

COST/RISK OPTIMISATION CASE

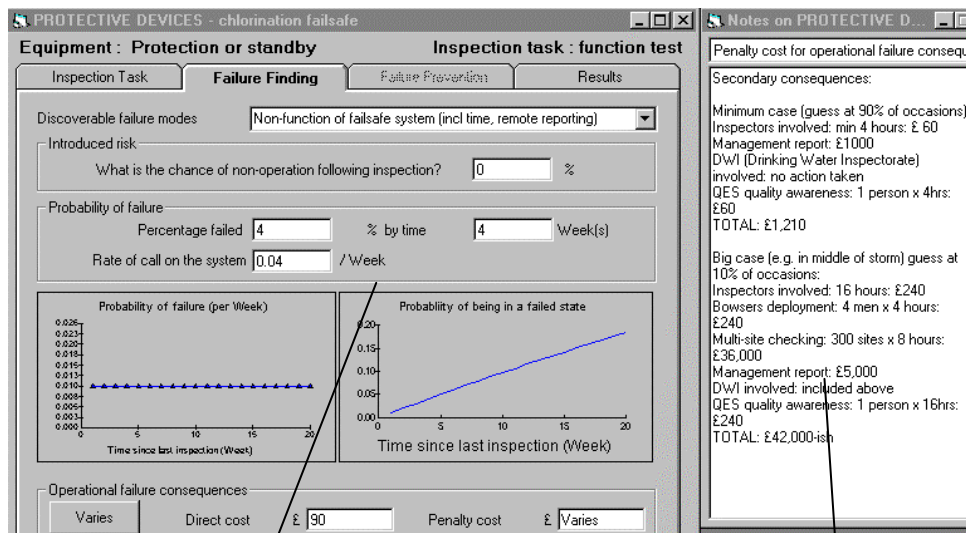
REF: 011
INDUSTRY: Power supply
PROJECT: Predictive/Condition Monitoring
DECISION TYPE: Inspection & CM intervals; CM cost/benefit justification; CM methods & performance; Failure finding inspections; Safety risk exposures
CLIENT: UK Power Supplier
TASK: Provide a robust risk-justified basis for inspection intervals of chlorination fail-safe system.

RESULTS

The analysis proved highly sensitive to the range-estimates for the consequences of operational failure.

In the 'most optimistic' case the optimum interval was three months. In the 'pessimistic extreme,' where system failure rates and operational demand frequency were doubled with a 20% chance of failure causing a major publicity impact, the optimum was three-weekly.

The 'most likely' case resulted in a five-weekly interval. Bearing in mind the considerable consequences of system failure, the failure probabilities involved and the minimal cost saving between four and five weekly regimes, the analysis provided strong evidence to justify the current level of monthly inspection intervals.



Example of data entry table

Analysis notes facility

DEMONSTRATES

- The verification of existing strategy using robust analysis
- The sensitivity of the data in determining the optimum strategy
- Variance between anticipated and actual strategies
- That APT-INSPECTION is a viable alternative to safety-critical decisions based on subjective judgement.

DETAILS

This project, to determine the optimum inspection interval for the chlorination fail-safe system, was undertaken as part of a test study for the client of the complete maintenance and inspection requirements of one borehole. The site selected was a single pump source with automatic chlorination dosing and simple dual redundancy dosing circuits.

The study group, consisting of representatives from the client and The Woodhouse Partnership, noted that downtime of just five minutes results in five properties being off supply. 12 hours downtime would cause around 100 properties to suffer reduced supply pressure. A RCM study identified a series

of filtered tasks and, in lieu of a Criticality System to prioritise activities, further analysis was conducted on a cross-section of six activities, assets and reasons for maintenance. The chlorination fail-safe mechanism formed part of this study.

Testing of the fail-safe system includes a full trip of the borehole operation to verify that both the pumping and dosing are closed down in event of a chlorination problem. This is a costly process, which incurs downtime and restart penalties and introduces secondary risks to the inspection. For this reason the group initially assumed that testing could be extended beyond the existing monthly interval.

