



*If your energy-saving campaign is a sign asking employees to turn off lights and computer screens as they leave you're missing a much, much bigger picture, says **John Dwyer***

**R**ead this and make money. No-one now needs telling, as oil finally breaches the \$100 a barrel misery-mark and power prices climb skyward, that saving energy is important. So far, however, with honourable exceptions, industry has been playing at energy saving, overlooking really easy opportunities to cut bills by many thousands a year.

The usual targets are smart purchasing; restricting plant activity to periods when energy charges are at their lowest; replacing old motors and other equipment with more efficient units; using computer-based load-shedding systems to turn equipment off automatically; running switch-off campaigns; and stopping compressed-air, steam and water leaks.

But the star turn on the list is good maintenance – making sure equipment is maintained and operated at peak condition.

At one level it seems obvious that poorly-maintained assets will waste energy. When a dry bearing heats up, that means some power to the machine is being wasted as heat instead of used in the process.

“If plant is properly maintained and kept in good working order,” says Mark Rawlings, deputy chairman of the Chartered Institute of Purchasing and Supply (CIPS) energy committee and managing director of Energytrak, “then it will run efficiently and therefore use less power.”

But the machine is probably running slow, and will eventually break down. If you really want to cut the power bill, you should take out a shift or stop working at weekends. And you can do that without losing a single unit of output by cutting out slow running and unplanned production stoppages.

Peter Gagg of consultancy MCP, much of

**Above**  
A two per cent annual improvement in OEE reduced energy costs by seven per cent at British Bakeries

whose work has been done under the DTI-sponsored Asset Management Information Service (AMIS), says most companies allow equipment to run to failure because they don't know the true cost of down time. It's usually at least £1,000 an hour, he says, and in some manytimes more. And how many companies, he asks, know the value of a one per cent change, either way, in overall equipment efficiency (OEE)?

OEE isn't the most obvious energy-saving starting point. Most manufacturers will save energy by going through the items in the list already mentioned. But while these are all necessary to improve energy consumption, says asset-care consultancy Idhammar's operations director and OEE specialist Alan France, they are not enough on their own. The real prize, he argues, is gained from operating the factory as effectively as possible to maximise energy efficiency.

The way to do it, he says, is to measure and improve OEE. An OEE improvement from 43 to 44 per cent in a business making 76,000 units a week will cut the production run from 118 to 115 hours, an energy saving of £1,200 a week. Idhammar's customers regularly achieve not one per cent but a 15 to 25 per cent improvement in their OEE score within three months. And there are wage and raw materials savings on top.

"Energy reductions," says France, "generally lead to some of the greatest manufacturing cost savings." If that 43 to 44 per cent OEE score were improved to 60 or 70 per cent the producer could fill the orders in 74 hours – five two-shift days.

Too difficult? Not if you start with a bottleneck. Just as a bottleneck is often the best asset to schedule, it's often the best place to measure OEE. A bottleneck breaking down, running slowly or making frequent short stops is pouring money down the drain.

Why? Not just because of the energy the bottleneck asset itself consumes but because the assets that feed the bottleneck aren't turned off when your bottleneck is stopped. They might be idling or on half power. The compressors are running too, and think of all the heating and lighting you're buying for a factory that isn't making anything.

If the bottleneck is running but at half speed – would you notice? – its production run takes twice as long, so the heating and lighting, not to mention the wages for the people on that line, are wasted for half that period.

Before Premier Foods bought the RHM group, says France, the RHM energy bill was £60 million a year. He quotes Bob King, at Premier offshoot British Bakeries whose brands include Hovis, Mothers Pride, who calculated that a two per cent annual improvement in OEE reduced energy costs by seven per cent.

Mark Rogers, site maintenance manager at Smith & Nephew (S&N) Wound Management, Hull, says S&N began its efficiency drive early in 2004: "We have seen real sustainable improvements in our assets through reducing the six losses of OEE.

"One particular asset was running seven days a week and still struggling to meet customer demands. Now it typically does the same volume in four-and-a-half days." This avoided capital expenditure to increase capacity through another asset, he added.

*An OEE improvement from 43 to 44 per cent can make an energy saving of £1,200 a week*

Another of France's examples is a paint manufacturer with three lines. "The OEE of each of these lines was about 30 per cent," he says, "and they wanted a substantial amount to install a fourth line." At a guess, he says, the fourth line would be even less efficient than the other three. By ramping up the OEE on the three lines, they could scrap the requirement for extra capacity.

