Optimizing Valve Maintenance Using Condition Analysis

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ABSTRACT

A challenge in targeting for higher plant availability and performance is to share limited valve maintenance resources between failures already disturbing the process and on preventive work to avoid future failures. In shutdown planning one of the biggest challenges is to determine which devices will be adjusted, repaired or upgraded, and ensure that key devices requiring attention are not ignored. Metso has developed a combination of analysis approaches to cover whole installed valve base, done either remotely by a condition monitoring system or by using portable analysis tools and visual inspection. With an expert analysis of field device condition, recommendations for predictive maintenance significantly improve the cost effectiveness of subsequent service actions.

Introduction

Cost efficiency is a term found on every pulp and paper mill's top priority list with raw material and energy costs rising and environmental legislation tightening. To help pulp and papermakers tackle these challenges, costly preventive or scheduled maintenance actions can be avoided using the latest tools to employ predictive maintenance during major shutdowns. Valve maintenance is optimized by using condition analysis to focus maintenance actions to only devices needing attention. This simplifies maintenance planning and ensures spare part availability based on actual requirements. As the number of maintenance activities is reduced not only does the cost of maintenance and spare parts fall but also costs associated with removal and reinsertion (e.g. scaffolding, transport, etc). Fewer valves being removed means also less potential sources of accidents (less high level working, less lifting, etc.). In addition, by avoiding unnecessary maintenance of devices in good health the risk of accidentally damaging properly working devices in the process is decreased.

Result and Discussion :

At a major pulp and paper mill in South America, the decision was taken in 2012 to step out from spot contracts to conduct the annual downtime period and make a three year Intelligent Shutdown agreement with Metso for the company's annual valves maintenance. Careful analysis of valves in the pulp mill identified those that required service in the actual shutdown situation, and those that those that could be maintained during normal operation (Fig 1).

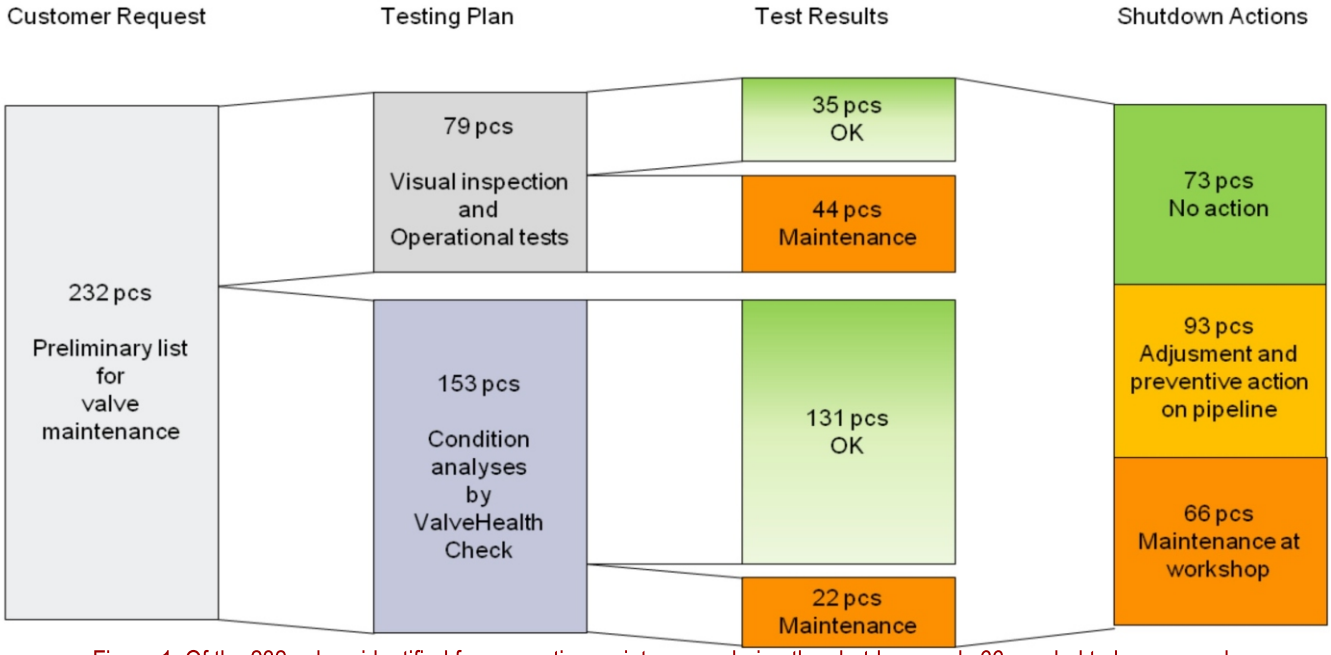

Figure 1. Of the 232 valves identified for preventive maintenance during the shutdown, only 66 needed to be removed for workshop service and 73 required no action at all.

