

COOLING THE HEAT

INDUSTRIAL COOLANTS & LUBRICANTS ARE CHANGING WITH THE EMERGENCE OF HIGH PERFORMANCE, SYNTHETIC, WATER SOLUBLE AND BETTER LUBRICITY OPTIONS THAT ARE EMERGING.

BY BINDU GOPAL RAO

A KEY FACTOR THAT IS GUIDING THE coolants & lubricants space is the consideration of environmental protection. This assumes increased importance in the context of manufacturing of machine industrial products, which is why the demand for the reduction of environmental load is becoming predominant in production. In the development of machining procedures, coolants & lubricants contribute not only to the increase of the effectiveness of material removal, but help to achieve the appropriate accuracy and quality. At the same time, coolants & lubricants, depending on their composition, pollute the environment to different extents. That is why it is the task of technologists in the planning and execution of material removal to reduce the amount of these auxiliary materials, or do without them if possible.

KEY DRIVERS

Out of the global lubricant demand of approximately 40 million tonnes, the industrial lubricant market can

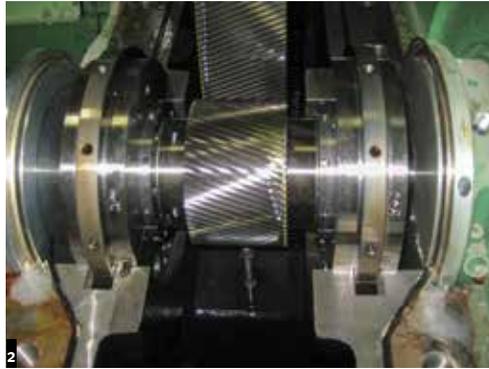
be segmented into several categories depending on their applications. Some of the most used lubricants are gear oils, hydraulic lubricants, engine oils and cutting fluids. Approximately 80% of these fluids are mineral-based. The quality and performance of these liquids largely depend on the quality and refining process of the base oils used and also the technology of performance additive packages.

"The important criteria for performance of hydraulic oils, gear oils, thermic fluids, spindle oils etc. are having excellent viscosity temperature relationship, superior anti-wear and anti-foaming characteristics, along with a high degree of corrosion protection and oxidation stability through specialised additive technology. Whereas the roles of cutting and other machining fluids are in machining processes, which include cooling, reducing friction, removing metal particles, and protecting the work piece, the tool and the machine tool from corrosion. Cooling system breakdown is the number one cause for engine-

1. The global lubricant demand is approximately 40 million tonnes.

related failures. Using ordinary coolants that contain high concentrations of silicates and borate may lead to premature system failure and drop in engine performance. The complexity of every engine warrants the need for a cooling medium that suits the conditions best. Coolants (AntiFreeze) have a key role, aside from transferring heat away from the engine. They should be manufactured with the understanding of the need of an engine or equipment and suitably catering to diverse engine requirements," says **SK Singh, director, S-CCI Golden Cruiser.**

Today, there is a special requirement from manufacturers for new age industrial coolants & lubricants that have a longer service life, lower consumption and improved plant efficiency, apart from being readily available. These qualities of new coolants/ lubricants (proper lubrication) directly give the machine performance excellence and this results in increased productivity. A compressor needs the right lubricant to keep operating reliably without unwanted disruptions. Compressor equipment manufacturers have the crucial task to design and specify the right type of lubricant for each product they bring to the market. This requires a lot of expertise. This process is typically executed together with lubricant manufacturers via co-design. Compressor equipment manufacturers will also prescribe the intended usage and even more important, the limitations of this lubricant, in line



with the environmental and operating conditions of the compressor product.

MAINTENANCE MATTERS

Maintenance and inspection instructions are created for the lubricant, in order to guarantee long-life and trouble-free operation of the compressor equipment. The right lubricant enables maximum uptime due to extended service exchange intervals. It prevents the debris of shafts and bearings. It also enables the superior behaviour of the oil film between shafts and bearings due to stable viscosity, even in varying environmental conditions and loads.

"The right lubricant also allows well-engineered

2. Gearing with TurboBlend by Ingersoll Rand.



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THE RIGHT LUBRICANT ENABLES MAXIMUM UPTIME DUE TO EXTENDED SERVICE EXCHANGE INTERVALS.

and optimised balance between load-carrying properties and mechanical heat loss evacuation between shafts and bearings. However, the wrong lubricant will increase the maintenance costs due to more frequent compressor oil system flushing activities and interventions," says a **spokesperson from Ingersoll Rand**.

It will require additional manpower and lubricant consumption and hence, cost, and causes unwanted downtime for the equipment. It will cause damages to the bearings due to oil film rupture, caused by instable film viscosity under varying load conditions. Also, it can damage seals due to the build-up of deposits, additive molecules being separated from the fluid under varying load conditions. These deposits can also affect the bearing pad surface and lead to catastrophic damages to the equipment. Damages to seals due to build-up of deposits, additive molecules being separated from the fluid under varying load conditions, is another risk.

"Lubricant design and selection is completely managed via manufacturer's quality procedures and should fully comply with a set of requirements imposed by the equipment. It has been validated through rigorous and extensive lab testing & field

endurance testing, in extreme testing conditions. No other commercially available lubricant has the same mechanical, chemical and thermal properties, and is by consequence of inferior quality as the blend is co-designed together with the lubricant manufacturer. However, operating with non-original lubricants can lead up to catastrophic damages on the equipment," adds the spokesperson from Ingersoll Rand.

