PROAIM

ACHIEVING DATA-DRIVEN RELIABILITY

DATA DRIVEN RCM

Yansan refinery in China wanted to improve the reliability of their 11 reciprocating compressors, due to unacceptable levels of unplanned shutdowns.

ProAIM was consulted and asked to review the current RCM and provide an optimised PM that would enable operations and maintenance to move from unplanned correct maintenance to planned maintenance.

BENEFITS

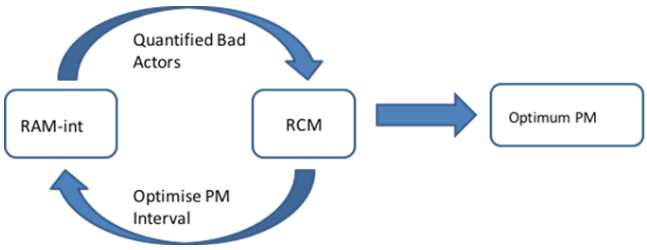
ProAIM was able to optimise the planned maintenance schedule to enable the compressors to run for 5 years. The client estimated that this would save them millions of dollars every year in lost production as they change from a fire fighting mode of corrective maintenance to an organised mode planned maintenance and operations.

SCOPE

The project took 3 months to complete. A total of 11 reciprocating compressors were reviewed, 4 pairs in the ethylene process and 3 (two redundant) in the hydrogen loop.

METHODOLOGY

Traditional RCM methodology is qualitative basis and heavily relied on individual subject matter expert's knowledge and experience to achieve results. Therefore, the results could vary from study to study conducted by different experts. ProAIM's innovative RAM-RCM methodology enhances the quantitative element in the RCM process. The results of RAM process guide the focus points on RCM process and the results of RCM could also be verified with RAM to quantify their effectiveness.



ABOUT PROAIM

A reliability-engineering consultancy company based in the UK, with operations across the globe.

Providing specialist bespoke consultancy with integrated RAM technology and training solutions in the area of reliability and maintenance engineering.

We enable our clients in asset-centric process industries to achieve the safety, production output and costs targets for their business.

ProAIM is one of the leading companies able to quantify the true life-cycle costs from design to decommissioning by combining RAM and Process Synthesis with ProAIM's patented RAM-int.

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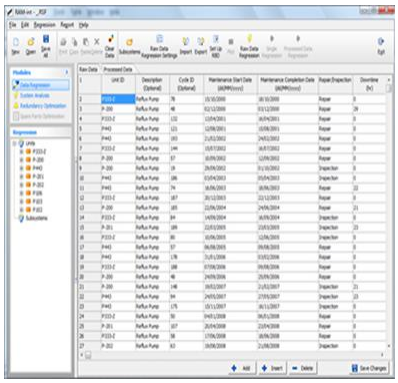
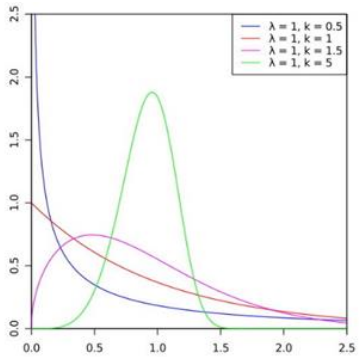
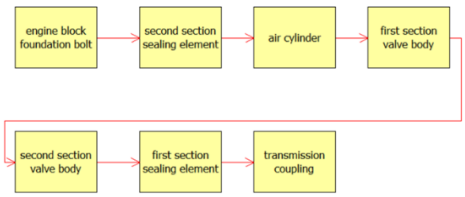
PROCESS

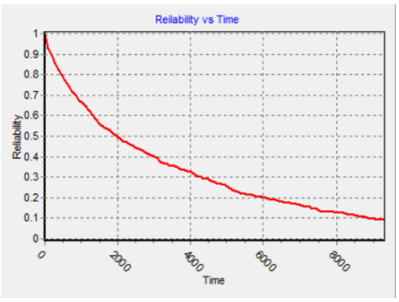
1. Historical failure data is cleaned and regressed
   - Using the ISO14224 Standard to represent the compressor structure hierarchy. The Weibull parameters for each component is calculated as shown below to quantify the bad actors.





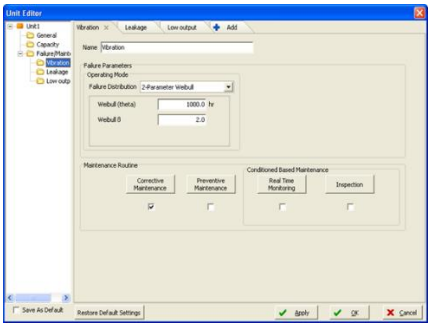
2. Generate the RBD for the reciprocating compressor at the component level enables us to understand how the components affect the reliability of the entire compressor.

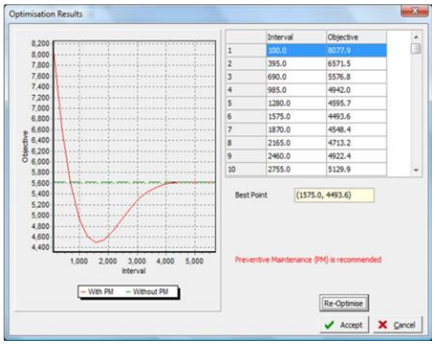




3. Following this ProAIM then applies a "Lean" RCM using the following:
   - Quantified bad actors
   - ProAIM's RCM decision tree.
   - Knowledge from subject matter experts, the PM interval was updated according the failure modes of bad actors to align the planned maintenance schedules. The schedules were reviewed with the Operations and Maintenance to practically assess the viability of the proposed PM.

4. Optimising PM within RAM-int
   - Recommended maintenance strategies were loaded into the RBD model. The PM was simulated using RAM-int's maintenance module to optimise the interval based on maintenance costs vs production downtime. The graph below indicates the calculated optimum time for the PM interval for one of the compressors, which is 1500 hours of running time.
   - In addition to CM the maintenance module within RAM-int can also include PM, RTM and inspection intervals if required.





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