Optimising pressure vessel inspections using pRIME toolkit

Implementing an integrated integrity management system to extend asset life and reduce inspection costs.

The client operates one of the UK’s largest onshore gas storage facilities. The asset consists of nine man-made salt cavities that have been leached into a salt layer 1.8 kilometres below the surface creating 325 mcm of gas storage capacity.

The client required an experienced supplier to instigate an integrity management system on the site to fully meet the requirements of HSE RR509 - plant ageing: management of equipment containing hazardous fluids or pressure.

Solution

ABB carried out a piping and vessels criticality and opportunity screening process. This allowed the pipework to be categorized and ranked in order of criticality and opportunity to provide the operator with a greater understanding of key pipework issues. We then applied our pRIME optimised inspection methodology.

ABB’s pRIME optimised inspection methodology concentrates on determining:

- **What** to inspect. i.e where failure is unacceptable
- **Where** to focus effort
- **How** the right techniques to use
- **When** optimise the examination interval

In addition, we considered what the impact of any potential failures would be on either, the business, the environment or safety.

Detailed reviews were undertaken to fully understand any potential deterioration mechanisms of individual items of equipment and piping systems. By doing this, ABB were able to highlight and prioritise items that were key to the operation, and focused inspection activities accordingly.
As part of the data review and analysis stage we also challenged the scope of the Non-Destructive Testing (NDT) to ensure the inspection regime was optimised and appropriate for the relevant deterioration mechanisms to provide the most cost effective solution.

Focused schemes of examination (inspection plans) were prepared for ABB inspectors to carry out detailed examinations of equipment. From these reviews and the subsequent inspections ABB were able to recommend a number of changes to inspection practices and frequency of inspections:

- Inspection intervals for pressure vessels were increased from 58 months to 82 months and inspection intervals on other equipment (storage tanks, piping etc.) were increased from 60 months to 86 months. This reduces costs associated with the inspections and equipment downtime.
- The current inspection schemes called for extensive NDT. The study demonstrated that equipment integrity could be assured by a more focussed NDT approach.

On completion of the inspection programme the findings were reviewed to determine any changes to the inspection plans and, if required, to the asset data. This continual review of inspection findings will ensure that the long term integrity is embedded in the integrity management system.

ABB’s pRIME optimised inspection was delivered using ABB’s pRIME toolkit. The web-based software further enhances this approach as it:

- Allows a number of team members to work concurrently in capturing the input data electronically to enable review during multi-disciplinary meetings. This functionality also allows the information to be reviewed by specialist engineers outside of the immediate project team.
- Ensures a consistent workflow and management reporting - Each equipment item review is subject to a series of secure stage gates to ensure that all of the necessary input data has been collected, analysed and the recommendations captured. This structured work process facilitates the tracking and reporting of project status by means of the progress dashboards.
- Provides a risk assessment according to client criteria.
- Automatically generates customisable reports.

Benefits:
- A 40% reduction in vessel inspection costs, just based on frequency - excluding savings from more uptime and changes to inspection scope.
- Average inspection intervals for pressure vessels increased from 58 months to 82 months.
- Average inspection intervals for other equipment (e.g. storage tanks and piping) increased from 60 months to 86 months.
- A complete set of inspection schemes for all HSE and Business critical equipment.
- Greater understanding of the equipment and how to operate and maintain it.
- Compliance with legal requirements.