

**EagleBurgmann®**

Rely on excellence

# Sealing solutions for multiphase pump applications





## Multiphase technology: Sealing high-wear media mixtures.

### Sealing solutions for multiphase applications

Multiphase pumps can pump mixtures containing oil, water, and gas and transport them over long distances in a single pipeline to separation. Therefore, separation of the oil from the gas and associated flaring of the off-gas is not required near the well head. The pumps are used on- and offshore as well as subsea.

The pump types most frequently used are twin screw and helico-axial pumps, whose seals must simultaneously seal off liquid and gas. One of the challenges in this application is that the composition of the media fluctuates between 100 percent gas and 100 percent liquid. Transient operating conditions thus result for the pump and its mechanical seals, not to mention the fact that the media frequently contains waxes and sand, which may have considerable adhesive and abrasive properties.

EagleBurgmann particularly uses robust mechanical seals with extremely hard sliding materials, which have already become standard in many multiphase pumps offered by leading manufacturers. The range includes different types of single seals to buffered dual seals with pressurization via barrier fluid circulation systems.

# Type HJ...

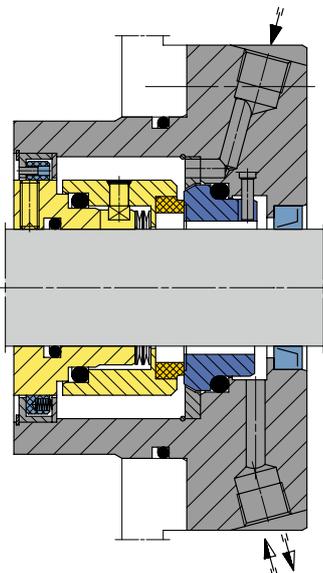
## Single seal arrangement with flush unit and quench system (API 682, Plan 32 + 62).



A straightforward solution is a single seal with a permanent liquid-flooded seal area. It is realised through a pressurized injection of clean liquid into the seal chamber from an external source (API Plan 32). The flush unit must be continuous and reliable even during start-up and shut-down of the pump.

A close clearance throat bush downstream of the seal isolates the pumped media from the seal faces and controls the flow rate of the flush medium into the process fluid.

A quench (API Plan 62) and laser textured hydrodynamic grooves at the inner diameter of the stationary seal face ensure that a lubricating film is present in the sealing gap even in the case of poor flush availability and / or vacuum conditions and also help to overcome the gas phase for a substantial time. This sealing solution is mainly used in twin screw pumps and is available as a semi cartridge design or a full cartridge unit.

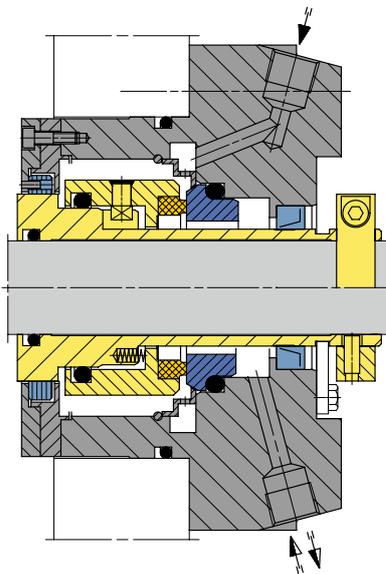


EagleBurgmann HSHJ92 component seal.  
Operating conditions:  $t \dots 100 \text{ }^\circ\text{C}$  (212  $^\circ\text{F}$ ),  $p \dots 25 \text{ bar}$  (363 PSI),  $n \dots 1,800 \text{ min}^{-1}$ , gas percentage 98 %.

The cartridge seal is designed in the spirit of API 682 and complies with the following main requirements:

- Cartridge design
- Multipoint flush injection
- Operating limits of type A pusher type seal  
41 bar, 23 m/s, 176  $^\circ\text{C}$  (595 PSI, 75 ft/s, 350  $^\circ\text{F}$ )
- Seal face and constructional materials

Special designs are often required to suit the available space envelope with sleeve drive and axial location specific to each application.



