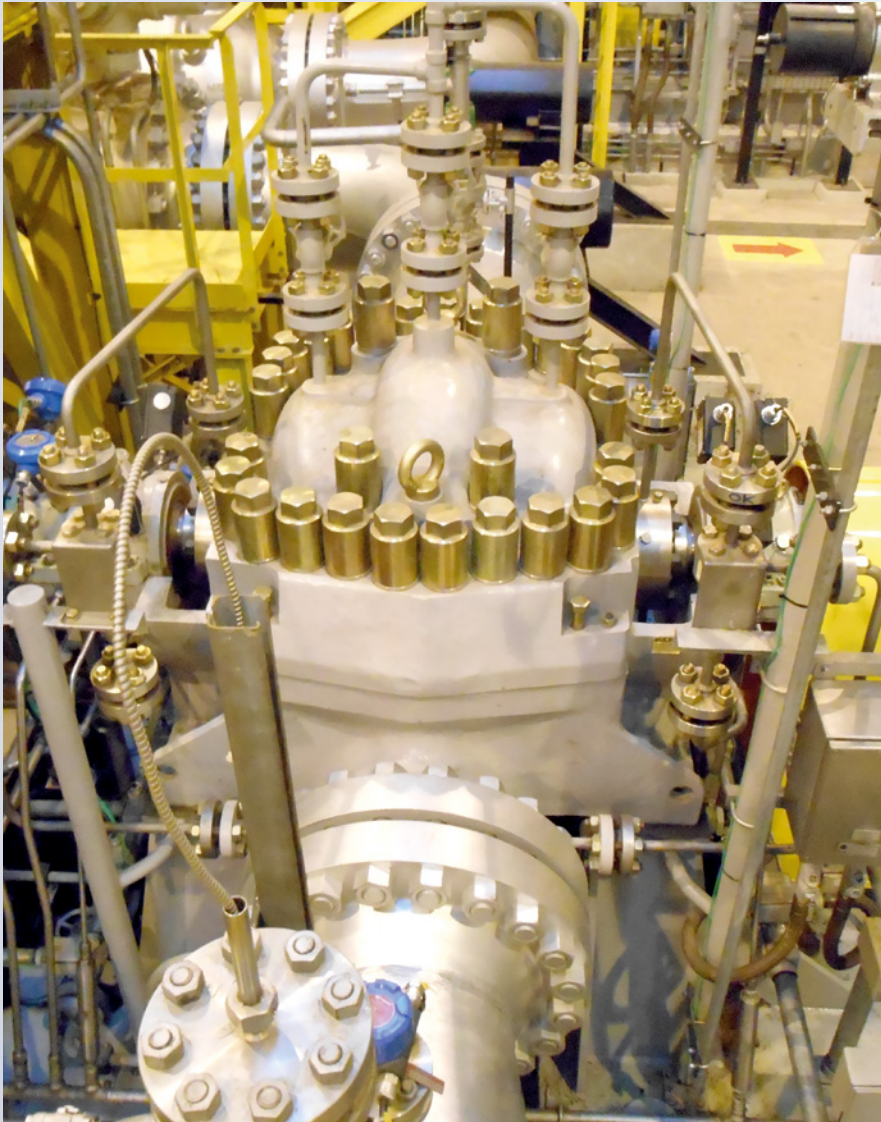


Extremely wear resistant seal solution
for Sulzer high pressure pipeline pumps

EagleBurgmann[®]
Rely on excellence

DiamondFace coated DF-HRS8 in crude oil application



Sulzer heavy duty multistage centrifugal pump in operation. 12 pumps of this kind are employed at four pump stations of the Brazilian OSVAT pipeline system. The sealing system consists of two DiamondFace coated EagleBurgmann DFHRS8 mechanical seals per pump, supplied acc. to API Plan 31.

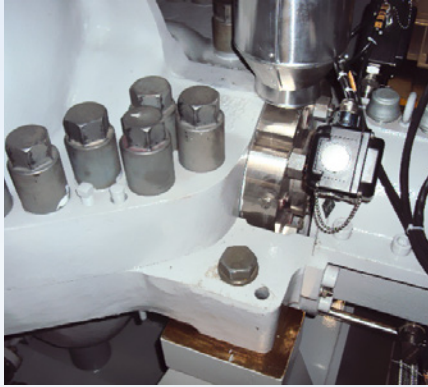
The 275 km OSVAT pipeline network plays an indispensable role in Brazil's economy, carrying about 55 % of the crude oil explored in Brazil. The network supplies two Petrobras refineries in the Sao Paulo province: REPLAN (Refinaria do Planalto Paulista) in Paulinia, the company's largest refinery (360,000 barrels/day, or about 20 % of Brazil's current oil refining capacity), and Henrique Laga REVAP in Sao Jose dos Campos, Petrobras' third largest refinery (250,000 barrels/day).

Up to 10 different crude oils at flow rates of about 5.5 million liters per hour are carried by the 38" (965 mm) OSVAT pipeline. The crude oils include high viscosity grades (up to 500 cSt) produced from the Bacia de Campos and Bacia de Santos fields off Brazil's Atlantic coast. 12 Sulzer heavy duty pumps are applied to maintain the fast flow of crude oil from the wells to the final destinations.

The pumps

Sulzer heavy duty multistage centrifugal pumps of types MSD and SZM have been selected for this demanding job. The pumps were custom-engineered to match the hydraulic fit and mechanical requirements of the end user.

