

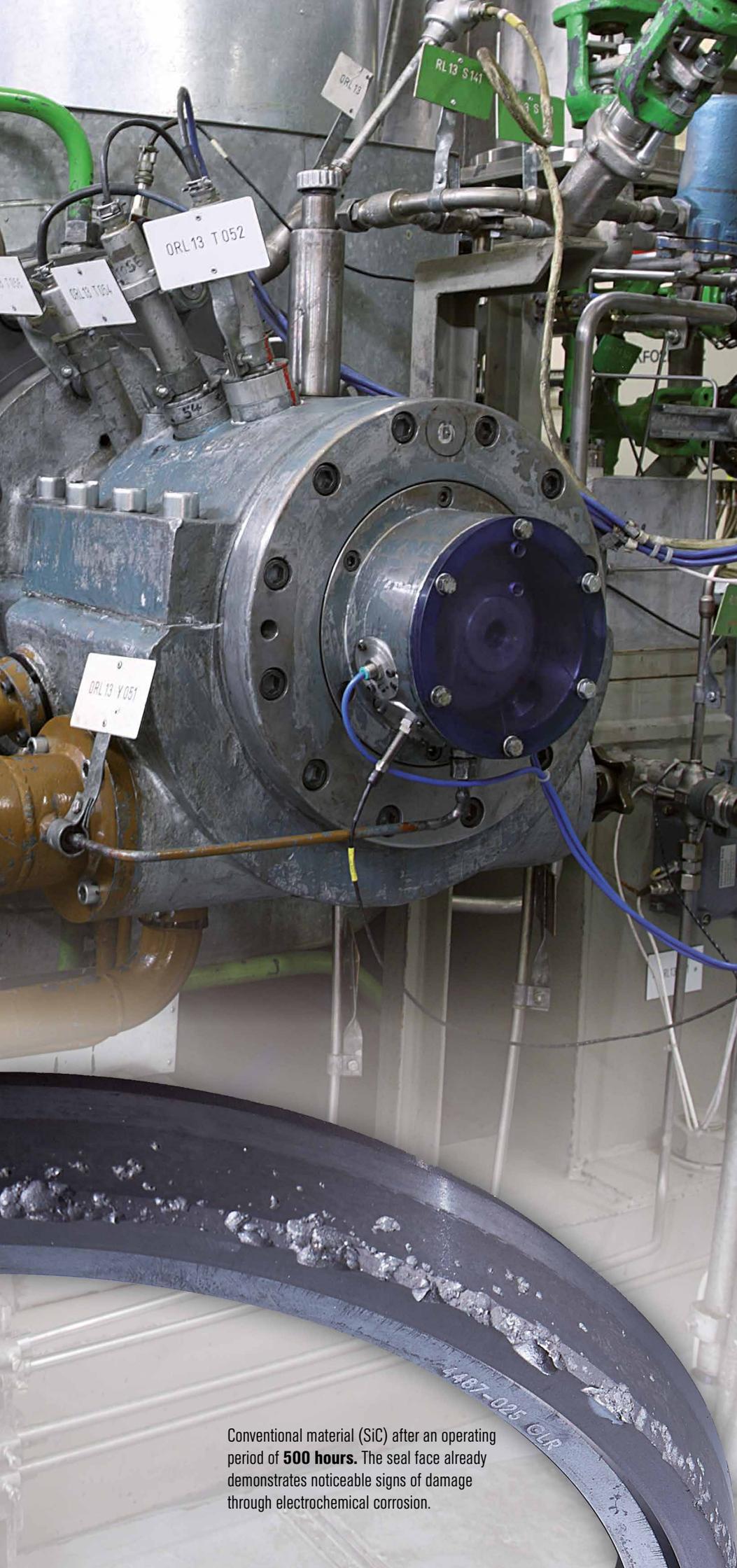
The smart solution against electrochemical corrosion in feed water pumps

**EagleBurgmann®**

Rely on excellence

# Mechanical seals DF-SA DiamondFace





## Electrochemical corrosion of sliding faces

Converting the water chemistry from alkaline to combination or neutral operation and using increasingly powerful feed water pumps caused electrochemical corrosion which considerably reduced the operating periods of mechanical seals at many power stations. This damage phenomenon, which leads to the destruction of face materials, had been particularly observed in large boiler feed pumps with high circumferential velocities.

## Causes of electrochemical corrosion

- Boiler feed water with a pH value below 9 and its associated extremely low electrical conductivity.
- Pumps with circumferential velocities of over 35 m/s (115 ft/s) promote the build-up of electrical potential at the shaft seal.

## Bridging technology: Dosing the feed water at the sealing point

In the past, the feed water in the cooling circuit of the mechanical seal had been conditioned with ammonia to prevent electrochemical corrosion. However, the application has a great number of disadvantages:

- High acquisition costs of the dosing system.
- Integration of the dosing system in the controlling network with great servicing expenditure.
- Additional operating costs.
- Injection medium ammonia is toxic and dangerous for the environment.
- Increased HSE expenditure due to handling ammonia.