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Maintenance activities carried out independently from the shutdown reduced labor requirements and allowed better management of resources during the shutdown. At the same time the spare parts requirements were determined for a fast, trouble-free shutdown. During the first year, changes carried out in the shutdown processes were responsible for a 44% saving in maintenance costs, where previously about 200 control and on-off valves were overhauled.

As the focus is on maintenance actions to only devices needing attention, costs associated with removal and reinsertion (e.g. scaffolding, transport, etc) are reduced and with fewer valves being removed there was less potential for accidents (less high level working, less lifting, etc.). In all, 33 Metso personnel attended the 11 day shutdown

Digital valve positioners as well as other intelligent field devices provide a lot of diagnostic information. With suitable Device and Asset Management software, “realtime” information offering the current status of the device, e.g. major status and fault bits is used on a day to day basis to give warning of valve malfunction. Additional diagnostic information stored in the device itself can be accessed that includes more detailed data as well as historical information. However, this data is of little value unless it is captured, tabulated and analyzed. In many mills, there isn't anyone available to do this time-consuming work and the advantages of using the information for predictive maintenance are lost. Using a combination of data collection from online diagnostic systems, point-to-point analysis and visual inspection, the maintenance of each valve can be planned well ahead (Figure 2).

When analysis of valve diagnostic values shows a deteriorating condition, service will be recommended even though the valve might still function in an acceptable way. Metso specialists can remotely provide an in-depth analysis using the diagnostic history database to determine the reasons behind the problem and provide expert advice on the corrective actions needed. Tools accessed through the device and asset management software enable device condition and maintenance status to be tracked on a tag by tag basis as well as documenting maintenance and other related actions to the device Fig 3).

