

Biolubricants: not just **green** but

Oils refined from crops are catching on, not for their green credentials alone, but because of hard-nosed commercial advantage. Brian Tingham examines the facts

Operations/ maintenance tips

From an operations and maintenance perspective, almost all modern equipment can run with biolubricants just as they would with conventional oils. Best advice, however, is to check the seals, particularly on older machines

- If good quality oil-resistant seals have been fitted, then they don't need to be changed. However, not everyone uses good standard nitrile or viton seals, so be aware of that
- Otherwise, engineers can treat biolubricants just as they would any other oil, although they must change over completely. That means a drain, flush and filter change. Otherwise they won't get the benefits.

Around 95% of industrial and commercial lubricant applications can be satisfied by the newer generations of biolubricants derived from crops like oil seed rape and sunflowers – and for many there are now clear advantages in swapping from mineral-based oils. What's more, while for some specialist uses prices remain double or triple those of conventional oils, as oil prices rise they're approaching parity for many applications. And that, combined with their considerable advantages, means enlightened engineers are increasingly taking them more seriously.

In fact, Fuchs Lubricants, the biggest producer of biolubes in the UK, reports that sales are currently growing at 100% pa. Hence the company's recent investment in its Stoke on Trent production plant – the UK's largest lubricants manufacturing site now producing 100,000 tonnes annually – enabling it to increase output of engine, hydraulic and gear oils, metalworking fluids, wire rope lubricants, corrosion resistant fluids and solvents, as well as pharmaceutical and cosmetic jellies.

With demand rising that fast, it seems it's time to take notice? Cliff Lea, Fuchs' European product manager, is realistic. He estimates that still only 5% of the market has wised up to the potential of plant-based oils, but now expects uptake to grow exponentially over the next few years. And that's not just because of their green credentials – rapidly biodegradable and formed from renewables. Although those factors are increasingly important to users, for him the turning point is their superior

operating characteristics, which are now making them very commercially viable.

We shouldn't be all that surprised. "Remember, mineral oils have really only been around for 100 years," says Lea, "Before that, engineers always used fat- and vegetable oil-based lubricants and greases. Aeroplanes right up to the First World War ran on castor oil derivatives."

But then came mineral oils, with lower prices and higher volumes – and the world forgot. Until the late '70s and early '80s. "Then it became more apparent that mineral oils' poor pollution characteristics and resource limitations mattered, so biodegradable oils – initially vegetable oils, but then also synthetic esters derived from these – started attracting our attention. At first, they were used on less stressed applications like lubricants for chain saws, but then also hydraulics in, for example, agricultural and turf care equipment where environmental spillage is a concern."

Keen to go green

That early experience led ultimately to investment in higher performance ester synthetics for the wealthy and ultra-demanding motor sport industry – and with success in serious racing, the doors started opening again for biolubricants in more highly stressed industrial applications. So today's informed view is that these advanced renewable oils are now ideal for everything from industrial compressors of all sizes and duties to hydraulic systems (even those working at high pressures and temperature), industrial gears, engines, plastic injection moulders, conveyors, machine tools and even turbines.

Why are converts to biofluids so enthusiastic? Going green is clearly an incentive, but the big deal is hard-nosed better value. And on the table here are better energy efficiency, reduced combustibility, lower volatility, good shear resistance, good temperature stability, lower toxicity and, perhaps most important, massively reduced metal wear of the equipment itself, even in aggressive environments.

What about some detail? Energy efficiency is a big one, coming from the fact of biolubricants' lower



**Cliff Lea, Fuchs
Lubricants' European
product manager and
biolubes evangelist**

better

coefficient of friction. Fuchs' experience shows that leads to fuel savings in, for example, hydraulic pumps of 1–3%, while for compressors the figures are 2–7%. For 100hp rotary compressors operating on full load across three shifts, that means a potential saving of more than £1,000 per compressor per year.

Meanwhile, Fuchs reports efficiency improvements of 12–30% on worm gears and 1–5% on spur gears, resulting in substantial overall gains on transmission equipment, depending on service load and temperature, equipment type and lubricant. On top of that, synthetic lubricants cut oil temperatures by around 5–7 degrees, reducing stress and extending equipment life, while also cutting oil consumption, wastage and disposal costs. Altogether, that's a lot of money saved – far outweighing any higher oil cost.

Ideal characteristics

Why are plant oils' lower volatility important? Lea says that biofluid evaporation rates are about two thirds less than comparable mineral oils, which means significantly reduced emissions from engines, as well as benefits in other applications where there are significant variations in ambient temperature.

But he also points out that, with lower volatility and a flashpoint 40–50°C higher, biolubricants have a very good record in applications like grinding, where there's a known fire hazard. "Sales of metal-cutting fluids are growing faster than just about any of our biolubricants, because users are realising that by changing over to them they can avoid expensive fires and downtime."

And then there's the astonishingly reduced metal wear, due to vegetable oils and their esters having exceptional polar properties – meaning they adhere much better to materials than mineral oils. Hence their current use as mineral oil additives in niche applications to give greater load-carrying capabilities.

Perhaps the best testament to that comes from the green regeneration Eden Project, set in Europe's largest china clay quarry in Cornwall. In 2005 and 2006, Fuchs worked on the construction of a new education centre at the Eden Project, alongside Robert McAlpine, Highway Plant and the UK's National Non-Food Crop Centre, specifically to demonstrate the value of biolubes.

Its plant-based lubricants were used mainly in hydraulic systems, but also engine oils, transmission fluids and bearing greases on a Merlo Telehandler, IMI excavator and a Barford dump truck owned by Highway, as well as some of the Eden Project's own club cars and road trains. And what the participants found surprised even its makers.

Says Lea: "We monitored all those applications over the two year period. Everything worked perfectly, which was no surprise, but when we came to do the analytical work, the condition of the oils was exceptional, with contaminants due to metal wear extremely low – in fact, one tenth of what you'd expect with equivalent mineral oils." And that was for all major metals likely to be picked up, including wear and corrosion components from ferrous, copper-based alloys, aluminium and steels.

Note, that was despite the equipment being used in a china clay environment, known to be one of the most abrasive and destructive of all the substances for construction equipment in extractive applications. As Roger Powell at Highway Plant says: "China clay is recognised as the most invasive and damaging of all quarry dusts and causes severe damage when entering oil systems."

Lea isn't suggesting that biolubes' superior polar properties mean that users can make savings by pushing out service intervals – there are too many other variables around water ingress, clogged filters and so on. But he and the other participants in the trial are saying that equipment lubricated with the more advanced biofluids are much better protected and so should not only operate more reliably and efficiently, but importantly, do so over a much extended asset lifetime – again, way outstripping any additional initial oil purchase cost. **FE**

The Eden Project: oil condition monitoring showed one tenth of the expected contaminants