Conventional material (SiC) after an operating period of **500 hours**. The seal face already demonstrates noticeable signs of damage through electrochemical corrosion.

# Simpler, more economical, longer lasting: DF-SA with DiamondFace technology for boiler feed pumps



## Innovative technology of today

There is no chance of electrochemical corrosion with the diamond-coated high-performance DF-SA seal. The technology not only makes dosing systems superfluous, but is also characterized through outstanding operational performance.

These are convincing arguments for the high economic efficiency of EagleBurgmann's innovation. DF-SA mechanical seals are perfectly coordinated to the powerful feed water pumps and available for all fossil and nuclear power stations.



- Resistant against electrochemical corrosion in feed water pumps (electrical potential is removed over the seal faces).



- Cooling circuit no longer requires conditioning.

**40.000 h**

- DF-SA mechanical seals reach operating periods of up to 40,000 hours and more. They therefore have the same maintenance intervals as pump bearings or balancing elements, for example.

**-30 %**

- Less friction of the DiamondFace seal faces and reduced power consumption as a result.

up to  
**-40%  
and more**

- Within five years the DF-SA mechanical seals can save costs of up to 40 % and more.\*



## Successfully in use the world over

Numerous operators of coal-fired and nuclear power stations are already relying on the innovative sealing technology with diamond-coating.

We would be pleased to provide you detailed advice:  
Phone: ++49 8171 23 1613  
power@eagleburgmann.com



In a German power station, the shafts of the main feed pumps are sealed with EagleBurgmann type **DF-SAF1/165** mechanical seals with DiamondFace coating.

Operating conditions:  $p = 20 \text{ bar (290 PSI)}$ ;  
 $t = 184 \text{ °C (363 °F)}$ ;  $n = 5.730 \text{ min}^{-1}$ .



EagleBurgmann **DF-SAPI1/158** diamond-coated mechanical seals operate trouble-free in a boiler feed pump at a coal-fired power station in Hadong, South Korea.

Operating conditions:  $p = 23 \text{ bar (334 PSI)}$ ;  
 $t = 173 \text{ °C (343 °F)}$ ;  $n = 5.830 \text{ min}^{-1}$ .

## You can rely on it

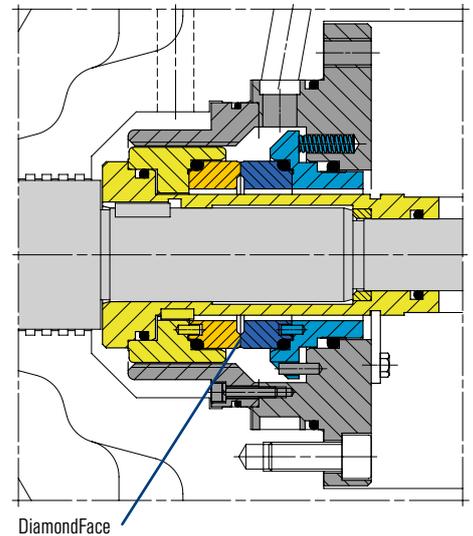
### A success story

DiamondFace is a high-performance technology which makes the seal faces extremely robust. The diamond thin-layer technology was developed in 2007 by EagleBurgmann together with the Fraunhofer Institute for Surface Engineering and Thin Films (IST).

The diamond layer has a thickness of up to  $10 \mu\text{m}$  and is applied to the seal face under vacuum at temperatures of  $2,000 \text{ °C (3,632 °F)}$  by means of chemical vapor deposition (CVD). It is characterized

by extreme hardness, high wear protection, excellent heat conductivity, maximum chemical resistance and low friction.

All in all, the best prerequisites for long operational performance. For years, DiamondFace coatings have proven themselves in pumps, agitators, and compressors in the oil & gas, chemical and pharmaceutical industries and in slurry applications.



### Transferring technology for power station technology

In a joint project with the Technical University of Graz, Austria, the diamond technology was further developed for power station applications. Since 2010, endurance tests under scientific conditions prove the corrosion resistance of the DF-SA seals.

### Advantages

- Cartridge design
- Single seal
- Balanced
- Integrated pumping device
- Stationary spring loaded unit
- Inserted seal ring
- Rotating mating ring (DiamondFace coated)

### Operating range

Shaft diameter:  
 $d1^{**} = 120 \dots 250 \text{ mm (4,72" \dots 9,84")}$   
Pressure:  $p_1 = 70 \text{ bar (1.015 PSI)}$   
Temperature:  $t = 300 \text{ °C (572 °F)}$   
Sliding velocity:  $v_g = 70 \text{ m/s (230 ft/s)}$   
Axial movement:  $\pm 3 \text{ mm}$

\*\* Additional sizes upon request.

DiamondFace coated stationary seal after an operating period of **26,000 hours**.  
No signs of wear, no damage.



