Lubricate the parts

Are you well oiled? Brian Tinham examines some of the opportunities for plant engineers arising as a result of developments in lubricant technology

Just a decade ago, outside the automotive industry, synthetic lubricants were in low volume production. PTFE-based lubes, for example, were expensive problem solvers, aimed only at applications where mineral oils just couldn't handle the extremes – primarily of temperature and pressure. Today, it's a very different story.

In April this year, ExxonMobil Chemical completed a major de-bottlenecking project at its Beaumont plant in Texas and increased its capacity to produce SpectraSyn Ultra High VI high viscosity polyalphaolefin (PAO) by a full 40%. Why? "To help meet increasing market demand for the advanced high viscosity PAO, used to create a wide range of high-performance synthetic fluids," says a company spokesperson. And he adds: "Lubricants formulated with SpectraSyn Ultra benefit from increased film thickness at high temperatures, extra energy efficiency and excellent low-temperature fluidity."

That almost says it all. Today, big boys such as Chevron, ExxonMobil, Petro-Canada and Shell, as well as independents like Batoyle, Fuchs Lubricants, Kluber Lubrication and Rocol, are raising their game. They're producing more and wider ranges of synthetic lubricants as plant engineers wake up to their technical advantages over conventional oils.

Prices slipping

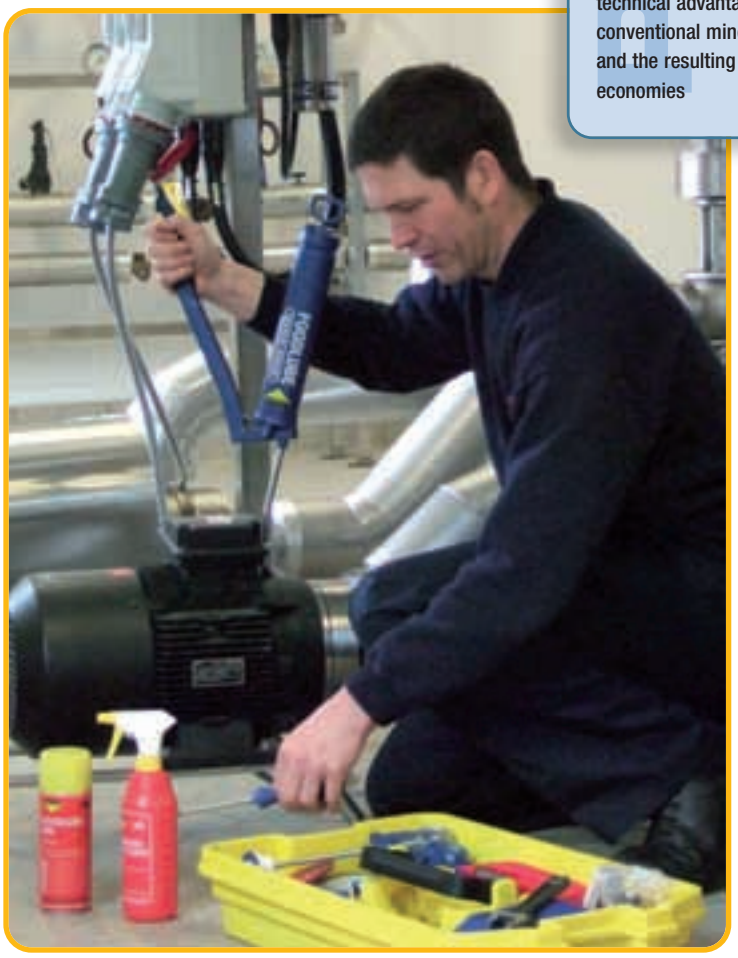
Also, prices are coming down. Keith Glossop, technical director of Huddersfield-based Batoyle, says: "Over the last couple of years, crude oil prices have nearly quadrupled and that has fed through to oil feedstocks. Synthetics have seen price pressures too, but not to that degree. So the gap has been narrowing." He concedes there are still variations in price, depending on the application, but suggests that most sell in the range £3.50 to £5.00 per litre, while others come in at nearer £10.

First, some background. PAOs and polyglycols (PAGs) are the mainstays of modern synthetic lubricants – there being substantial ranges of each, engineered to provide for a spread of viscosity, adhesion, water resistance and temperature, pressure and oxidation resistance characteristics.

PAOs are most widely recommended for applications ranging from car engine oils to truck engines, drive line lubricants and industrial machinery. PAGs, particularly those with EP (extreme pressure) additives, come into their own in higher temperature applications and, for example, with transmissions involving phosphor bronze, such as worm wheel gearboxes – where the motion is predominantly sliding, rather than rolling – providing lubrication and preventing pitting.

Peter Morrey, Shell's technical manager for the UK and Nordics, makes the point: "Transmissions are getting smaller, while power inputs are growing, even for existing machines. Some of that inevitably increases lubricant temperatures and then you're climbing away from a relatively comfortable 60°C up to the more testing area of 90°C. That's when you need to use synthetic products, because they retain a much more robust working viscosity."