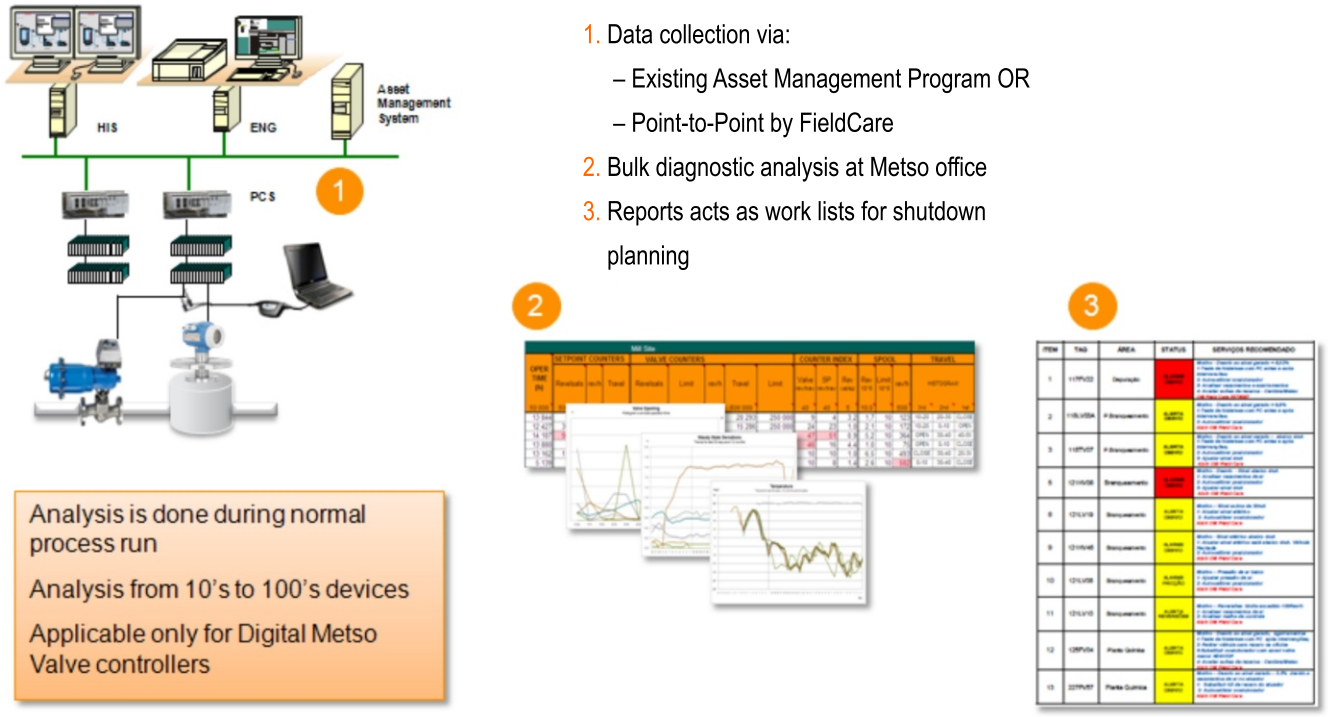

Figure 2. Following data collection, either remotely or point-to-point onsite, an action report is developed for shutdown planning.

Portable testers are important tools for valve analysis both before and during shutdown. In addition to dataloggers for point-to-point downloads of intelligent positioner diagnostic data, portable devices are available for control valve performance tests, leak detection and safety calibration.

Valve Control Performance Testing checks the control valve's capability to follow the control signal using Metso's Nelscope valve testing tool, which can provide an accurate diagnosis of control valve performance while the valve still in the pipeline (Figure 4).

Isolation from the process or a process stop is required to perform the fully automated tests covering step response, dead band and hysteresis. Nelscope can also be used when re-commissioning a repaired valve to ensure that original equipment specifications are met.

