



## **Where Did All the People Go? The New Case for Condition Monitoring**

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Not so long ago the main reason companies monitored equipment condition was to reduce direct maintenance expenses. Condition Monitoring (CM) and its logical extension, Condition-Based Maintenance (CBM), served them well by identifying impending failures early enough to avoid costly repairs and reducing downtime by only performing maintenance when required. It may have taken some convincing in the maintenance department, to change from fighting fires to spotting them, but over time the advantage of identifying little problems before they become big ones proved itself financially through lower repair costs and fewer outages.

Today, lost production is the primary reason companies engage in Condition Monitoring and Condition-Based Maintenance. Lost production has become problematic in an economy at full capacity. Its cause is not obvious - one might reasonably think that plants running full out are more prone to failures, and to some extent they are, but the real culprit increasing downtime risk is the diminished human resources available to execute repairs and provide maintenance engineering follow up. Where once interruptions associated with scheduled repairs was merely troubling, now hyper-extended downtime due to lack of maintenance personnel is cause for genuine concern.

CM and CBM have become key management strategies to deal with the severe shortage of technical staff, something much more than the basic engineering tactics they have been in the past. Successful companies gain strategic advantage by leveraging scarce human resources on value adding activities that enhance equipment reliability in order to maximize production. The case for planned, preventative and predictive maintenance has never been stronger than it is today, and Condition Monitoring and Condition-Based Maintenance, mainstays of a proactive asset management strategy, are now common practice in top-quartile companies. As usual, the best are poised to exploit their position as industry faces a serious new challenge - finding people.

## ***The problem***

It is no secret that we are running short of tradesmen and engineers. The combined effect of retiring baby-boomers and a cultural bias against technical education and trades has left industry scrambling to fill vacancies. The short-term impact has been a rapid increase in salaries and wages offered to qualified people, often coupled with significant signing and staying bonuses. Longer term, it is reported that up to 60% of plant engineers will retire by 2010<sup>1</sup>, and there is not an adequate supply of new people to take their places. The problem is made worse by the increased knowledge people need to succeed in a technical environment, for example we now see minimum standards for apprenticeship that are far higher than they were a generation ago. Equipment is getting more complex, the skill needed to understand and maintain it has increased, and the result is a smaller pool of people who have the intellectual horsepower to do the work properly. Young people with the full package – numerate, literate, and with plenty of initiative – traditionally seek high-income careers in management, finance or health care rather than trades or engineering. Whether its status, or income, or just the perception that they will not be able work close to home, not enough people are opting for technical careers.

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<sup>1</sup> Journal of Petroleum Technology

Anecdotes abound, but one example that really brought it home for me was a recent conversation with an executive at an OEM equipment distributor. His company is reeling from a lack of tradesmen – from a base of about 1,000 customer service mechanics they currently have over 400 openings. 400! While it represents a serious lost revenue opportunity for the distributor, imagine what it means for their customers. In the past they could run equipment until it failed, call the dealer, and expect to have it up and running again within a couple of shifts. That might not have been the most cost-effective way to run a business, but at least they could get away with it without suffering serious downtime. Today those customers have to assume they won't be able to get help for several days and, even once it arrives, that it may take longer to complete repairs due to lack of people. This represents a profound change for these businesses, and it ratchets up financial pain from lost production.

It is the same everywhere, whether companies maintain their own assets or outsource maintenance, there is a lack of qualified people to do the work.

### ***Why Condition Monitoring matters***

Something has to change. While it is possible that more people will be attracted to technical careers by improved wages, and there may be a good case for increasing the number of qualified immigrants to fill some skill gaps in our economy, neither of these ideas addresses productivity. In the future fewer skilled people must respond faster, handle more complex processes, and make better decisions with greater consequences – in other words, work more productively. Condition Monitoring and Condition-Based Maintenance are keys to improving productivity because, when successfully executed, they lead to less maintenance per unit of production.

Condition Monitoring frees people's time to do the things that really matter in managing assets. It imposes discipline. CM is at the core of programs designed to identify conditions leading to equipment failure, avoiding those situations in the future, and extending the life of assets that otherwise would be repaired before it was necessary. Tradesmen's time is much better spent engaged in planned, preventative and predictive tasks and in feeding information back to reliability engineers in order to gain continuous improvement. Downtime cannot be eliminated, but it can be minimized, and CM is critical in managing that risk.

