

# MFLCT triple seal

Information **EN06111**



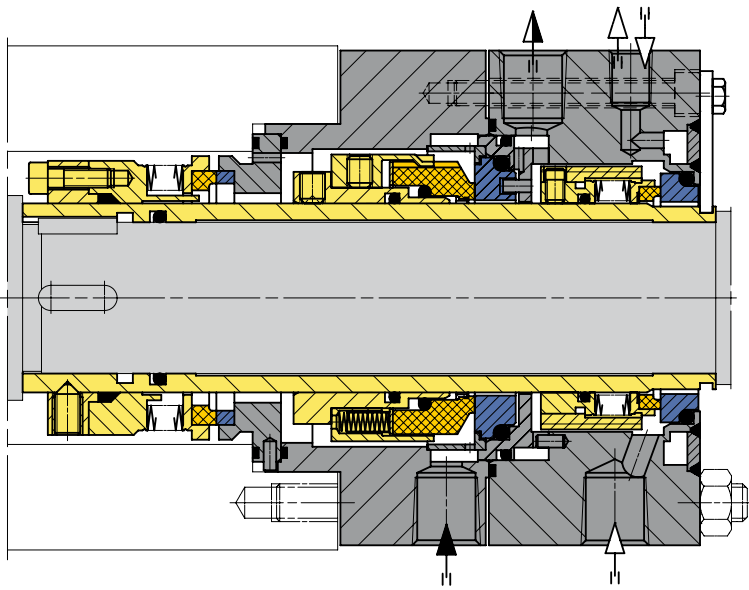
Ethylene pump with EagleBurgmann triple seal

The ethylene unit (cracker) is the key production plant at the Dow olefin complex in Böhlen / Germany. A transfer pump is used to transport the final product (ethylene with purity >99 %) to the next stage in the following production process.

## Demanding requirements

In order to comply with very stringent safety standards and to avoid possible product contamination resulting from a seal defect, a triple mechanical seal in tandem configuration is installed in the ethylene transfer pump. To withstand temperatures down to -100 °C, a metal bellows seal is used. Heavy icing also occurs on the atmospheric side of the pump.

The bearing supports are heated electrically to prevent icing on the supports and the mechanical seals. If heating power is not sufficient, icing can damage the bearings and the atmospheric seal. Because these applications often operate very near to the boiling point, it is important to prevent vaporization in the sealing gap since dry running could otherwise occur.



The Burgmann triple seal solution:  
product side MFLCT80, 2nd seal  
H75VK1, atmospheric side MFL85F

## Special sealing solution

The triple seal consists of the following EagleBurgmann components: an MFLCT80 on the product side, an H75VK1 as the second seal and an MFL85F with pumping screw as the third seal on the atmospheric side (containment seal). The elastomer material is a special fluoro-silicone rubber which is designed for low-temperature applications. The barrier medium is divided into several sub-currents (multipoint injection) which are directed towards the sliding face at relatively high flow velocities. The operating mode of the third seal (modified Plan 52/53) means that the barrier medium is pressurized (5 bar), but its pressure is lower than the product pressure. This is done to avoid vaporization in the sealing gap of the second seal caused by an increase in pressure.

Additional design features were used to prevent damage to the seal during start-up caused by icing which forms between the pump shaft and the

atmospheric seal, for example a heating chamber in the seal cover which is heated with low-pressure steam. The temperature of the barrier medium must not exceed 30 °C in stand-by mode to ensure that the barrier medium does not vaporize in the sealing gap and dry running does not occur. For this reason, the cover heating is shut off before the pump starts up.

## Successful in operation

This seal concept is successfully in operation for several years and reaches excellent MTBF values. The version with the heating chamber has also been running without failure since June 2005. The triple seal fully complies with the customer's safety requirements. A metal bellows seal, special materials and other specific design features have provided a solution which meets the challenges of low-temperature operation.

## Operating conditions

Pump manufacturer: Sulzer  
Pump type: horizontal, multi-stage, centrifugal pump between bearings (GSG 50-215)  
Medium: liquid ethylene  
Temperature: -54 °C, when product pressure drops down during shut down temperatures may reach -102 °C  
Suction pressure: 8.5 bar overpressure  
Discharge pressure: 63.5 bar overpressure  
Pressure on the seal: 8.5 bar overpressure  
Speed: 4500 min<sup>-1</sup>  
Seal incl. materials: MFLCT80S1/60-KB3, AQ22GM6M/G-AQ2P3GG-AQ1U1M6G1 (1.4571)  
Seal type: triple seal  
Supply system: Burgmann TS 2000 Thermosiphon system  
Barrier medium and mode of operation: Ethylene from a higher pressure stage of the pump for the second seal  
Barrier pressure: 22 bar  
Third seal's mode of operation: Modified Plan 52/53 API 682 / ISO 21049 with methanol as barrier medium, leakage is drained to the flare system.