The other main area is food grade and medicinal quality lubricants, again mostly versions of PAGs and PAOs. Says Glossop: "There's a push now coming down from the food retailers and the



Pointers

- The golden rule is always to approach the OEM. Plant is built for operation around the globe and the company will recommend different lubricants in the UK, as opposed to, for example, Siberia or the Far East
- Lubricants producers are developing more and wider ranges of synthetic lubricants, as plant engineers wake up to their technical advantages over conventional mineral oils – and the resulting in-service economies

Chevron solves biogas lube problems

Chevron Global Lubricants' Texaco Geotex HD 40 lubricant has solved efficiency problems on a biogas plant in Spain. CLP Envirogas, which produces electricity from solid waste, needed lubricant able to cope with contaminants from landfill biogas, such as sulphuric acid and silica, that would be harmful to its 12 Jenbacher JMS320 GNW power generation engines.

CLP says that engine power had been dropping off during the summer months, reducing energy output. Chevron España proposed Texaco Geotex HD 40 lubricant, which is suitable for the working conditions, as well as Havoline XLi coolant, which has good anti-corrosion performance and heat transfer properties. CLP says service life has now increased from 900 hours to 1,400 and that Havoline XLi has achieved the required drop in operating temperature, enabling the company to achieve optimum engine performance throughout the year.

CLP has now extended use of these Chevron products to other plants, including CLP Organogas in Seville, which is using Geotex HD 40 with a service life of 2,000 hours on an aggressive gas application.

packers, processors – even the secondary suppliers of materials like packaging – towards using food grade lubricants. And synthetics are the route of choice, by far and away, over highly refined conventional white oils, despite the price difference." That's primarily for H1 category product approved for incidental contact with hydraulics, gears, compressor, bearings etc.

Specialist fluids

Beyond these, Morrey draws attention to biodegradables and environmentally considerate lubricants (ECLs), as well as those used in metal cutting, where the emphasis is on fire resistance. And there are the ranges of synthetic greases – which have come a long way since the lithium-based grease of the late 1950s. "There have been significant developments in terms of thickeners and additive packages, but also using synthetic lubricant base oils, which then inherit all their benefits."

Completing the picture, no-one denies the value of engineered mineral oils that, depending on how they're refined, demonstrate some of the synthetics' performance characteristics. "Some of these have a naturally high viscosity index or resistance to oxidation, for example, and we can do a lot with the right combination," agrees Morrey. "They're particularly useful for big volume systems where the higher cost of fully synthetic is prohibitive – for example, circulating oils in the paper and pulp industry, or in hydraulics or big cooling applications, where you're talking about many thousands of litres."

However, outside these systems, he and others advise that the advantages of synthetics are worth serious exploration – even on benign applications. The big message is: don't be put off by the initial price hike. Why? Shell's Morrey explains: "It's all about the extra longevity you get from a synthetic oil, which pays for itself much faster than many realise. Think about the cost savings from cutting out one oil change per year, say on a screw air compressor. If, with a mineral oil, the drain interval is 4,000 hours and that goes out to 8,000, it's not just half the oil cost – which is still more with synthetics. It's also the savings on plant downtime, maintenance and the extended operating life of the machine itself."

And if you're in any doubt about his assertion, just look at what the big compressor OEMs are recommending and what big users – especially those that buy air by the cubic unit, rather than owning plant – are already doing.

Meanwhile, Batoyle's Glossop points to his company's growing operations in industry sectors such as wire and tube drawing, glass and textiles. "In the glass container industry, for example, we've seen a radical switch to synthetic lubricants for glass-forming machines, because of the improvements in machine efficiency and longevity. We're talking about continuous production, and they measure lost hours in thousands of pounds, so machine uptime is crucial. Mineral oils give reasonable performance, but we can do much better with ester-based lubricants, because of their thermal stability and resistance to carbon forming."

The one remaining difficulty: putting a hard value on the savings – until now. A recent study by Fuchs at "a leading food manufacturer" showed that using synthetics meant energy comsumption was reduced by 5% on hydraulic systems and bearings, 5% in spur gears and 30% on worm gears. Indeed, Fuchs cites synthetic lubricants on a single 100hp rotary compressor, operating at full load over three shifts, as seeing savings totalling £1,000 per year.

The findings fit well with trials undertaken by Shell. For example, on triple reduction worm wheel units, it found efficiency improved from 75% on a typical 25:1 ratio box, to 84% using PAGs. "That's an 11% improvement in efficiency and it translates to a very dramatic energy saving that recoups the extra cost very quickly indeed," says Morrey.

In fairness, its improvements recorded with other transmissions are not as impressive, essentially because units such as single reduction gearboxes, where there are four bearings, two gears and one point of contact, are already typically 97% efficient. "But with PAO, we can reduce that 3% loss to 2.5% and that means a 0.45% improvement in efficiency. And, if you've got thousands of helical gear boxes, that's still a significant saving." PE