

Robust, gas-lubricated mechanical seal
for processing natural gas

EagleBurgmann®
Rely on excellence

RoTechSeal: optimized standard protects against contamination

Prior to processing natural gas in its pure form into liquid natural gas (LNG), undesirable components such as solids, mineral oil, coal particles and heavy hydrocarbons are largely removed. Nevertheless, small quantities of these components can reach the compressors installed at the end of the purification process and which transport the natural gas into the pipeline to the liquefaction plant.

As a result, the seals in the compressors could be contaminated, something from which they must be protected to ensure their permanently reliable function. This is particularly challenging if the natural gas contains a lot of moisture.

EagleBurgmann supplies gas-lubricated mechanical seals for various applications in the LNG industry. For a natural gas processing plant in Queensland, Australia, the company equipped eight high pressure and eight low pressure compressors with its standard gas-lubricated mechanical seals.



The dehydration process in a natural gas processing plant posed a special challenge to EagleBurgmann.



EagleBurgmann RoTechSeal with CSR bearing sealing. The tandem design offers particularly high operational reliability.

The natural gas from the coal seams in the Surat Basin is collected, treated, and compressed in a processing plant, then transported via a 340 km long pipeline to a liquefaction plant on Curtis Island near the town of Gladstone on the east coast.

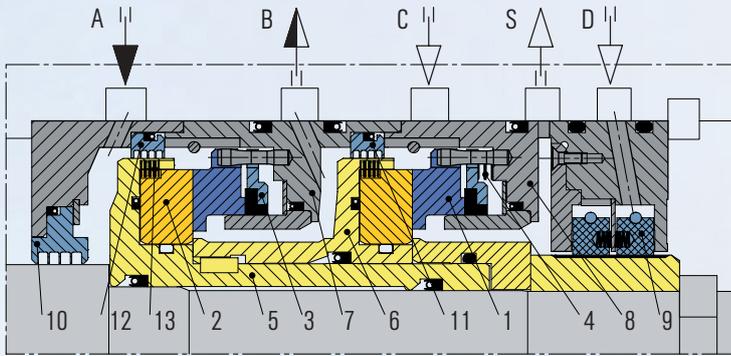
PDGS - Standard for a wide range of applications

For the compressors in this plant, EagleBurgmann selected the gas-lubricated PDGS seal in tandem design with intermediate labyrinth to seal off the shaft to the process chamber. This seal has a very low leakage. On the one hand, this is ensured by the specially shaped groove on the surface of the seal faces. On the other hand, the seal faces are made of silicon carbide in hard-hard pairing to achieve high stiffness and thus stable sealing

gaps. The compressor manufacturer also values the use of PDGS for a wide range of pressures and temperatures. The basis is formed by a PTFE element at several points in the seal. The tandem design additionally increases the safety of this established product, because a secondary seal takes over the function of the primary seal in an emergency.

Unexpected operating conditions

After the compressors were first put into operation, unexpected and heavy contamination of the seals in dynamic operation was noticed. Moisture and dirt from the supply line leaked directly into the seal. This increased the torque and friction, causing the sliding faces to heat up considerably during operation.



RoTechSeal with special features for advanced robustness against contaminated seal gas.

- | | |
|------------------------|------------------------------|
| 1 Stationary seal face | 11 Intermediate labyrinth |
| 2 Rotating seat | 12 „Smart labyrinth“ |
| 3 Dynamic seal element | 13 Torque transmission |
| 4 Spring | |
| 5 Shaft sleeve | A Gas supply, primary seal |
| 6 Intermediate sleeve | B Primary vent |
| 7, 8 Housing | C Gas supply, secondary seal |
| 9 Separation seal CSR | S Secondary vent |
| 10 Labyrinth | D Separation seal |

Such processes can also be found in natural gas production and storage facilities.

Upgrade from PDGS to RoTechSeal

Since it was not possible to simply stop moisture from entering, the seal needed to be changed accordingly to help it cope with this condition. After an in-depth investigation, the decision was made to equip the PDGS with the technical features of a RoTechSeal. The gas flow inside the seal was modified to allow most of the liquid to bypass the sealing surfaces. The effect is similar to a cyclone filter that separates liquids from gases. Such filters are frequently found in „Seal Gas Conditioning Units.“ In this case, however, the filter was integrated directly into the seal and was not installed in an expensive external system. The new gas flow minimized the liquid input to such an extent that the heat generated from the high friction on the sliding faces was also reduced to an acceptable level.

EagleBurgmann also optimized the torque transmission, since further liquid input could not be completely ruled out. This further increases the seal's robustness and protects it in the event smaller quantities of liquid continue to enter the seal and cause increased friction and torque.

The modified seals were delivered within four weeks. Since then, the compressors have been functioning flawlessly and the service intervals have been considerably extended. In the meantime, more natural gas is now being processed than was predicted during the project.

Conditions of use

High pressure compressors:

Pressure: $p = 120 \text{ barg (1,714 PSIG)}$
 Temperature: $t = -20 \text{ °C ... +150 °C}$
 (-4 °F ... +302 °F)
 Speed: $n = 11,800 \text{ min}^{-1}$
 Gas, primary seal: Methane

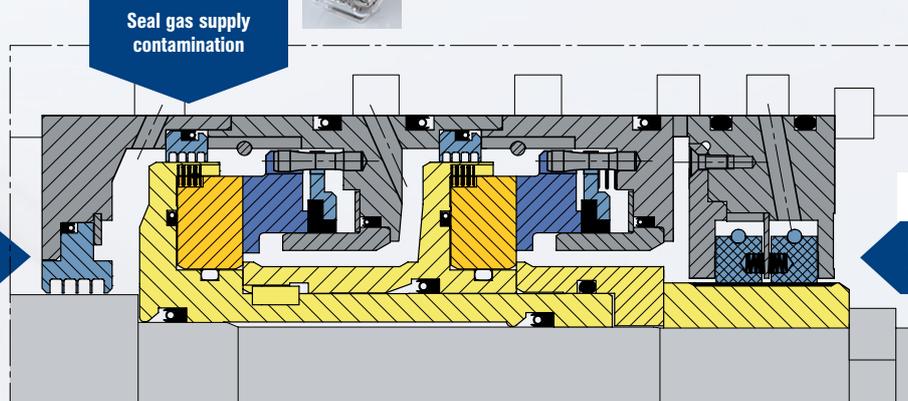
Low pressure compressors

Pressure: $p = 79 \text{ barg (1,146 PSIG)}$
 Temperature: $t = -20 \text{ °C ... +150 °C}$
 (-4 °F ... +302 °F)
 Speed: $n = 10,000 \text{ min}^{-1}$
 Gas, primary seal: Methane

The main cause for this was found in the dehydration process. In this process, water is removed from the natural gas by adding liquid triethylene glycol (TEG) to the gas. The water is bound to the TEG and is then separated from the natural gas again. In the present case, however, some of the TEG penetrated the seal via the gas supply and caused the increased torque and friction.

Thanks to its highly hygroscopic properties, TEG is often used to extract natural gas from water. Processes with TEG and other glycol variants are therefore widespread in natural gas processing, as corrosion of downstream plant components or pipelines could occur without water withdrawal.

RoTechSeal



The EagleBurgmann RoTech family offers solutions for seal contamination caused by lube oil, process gas or seal gas. Regarding the compressors of the natural gas processing plant in Australia, EagleBurgmann selected RoTechSeal to cope with contaminated seal gas.