

Oiling the wheels

Lubricants and lubrication systems are advancing more than many realise – and that's for both static and mobile plant. Dr Tom Shelley reports on key developments for operations engineers



Plant operations excellence in action at Chevron's Pembroke refinery, with Project Pride

Are environmentally friendly lubricants as good as the mineral stuff or are they just an expensive way of trying to go green? Are synthetic lubricants worth the extra money? Equally, is a centralised lubricant system the best thing since sliced oil or is it, too, an expensive con?

These issues have been argued over for years and will probably be debated for years more. However, the fact is that, for some applications, such as food, pharmaceutical, agriculture and forestry, biodegradable lubricants are increasingly being demanded – so plant engineers would be wise to get to grips with the pros and cons. Similarly, while it may still not be the norm to install automatic lubrication, except in large, static plant and the railways, it is widely used in Northern Europe and now expanding in the UK.

Step back a minute, and lubricating oils and greases originally all came from plant and animal sources, so biologically-derived and biodegradable lubricants have a long history. They were eventually supplanted by mineral-based oils, because these were cheaper.

Fast forward, and there is, as yet, no Europe-wide legislation mandating biolubricants – although several German states, Austria and Switzerland do now forbid the use of mineral oil-based lubricants around inland waterways and forest areas. As for

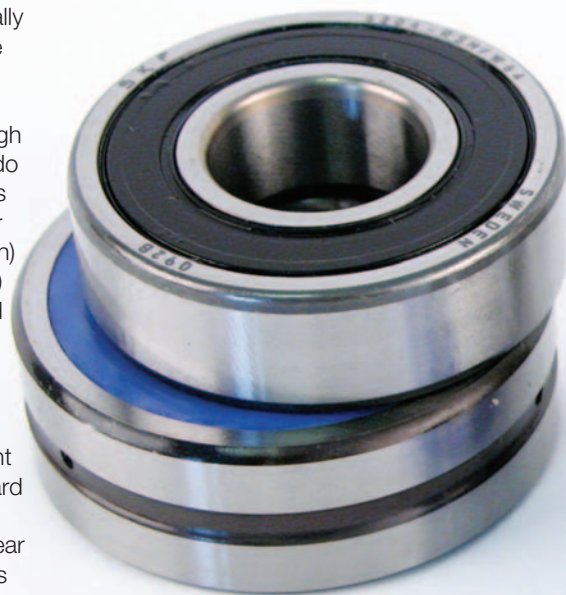
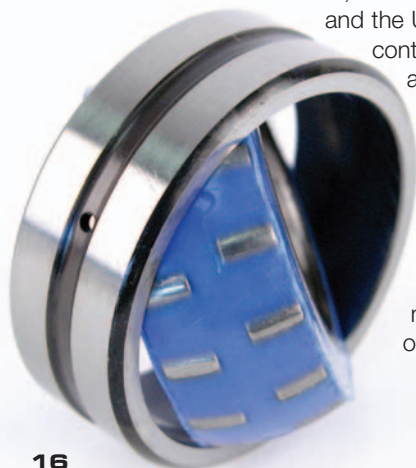
the US, the FDA (Food and Drug Administration) and the USDA (Department of Agriculture) control lubricant formulations for food and farming use respectively, but there neither has prescribed biolubricants.

Meanwhile, Portugal mandates the use of biolubricant two stroke engine oils in outboard engines; Belgium requires biolubricants for all operations near non navigable waters; and various other countries have incentive

schemes to encourage the use of biolubricants, as opposed to mineral oil derived formulations.

Chainsaw oil is an issue, because it is automatically applied to the chain as it cuts, so ends up in the environment. In the UK, GB Lubricants and Fuels in Gateshead produces three grades of GB Bio Chainsaw oil, which has been approved by the Environment Agency for England and Wales. After six months of using this oil, Forestry Contractors Association director and harvesting contractor, Martin Henderson, reports good results, with bar and chain wear on the chainsaw and harvester the same as with mineral-based oil.