You don't get anything for nothing, and OEE is no different. To get the real savings takes commitment and a certain amount of investment in OEE measurement tools and infrastructure. S&N equipped 30 of its machines on one production line with Idhammar touch screens to monitor how often they stopped and why. The screens replaced paper and spreadsheets. But S&N now plans to install screens on up to 10 more production lines.

Short stops and minor interruptions show up immediately in a data collection system. Fieldbus is another key technology, says Anthony Mayall of Siemens Automation and Drives. It can gather not only the information about a valve or other plant item but about its work cycle and the ambient conditions to make an intelligent guess about its condition and its remaining life. "You can monitor the state of motors and tell you may have a problem if the current in a motor goes up over time or the

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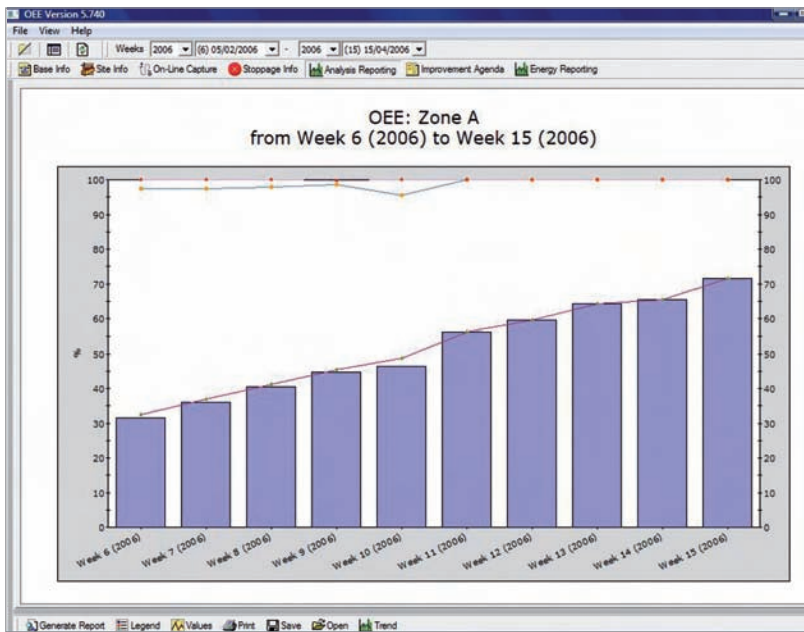
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temperature goes up, and that's all presented over the network."

Condition-monitoring tools which rely on current measurement to detect faulty equipment are obvious energy-monitoring candidates both in their own right and as a means of ramping up OEE. But every manufacturing site has its own peculiarities, and sometimes the best course is the opposite of what you'd expect.

Injection moulder Kayserberg of Gloucester, for example, used condition monitoring to save money – not by cutting a shift but by adding one. Kayserberg is a high energy user which makes twin-wall polypropylene sheets of the kind estate agents use for temporary signs. It assumed its three injection moulding machines were pretty similar. Then it put data loggers from Parasense on its power-distribution board to analyse plant-item power-consumption and watch for drift. That way, says Parasense business development manager Dave Archer, "it's easy to spot things like bearing failures or motor windings starting to overheat."

Guess what? The oldest of Kayserberg's machines was consuming so much power that its unit costs were three times those of the other machines. It was cheaper to stop the machine, move its work to the others and run them round the clock, seven days a week. Even with overtime, says Archer, the change paid for itself and Kayserberg was still using less energy.

The other part of the investment is in people and training to run carefully-considered

asset-management processes. Gagg says that, in rough terms, most companies will find that a 10 per cent improvement in OEE is enough to pay for the whole maintenance budget.

One of the best things about OEE, says France, is that it's consultant-proof. If OEE is measured as it should be – worst case, measured against elapsed time – it will always show true results, unlike the other KPIs consultants design to show themselves in a good light.

Worst-case OEE measurement is also immune to internal manipulation – it allows easy site by site comparison, doing away with confusion about which site-specific spreadsheet presents the truer picture.

Too often, says France, if two facilities are producing the same product, "they'll allow a bright young operator in one of them to create a spreadsheet, and another bright young operator in the other plant will create another spreadsheet, and they're not really comparing like for like. They find themselves asking: 'Why is our data different to the ones they are collecting?'"

OEE cheating comes in lots of flavours, most of them aimed at reducing the denominator in the percentage calculations. So tea breaks and all kinds of other hold-ups will be excluded as 'planned' stoppages.

Don't be tempted. What matters with OEE, says France, is to use the figure to improve, not to fret about the actual figure. Then just watch the savings mount. And the higher energy prices go, the greater the saving. ■

**Above**  
Measuring overall equipment efficiency can help save energy