The Exelon Quad Cities Nuclear Station in the U.S. uses Pacific pumps as reactor feed pumps. The reactor feed water is sealed by an EagleBurgmann type **DF-SAF5/133-ET1** mechanical seal. Operating conditions:  $p = 31 \text{ bar (450 PSI)}$ ;  $t = 281 \text{ }^\circ\text{C (538 }^\circ\text{F)}$ ;  $n = 4.500 \text{ min}^{-1}$ .



The EagleBurgmann **DF-SAFI4/188** diamond-coated mechanical seal runs in the boiler feed pump of the black coal power station in Voerde, Germany, to the complete satisfaction of the operator. Operating conditions:  $p = 21 \text{ bar (305 PSI)}$ ;  $t = 158 \text{ }^\circ\text{C (316 }^\circ\text{F)}$ ;  $n = 5.100 \text{ min}^{-1}$ .



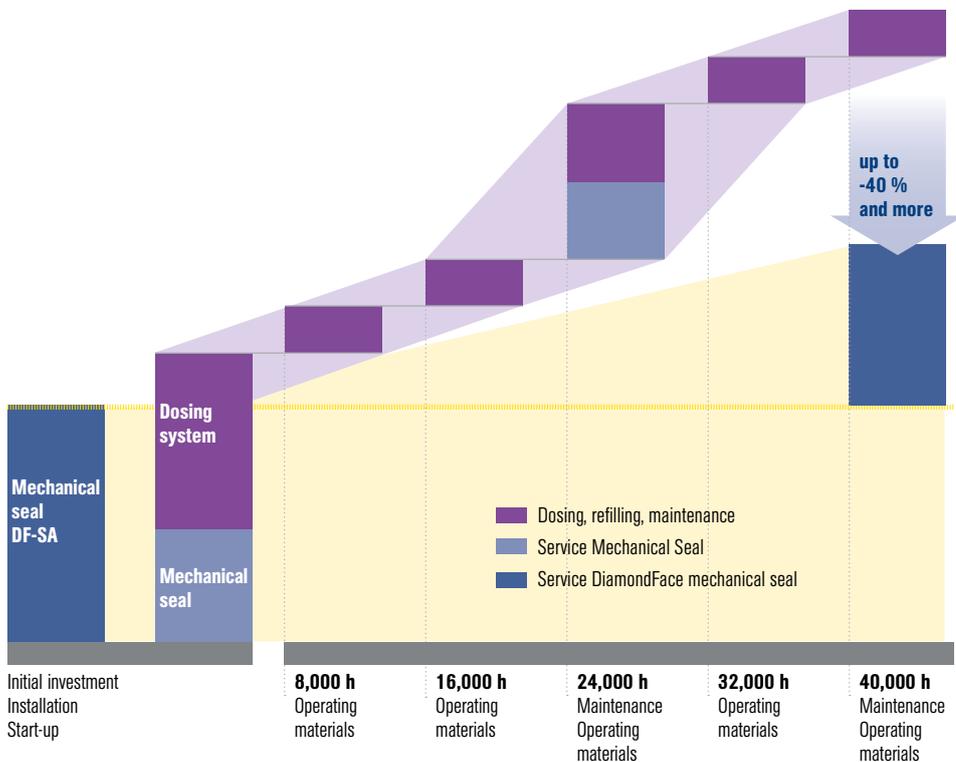
The reactor feed pumps of the nuclear power station in Leibstadt, Switzerland, are sealed successfully with EagleBurgmann **DF-SAF5/165**. Operating conditions:  $p = 35 \text{ bar (508 PSI)}$ ;  $t = 28 \text{ }^\circ\text{C (82 }^\circ\text{F)}$ ;  $n = 5.125 \text{ min}^{-1}$ .

## You can count on it

### Cost savings of up to -40 %

DF-SA mechanical seals are not only technically but also economically convincing. No dosing system means considerable savings during the initial investment and technical integration. Added to this are savings in operation and servicing as well as through the elimination of hazardous substances.

At the same time, DF-SA mechanical seals with operating periods of more than 40,000 hours reach the maintenance intervals of pump bearings and balancing elements. All in all, this yields a considerable savings potential that can be realized immediately.



\* The calculation is based on a typical installation and operation of a feed water pump with mechanical seals with 140 mm (5.51") shaft diameter. The actual savings essentially depend on how the pump is operated. The statements made here indicate possible potentials through the use of mechanical seals with DiamondFace technology as compared to preceding installations at corresponding use and application.

Video:  
DF-SA



Video:  
DiamondFace



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EagleBurgmann is one of the internationally leading companies for industrial sealing technology. Our products are used everywhere where safety and reliability are important: in the oil and gas industry, refining technology, the petrochemical, chemical and pharmaceutical industries, food processing, power, water, mining, pulp & paper, aerospace and many other spheres. Every day, more than 6,000 employees contribute their ideas, solutions and commitment towards ensuring that customers all over the world can rely on our seals. Our modular TotalSealCare service underlines our strong customer orientation and offers tailor-made services for every application.

[eagleburgmann.com](http://eagleburgmann.com)

[info@eagleburgmann.com](mailto:info@eagleburgmann.com)

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