Mending

Right tools, right parts and engineering team competence are all keys to getting maintenance slick and effective. But alone, they're not enough, as Brian Tinham discovers

Pointers

- Maintenance engineering competence needs to be the minimum requirement
- Right tools, right parts, right plant, slick organisation are also key
- Maintenance engineers need to help managers understand how they can change operations and improve profitability
- They also need to point out the health and safety implications of failure
- Condition monitoring provides for evidence-based maintenance decisions
- Remember that many MRO vendors offer excellent training facilities
- Making maintenance visible kills finger-pointing

Stripping down, rebuilding, fitting, aligning, testing, calibrating and lubricating: they may not be sexy, but they're all essential elements of plant engineering and maintenance. Always have been, always will be – whether you're dealing with bearing assemblies, gearboxes, motors, pumps, conveyors, pneumatics, hydraulics, engines, drives, machines, controllers … whatever.

So getting all this right – which is primarily about engineering competence – is a minimum requirement. But the word 'minimum' is key. Just as important as properly trained, proactive technicians, are staying within budget and completing jobs in well-defined time constraints.

There's the rub. We all know that dreams of efficiency, right tools, right parts, even team competence are, for far too many, just that – they're dreams. Because the fact is that many plant engineers' days are still about fire-fighting: repairing what operations has broken; holding operators hands because they're not adequately trained; looking out for contract technicians who tick all the boxes, but don't have plant knowledge; and so on.

Clearly, better professional development is part of the answer, but it's only part. It's also about setting up SOPs (standard operating procedures) and ensuring that documentation (from work instructions to spares bookings) is up-to-date, correct and clear. Most of all, though, it's about management taking maintenance seriously. Richard Jones, managing director of MCP Consulting, says it all when he suggests that 70% of CMMSs (computerised maintenance management systems) are "rubbish". That's not because they don't work, he says, but the result of people failing to input data accurately or when they should – because management is only interested in satisfying demand and making money. And, to the unenlightened, what matters then is production, not maintenance.

Jones should know: his company has performed around 4,000 benchmarks on a range of sites, and helped maintenance departments at some of the biggest names in the world. "We see so many sites where a huge amount of work falls on the shoulders of highly skilled technicians. They can't possibly be efficient, because when they're not looking after agency workers, the CMMS is telling them to check the wrong [non priority] plant – and spares are running out because they aren't properly managed."

It's much the same with stores. Management that wants to cut the value of spares often issues edicts, such as 'discard anything that hasn't been used in the last five years'. It's understandable: with CMMS documentation unreliable, engineers up and down

the land build expensive personal inventories, which sadly, over time, get damaged due to corrosion, dirt, vibration etc. However, the problem with a wholesale removal programme only becomes apparent when critical plant that rarely requires serious attention finally needs repair or refurbishing.

How do we break these vicious circles? To an extent, the HSE's Shattered Lives campaign, coming shortly after last year's introduction of the Corporate Manslaughter Act, is beginning to do it for us, as plant managers reconsider their risks and responsibilities. Clearly, it's no longer acceptable for management only to demand good output and PPM defect figures – if only because failure to complete realistic maintenance schedules could be deemed to be introducing hazards, and hence the potential for accidents and consequential claims. Turning concerns into reality, however, requires

maintenance

management metrics and record-keeping.

But those are just the starting point. As Jones says, planning maintenance is then the first priority, closely followed by making sure the systems drive work to the right jobs. To get there, he suggests using a REM (reviewing existing maintenance) tool, if you have enough plant history, because it focuses attention on the main equipment failures. "If you don't have plant history, then you need to adopt an RCM [reliability centred maintenance] programme, and do the criticality, FMEA [failure mode and effects analysis] and MTTF [mean time to failure] work to establish the most important equipment and best frequency of intervention," he suggests.

Maintenance best practice

Beyond that, you also need to make sure that plant numbering is understandable and consistent, to eliminate errors and stock duplication. Then third, you need to keep accurate information on key plant – drawings, work instruction sheets etc – to simplify and streamline maintenance procedures themselves. "Then you also need to set up an operator asset care programme and put in some condition monitoring," advises Jones.