GOING GREEN

Coolants & lubricants should be environmentally friendly and this is more important in metal industries. They are most likely to be tested for biodegradability, aquatic toxicity and bioaccumulation potential to ensure that the products are ecologically sensitive. **Munish Garg, MD, See Lube Technologies**, avers, "Nowadays, looking into the environmental consideration, biodegradable lubricants will be the future. Apart from biodegradable, Minimum Quantity Lubrication (MQL) will also take its place in this ever-growing market. First of all, the disposal is a major concern, as it impacts the environment greatly. So products are to be formulated with greater sump life so that the usage can be prolonged and disposal is shortened. We, at See Lube, are quite successful in proving such solutions to many customers, where sump life is achieved in excess of 12 months."

One of the main problems of cutting fluids that has recently been decreased is the amount of nitrosamines, which is carcinogenic; produced by the reaction of nitrite with secondary amines (such as the diethanolamine). The chemicals like sodium nitrite, used as a corrosion inhibitor, are very toxic to aquatic life and harmful to the workers. On the other hand, secondary amines are used to neutralise the



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— Yashwant Mahajan

4. In machining, cost comprises of various parameters like price of lubricant, consumption pattern, sump life, tool life, cost of disposal and the like.

acids from the cutting fluids and provide corrosion protection. The use of chlorine additives, such as chlorinated paraffin that had been used as extreme pressure additives, pose a threat to ecology and the workers' health.

"The used coolants, which are harmful to the environment primarily for the use of mono ethylene glycol, are now being disposed of after a much longer period than earlier. This is a major step towards environment preservation especially in India, where there is no organised system of collection of used coolants and treating it or refining it to make it environmentally safe. Normally used coolants are Mono Ethylene Glycol (MEG) based and green coolants are primarily mono Propylene Glycol (MPG) based. The cost of the environment-friendly MPG is also higher. It is due to the high cost of MPG as compared to Mono Ethylene Glycol (MEG) that MPG based coolants are not finding many takers. We had introduced the super long life coolant range, which are being used by many OEMs in India and globally. The change (life-cycle) of these super long life coolants varies from 8-10 years. That in itself has made a change in the environment. We are now looking at an efficient collection system for India as well," says Singh.

METALS MATTER

Metal working coolants & lubricants are used for metal forming, metal cutting, lapping, polishing and grinding applications. "They lubricate, decrease thermal deformation and flush away removal material. The use of MWF also improves surface finishes, increases tool life and inhibits corrosion. For high-

precision machining, the main function of coolants & lubricants is cooling, lubrication and chips removal," says **Yashwant Mahajan, DGM - R&D lubes, Grauer & Weil (India).**

As compared with normal machining, the concentration percentage of coolants is always on the higher side for hard machining at 8-12% against 3-5% otherwise. "Majorly, water soluble coolants are used in a majority of applications. There are certain applications where water soluble is ineffective and mandatory straight oils are the first preference. See Lube is proud to develop many applications like threading, tapping, broaching and reaming, where the straight oils have been replaced with water soluble in select applications, thus saving directly on cost of oil and also benefitting the environment as those products are biodegradable upto 50%," adds Garg.

COST CONSIDERATIONS

In machining, cost comprises of various parameters like price of lubricant, consumption pattern, sump life, tool life, cost of disposal and the like and the optimum balance of all these parameters needs to be done. The cost is being balanced four ways to avoid hidden lubrication cost.

"First, keep everything consistent as per the application. Select the proper coolant/ lubricant. Second, apply it right to avoid cost. Third, do not forget disposal. Always use biodegradable lubricant to avoid/ minimise disposal cost. Fourth, get the lubricant in the application efficiently. The best practices in coolant/ lubricant cost is being balanced by boiling it down to monitoring and managing the variables. Whenever





COMPARATIVE ENVIRONMENTAL BEHAVIOUR OF LUBRICANTS BY BASE OIL TYPE				
Lubricant/coolant base oil	Base oil sources	Biodegradation	Potential for Bioaccumulation	Toxicity
Mineral oil	Petroleum/Crude	Persistent/Inherently	Yes	High
PAG	Petroleum – Synthesised Hydrocarbon	Readily	No	Low
Synthetic Ester	Derived from Biological sources	Readily	No	Low
Vegetable oil	Naturally Occurring	Readily	No	Low

Courtesy: Grauer & Weil (India)

possible 'right-size' the lubricant usage, applying no more and no less than needed. Maintaining the correct concentration, use of the right amount of coolant/ lubricant in the system and applying it when and where needed. Considering these points effectively, cost is being balanced," says Mahajan.

NOW TRENDING

Increase in productivity and reduction in cost has seen industries cutting back on their coolant needs. The market demand today is for vegetable-based coolants and implementing a recycling programme. "The industrial lubricant/ coolant market in India has grown significantly accepting green field technology products to deliver sustainability benefit. The 'Grodal' range of water-soluble metal working fluids has shown superior performance in demanding application in the industry across various regions in India," says Mahajan.

Rapid industrialisation and increasing demand has raised the production rate in each and every manufacturing company. All the industries are now taking care of maintenance of machinery with bet-

ter quality coolants & lubricants. This has enhanced the demand of lubricants. Moreover, with the need of enhanced lubricants to work under extreme conditions, its new trend technology will drive the market in the coming future. All equipment manufacturers are designing for extended service life and lower lubricant operating volume flow of their lubricants, as total-cost-of-ownership (in which both energy efficiency score and maintenance cost are determining parameters) is a key driver/key purchasing criterion for today's customers.

"Lubrication plays a major role in cost as well as manufacturing performance of the machining industry. Around 20% cost is of the lubrication in the total manufacturing cost. If we talk about the MSME sector, then a majority of the industries are not considering this cost as measurable cost. People prefer price-oriented products, which in turn always increases their overall cost of machining. Lubricants should be selected as per application requirement, which will be the most appropriate method for cost reduction," concludes Garg. 

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