EagleBurgmann HSHJ42 cartridge seal.  
Operating conditions:  $t \dots 120 \text{ }^\circ\text{C}$  (248  $^\circ\text{F}$ ),  $p \dots 50 \text{ bar}$  (725 PSI),  $n \dots 2,200 \text{ min}^{-1}$ , gas percentage 98 %.

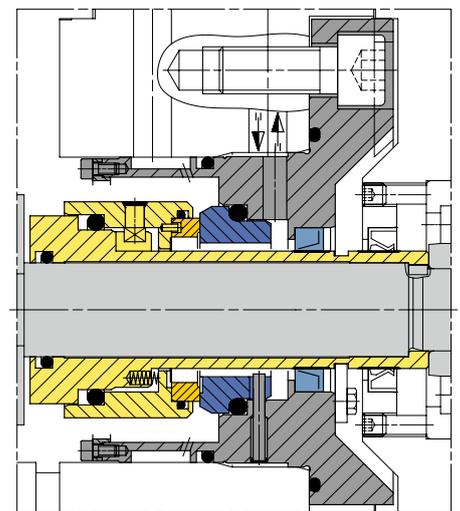
# Type DF-HJ...

## Single seal arrangement with DiamondFace technology.



The Panacocha oil project in Ecuador is provided with a unique sealing solution because clean fluid cannot be supplied by an external source (API Plan 32).

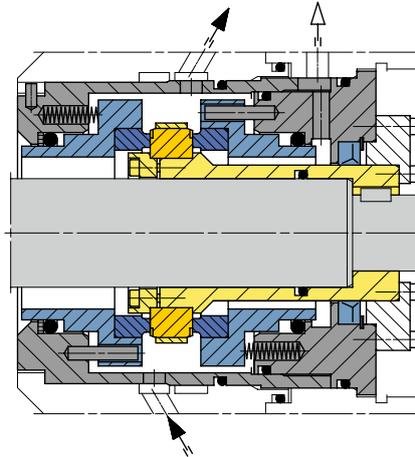
For this demanding challenge a single seal arrangement with DiamondFace technology was selected. This new coating technology for sliding surfaces had already been introduced by EagleBurgmann in 2007 and is characterized by its extreme hardness, high wear resistance, excellent thermal conductivity and low friction coefficient. These seal faces can handle dry running for a substantial period of time, making them able to cope with the transient conditions on the pump inlet side where the mechanical seals are located.



EagleBurgmann DF-HSHJ4S1 single mechanical seal

## Type SH...

**High pressure dual seal cartridge with pressurized supply fluid (API 682, Plan 53, 54).**



This example is a high performance stationary dual pressurized seal in cartridge form developed for high pressure applications. The face-to-face arranged seal faces are equipped with hydrodynamic grooves to increase the cooling and lubrication provided by the barrier fluid from a supply system (API Plan 53 or 54). The cooling and lubrication of the seal is ensured in any operating condition of the pump.

This measure protects the seal if there is a high risk of dry-run or for high duty applications. This type of seal is commonly used even in low duty applications in regions such as the Middle East or Africa where the practicality of using a single seal with an external flush (API Plan 32) is limited due to the restricted availability of suitable fluids. The seal usually has one rotating seat between the stationary seal faces to provide a high performance seal with short axial length suitable particularly for twin screw pumps.

EagleBurgmann SHV-D cartridge seal, face-to-face arrangement.

Operating conditions: p ... 150 bar (2,175 PSI),  
n ... 4,000 min<sup>-1</sup>, t ... 120 °C (248 °F),  
gas percentage: ... 99 %.

