

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

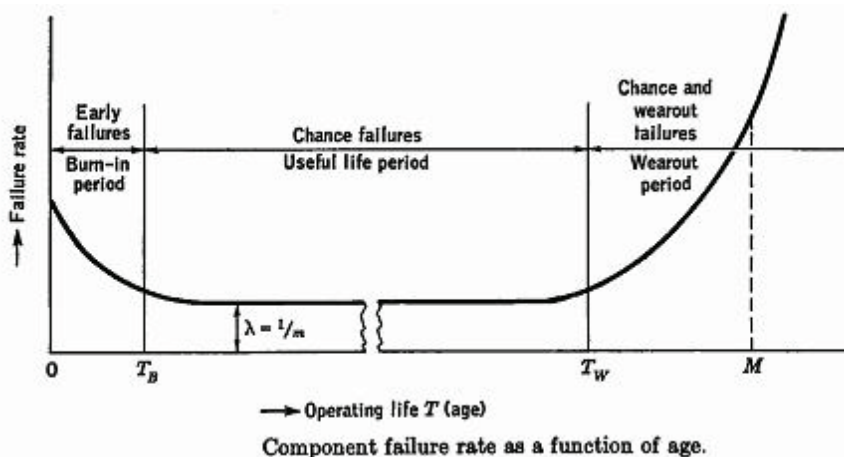
By Michael Currie

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

Avoiding lost production is today's primary driver behind Condition Monitoring and Condition-Based Maintenance programs. Downtime has become problematic in an industry operating at full capacity and one of its causes is insidious; increasingly, downtime is aggravated by the lack of qualified people to execute repairs and provide maintenance engineering follow up. To counter this, CM and CBM have become important management strategies because they deliver:

1. Fewer maintenance "events" because Condition-Based Maintenance is performed on an as-required basis;
2. [Lower Mean Time to Repair \(MTTR\)](#) because Condition Monitoring identifies early stage equipment failures and thus repairs are less severe and time consuming;
3. Less time spent by mechanics on inspections because many Condition Monitoring technologies are automated;
4. Improved component [Mean Time to Failure \(MTTF\)](#) because components are changed less often and, therefore, early hour failures are less frequent (the "bathtub curve" effect).

These results allow firms to concentrate scarce technical resources on activities that enhance equipment reliability and maximize production. The case for planned, preventive and predictive



Reliability Bathtub Curve

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 the industry faces a serious challenge - finding people.

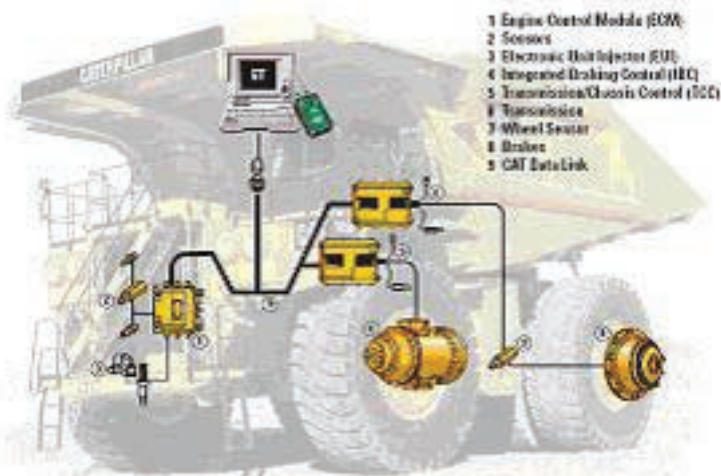
The Problem

It's no great 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 the mining 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. 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.

Anecdotes abound, but one example that confirmed the problem for me was a recent conversation with an executive at a large mining equipment distributor. His company is reeling from a lack of tradesmen. From a base of about 1,000 customer service mechanics, it currently has over 400 openings. While this represents a serious lost revenue opportunity for the distributor, imagine what it means for its customers. In the past it 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 the company could get away with it without suffering serious downtime. Today those customers have to assume that they will not be able to get help for several days and, even once help arrives, it may take longer to complete repairs because the dealer may only be able to spare one or two people rather than an entire crew. This represents a profound change for these businesses as it ratchets up financial pain from lost production.

The situation is the same everywhere, whether companies maintain their



Truck Sensor Graphic

own assets or outsource maintenance; there are not enough qualified people to do the work.

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 is a good case for [increasing the number of qualified immigrants to fill some skill gaps](#) in developed economies, neither of these possible solutions 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, they will need to 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 and save downtime, which, at today's exceptional commodity prices, can literally be worth several hundred thousand dollars a day for a large truck.

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, thus 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, preventive and predictive tasks and in feeding information back to reliability engineers in order to achieve 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 would they not 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. These companies are more successful than their competitors and they also enjoy better recruitment and retention outcomes, because they are seen to be more progressive, which further enhances their strategic advantage.

One of the best CM programs I have encountered was at [Synchrude's](#) mining operation with its fleet of large, sophisticated trucks. Synchrude mounted a program to increase the average life of major power train components beyond the manufacturer's benchmark. It had a coherent plan; it included a strict [fluid analysis](#) program (experimenting with sampling, filtration and service interval) coupled with physical tear down inspection of every component when it was rebuilt. The company increased the time between rebuilds incrementally and closely monitored wear in critical areas of the components. It 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, component benchmarks increased by as much as 30% while improving reliability at the same time. Taken over the entire equipment fleet it generated direct annual savings and lowered unit production costs, reducing the need to expand its skilled 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).

Mines today have a great opportunity to leverage on-board monitoring systems found on most large mining vehicles. Manufacturers such as [Cat](#), [Komatsu](#) and [Hitachi](#) all have sophisticated monitoring systems built into their mining products that track critical component data and operating conditions. Even tire manufacturers such as [Michelin](#) offer devices that are installed right on the tires to report temperature and pressure in real time. This information forms the basis for alarm tracking, trend analysis and Condition-Based Maintenance.

Technology's Role

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 support, rather than drive, a Condition Monitoring program.

The most valuable Condition Monitoring 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 make the right decisions based on the right inputs. The second item is sometimes the most important; many CM programs suffer from data overload and are rendered ineffective as a result. It is very important that information be filtered to the extent that it is relevant. Otherwise it is just "noise." Built-in logic and integration to other systems serves three purposes: first, it saves time; second, it captures the intelligence necessary to support decisions and, third, that intelligence is documented 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, but will be expensive. Costs have increased geometrically because the risk and expense associated with lost production is what really matters now that we live in an environment in which technical expertise is in extremely short supply. The business case for investing in technology should therefore be made relative to lost production.

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

Mines are uniquely positioned to take advantage of Condition Monitoring technology installed on most of their fleet of large production vehicles. Using the resulting information to support a Condition-Based Maintenance program can be justified on the basis of reduced downtime, since CBM reduces the amount of maintenance performed and the cost of downtime is so high.

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. ■

Michael Currie is a director of [iSolutions International](#), developer of AMT life cycle costing software, and has led business units at PricewaterhouseCoopers and Finning. His course, "[Haul Truck Life Cycle Management](#)" is published on EduMine.

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