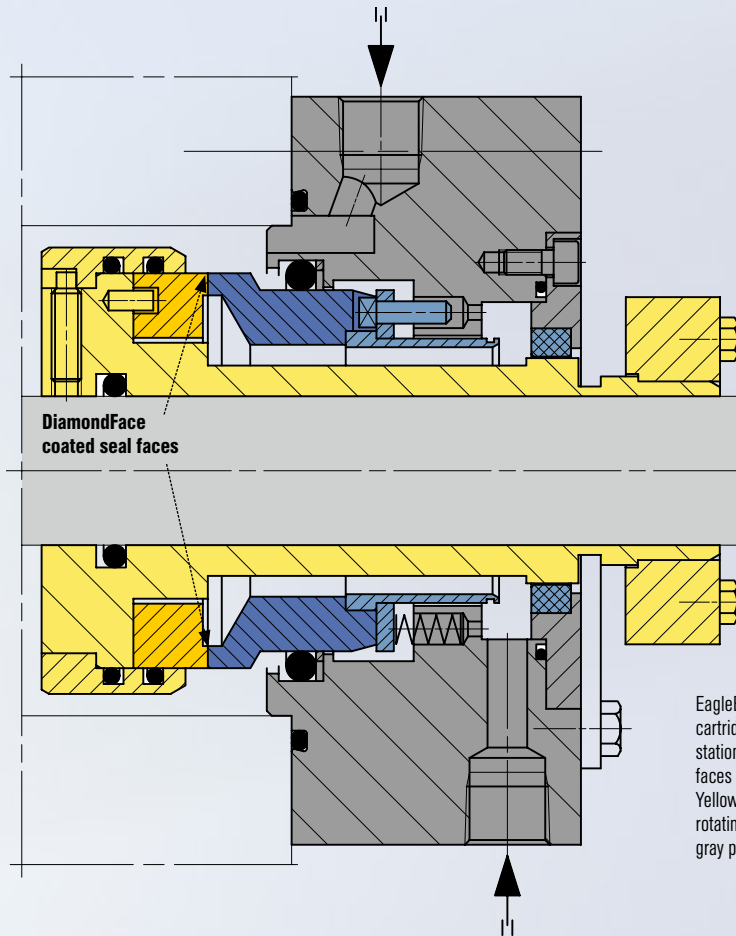
The Sulzer MSD pump is an axially split casing design with a double volute construction in a between-bearing arrangement, also known as an API 610 BB3 pump. The mechanical seal chambers, one at the drive end and the other at the non drive end, are equally pressurized due to throttle bushings and the integral balance line.



Top view of a mounted EagleBurgmann HRS8 shaft seal.

Operating conditions

Suction pressure: 25 bar (363 PSI)
 Discharge pressure: 100 bar (1,450 PSI)
 Seal chamber pressure: 34 bar (493 PSI)
 Rotational speed: 3,585 min⁻¹
 Sliding velocity: 30.88 m/s (101.31 ft/s)
 Temperature: 30 °C (68 °F)
 Viscosity: ... 500 cSt at 20 °C (68 °F)



EagleBurgmann HRS8 cartridge seal. Both stationary and rotating seal faces are diamond coated. Yellow colored seal parts are rotating, blue are stationary, gray parts: housing.

The Sulzer SZZM is also an axially split design with just two stages in a between-bearing arrangement, also known as an API 610 BB1 type. The two stages are arranged back-to-back in order to reduce the axial load on the bearings.

The same sealing concept was selected for both pump types.

Challenges for the seals

The seals face a harsh environment in this specific application: an abrasive and highly viscous medium pumped at high speed. Conventional hard/hard seal faces have only limited capabilities to handle high viscosity, poor lubrication and the resulting high temperatures. The seals are subject to periodic dry running, which can degrade or even destroy the sliding faces and secondary seals. The service life of mechanical seals with conventional seal face materials is typically only a few months.

The sealing system

To reliably seal the pumps shafts, single DF-HRS cartridge seals were applied. The seal type EagleBurgmann HRS is a well-proven design for slurry applications. Only minor modifications needed to be made in order to handle crude oil with high viscosity. Other favorable seal features are stationary seal design and multiple springs protected from the product.

Seal face lubrication and cooling is provided by flushing acc. to API Plan 31: Crude oil flows through a cyclone separator from the discharge of the pump. The clean fluid is routed to the seal chamber while the fluid with the heavier solids is routed back to the pump suction.

Video:
DiamondFace



The solution: DiamondFace

To avoid any seal problems with this demanding application and to significantly extend the MTBF, DiamondFace coating was applied on both sliding faces of the seals.

The crystalline diamond layer is characterized by extreme hardness, wear resistance, excellent thermal conductivity, highest chemical resistance and lowest friction coefficient, combined with maximum adhesive strength on the base material. This innovative technology turned out to be an excellent and reliable solution for applications in the oil and gas industry. Numerous references for variously demanding applications all over the world show a service life that has been greatly prolonged up to a factor of 25.

Since the start-up in 2012, OSVAT Sulzer pumps have been running without failures, and the DiamondFace coated EagleBurgmann DF-HRS8 mechanical seals have exhibited no wear so far. This results in a significant economic and environmental benefit for the operator, Petróleo Brasileiro SA (Petrobras).