

Pusher seal H75VN with DiamondFace for a pump in a cooling process

**EagleBurgmann**<sup>®</sup>  
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## DiamondFace resists poor lubrication properties of R134A-Freon

At one of its several manufacturing plants in the Middle East, a chemical company produces Toluene Diisocyanate (TDI). This chemical is a base material used for the production of polyurethanes, which in turn is used for flexible foam applications like furniture or carpet underlays or packagings, as well as for coatings, sealants, adhesives or elastomers etc.

For the purifying process, this fluid is dissolved in a suitable organic solvent and then cooled to a temperature so that portions of the isocyanate crystallize. The crystallites are separated from the mother liquor, where a portion of the mother liquor is recycled to a crude isocyanate stream while the remaining portion is purged from the system. The crystals are then dissolved again in a mixture of fresh solvent and mother liquor recycled from a subsequent stage, depending on the requirement. The temperature of each crystallization stage is higher than in the previous crystallization. TDI must therefore be cooled.

### Cooling of TDI

The chemical company operates a mechanical refrigeration unit (MRU) with a magnetic coupling pump. R134A-Freon serves as refrigerant, as it is completely compatible to the production of TDI as well as being non-ozone depleting. It is widely used, but because of its poor lubrication properties it is a very challenging fluid for the seals at the pump shaft.

Two weeks after commissioning the magnetic coupling failed. They didn't withstand the poor lubrication in conjunction with the contaminating particles. A quick solution was needed. It was therefore decided to remove the pump from the system and replace it with a stand-by-pump equipped with the pusher seal H75VN from EagleBurgmann. However, the stand-by-pump was not originally equipped for such a cooling process,



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which is why the seals also failed in less than three weeks.

### Extremely wear-resistant: DiamondFace

The technicians of the chemical company contacted EagleBurgmann and requested a solution. Since the delivery of the dry gas seal DGS6 with DiamondFace, the standard recommendation for processes with R134A-Freon, would have taken too long, EagleBurgmann suggested to change the seal face and seat of the H75VN and replace it with DiamondFace seal faces. This special technology provides the surfaces of the seal faces with a microcrystalline coating of artificially produced diamond, making them extremely wear-resistant and capable of temporary dry running. DiamondFace reduces heating of the seal and car-

bonization effects due to contaminating particles. After operating for 18 months without interruptions, the seal was inspected and its good condition impressed the customer very much. The EagleBurgmann solution now plays a role model with the result that several other pumps were retrofitted, including some pumps in other processes where seals were affected, for example, by barrier fluids like monochlorobenzene with very poor lubricating and high oxidizing characteristics.

### Operating conditions

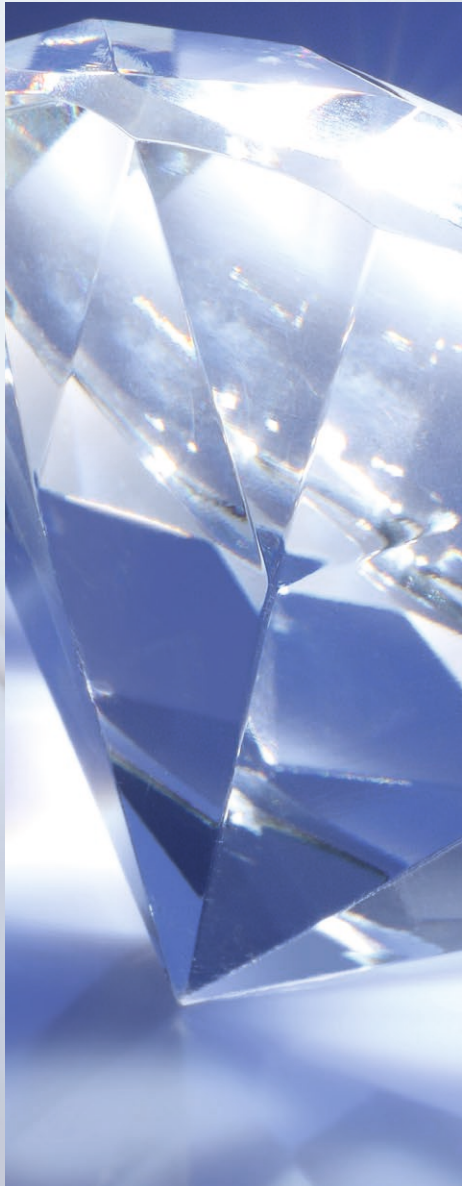
Shaft diameter: 90 mm (3.543")  
Pressure:  $p_1 = 12.4$  barg (179.8 PSIG)  
Temperature:  $t = 45$  °C (113 °F)  
Sliding velocity:  $v_g = 6.5$  m/s (21.3 ft/s)

## Pusher seal H75VN

- „Low-Emission-Seal“ according to the American STLE-limits
- Universally applicable both for retrofits or original equipment
- Efficient stock-keeping due to standardized components
- Extended selection of materials
- Extended field of operation in terms of temperature and pressure
- Metal parts also in special materials available



## DiamondFace – valuable benefits



### Minimal friction

- Minimized friction coefficient when dry running and when exposed to fluid friction. The measured value is five times lower than with a standard SiC/SiC pairing.
- No problems caused by inadequate lubrication
- Tolerant to dry running
- Low heat generation
- Less cooling capacity required
- Higher operating temperatures possible



### Minimal wear

- The average wear of the hard diamond layer in pure dry running mode is an outstanding 0.08 ... 0.2 μm/h.
- Unparalleled wear resistance even with solids or abrasive media
- Long operating period
- Highest chemical resistance
- Highest corrosion resistance
- No abraded particles to contaminate the product
- Excellent heat conductivity



### Excellent adhesion

- The diamond bonds chemically with the silicon carbide and the resulting layer adhesion exceeds all known practical requirements.
- Extremely robust and solves the problem of crack defects and flaking
- No delamination
- Long operating period



### Optimal surface flatness

- The surface flatness of DiamondFace seal faces lies within the tolerance range of uncoated silicon carbide seal faces.
- Full functional reliability