

COST/RISK OPTIMISATION CASE STUDY

REF:	004
INDUSTRY:	Water supply
PROJECT:	Predictive/Condition Monitoring
DECISION TYPE:	Inspection and CM intervals; CM cost/benefit justification; CM methods & performance; function testing intervals; Failure finding inspections; safety risk exposures
CLIENT:	UK water supplier
TASK:	Devise an optimum cleaning and inspection interval for dosing analysers and advise on the potential impact of remote condition monitoring.

RESULTS

The study called for the assessment of an optimum cleaning interval and an optimum inspection interval for the client's chlorine dosing analysers. The project made the following findings:

Inspection Interval

When cleaning of the dosing analysers was considered in isolation from other related maintenance tasks, APT-INSPECTION indicated an optimum 6-8 week interval. This would reduce the Total Business Impact by 40% compared to the existing three-monthly policy.

To cope with the unique cleaning requirements of this item, it was recommended that a composite schedule based on re-analysis be devised to determine whether visit alignment advantages would outweigh the individual cost/risk benefits. This could be achieved by a series of 'What if?' studies using APT-INSPECTION.

Impact of Remote Monitoring

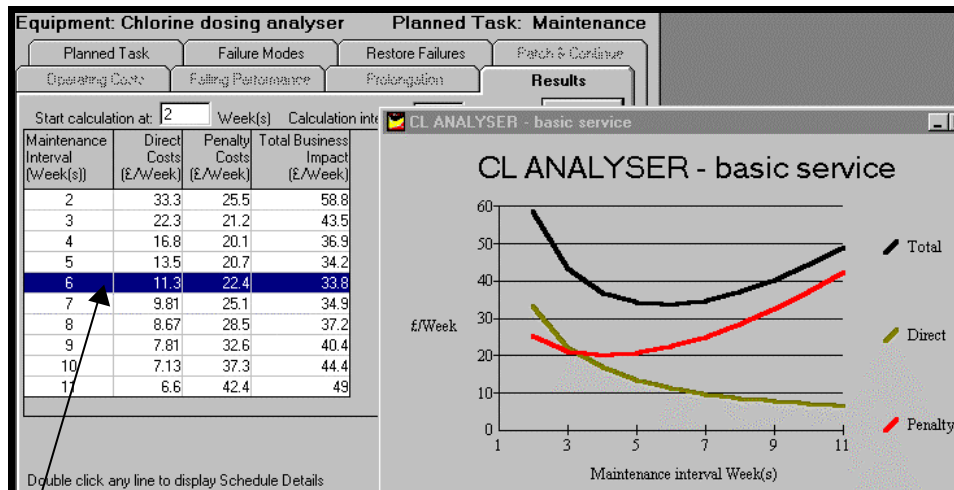
Analysis of single cell failure alarms resulted in a composite policy of 'next day' response to indicated cell failures, plus two-monthly planned maintenance due to the residual risks of second cell failure before the first is restored. This approach would halve the Total Business Impact incurred by periodic maintenance, from £33/cell/week to £16/cell/week. This provides a potential payback of around £2400/analyser/year for the investment and operation of the monitoring.

Analysis of multiple failure alarms showed how an 'on-alarm' maintenance policy can be compared to periodic (preventive) cell maintenance. Although the per-occasion costs would be higher if the response to a 'dual cell failure' alarm was immediate callout and repair, the secondary risk exposure would be substantially lower because of the shorter period of exposure to further problems.

APT-INSPECTION analysis indicated that the overall cost/risk would be reduced to £10.50/cell/week if three-monthly cleaning was continued, or £14/cell/week if 'on-alarm' maintenance was adopted.

DEMONSTRATES

- Unforeseen advantage of on-alarm maintenance compared to preventive maintenance strategy
- Composite and 'in exclusion' maintenance policies for dosing analysers
- The significant potential reduction in Total Business Impact by switching to an optimal maintenance strategy based on APT-INSPECTION
- The versatility of APT-INSPECTION when assessing various inspection strategies



Optimum interval

DETAILS

A study team consisting of representatives from the client and The Woodhouse Partnership Ltd was set up to assess the maintenance strategy and impact of remote condition monitoring for dosing analysers. A three-monthly inspection interval existed but was considered to probably be too infrequent.

The cleaning task concentrated on biofouling of the analyser, caused mostly by the buffer added to the pots, and deposits of iron and manganese. Mixing ball wear was also identified but occurred

on a different timescale so that monitoring/replacement could be omitted from the quarterly maintenance.

The three cells contained within the dosing analyser unit were cleaned in rotation so that the analyser was calibrated and the alarms tested every month following cleaning of one of the cells. Time constraints on the study team meant that only the cleaning tasks were evaluated together with the potential impact of remote condition monitoring.

ANALYSIS

APT-INSPECTION was employed by the study team to evaluate the optimum maintenance interval. Although a reduction in the net cost/risk impact was found to be possible - and is detailed above under 'Results', The Woodhouse Partnership Ltd expressed reservations. They recommended devising a composite schedule since the proposed optimum policy would make the monthly rotation for the three cells difficult.

Development of a composite schedule would involve re-mixing the work required for other purposes and re-analysing the case to determine whether the advantages of visit alignment outweigh the individual

cost/risk benefits. It was recognised that this would be outside the current study but could be achieved by a series of 'what if?' analyses using APT-INSPECTION, or automatically using a forthcoming addition to the MACRO software suite called APT-SCHEDULE.

APT-INSPECTION provided a robust justification for rescheduling the inspection intervals of the dosing analyser and indicated the potential impact of remote condition monitoring. The results differed significantly from the subjective judgements and indicated that substantial cost savings could be made.

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 part of 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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