



**Above and far right: Ecolite Technology and Dialight Europe both recommend replacing 'high efficiency' lighting with LED technology**  
**Below and top right: Jenbacher's latest monster gas engine gen set (and the management team): designed for maintenance**

**Renovating or refurbishing major plant can be more complicated than some realise. Dr Tom Shelley walks us through some of the key processes and issues**

**A**s a general rule, if a unit of plant is to be refurbished, there is little point in simply reassembling it with new filters, bearings and seals, if it can, and should, be upgraded. For a start, the Machinery Directive will almost certainly require that any rebuild includes new safety interlocks and systems to bring it up to current standards. But, additionally, there are likely to be opportunities to make the plant more efficient and hence also to save energy.

Jenbacher, an Austrian company that makes gas engine generator sets, is one plant manufacturer that takes this approach to renovation very seriously. The firm has a policy of offering to refurbish all its major plant products, but will also replace engines with refurbished units on a swap basis, with a view not only to restoring performance

# Making it

and efficiency, but also improving it.

According to product manager Karl Wetzlmayer, the company prefers to transport engines back to its factory, or another centre of excellence, for refurbishment after 60,000 hours of running. They are mostly designed to travel as standard loads on a flatbed truck, but its latest unit, the J920, is too large and travels as a wide load – not much of a problem, given that it only requires maintenance at 40,000 hours and refurbishment at 80,000 hours, meaning more than nine years of continuous service.

Wetzlmayer also explains that refurbishment here means a virtually new engine that will be more efficient. "In many cases, we install new electronics, change the pistons and Miller timing, and increase the turbocharger boost pressure, if the engine components will take it." The end result is an increase in efficiency of between 0.5% and 2%.

To make this approach work, Jenbacher engines are designed to be relatively easily to maintain, with the J920 constructed as three inline modules: the generator set, the engine and the turbocharger, which is manufactured as a separate module at one end, not mounted on top. In addition, this generator set has a segmented camshaft, allowing easy exchange through a maintenance window at the top of the crankcase.

While this is the ideal approach, if charges from your supplier are deemed excessive, or plant has

been assembled from a number of sources, there are still many opportunities to enhance plant through proper refurbishment – and there is the important matter of legislative compliance. Looking at health and safety, for example, it will almost certainly be necessary to upgrade relays, control systems and stop buttons, in light of the Machinery Directive and BS EN 60204 'Safety of machinery. Electrical equipment of machines: general requirements'.

Lew Harton, product support manager with Idec Electronics, says that, in a previous life, he was engaged in refurbishing injection moulding machines. In most cases, he says, it was necessary to fit new emergency stops, ensure that full resets would be required before restarting and engineer dual redundancy into the safety systems. To do this, Harton says he usually had to devise new systems –

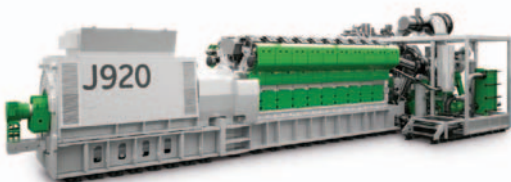
although these are mostly now available off the shelf. Pilz, he says, was the first company to offer dedicated safety stop switches, relays and controllers, for example, but Idec and others all now offer similar products.

So such work is easier. Indeed Idec's latest stop switch, the X6, offers significant further advantages. First, it is mushroom shaped to prevent dirt build-up beneath the button, making it particularly suitable for food and semiconductor industry machines. And secondly, its normally closed contacts are set up to disengage, if the switch is damaged through shock. X6 also conforms to EN 60947-5-1 and 5, and is designed to withstand a 2.5kV impulse voltage and 1,000A short circuit.

## Better interfaces

Meanwhile, if the machine or plant to be refurbished has a CRT based HMI (human machine interface), this is likely to have become difficult to read and replace, so it should be replaced using modern technology. Idec's HG3G interface, for example, has an 8.4in or 10.4in colour, daylight readable TFT touch screen, designed to work with the company's proprietary I/O system, Ethernet or RS232C/485. However, if your plant system does not use a nine-pin D connector, there is also a terminal block to allow individual wired connection.

Idec managing director Stephen Schiller also says that his company's LED lighting modules are aimed at retrofits, as well as OEMs. The firm sells these to





# better



supermarkets for lighting freezer showcases, for example, because they use 58% less power than fluorescent tubes, while dissipating less heat. They also produce no ultraviolet light that might discolour food. Additionally, its dual lens type plastic lenses direct the light sideways, so there is no glare from the front – a useful feature way beyond freezer cabinets.

And Idec is not alone on LEDs: Ecolite Technology, based in Chipping Campden, Collingwood Lighting in Sywell and Dialight Europe in Newmarket all say that, for plants that are running lights 24/7, payback times from replacing existing 'high efficiency' lighting systems are in the range of 18 months to two years. If energy prices rise, as seems likely, and prices of LED units continue to fall, these times can be expected to shorten.

Moving on, electric motors continue to gain in performance, too. At the Energy Solutions show, Ebm-Papst demonstrated one of its new permanent magnet iQ motors attached to a fan and drawing 7A, while an identically performing fan, using one of its earlier shade pole motors, was drawing 32A. Special projects manager Robert Harness says that the iQ motor was named 'Refrigeration product of the year' at the RAC Cooling Industry Awards last September. And it's not difficult to see why. Switching from the most common types of induction motors to this kind of high efficiency design during refurbishment can yield returns on investment in months, rather than years.

Also, if the plant uses air or steam, payback times for remedial work can be even shorter, especially if leaks are eliminated on the way. Most plants are not even clear about what their compressed air actually costs, although the British Compressed Air Society believes it is usually in the range £0.01 to £0.03 per cubic metre. The cost of steam, on the other hand, is about £20 per tonne, depending on the price of natural gas – so it is easy to find significant savings.

TLV Euro Engineering, based in Cheltenham, provides an excellent example. The company says it was contracted to provide regular steam trap surveys at all 13 UK based sites belonging to BOCM Pauls, which makes animal feeds.

Using its TrapMan TM5 testing equipment, it found that of 552 traps, 89 were leaking, with an estimated wastage cost of £95,000 annually. It notes that "an efficient condensate return system, with associated pipe modifications, can result in a payback of less than six months".

The firm also suggests that 10m of unlagged pipe containing steam at 10bar can cost as much as £4,500 per year in wasted energy, on a process running 24/7 at an ambient of 20°C. On the other hand, installing 50mm insulation on the same 10m pipe can reduce running costs to £400 per year. A 1mm hole in a steam main, it adds, can cost £500 per year. And a two-inch isolation valve with a leak in the stem could be costing £750 per year. The solutions should be obvious. **PE**

## Pointers

- New filters, bearings and seals are increasingly unlikely to be enough for plant refurbishment
- The Machinery Directive alone is likely to require at least new safety interlocks and associated systems
- Technology improvements mean that many plant types can be made more productive and efficient
- Modern HMIs, too, are much easier to use
- Permanent magnet motors can slash energy consumption and cost
- Energy, steam and air audits on plant can pay massive dividends