Inspecting a batch plant

The optimum way

A new way of inspecting pressure systems provides production flexibility, peace of mind and saves time and money.

This client used an insurance company to inspect their pressure systems, which is a common approach. The insurance company had already started preliminary work on Risk Based Inspection (RBI) for certain pressure vessels, but the client felt they needed people with greater expertise to expand this study and to reduce the cost of the exercise. The annual shutdown to allow inspections and project-related work was planned to be maintained. This was obviously a major constraint on production levels.

ABB was asked to take over the RBI.

Solution

ABB completed a comprehensive RBI study using ABB’s RBI+© methodology, an inspection method highly suitable for identifying areas of potential deterioration and failure.

The RBI+© methodology where deterioration is possible 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.

By doing this, ABB was able to highlight and prioritise items that were key to the operation, and focused inspection activities accordingly. This resulted in a number of changes to inspection practices:

- For low-hazard items, a large number of inspections employed non-invasive techniques, which in some cases allowed on-line inspection
- By understanding the full operating regimes, we identified potential failure mechanisms that hadn’t been looked for before. We then specified appropriate inspections to find defects before they caused any incidents. This predictive approach minimised surprises and improved plant reliability
- Many inspection intervals were extended while excessive inspections were eliminated. This increased plant availability and reduced inspection costs
As a result the success of the RBI study the client appointed ABB as its inspection authority. To put this into effect, we assembled a team that included both client personnel and our own specialists. This team used the RBI+© methodology to prepare new schemes of examination for all the pressure equipment, focusing on those areas most likely to suffer from deterioration.

The study developed specific schemes of examination for all the items considered. In most cases, these were based on non-destructive testing at particular points, highlighted on sketches.

Some key changes to schemes included:

- The potential for stress corrosion cracking was highlighted in a number of vessels, where untreated water was present
- Checks for fatigue of some batch reaction vessel nozzles were included for the first time. Initial inspections found small defects were present, allowing repairs before failure
- Routine pressure tests of a number of heat exchangers were removed from the schemes, significantly reducing work where no defects had ever been found

The integration of RBI and the inspection authority role enabled the actions from the reviews to be implemented economically and efficiently. Schemes of examinations highlighted deterioration mechanisms which needed to be inspected for. Completed inspections validated the outcome of the RBI review and were used to assess the remaining life of the equipment.

“The overall objectives of relating the type of inspection and testing regime to the potential failure mechanisms was achieved by the combined team, with shutdown periods being extended, maintenance costs reduced, and production increased. A ‘win win’ situation for all concerned.”

Benefits
- Reduced planned downtime
- Plant reliability improved
- Reduced costs
- Production far more flexible
- Defects discovered before they cause incidents
- Unnecessary / excessive inspections identified and eliminated
- Key items prioritised