

## LCA Refinery Customer Retrofits Compressor to Save Money All Around

Dry-running Gaspac Seal Solution Reduces OPEX and Improves Reliability at Lower Cost Than OEM Modification

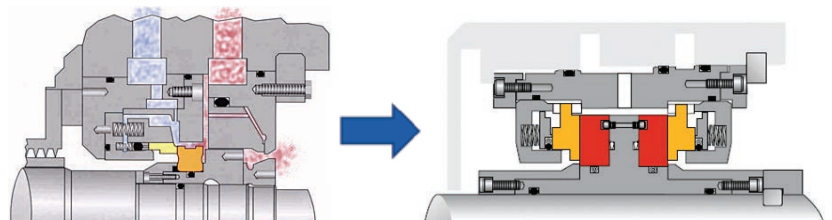
**The Challenge:** A light ends compressor in a Spanish refinery had experienced an extremely expensive wet seal failure, including significant disruption of production. Costs related to seal lubricating oil leakage, the de-gassing of contaminated oil and OPEX (Operating Expense) were steadily mounting. Plus, the seal oil support system had become increasingly problematic and hazardous.

**The Solution:** A dry-gas seal retrofit (without OEM equipment modifications) was made to the compressor, including: Gaspac D double-compressor seals; Circpac LO carbon ring seals for bearing protection; and a buffer/barrier gas panel. The competing OEM solution required compressor modifications and a higher total package cost. By accepting the Flowserve proposal, the customer was able to minimize upfront costs. The elimination of the seal oil support system cost, including oil consumption, de-gassing and maintenance, helped to support this process and is calculated to aid in future project payback.

A refinery located south of Valencia, Spain, suffered a sats gas plant compressor failure, causing costly unit shutdown and lost revenue. This unsparred light ends compressor is used to liquefy and draw off CH<sub>4</sub> and lighter gases (e.g., mixed butane, ethane and methane) at the relatively low pressure of about 14 bar (200 psi). Refinery engineers traced the failure to faulty wet mechanical seals and isolators. Also, the oil seal support system was a growing concern in terms of climbing operating and maintenance costs. They turned to the compressor OEM for an upgrade/retrofit remedy. Subsequently, Flowserve on-site technical engineers became aware of the project.

### Light Ends Compressor Specifications

- Duty: Stand-alone compressor with no standby unit
- Shaft: 85 mm (3¼ in)
- Drive: Electric motor and gearbox > 7827 rpm
- Media: Mixed hydrocarbon gas
- Temperature: Inlet — -40°C (104°F);  
Outlet — -120°C (248°F)
- Seal Pressures: Dynamic — 2 bar (29 psi);  
Static — 15 bar (218 psi)
- Seal: Compressor OEM wet seals



Typical Compressor Seal Retrofit

Flowserve had developed an excellent relationship with the refinery operators and established a Life Cycle Agreement (LCA) with them. Prior Flowserve dry-gas seal retrofits had performed to and beyond expectations:

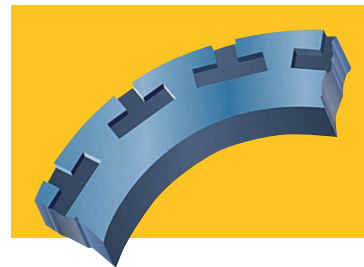
- Gaspac L tandem seals with interstage labyrinth installed in a coker gas compressor (2003) have been serviced once during routine turnaround.
- Gaspac D double seals installed in a methane mix compressor (2007) have yet to be removed from service.

As a result of this superior past performance, refinery operators invited Flowserve to submit an alternative retrofit proposal.

### Recommendations

Unlike the OEM proposal, the Flowserve solution required no compressor modifications and delivered a safer, faster, more reliable retrofit at lower cost. The scope of work included:

- Removal of wet seals and seal support system
- Supply and installation of new Gaspac D seals with T-groove face geometry for bi-directional rotation
- Supply and installation of Circpac LO bearing isolation seals
- Supply and installation of new gas control panel, complete with piping and wiring
- Commissioning of seals and panel
- Rotor dynamic analysis to check compressor stability with DGS



T-groove

The project was completed on time and on budget to the owner's complete satisfaction. Additionally, the refinery will continue to benefit from local Flowserve customer service support.

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