Strategic advantage is derived from scarcity and managing risk better than your competitor does. It follows that companies should consider their technical staff as strategic assets. How these resources are utilized can have a significant impact on the success of an enterprise. Why would an organization burden these people with tasks that are avoidable, costly and redundant? Why wouldn't they choose a strategy that minimizes risk? I have seen companies gain advantage over their rivals by employing simple CM programs that reduce operating costs and improve reliability. To be sure, these companies were more successful than their competitors were. They also enjoy better recruitment and retention outcomes because they are seen to be more progressive, further enhancing their strategic advantage.

One of the best CM programs I have encountered was at Syncrude's mining operation with their fleet of large, sophisticated trucks. They mounted a program to increase the average life of major power train components beyond the manufacturer's benchmark. They had a coherent plan; it included a strict lubricant analysis program (experimenting with sampling, filtration and service interval) coupled with physical tear down inspection of every component when it was rebuilt. They increased the time between rebuilds incrementally and closely monitored wear in critical areas of the components. They carefully estimated the risk of premature failure based on condition and noted which type of lubrication program yielded the best outcome. The results were impressive; over the course of three years the average benchmark increased on some components by over 30% and reliability improved. Taken over the entire fleet of trucks this amounted to significant direct annual savings and was instrumental in helping the mine achieve lower unit production costs. As part of its continuous improvement program, this mine is now working with Matrikon technology to further leverage CM by automatically gathering and filtering on-board sensor information from the trucks in order to identify critical events that require maintenance intervention. Along the way this company has minimized its need to expand its technical support labour force.

This example is a template for setting up a Condition Monitoring program. It had a clear purpose (increasing benchmark hours), a logical approach that minimized risk (incremental increase in time between rebuilds coupled with slight changes in lubrication programs), and made valuable use of reliable condition information (fluid samples and visual inspections during overhauls).

## ***Technology's Role***

When I discuss Condition Monitoring I am not necessarily referring to an IT-intensive plan for gathering and assessing information. Even though I work with a software company I always advise clients to invest in technology only once they have a compelling reason to and even then just if technology is the most cost-effective solution for achieving their objectives.

In the words of Li Ka Shing, "information technology...unlocks the value of time". It allows people to do what they are best suited to, to add the most value. In the case of a plant that has a limited number of highly skilled workers; technology should provide those people with reliable information to support decision-making. It should automate tasks that are repetitive and mundane, reduce errors, and perform complex calculations that would otherwise be difficult and time consuming. It should form a part of, rather than drive, a CM program.

The most valuable CM technologies do four things:

1. Gather data automatically from multiple sources
2. Filter that data for errors and relevance
3. Incorporate logic to identify conditions that require maintenance intervention
4. Integrate to other business systems that utilize the same information

These features allow asset managers to select the right inputs. The second item is sometimes the most important – most CM programs suffer from data overload and as a result are rendered ineffective. Building in logic and integrating to other systems serves two purposes; first, it captures

the intelligence necessary to support decisions and, second, it provides a documented (or digitized) legacy to assist technical staff in the future.

Whether it makes sense to invest in technology that provides these features usually depends on scale, location and risk. Where it may not make sense to automate collection and manipulation of a single data point in a local plant, it might make sense to automate it for several hundred, or for a single point located inside the Arctic Circle. The cost and availability of people to manually gather and assess data has to be compared with the cost of automating that process, along with the inherent risk of manual error or omission. For example, a recent disaster at an oil refinery was partly the result of an illegible site gauge on a critical vessel. Had that gauge been automatically monitored, no doubt at a cost that exceeded that of manual inspection, a tragic and expensive failure might have been avoided.

In most settings the risk of failure will not be catastrophic, just expensive. The premise of this article is that costs have increased geometrically because the risk and expense associated with lost production is what really matters now that we live in an environment where technical expertise is in extremely short supply. The business case for investing in technology should therefore be made relative to lost production, not simply to offset direct maintenance costs.

## **Conclusion**

Condition Monitoring and Condition-Based Maintenance have been around long enough to be well understood. From an engineering perspective, progressive organizations adopted these techniques and justified them through savings on direct maintenance costs. Implementing CM was usually straightforward since most plants already collect significant amounts of operating data, requiring only a management plan and a way to aggregate information in a usable form to create the CM program.

Today, critical labour shortages in trades and technical roles have increased downtime risk to such a level that there is a new urgency to leverage CM to increase labour productivity and avoid lost production. Condition Monitoring is no longer considered just an engineering tactic; it is valuable management strategy for coping with changing economic circumstances.

As Condition Monitoring receives greater emphasis in the business planning cycle, so too will technologies that enable it. As with all technology investments, those made with a clear purpose in support of coherent management programs will provide the best results.

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