Protect *and* perfect

Maintenance management might not have top billing on the business agenda, but manufacturers are sheltering their plants from unplanned downtime by combining computerised maintenance management systems, OEE and operational excellence to excellent effect. Brian Tinham reports

There is a popular misconception, among some manufacturing and operations directors, about maintenance management. It goes something like this: how much you spend on maintenance – including your selection of maintenance policy, staff and their supporting management system – depends on the value of that plant. Low value plant means lower cost monitoring; high value plant warrants bigger ticket technology. Right?

Wrong: the word 'value' is key, and, critically, that's not of any single piece of equipment, nor its components. The real deal is risk mitigation – it's actually about protecting your organisations' ability to function reliably and efficiently. So the question any management team needs to ask itself is how critical is any particular plant or equipment in that context – and how much does it make sense to spend on maintenance regimes and computerised maintenance management systems (CMMSs) to prevent reduced capacity or, at worst, shutdown?

At the risk of labouring the point, Kate Hartigan, managing director of condition monitoring equipment manufacturer Schaeffler UK, puts it well: "Although the cost of a machine component, such as a bearing or a motor, is very small compared to the cost of the machine, the cost of downtime and any consequential losses can be significant. What would [you] pay as an insurance premium to protect your plant against those?"

That said, let's review the cost/benefits of the three main maintenance regimes before moving on to manufacturers' experiences. Anthony Mayall, of Siemens Automation and Drives, is best value here. He warns that break/fix – often thought of as the simplest and cheapest, since there's no inspection workload – is ultimately the most expensive. The reason: breakdowns happen when they happen, so your spares stockholding of motors, gearboxes, couplings, shafts, bearings, sensors and the rest, is necessarily high, while the impact on production schedules is unpredictable. "This approach will only suffice as long as [your plant] is relatively cheap and quick to fix or replace, and you can afford unscheduled downtime," he advises.

As for preventive/planned maintenance, where equipment is taken off-line at pre-defined intervals for inspection and overhaul, he cautions: "Although well intentioned, this too can also be very expensive; 60% of the time, equipment is replaced unnecessarily." The approach also risks maintenance-induced failures – the nightmare of engineers inadvertently causing more problems than they solve as a direct result of intervention.

Economical predictions

Finally, for predictive maintenance, in which equipment is monitored, online or periodically, to assess likelihood of failure, Mayall offers: "Many think this is the most expensive, but it can be far more economical – despite the initial outlay." Since unplanned stoppages are less likely, labour, materials and production are used more effectively. Just as important, you can manage problems early, which – when lead times, even on mid-size plant bearings, now stretch to months – can be compelling. It's also worth noting that condition monitoring techniques, such as acoustic emissions (known to more mature engineers as stress wave analysis), are now far cheaper and easier than they once were.

Mayall suggests savings of 50% for preventive maintenance over break/fix, and 90% for predictive. Others suggest more modest gains. The US Federal Energy Management Programme, for example, cites 8-12% by moving from preventive to predictive maintenance. It does, however, indicate that switching from reactive to predictive could result in 40% savings, due to reduced downtime (45%), increased production (25%) and cuts in maintenance costs (25-30%). Add the impact on goodwill, customer service and product quality, and you can do the sums.

But whether you go for planned or predictive, getting the maintenance regime under computer control always brings its own rewards – not just in terms of automating work schedules, with reports and audit trails, but also improving the management of your engineering department. What's more, some manufacturers cite optimisation of spares holdings and stock locations as additional benefits, while others claim cost reductions from tighter procurement and supplier management processes.

Others again point to slightly sideways developments of CMMSs that add three key elements. First is a prescriptive but flexible user interface that forces operators to account accurately for problems, while also following standard operating procedures. Second is so-called business intelligence software, which analyses production issues and points to likely causes, or at least suggests priorities for investigation. And third are the OEE (overall equipment effectiveness) add-ons, which do much the same, but focused on that metric. More on these later.

There is also talk of online services, such as system builder Deritend's Portal and Asset database, aimed at customers using large

numbers of rotating machines. The system is said to run with most CMMSs and interfaces to SAP ERP systems.

So what do manufacturers say? Greencore Malt in Bury St Edmunds, which runs the largest malting plant in the UK (and one of the biggest in Europe), has been running planned maintenance for years, but using a paper-based system. The site is about to go live with a Mainsaver CMMS from Spidex Software, keeping tabs on everything from its screw conveyors to elevators, grain dressing plant, steep tank plant, huge rotating germination vessels, and 3.2 and 5.5MW kiln plant. Maintenance manager Andy Rush expects the implementation to transform his site, both in terms of engineering operations and reports for customers and auditors.

