

OIL AND GAS CASE STUDY - MAJOR OIL AND GAS PRODUCER

Improving offshore gas compression train reliability



ABB's rotating equipment specialists enabled an oil and gas producer to improve the reliability of the gas compression trains installed on their offshore installations.

Industry wide studies into the causes of declining production efficiency in the North Sea have identified that gas compression train unreliability as one of the major contributing factors to the loss of crude oil production.

The client is an oil and gas producer and operates offshore installations in the North Sea region. They were experiencing repeated trips of an installation's gas compression train. This resulted in significant production uptime being lost and costs incurred owing to the loss of gas lift and the need to run the power-generating gas turbines on buyback gas. The running time of the gas compression train between successive trips was typically measured in days and its resultant poor availability had resulted in periods of no crude oil production.

The client turned to ABB to work with them to resolve the situation and help bring about a step change in reliability performance. The client knew that ABB has specialist consultants with a proven track record of addressing the range of issues involved and also in-depth capability in this area. The consultant worked at their offices alongside the client's team. Furthermore, he interacted fully with the operations team, process engineers, safety and R&M staff.

Solution

One of ABB's experienced rotating equipment specialists facilitated and also led root cause and failure investigations, drawing upon the accumulated knowledge and the experience of other ABB specialists.

The consultant's ability to act independently and objectively as a third party specialist was of critical importance when it came to winning the trust of the various parties involved.

Primarily the work involved:

- Conducting root cause analysis of recent failures following a focused and objective approach
- Applying specialist technical knowledge and previous experience
- Gaining a detailed understanding of how the reliability of the gas compression train was affected by the operation of upstream and downstream equipment
- Reviewing in-depth the design and specification of key equipment
- Identifying the necessary operating procedures for the compressors and the application of Industry good practice

- Identifying the correct standards to be applied during maintenance and inspection events
- Working with the OEMs and contractors to remove any contractual barriers to developing a technical solution
- Working closely with the client and OEMs to support the implementation of the necessary changes

The investigation identified that the key vulnerabilities, which brought about poor gas compression train reliability were:

- A failure to fully understand the key importance of maintaining the dry gas seal support system
- The use of incomplete pre-start, start, running and shutdown operating procedures
- Incorrect interpretation of condition / health monitoring data
- Walk-round checks that did not fully focus on the key aspects of safeguarding safe and reliable performance
- The lack of dedicated short, medium and long-term equipment preservation procedures
- Inconsistent control and instrumentation reliability
- The need for a more holistic approach to modifying equipment and introducing process changes

The solution required:

- The conducting of root cause and failure investigations; which used the evidence and not subjective opinion to fully determine the basic root causes
- The review of reliability data and analysis of previous gas compression train failure events
- The in-depth review of the OEM's guidance for safe operation and maintenance of the gas compression train and its ancillary equipment
- The prioritisation of the maintenance interventions required to ensure equipment uptime
- The review and amendment of operating procedures to introduce the necessary steps to achieve the successful starting, operation and shutting-down of the gas compression train
- The redefining of the walk-round checks to make them better targeted to enable the earliest detection of potential faults

- Identification of equipment modifications to be embodied to further improve the reliability of the gas compression train
- The introduction of short, medium and long-term preservation procedures

Overall, the quickest wins resulted from the client's operating and maintenance teams initially getting 'back to basics'. In that, greater emphasis was placed on the need to review and react more quickly to condition / health monitoring data. This approach when combined with the introduction of revised operating procedures, more robust walk-round checks and the use of equipment preservation procedures, brought about an almost immediate upturn in equipment reliability.

Having successfully helped bring about a significant improvement in the reliability of the gas compression train, ABB went on to work closely with the same client to enable them to improve the reliability of their rotating equipment installed on the remainder of their North Sea assets.

Benefits

ABB's involvement enabled:

- The asset management team to deliver a tenfold increase in the gas compression train's uptime between successive trips
- The introduction of revised operating procedures and walk-round checks; that when followed by offshore technicians serve to underpin the safe and reliable operation of the gas compression train
- A greater emphasis to be placed on the condition / health monitoring of the gas compression train; that enables timely maintenance interventions to be made to minimise downtime
- The introduction of equipment preservation procedures; that has improved the likelihood of a successful restart and sustained availability of the equipment when offline for short, medium and long-term periods
- The fuller understanding of the offshore maintenance technicians need to follow the scheduled preventative maintenance procedures
- The original equipment manufacturer's (OEMs) to focus more closely on their working with the client to deliver improved reliability rather than feeling the need to occasionally defend their contractual position