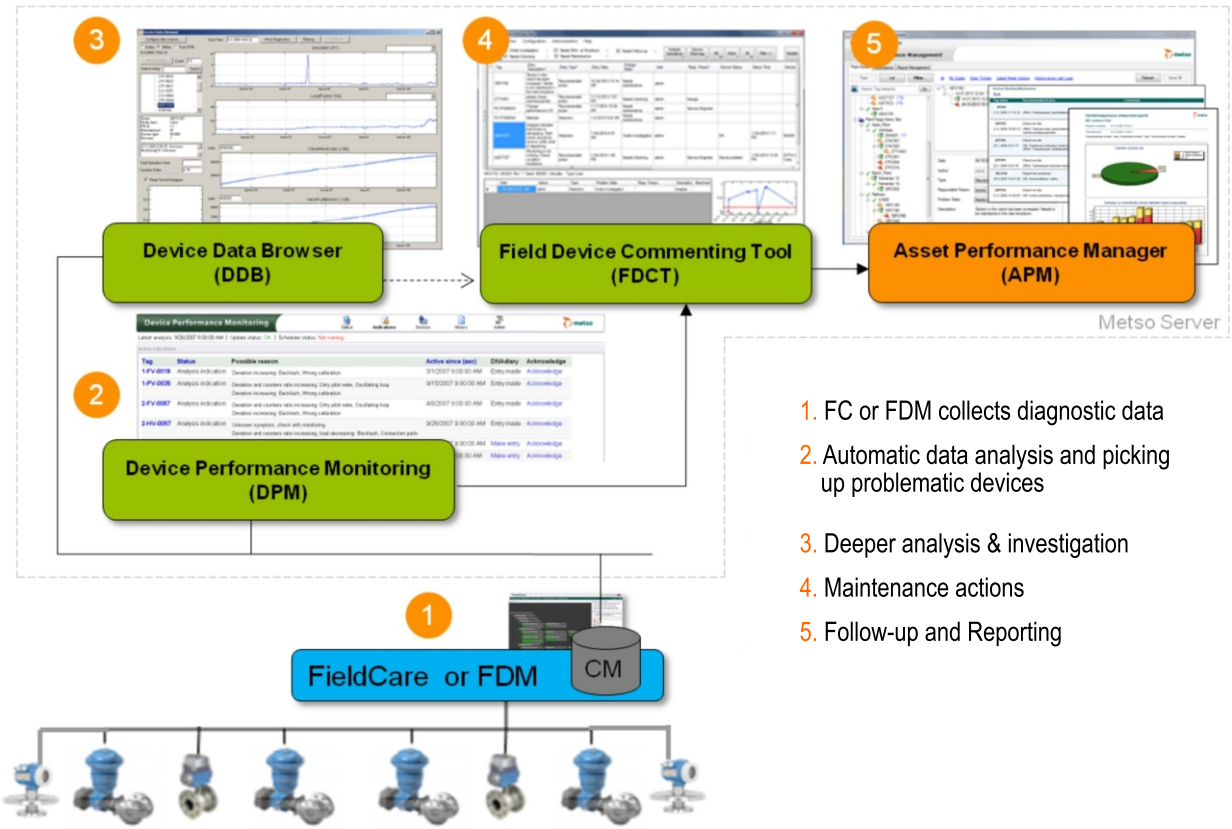

Figure 3. Tools to monitor workflow

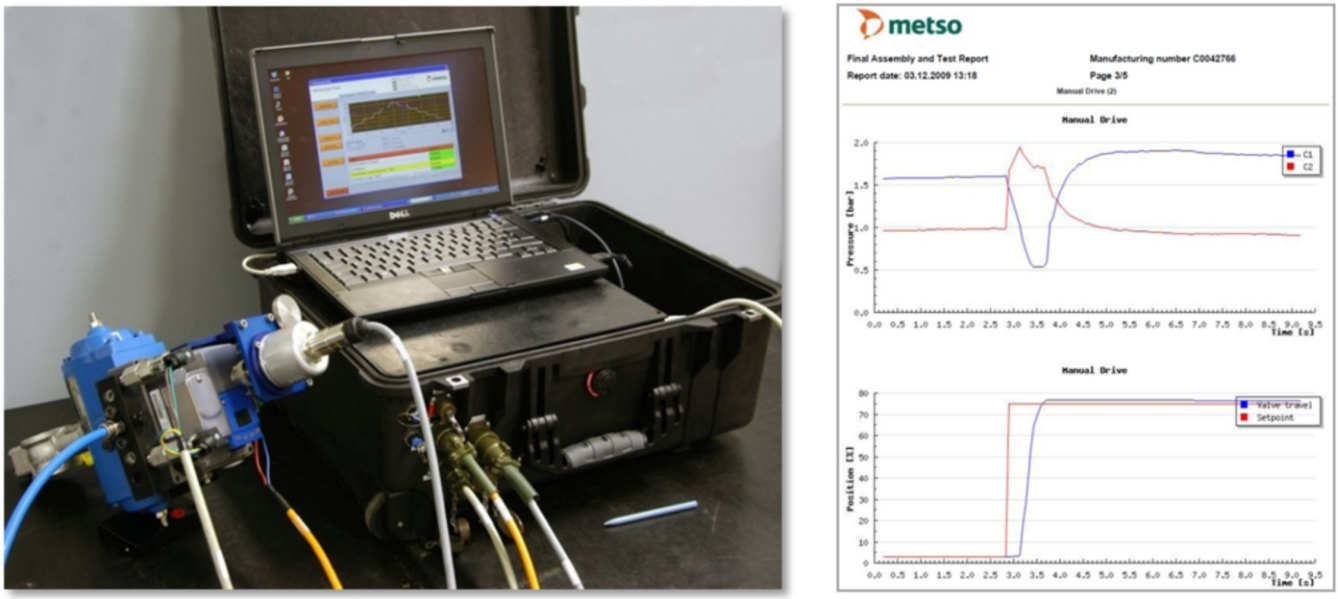

Figure 4. Test reports generated by Nelscope show valve performance.

Conclusion

Using the intelligent shutdown analysis, changes to the shutdown processes were responsible for a 44% saving in maintenance costs. Only 30% of valves needed to be removed from the pipe and 40% valves had minor adjustments without being displaced. With the previous system of spot contracting the shutdown, the budget was always exceeded, but the mill now reports that with the shutdown pre-planning they can share critical decisions and have a closer control of all details involved. With the savings achieved during the contract, the mill expects to fund new planned investments that will significantly improve production in the near future.