

Circpac™ LO Seal Eliminates Costly Downtime for German Refinery

Challenge

Rotary piston blowers with traditional packing were creating disproportionately high maintenance costs for a German refinery and also posed environmental concerns.

Solution

Retrofitting the blowers with Flowserve Circpac LO seals dramatically increased their continuous runtime and slashed maintenance costs while eliminating the risk of gas leakage. The new seals have operated for more than a decade with negligible wear.

High vibration is a challenge for traditional packing

Despite the availability of advanced seal technologies, many manufacturers continue to use traditional packings because of their simple structure and comparatively low up-front cost. Depending on the sealed medium and desired equipment runtime, however, packing is not always the best solution.

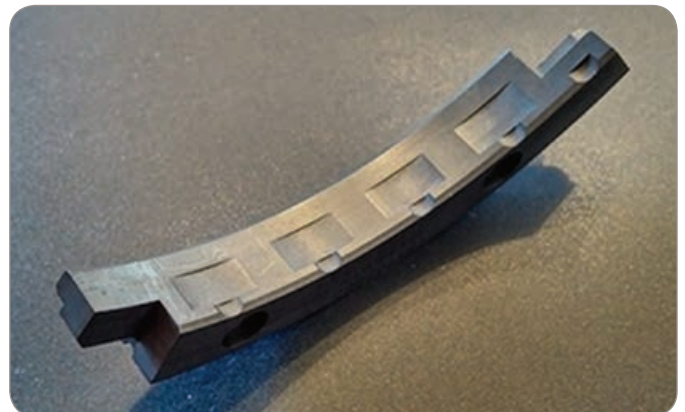
This was the case for PCK Schwedt, a leading refinery in northeast Germany. The refinery uses two rotary blowers to transport process-related waste gases to the flare, where they are burned. The two machines are operated alternately, generating pressure of 1.8 bar at 600 rpm. As a result of the working principle of the blowers, the seals were being subjected to significant vibration, which required them to be replaced every six months.

This mean time between repairs (MTBR) was creating unjustifiably high operating costs. In addition, the high hydrogen sulfide (H₂S) content of the gas mixture — up to 10 percent — would be hazardous to refinery workers, the public and the environment if the product leaked from the piston blowers.

An innovative retrofit

The Flowserve team proposed retrofitting the rotary blowers with the Circpac LO. This lift-off floating ring seal features a stable gas film that compensates for vibration by feeding an inert gas, such as nitrogen, into the sealing gap between the rotating shaft and the circumferential seal ring.

T-grooves in the seal's carbon rings enable them to "float" when gas enters the sealing gap. In this way, the Circpac LO enables bi-directional operation with no contact or wear. Gas consumption is low due to minimized clearance and remains consistent in both static and dynamic conditions, keeping operational costs predictable.

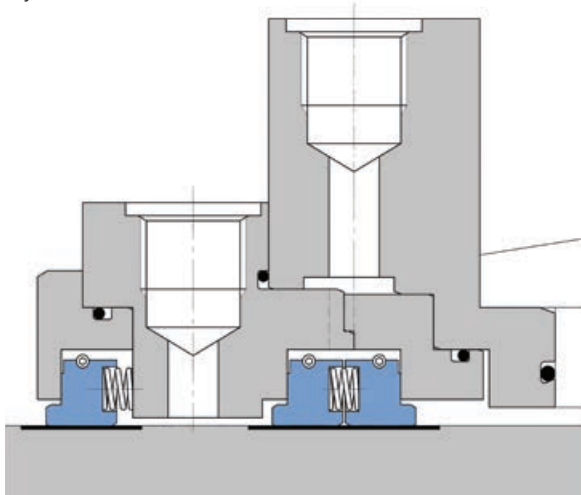


The T-grooves in this carbon ring segment allow gas to enter the seal gap and support ring lift-off, eliminating contact and wear.