ANALYSIS

The study had plentiful and reliable historical data on test results and operational trip experience, but a failure had never occurred and so the consequences were very difficult to quantify. A failure would refer to the chlorination fail-safe system itself failing when it was needed during normal operations. These effects were widely range-estimated and tested for sensitivity. As the analysis progressed, it became clear that the consequences of system failure, combined with the failure probabilities involved, provided a considerable pressure to continue the current level of testing.

The importance of the failure consequences to this analysis and the relative problems with quantifying them ensured that this study was particularly data sensitive. Consequently, APT-INSPECTION provided

a series of optimum intervals representing the 'pessimistic extreme', 'optimistic extreme' and 'most likely' alternatives. For these reasons, and in the absence of actual cases where costs for publicity and public and regulator reaction could be attributed for failure, The Woodhouse Partnership recommended continuing with the existing strategy.

The analysis was validated by separate calculation undertaken by an independent research council.

APT-INSPECTION demonstrated a link in this case between test results and the implied operational risks associated with alternative testing strategies. It provided the reliable justification for maintaining safety-critical inspection intervals demanded by the water regulator.

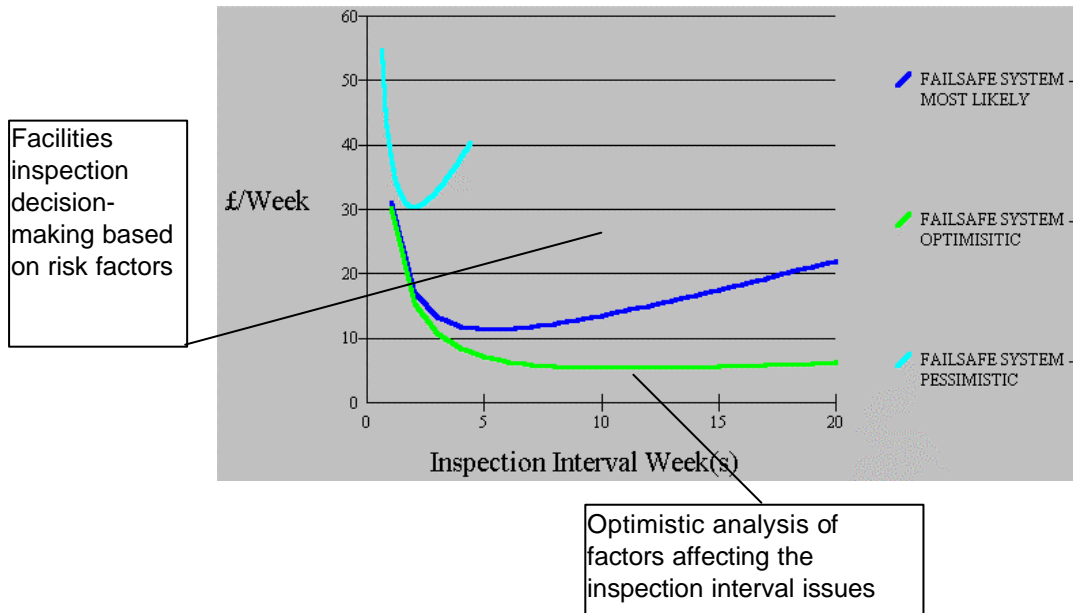
APT-INSPECTION

APT-INSPECTION is a flexible software tool that helps asset managers plan optimum inspection strategies for all types of assets. It provides solutions based on fact and scientific rather than subjective judgement. It will optimise the associated costs and risks, using incomplete data if necessary, and range-estimates can be used to test data sensitivity.

APT-INSPECTION will compare current policy against the optimum and provide a financial measure of the Total Business Impact (TBI) of each strategy. During this

process it will highlight the often vast disparity in costs between optimum and existing or supplier recommended strategies. The software has the versatility to cope with any inspection task individually or as a 'bundle' of activities.

APT-INSPECTION is one of a range of MACRO evaluation tools that is allied to the expertise of The Woodhouse Partnership to address the cost/risk assessment of engineering and management decisions.



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