"I've spent the last few weeks putting our asset register together and getting all the PMs [planned maintenance sheets] in place and, once this system is live, I can see engineering working much better as a team. We'll also be getting the right work done at the right time, and with good management feedback to prove it. Engineers will automatically be issued the routes they need, details of the machinery they need to inspect, any risk assessments they need... It's very professional and I believe it will help us to keep the plant up and running better."

Rush says that for CMMSs to work, you need both simplicity and sophistication. "For example, Mainsaver has a simple operator interface, with large buttons on the screen and a menu for what's gone wrong. At the other extreme, it will give us visibility of what the engineering team is doing, when, who and the reasons for problems or delays. It will also manage our spares, so we're sure we have what we need, and I'm expecting it to help us with substitutions – for example on motors and proximity switches for our conveyors and elevators."

Time equals money

He can't estimate the likely value of these improvements, but Greencore's operations director George Irving puts it thus: "Within continuous manufacturing operations like ours, you can't create time, you can only lose it. Production hours lost to machine failure can equate to significant sums of money – that's just too important to try and rectify based on anecdotal evidence... If certain equipment suffers repetitive faults, I need to have a discussion with that supplier, armed with the facts, not hearsay. Mainsaver will provide me with the fault/cause data I need."

Their optimism appears well founded. Another malt production facility, Simpson's in Berwick-upon-Tweed, went live with Mainsaver in June 2007, and chief engineer Pat Richards says: "Once we started to get daily intelligence, we could see very clearly where we were spending [maintenance] time. One small production area where we knew we had problems turned out to be responsible for 30% of our work. The difference now is that we know the extent of the problem and can address it in an informed way."

And he adds: "Similarly, we gained a wealth of new detail on the small tasks that every maintenance department has to do. I can tell you accurately how long it will take three of my engineers to build a conveyor and how much it will cost. What I couldn't do previously was tell you how much time and expense was going on 10-minute jobs. Now, I have that information and we can target preventive maintenance to reduce them."

Richards also refers to savings as a result of optimising spares stores, as well as improvements in efficiency of the engineering team. Tellingly, he adds that, for him, Mainsaver is anything but a tool for engineering redundancies. "Mainsaver shows me how many jobs are still outstanding on the work queue, the number of engineer-hours available to do them and the percentage job completion rate. Using this information, I have been able to put together a strong justification for recruiting two additional engineers. That's just another example of the priceless information now available to me."

But doing this really well is rarely just about IT. Yes, it can help drive useful behaviour and process changes, but blockbuster gains come when a serious operational excellence programme works hand-in-glove with CMMS – and even more so when an OEE system is also involved. Few organisations demonstrate that better than food manufacturer Aunt Bessie's, which implemented Idhammar's CMMS and OEE systems as integral parts of its company-wide lean and total productive maintenance (TPM) improvement project.

Stuart Drysdale, general manager operations at Aunt Bessie's, explains that, back in 2005, the company was looking for an OEE system for the programme, but came across Idhammar's complementary CMMS and decided "to kill two birds with one stone". Up to that point, Aunt Bessie's had been running maintenance using spreadsheets, and Drysdale makes two important points: first, they aren't good enough, and second,

maintenance has to be part of any production improvement.

"With spreadsheets, you struggle to get PM schedules based on time-running, or work activity and you can't get them co-ordinated. Also, there's no way of controlling spares and keeping critical parts available; you can't record the details of critical jobs or materials requirements and changes; and you can't automate spares ordering or invoicing." As for the role of maintenance: "It's no good just concentrating on production. Availability is the first metric for OEE and nine times out of 10 that's about efficient and effective maintenance management. So, in my book, the two absolutely go together," he insists.

In fact, Aunt Bessie's didn't initially use its systems' OEE output, but revisited the maintenance basics, using the all-important database – recording availability, running speeds, downtime and the detail of causes, as well as links into waste and quality issues. "We started by working to standard performance and using the database to drill down into the bigger issues. You've got to reduce or eliminate these before you move on to lean, TPM and introduce OEE," explains Drysdale.

At the end of each shift, the line manager enters data ranging from shift pattern to production numbers and problems experienced, using the system to pick assets and log downtime against each. "Then we can display graphs showing performance for the last 24 hours, 24 days or 24 months by line, product or asset, as well as MTTF [mean time to failure], time spent by engineers on the line or top events – and drill down into quality, availability and so on," he says.

Drysdale accepts that it's not watertight, because it isn't in real time: data logging is always eight hours behind. However, for now, the combination of lean, TPM and OEE – with improvement teams on the lines, focusing on the top three issues revealed by Idhammar – has already achieved results that are nothing short of outstanding.

"We calculated that 1% of OEE improvement across every line is worth around £150,000 of savings per year. Our minimum improvement last year was 14% and our best was 47%, so the system paid for itself in a couple of months – because it was part of the whole project. Using OEE... highlights losses, drives our improvement agenda and, in the end, leads to improved effectiveness, a better working environment and big bottom line improvements."

That's the way to do it. ■

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