Case Study

John Crane Dry Gas Seals

John Crane's Dry Gas Seals Reduce Gas Emissions for Pipeline Station in the Middle East

BACKGROUND

Industry: Oil and Gas

Site: Pipeline Station

Location: Oman, Middle East

End Product: Crude Oil, Natural Gas

John Crane Type 28AT and Type 28XP non-contacting dry gas seals were chosen to minimize leakage

Customer Need

- The customer is part of a leading exploration and production company in the Middle East that delivers the majority of the country's crude oil production and natural gas supply
- The customer is focused on environmental initiatives and reducing overall emissions, which was generated from the oil seal technology currently in place
- An additional focus for the customer was to reduce machine maintenance costs and eliminate process gas contamination with oil on outdated equipment

Highlights

- A pipeline station was searching for ways to lower methane emissions and machine maintenance costs and eliminate process gas contamination on outdated equipment
- John Crane was able to pinpoint a potential rotor dynamic issue that put the equipment at risk for instability problems
- A 98% reduction in CO_2 emissions was achieved due to the change in gas seal technology

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Application

- The two-phase project called for John Crane to retrofit two large compressor trains from oil seals to dry gas technology
- Each compressor train was comprised of two gas lift compressors—one low-pressure (LP) compressor with the horizontal split casing, and one high-pressure (HP) barrel-type compressor
- The initial stages of the first retrofit—known as "pre-shutdown"—called for the John Crane team to carry out a wide scope of engineering work, including RDA. This process was critical for successful seal implementation, as it is commonly used to analyze and diagnose the behavior of rotating structures
- As a result of the pre-shutdown RDA, a potential rotor dynamic issue was discovered, which put the equipment at risk for instability problems, including high vibration and potential performance failure. Realizing the criticality of this issue, it was quickly escalated and resolved by the John Crane team with modifications to the systems to prevent future performance issues

Solution

- John Crane proposed a turnkey retrofit, which called for the supply of new Type 28 dry gas seals—including a gas seal system with a gas conditioning unit, filters and a heater—separation seals, rotor dynamics analysis (RDA) and modifications, and installation and commissioning support
- Seals needed to be designed that could fit into the existing seal cavities—originally designed for oil seals—either with or without only minor modifications being made
- After the primary engineering work was complete, a full general arrangement drawing of the new equipment was prepared, after which the new dry gas seal cartridges and control systems were manufactured, tested and shipped to the site for installation
- During the project implementation stage, or "shutdown stage," both LP and HP compressors within the train were disassembled so their rotor and compressor casings could be modified to accommodate the new dry gas seal cartridges

Results

- A 98% reduction in CO_2 emissions was due to the change from oil seal gas seal technology to the Type 28 dry gas seal and was credited to the thin running gaps between the seal faces
- Combustion from the gas turbine is consuming 2% less gas because the gas seal has a lower power consumption
- Process gas contamination with oil was eliminated, enabling higher quality gas and reduced costs associated with oil removal
- Maintenance and energy costs were significantly reduced due to improved mean time between failure and increased reliability
- In addition to equipment and cost benefits, John Crane was able to educate local site operators about the benefits associated with dry gas seal technology
- Besides the reduction in emissions, the retrofits significantly increased the reliability of the compressors. With oil seals in place, the seal change was carried out on average every three to five years. After the retrofit to dry gas seals, compressors ran for over 10 years prior to shutdown