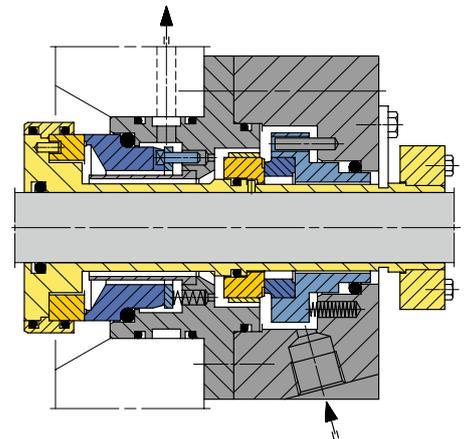
## Type HRK...

**Slurry dual cartridge seal with pressurized supply fluid (Plan 53, 54).**



This engineered product is designed for multiphase mixtures with high solids contents of up to 25 %, high pressure and high sliding velocity. The dual seal in a tandem arrangement is able to handle solids because of the open design and the inside pressurization of the product side 'slurry' type seal which ensures against the accumulation of solids in the seal chamber and the intrusion of process media into the seal.

The cooling and lubricating is supplied via a pressurized supply fluid system (API Plan 53 or 54) and is supported through hydrodynamic grooves on the seal faces.



EagleBurgmann HRK-D cartridge seal, tandem arrangement, slurry seal design

Operating conditions: p ... 100 bar (1,450 PSI),  
t ... 120 °C (248 °F), n ... 2,200 min<sup>-1</sup>,  
gas percentage: ... 99 %, sand content: ... 5 %.



## Mechanical seals from EagleBurgmann ...

... have proven their ability to seal multiphase mixtures over a wide range of operating conditions in thousands of applications with all types of equipment in extremely harsh environments around the world.

The mechanical seal types and sliding materials available today are capable of meeting any technical demand defined by multiphase pumping services. In order to assimilate the sealing systems with the specific operating conditions a keen understanding by the seal manufacturer of the nature of multiphase pumping as well as close co-operation between the seal manufacturer, pump manufacturer and end user is a basic precondition. The key-factors for long MTBF are correct application, installation and operation.

EagleBurgmann offers a depth of experience and product development in multiphase that is second to none. Besides this, we constantly develop with our customers our products, materials and business processes to deliver simple, cost effective and reliable sealing solutions.



Single mechanical seal EagleBurgmann HSHJ42S6/80-E1 installed at Ameriven (Venezuela) in a Bornemann twin screw multiphase pump.  
Operating conditions:  $t = 38\text{ }^{\circ}\text{C}$  ( $100\text{ }^{\circ}\text{F}$ ),  $p = 8\text{ bar}$  ( $116\text{ PSI}$ ),  $n = 1,800\text{ min}^{-1}$ .



Dual mechanical seal EagleBurgmann SHV-D2/145-E1 installed at Saudi Aramco (Saudi Arabia) in a Sulzer helico axial multiphase pump.  
Operating conditions:  $t \dots 80\text{ }^{\circ}\text{C}$  ( $176\text{ }^{\circ}\text{F}$ ),  $p \dots 60\text{ bar}$  ( $870\text{ PSI}$ ),  $n \dots 4,000\text{ min}^{-1}$ .



EagleBurgmann DFHSHJ4S1/110-E4 cartridge seal  
Operating conditions:  $t = \text{max. } 80\text{ }^{\circ}\text{C}$  ( $176\text{ }^{\circ}\text{F}$ ),  $p = 7\text{ bar}$  ( $102\text{ PSI}$ ), gas percentage ... 80 %.  
Medium: multiphase mixture, with 90 % water and gas.



Dual mechanical seal EagleBurgmann SHV-D4/170-E1 installed at Exxon Mobil in Chad (Africa) in a Leistritz twin screw multiphase pump. Operating conditions:  $t = 54\text{ }^{\circ}\text{C}$  ( $129\text{ }^{\circ}\text{F}$ ),  $p = 30\text{ bar}$  ( $435\text{ PSI}$ ),  $n = 1,200\text{ min}^{-1}$ .

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