Can you see those happening? If not, you might want to challenge management to take MCP's top 10 test, which asks everything from 'Is your level of engineering downtime less than 2%', to 'Is the total cost of maintenance less than 5% of your operating costs?' and 'Is that cost decreasing year-on-year?'. If the answer to two or more of its questions is 'no', MCP reckons there are big savings to be achieved, which usually excites interest in high places.

By way of example, look at what the Environment Agency achieved when it installed a FAG online vibration monitoring system on a pumping station at Winstead, near Hull. Simon Thompson, MEICA operations engineer, explains that the station houses two 240kW vertical spindle, axial flow pumps, each designed to transfer 3,700 litres per second of floodwater back into the river. "Unfortunately, if weather conditions are such that these pumps have stood idle for some time, our engineers have no way of knowing if they are in good working order. So one of the major challenges for me was how to decide which pumps should be refurbished," he says.

Thompson was familiar with vibration tools from his time at British Sugar, where patrol monitoring was used. However, due to Winestead's remote location, he went for online kit. "The system has given me the confidence that the two pumps are doing what they should," he says. "People ask me what is the point of condition monitoring when all you get are readings that say everything is OK? For me, they're missing the point. We could be making refurbishment decisions on equipment that is either in good working order [at £20,000—25,000 to refurbish a large pump] or is about to fail, but we have no way of knowing… With a condition monitoring system, I have the peace of mind that the decisions I make are based on hard evidence."

And, if you need further convincing, Schaeffler tells of a tanker stuck in port for 14 days while technicians from its German shipping company searched in vain for the cause of problems on two big power supply exhaust fans. FAG Industrial Services (F'IS) sent one technician to the site, armed with a handheld vibration monitoring and balancing system, and immediately solved the problem.

So far, so good. But what about engineering practice – ensuring that repairs work and don't introduce problems of their own – for instance, by failing to ensure proper alignment. The skills shortage is now such that almost all organisations can no longer assume competence at every level, so training is essential to avoid problems and fire-fighting. See Plant Engineer, January/February 2009, page 12, for ideas, and remember that many of the MRO (maintenance, repair and operations)

Left top: An F'IS handheld vibration and balancing tool solved a tanker fan problem fast
Left below: SKF's dry lube for food and beverage plant

Below: thermal imaging products soon reveal problems

component vendors offer useful support.

On bearings, for example, Schaeffler offers training on everything from fitting to lubrication, alignment and condition monitoring – geared to apprentices, but also time-served engineers. Service engineer Ian Pledger explains that his courses cover mounting and dismounting for rolling bearings, mounting tools and spindle bearings, right through to taper roller bearings for rail vehicles. They also cover bearing selection and what you need to know about lubrication, alignment and vibration monitoring. "Many inexperienced technicians are unsure how to correctly fit rolling bearings and are equally unaware of how susceptible they can be to damage and wear, if not fitted appropriately. Also, if you use the right tools, the task can be completed in half the time, with half the effort," he says.

However, there's another point: best practice is a moving target, driven by changing technologies and products that get jobs done faster, better, slicker. Useful developments range from more effective lubricating systems to belts, chains, couplings, laser alignment tools and better gearbox designs.

Better equipment

Did you know, for example, that by incorporating lubricant metering discs on its range of linear recirculating roller bearings and guideways, Schaeffler reckons it has reduced lubricant usage by more than 25% and improved reliability? Then again, had you heard of SKF's Vogel dry lubrication, which, the company says, safely boosts line efficiencies, particularly on food and beverage plant?