At a more general level, bearings manufacturer Schaeffler has published a list of 49 greases and 97 oils, which it describes as 'not harmful to the environment'. Makers include Addinol, Carl Bechem, Chemie Technik, BP, Shell, Klüber



Lubrication, Zeller and Gmelin, but the greatest number comes from Fuchs Petrolab, which is headquartered in Mannheim.

This company offers what it calls its Planto range of 'rapidly biodegradable lubricants', about which it proclaims: "The technical properties of these products are equal to mineral oil-based products and, in some characteristics, show an improvement." Lubricants it offers include total loss lubricants, chain saw oils, two stroke engine oils, concrete mould release oils and greases, and total loss lubricants for rail applications. Among circulated lubricants, it mentions hydraulic oils, engine oils, gear oils, multi-purpose oils and metalworking oils.

One alternative for the food industry is to use what SKF calls 'solid oil', a synthetic lubricant retained in a polymer matrix, which completely fills the internal space in a bearing and encapsulates the cage and rolling elements. No seals are required and the material is resistant to cleaning chemicals, although not organic solvents. One point, though: at room temperature, samples show slightly increased friction, particularly on start-up, so their adoption may require use of slightly larger motors.

Solid fluid

Nonetheless, beyond the food industry, solid oils have found favour with paper making, pneumatically-operated couplings, overhead cranes and hoists, and chemical mixers. In low temperature applications, such as on ski lifts, starting torque is lower than for conventional greases. Minimum start-up temperature is -40°C and maximum operating temperature is 85°C, although the lubricant can handle 95°C intermittently and bearings can be heated to 100°C for mounting.

It does, of course, cost more than mineral oils – as do synthetic and partially synthetic lubricants generally. However, they do provide a cost effective solution for the most arduous applications, such as large diesel engines and gas engine generating sets.



But there is another point: in all these kinds of machines, automatic pumped lubrication is considered an essential part of the design. However, there are plenty of other instances where centralised lubrication is beneficial. In Germany, manufacturers of mobile plant such as Vögele, which makes road paving machines, are exponents of the practice. However, Stuart Diesel of HES Lubenec, which designs and supplies SKF's Vogel lubrication components, agrees that uptake in the UK remains slow.


Which is odd: the big advantage of centralised lubrication is that machine owners can be sure that it is being done. Also, a guideline price from Lubemec is only around £200 per grease or oiling point, which seems cheap, if it adds a few years to the life of a machine costing well in excess of £100,000. And Diesel observes that, if the price to equip all lubricating points with automatic lubrication is too steep, much may be achieved by applying the system only to inaccessible points. Also, if electric pumping is too expensive or inconvenient, tubes can be run from a centralised grease unit equipped with a metering device to ensure that grease is distributed where it is needed.

While owner-users may believe they can ensure that lubrication will be carried out properly on their machines, plant hire companies can be much less sure, and Diesel describes these as being "more receptive" to the idea.

That said, the human element is always crucial and much can be achieved by giving workers who use equipment a sense of personal ownership. Such a policy is promoted by reliability and change management consultancy Reliable Manufacturing, based in Warrington. Managing director Andrew Fraser talks of Chevron as one customer that, following attendance at a seminar, implemented such a policy at its refinery in Pembroke, with dramatic results.

Proper lubrication formed part of 'Project Pride' (Pembroke Refinery Implementation of Defect Elimination). Says project manager Richard

Allen: "The work ethic and communication between teams has been first class and we've made some significant improvements already. We believe we've now got the best lube oil management system within Chevron and are probably starting to hit world class standards.

"We've reduced lube oil usage, and the meantime between failures of seals and bearings has improved significantly, which means we're getting greatly improved equipment efficiency, too. It has really encouraged ownership of the plant among the workforce, and helped establish the importance of care and restoration of their machinery." 



Chainsaw oils: now available in the form of rapidly biodegradable mineral equivalents

Pointers

- Oils and greases originally came from plant and animal sources – so biodegradable lubricants are not a new concept
- There is no Europe-wide legislation on biolubricants, although some national regulations exist and there is a strict US regime
- For a detailed list of environmentally 'non harmful' lubricants, go to Schaeffler's website
- So-called solid oils are offering an increasingly valuable alternative lube
- Automatic lubrication may be more applicable than many engineers think