

Improving Reliability and Reducing Maintenance Burden

Reliability Centered Maintenance on HMS Ocean's High Pressure air system



Reliability Centred Maintenance (RCM) is a proven methodology for establishing the optimum preventive maintenance regime. It begins by identifying the performance required from the equipment, the way in which the equipment fails and the plausible causes of failure, and then details the effects and consequences of failure.

This allows an assessment to be made of the criticality of the failure and identifies significant safety, availability or cost consequences.

The methodology allows the selection of an appropriate maintenance task that addresses each identified failure. RCM is an effective first component in any process to determine maintenance requirements. It provides a fully auditable decision-making process and ensures compliance with statutory requirements.

The RCM Study

LSC Group was requested to carry out a RCM analysis of the High Pressure (HP) Air system on board HMS Ocean on behalf of the UK Ministry of Defence. The system provides compressed air to a range of services throughout the vessel. Three dedicated electrically driven compressors supply the system. The purpose of the analysis was to derive the most appropriate, cost-effective maintenance regime with no detrimental safety, operational or economic impact. The platform had been in-use for approximately 3 years and was being maintained in accordance with the manufacturer's recommended maintenance schedule.

The Challenge

To identify the most appropriate, cost effective maintenance regime for HMS Ocean's HP air system with no detrimental safety, availability or economic impact.

Solution

An RCM analysis that identified the various alternative solutions to manage the HP air system maintenance schedule.

Customer Benefits

Scheduled maintenance for HMS Ocean HP air system reduced by 1,864 man-hours per year.

Time and labour savings as a result of stripping out unnecessary maintenance.

Working alongside the MoD, LSC Group supplied the RCM expertise and was responsible for recording the analysis and reporting the results. The MoD supplied the appropriate engineering expertise, allowing the RCM study to be conducted on a team basis. This partnership brought together the following attributes:

- Knowledge and experience of the RCM process.
- Detailed knowledge of the appropriate design features, installation and commissioning.
- Knowledge of how the equipment is used, operated, maintained and supported.
- Knowledge of the condition of the equipment and its components at overhaul, including understanding of the actual failure modes, and their effects.
- Specialist knowledge of constraining influences, e.g. Health and Safety, environmental legislation, regulatory bodies, etc.

Detailed technical data was required to conduct the study and was obtained from manufacturer's handbooks, assembly drawings and wiring diagrams. Available failure data was reviewed to ensure that all failures that had previously occurred were addressed. Maintenance records were reviewed to give an indication of the condition of equipment after use. Where historical failure data was not available, the engineering judgement of the team, with a thorough knowledge of the equipment, was used. Visits to HMS Ocean were essential to understand the physical attributes of the system, appreciate any difficulties experienced by operators and maintainers and to assess the environmental conditions under which the system operates.

Deliverables

The following deliverables were provided in the form of a RCM Study Report:

Operating Context Statement

This statement provided a physical and functional description of the HP system and described the physical environment in which the system operated. It also provided precise details of the manner in which the system is used and specified quantitative performance requirements.

Analysis Comments Report

This report provided details of the documents used and referenced during the study, identified individuals involved and listed any assumptions made throughout the study.

FMECA / RCM Report

This report recorded the results of the analysis and detailed the justification for maintenance task selection and frequency. 16 new tasks that had not previously been carried out were recommended. 73 of the existing maintenance tasks were not justified by the RCM analysis and auditable rationale was provided to support their removal from the maintenance schedule. 2 'Desirable Redesigns' were recommended to address engineering failure modes with operational consequences.

Planned Maintenance Schedule

This document listed the routine preventive maintenance tasks required to support the system in its operating environment for the duration of its anticipated life cycle.

Maintenance Comparator Report

This report allowed a direct comparison between the existing maintenance schedule and the RCM-derived maintenance schedule. The comparator showed a 56% reduction in the maintenance effort required to support the HP system. This reduction was possible because the man-hours needed to meet the requirements of the RCM-derived maintenance schedule were significantly less than the man-hours required to complete the existing schedule.

Benefits

The RCM-derived maintenance schedule identified reductions of 1,864 man-hours per year compared to the current regime.

The study justified the removal of existing maintenance tasks from the schedule and identified new tasks to prevent adverse safety, availability or economic consequences with the net result being greater equipment availability at a significantly reduced cost