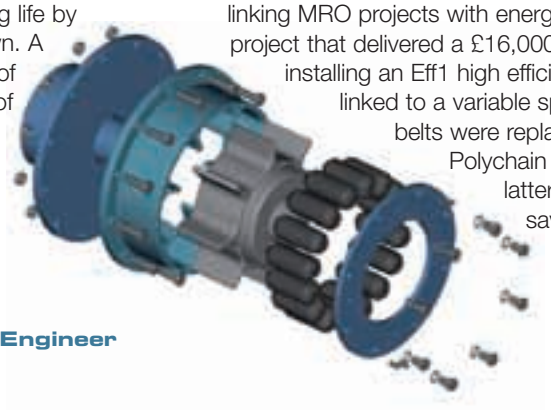
What about couplings? It's basic stuff, but there's some mythology here – in particular that rubber-in-shear units protect diesel-driven generator sets by failing (acting like a fuse) when there is a short circuit. As Paul Shuffleton, managing director of Renold Hi-Tec Couplings, says, most of these couplings fail through fatigue. The solution is rubber-in-compression couplings that protect systems from shock and vibration, but operate for up to 10 years without maintenance. He cites Renold's UJ range, which can be used for torques to 18,000Nm, and has universal joints for diesel engines and the driven interface where the two cannot be aligned accurately, or where there is a distance between them, or one can move radially and axially.

While we're on the subject of transmissions, what about gearboxes? Bain Nicholson, operations manager at Deritend RMB, makes the point that you can improve reliability and operating life by keeping running temperatures down. A 14°C reduction can double the life of a nitrile seal, whereas an increase of 14°C halves it. He also points to other problems, such as burnt lubricant, scoring on bearing raceways and damaged gears, all of which lead to premature gearbox failure.

Nicholson reminds us that heat is the result of friction – due to the load, but also faulty bearings, misalignment, imbalance, misuse, wear or, more likely, lubrication problems. "Lubricant performs a dual function: it reduces friction by separating the moving components, and transports and distributes heat from the gears, bearings and seals, to the gearbox housing," he explains. "But the viscosity of the lubricant decreases drastically with increasing temperature, so choice is critical."

That said, thermal imaging products and services are now widely available to check temperatures – although, for Nicholson, getting this right is first and foremost about selecting the right gearbox for the job – ideally helical, bevel helical or planetary units, which are more than 90% efficient, compared with worm boxes, which struggle around the 50% mark.

One final thought: Cadbury's engineering and facilities manager Tim Jeffries, who looks after its Sheffield plant, believes there's a lot to be said for linking MRO projects with energy saving. A recent project that delivered a £16,000 saving involved installing an Eff1 high efficiency electric motor, linked to a variable speed drive, while V belts were replaced with Gates Polychain drive belts. The latter alone meant savings of 5–6%. PE



Left: exploded view of Renold Hi-Tec low maintenance rubber-in-compression couplings for diesel engines

Getting it out in the open

Paul Rumsey, managing director of bizarrely named Logical Fish, has an interesting approach to solving the finger-pointing that so often dogs plant maintenance and operations. "I was tired of coming across CMMSs [computerised maintenance management systems] that collected useless information that was never acted on. Our approach is different: you display information right across your factory. This way, your entire organisation can be aware of your service and asset status – resulting in unambiguous priorities, a healthy appetite to improve response times and ongoing data analysis that will eliminate the root causes of any problems," he says.

It's a helluva claim, but Rumsey was formerly production engineering manager at a large automotive supplier, so he comes from a position of wanting to knock heads together. That's why the company's so-called Effishon CMMS has been designed primarily as a visual management and communications tool, not just a TPM (total productive maintenance) support or maintenance scheduling system.

And it works: gas detectors manufacturer City Technology installed Effishon just over a year ago and lead technician Barry Martin can't speak highly enough of it.

"I reckon we've reduced downtime by about 50%," he claims. "And it's not just downtime: it's call waiting time as well. No one has to chase technicians around any more. Everyone knows they'll be wherever they're needed as fast as they can, because they can all see what's happening on screens all over the factory."

That's the key. "There's no more phoning, no more forgotten call logs: if something goes down or an operator has a question, he or she just swipes their barcode card on the nearest shopfloor PC and logs the fault – which then appears on all the screens. Our technicians then go to the line, fix the problem, log onto any PC, mark the job as done and complete the engineering log."

What's more, he says, those same screens also show planned TPM activity, with the detail of which machine, next job and, behind that, facilities for data entry, setting up follow-on tasks etc. "Because everyone can see where we are and what we're doing, the system improves team working," observes Martin. He also says it improves decision making, because its analysis functions make finding the biggest causes of downtime etc, so easy. Food for thought?