a satisfying operation as well as the sensitisation of the customer for this sophisticated sealing technology e.g. by seminars and training. The seal with the longest life time in this application up to now is in successful operation since mid of 2000 whereas the production plant is working to full capacity (3 shift system).