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Inspection optimisation: Going beyond risk-based inspection

When was the last time you analysed your risk-based inspection (RBI) strategy? Have you ever asked, "Why are we doing it this way?" and has someone responded, "Because that's the way we've always done it"? If the answer to either of those questions is yes, it may be time for a change.

RISK-BASED INSPECTION (RBI)

At processing facilities, RBI is a risk assessment and management process that focuses on loss of containment of pressurised equipment due to material deterioration. RBI complements process HAZOP studies by focusing on physical integrity-related damage mechanisms and managing risk through methods, coverage and frequency of inspections.

API RP 580 (Ref. 1) provides guidance for developing RBI programmes and API RP 581 (Ref. 2) sets out methods for the calculation of risk by combining the probability of failure with its consequence. This provides the basis for making informed decisions on what to inspect, the inspection frequency, the extent of inspection and the most suitable type of non-destructive testing (NDT). In this way, inspection efforts target the process equipment with the highest risk.

GOING BEYOND RBI

Technological advances in non-intrusive inspection (NII) techniques, where inspections are performed from the outside of the vessel without breaking containment, and the use of robotic equipment for internal inspection, can both realise significant benefits:

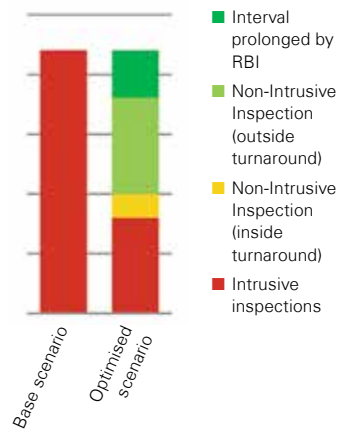
- NII significantly reduces turnaround time, leading to greater production availability, because there is no need to shut down a vessel, isolate it and prepare it for entry.
- NII, in conjunction with robotics, can eliminate the occupational safety risks associated with confined space entry.

Improvements such as these can be achieved by going beyond the standard RBI approach and minimising interventions by applying a simple process called inspection optimisation strategy (IOS).

WHAT IS IOS?

The IOS process is a structured, experience-based way of identifying opportunities to mature an asset's RBI strategies and is typically conducted in four steps.

Figure 1 - Inspection optimisation



Step 1 – RBI quality review: Using a team comprising individuals experienced in RBI and inspection methods, as well as other subject matter experts, the quality of results from recent rounds of RBIs are reviewed to screen opportunities for extending inspection intervals or changing the scope of the next turnaround.

This is important, as most facilities' RBI programmes are a well run routine process. Inspections are planned, NDT contractors hired, preparations made, inspections conducted and results returned to the company, often without critical owner review. Unless there is an outlier, the information is entered and stored, and the inspection rescheduled according to the original RBI strategy. This means that opportunities for optimisation may be missed.

Step 2 – Scope optimisation: Next, the team optimises the RBI programme by reducing the scope (amount) of work during the turnaround. This can be achieved by changing from intrusive inspection to NII or remote inspection (robotics), or prolonging the inspection interval without compromising integrity. With improved confidence in the quality of the data obtained during the previous step, the facility is in a better position to make this distinction. Analysis by experienced reliability engineers, in-house or external, can support the decision to delay an inspection.

Step 3 – Non-intrusive inspection: For vessels, the team should determine if the inspection can be replaced with a NII technique based on knowledge of the potential damage, equipment design and operational parameters. Typically only 5% of the cost of a vessel inspection is for the inspection itself. The remainder of the cost is associated with taking the vessel out of service, preparing it for inspection and placing it back in service. NII removes most of this work from the scope. Where this is an option, the RBI strategy should be modified and the inspection schedule adjusted to reflect the ability to inspect equipment while in-service.

Step 4 – Robotic inspections: Where NII is not a possibility, the team should investigate whether there is the ability to use robots to perform the internal inspections. Choosing robotic inspection eliminates the requirement to prepare equipment for human confined space entry. Not only is this safer, but it can also reduce the number of hours of overall downtime to prepare and conduct the inspection.

Step 5 – Future strategy: The new, optimised scenario is illustrated in Figure 1. It is crucial that the results from the new inspections are themselves reviewed to confirm that the data collected was of sufficient quality and quantity to make an informed decision on the future RBI strategy.

CONCLUSION

Applying the IOS concept for one company realised turnaround scope and cost savings of at least 10%, and up to 50% per asset, the extent depending on the maturity of the RBI strategies in place at the asset. So, the next time you ask, "Why are we doing it this way?" perhaps it's worth a look at the IOS approach.

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References:
1. API RP 580, Risk Based Inspection, 2016.
2. API RP 581, Risk Based Inspection Methodology, 2016.