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While Flowserve had designed the gas barrier system specifically for this application, this was a new operational use of the Circpac LO. Therefore, the team conducted extensive tests, both at the Flowserve development site in Dortmund, Germany, and at a special machine test bench at the PCK refinery. Key simulations included vibration and incoming water spray, which the seal managed without any restrictions.

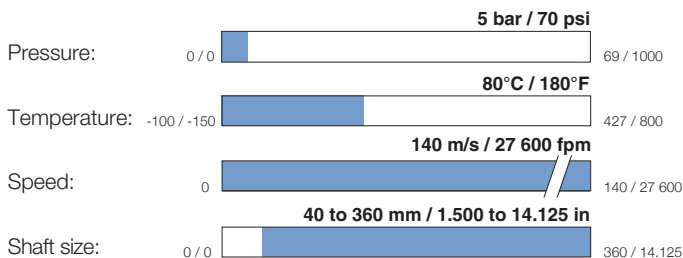


Section view of the Circpac LO installed at the PCK Schwedt refinery

Flowserve seals still going strong

The first blower was successfully retrofitted in 2007 and put into operation without any incidents. The second blower was upgraded the following year. Since that time, PCK Schwedt has operated both machines successfully and without significant issues for more than 10 years. In 2017, Flowserve performed an inspection of the first blower and found the Circpac LO seals to be in very good condition, with no significant visible wear.

Standard operating limits of Circpac LO

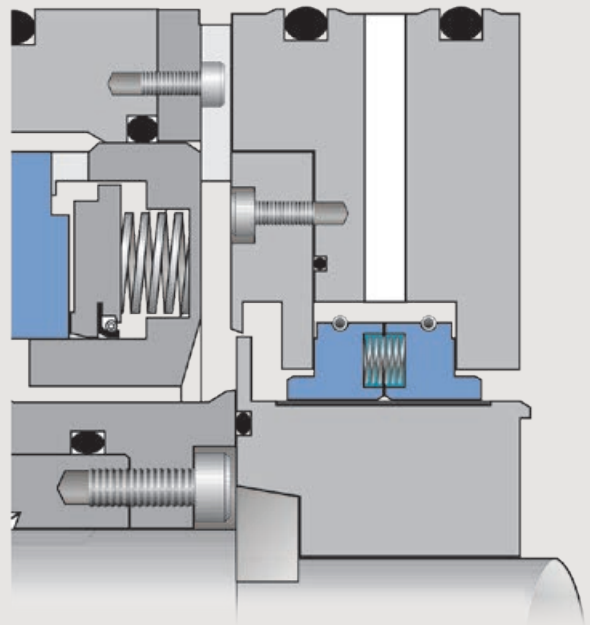


Circpac LO

The Circpac LO seal is a segmented-carbon ring gas seal engineered for low consumption at all operation conditions. It was originally designed in a double configuration to work as a separation seal between bearings and compressor dry gas seals.

Advantages of the Circpac LO include:

- Bidirectional operation
- Balanced floating lift-off carbon ring design
- Non-contacting design – no wear
- Precision mortise joint design with low joint bypass leakage
- Minimized clearance for low gas consumption
- Consistent gas consumption in both static and dynamic conditions



Section view of a typical Circpac LO, used as a separation seal



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The results: A safer, more profitable refinery

Retrofitting the rotary piston blowers with the Circpac LO proved to be a cost-effective and durable alternative to traditional packing. In its first decade, the seals have delivered numerous benefits to PCK Schwedt, including:

Significantly reduced downtime. The technically advanced gas film design of the seals accommodates the equipment vibration, dramatically increasing the continuous runtime of the two rotary piston blowers.

Cost savings. Since 2007, the refinery has saved thousands of euros per year by eliminating the staff and maintenance costs associated with replacing traditional packing seals every six months.

Improved safety and environmental compliance. By eliminating the potential leakage of a hazardous chemical, the refinery has lowered health, safety and environmental risks for both its workers and the community.



Front view of the barrier gas system controlling the Circpac LO seals of both blowers

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