

High Pressure Non-Lube Hydrogen TR² Packing Ring Upgrade

The Challenge

This 2-stage non-lube horizontal compressor is used in a refinery Hydrogen unit, compressing H₂ from 362 to 2320 psi (25 to 160 bar).

In addition to poor mean time between failures (MTBF) with the original OEM supplied packing cases and rings, the customer was facing issues with unscheduled shutdowns for high temperature alarms on the packing cases at 266 °F (130 °C).

The existing packing case used a mix of segmental rings and triple circles, meaning the case was very long, but the stroke on the compressor was very short. As a result, the full swept area of the piston rod never leaves the packing case resulting in insufficient heat dissipation to cool the frictional heating of the rod.

The Solution

Initial improvements were made by upgrading the existing packing ring material with CPI 184 and by implementing new packing cases of CPI's Hextra cooling design. This provided an initial improvement, taking the packing ring lifetime to 6,000 hours and a reduction in the temperature. However, that was not sufficient, the customer was looking for at least 1 year MTBF.

A further upgrade involved CPI, part of the Howden group, specifying EMISSIONGUARD™ TR² rings in a combination of CPI 184 and CPI 192 materials. Due to the design features of the TR² rings, incorporating narrow rings and reduced ring quantities, there was an immediate and continued reduction of friction on the piston rod.

The running life is now 10,000 hours before any increase in leakage and temperature is observed with an expected MTBF >12,000 hours. The packing temperature is now 140 °F (60 °C) and there are no more shutdown alarms. The customer is very satisfied.

