

HYPOTHETICAL CASE STUDY: NATURAL GAS INDUSTRY
SERVICE OFFERING: TURNKEY UPGRADE SERVICE FOR CENTRIFUGAL COMPRESSOR SHAFT SEALS

John Crane Gas Seal Technology Cuts Costs, Emissions and Downtime



BACKGROUND

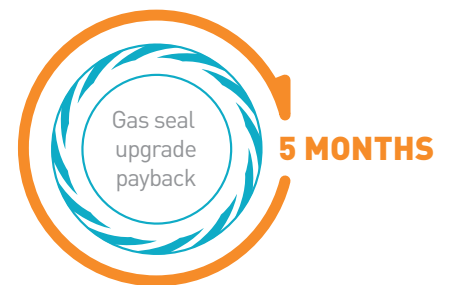
Industry: Natural gas processing
Site: Single compressor operation, process gas owned by equipment operator
Location: United States
End Product: Natural gas 85% methane
Equipment Utilization: 355 days a year

CUSTOMER NEED

- The company’s publicized commitment to the environment and meeting potential emission regulations were priorities.
- The upgrade needed to lower operating costs with short-term payback.
- Downtime from oil seal maintenance and replacements hurt production.
- Oil seal methane leaks cut deep into profits.

HIGHLIGHTS

- Customer compared the three viable options to reduce methane emissions using John Crane’s Lifecycle Cost Calculator (LCC). *(See lifecycle cost graph)*
- Results from LCC showed gas processor could immediately begin saving millions of dollars by upgrading from shaft oil seal to time-tested gas seal technology.
- These calculated savings are the result of reduced methane emissions, downtime and maintenance costs.
- Company confident of full compliance with potential environmental regulations regarding compressor emissions.



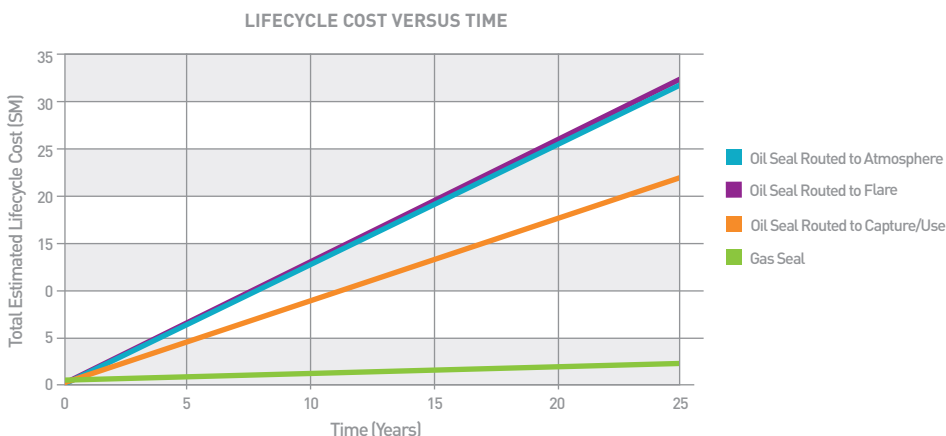
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NATURAL GAS PROCESSING

- Assumes 1 compressor running approximately 100% utilization with the equipment operator owning the natural gas flowing through the compressor
- Centrifugal compressor with 2 seals running on a 5.52 shaft at 9,440 rpm and 470 psi
- Assumes methane content of 85% with a natural gas value of \$2.86 per thousand cubic ft
- Assumes oil seal mean time between repair of 12 months
- Lost production due to oil seal maintenance estimated to be 200 hours per year

TECHNICAL SOLUTION

- Turnkey Upgrade Service for Centrifugal Compressor Shaft Seals, including as standard:
 - Equipment audit and emissions baseline measurement
 - Oil seal and system removal and disposal
 - Custom gas seal solution (including rotor dynamics optimization and compressor modification if required)
 - Installation and commissioning of narrow section gas seal, separation seals and gas seal system
 - Emissions reduction monitoring
- Optional services include:
 - Coupling change
 - Bearing service
 - Thermoplastic inter-stage labyrinth upgrade
 - Replacement filters
 - Dry gas seal management



PROJECTED LCC ECONOMIC RESULTS

Calculated over 15 years, the total lifecycle cost of...

- Capturing the uncontrolled, vented methane and **routing to a flare device** is projected to be \$20M.
- Capturing the uncontrolled, vented methane and **routing for another purpose** is projected to be \$13M.
- **Upgrading the oil seal to a gas seal** is only \$2M.



- Annual operating costs drop to just \$73,000 compared to \$1.4M with oil seals, representing more than \$1.3M in savings.
- Product loss due to leakage estimated to drop to \$31,000 — a \$470,000 cost reduction from oil seals.
- Maintenance and downtime annual expenses are estimated to reduce to \$30,000 — down \$792,000 compared to oil seal.
- Methane leaked into atmosphere nearly eliminated, preparing the way for compliance with potential environmental and greenhouse gas legislation.