

# LUBE-TECH

NO.29

## PLANT MAINTENANCE CAN BENEFIT FROM LUBRICATION CONSOLIDATION

### *Reduces Maintenance Costs, Extends Equipment Life, Simplifies Purchasing Process*

Billions of euros each year are spent to repair the damage caused by mechanical wear in European factories. The key elements of damage are due to surface degradation including mechanical wear and fatigue - a high percentage of which is due to lubricant degradation and problems associated with related maintenance.

With increased competition and rising costs maintenance professionals must find solutions to these unnecessary losses by getting back to basics - paying particular attention to the lubricants they use and the suppliers selected, as well as their overall approach to management of the lubrication maintenance function. One solution is total lubrication consolidation, which offers a highly effective solution to meet continuing and unforgiving industry challenges to reduce overall maintenance costs, extend equipment life, and simplify the lubricant purchasing process. While this is not a new option for plant maintenance professionals, it is generating understandable new interest. The reason is simple. In addition to these important benefits, total lubrication consolidation also provides efficiency improvements through better inventory control, more effective preventive maintenance, and improved overall management practices.

How can plant management choose the best lubrication consolidation program? They should look for a "package" offering a complete product line that meets the requirements of virtually every need in their plant, as well as an integrated oil analysis service, and lubrication management software. All of these offerings should be supported by local product supply and expert technical assistance.

Until recently few suppliers could meet all these requirements, but the lubrication marketplace is changing due to the demand for increased production efficiencies and greater supplier performance. These demands have resulted in the re-design of a variety of programs with "twists" that make them look new, featuring claims of complete lubrication packages.

#### **BUYERS BEWARE!**

Total lubricant consolidation presents a deceptively simple challenge that is not easily achieved. This is mainly because most suppliers simply do not truly have the capability to provide a total lubrication package, so implementation has been incomplete. As a result, many maintenance professionals are unclear about the criteria needed to select the right products and services to implement a total lubrication program. Certainly some plant operations require only a limited amount of support and many suppliers have the needed capabilities to meet such requirements. The challenge is especially daunting, however, for those plants where thousands of moving parts have unique lubrication requirements and schedules that are difficult to meet and track effectively and efficiently. In addition, selecting the right supplier is a particularly tough challenge for plants where lubricants come from many companies. Nevertheless, consolidating lubrication-related purchases into a single, integrated program is possible, and there are many reasons why maintenance professionals are giving it serious consideration.

Lubrication consolidation helps manufacturers optimize the lubrication maintenance process to keep equipment running smoothly and continually at maximum capacity, which is essential to profitability. Failure to do so can be costly, as preventable breakdowns interrupt production and hike maintenance costs. Lubrication engineers estimate that 60 percent of all mechanical failures are due to inadequate or improper lubrication practices<sup>1</sup>. Bearing experts attribute more than 50 percent of all bearing failures to inadequate lubrication<sup>2</sup>. Other causes for unnecessary expenses are mistakes and oversights such as empty oil reservoirs or grease fittings that may have been overlooked due to lack of proper documentation. If it is difficult to find, it will be even more difficult to repair. A study by the Massachusetts Institute of Technology in the U.S., for example, calculated that six to seven percent of America's Gross National Product (about \$240 billion) is spent repairing wear damage caused by poor lubrication<sup>3</sup>.

Consider, for example, the lubrication requirements of a large chemical plant. It typically has 80,000 lubrication points to attend, involving hundreds of combinations of lubricant types, lubrication points, lubrication frequencies, and methods of application. The wrong lubricant, or the correct lubricant applied in the wrong manner, can halt plant operations. With so much at stake, making sure that the right lubricant is used at the right time is critical. It is no wonder that lubrication consolidation requires expert assistance.

#### **SOURCES OF ERROR**

Multiple suppliers offering partial solutions to diverse lubrication requirements compromise good lubrication management by making the delivery of products and

services more complex than needed. The difficulty is evident when considering that plant maintenance managers typically purchase a couple dozen or more different lubricants from as almost as many suppliers. Why? Inertia, historical relationships, different buyers for different plants. No plant focus on lubricants. It's often a nightmare, yet in many instances there is just no other choice. Almost no single supplier offers a complete line of products that meet virtually every plant lubrication need. And this goes for related lubrication services, too! That's where the words "total lubrication consolidation" come into play. It's not just about lubricant supply. It's about consolidating the entire spectrum of lubrication products and services as a means to ensure that production lines operate continuously, without interruption, in the most cost efficient manner possible.

As a first step, maintenance professionals interested in evaluating the prospects for savings should look for suppliers that offer a total lubrication package, not just a "full" or "broad" product line. By selecting a supplier that offers the right mix of products and services, customers are better assured that their inventory carries the most appropriate lubricants for their plant needs, and that they are supplied to the right applications at the right times.

Without a single supply source, however, redundant orders of comparable lubricants with different brand names can contribute to wasteful inventory. Maintenance professionals facing unclear or multiple lubricant choices can make mistakes that damage equipment, causing preventable maintenance and increased downtime. What's worse, suppliers offering only a limited line of lubricants sometimes try to force-fit their products regardless of specific application requirements. As a result, lubricants over- or under-"engineered" for a given application can cost machine life and maintenance euros. But the waste of maintenance euros doesn't just stop there.

Maintenance professionals typically adopt a conservative but costly approach to machine lubrication by replacing fluids at shorter intervals than necessary. Although the decision is often well grounded on conservative maintenance guidelines by the original equipment manufacturer (OEM), oil drain intervals can be extended in many instances contingent on the selection of better oils for the application. For example, the switch from conventional oils to a new generation of ultra-high purity mineral oils or synthetic lubricants can extend drain oils by as much as three to ten times respectively. In other instances, extended drain intervals stem from oil analysis readings indicating that a lubricant will tolerate extended service.

Whatever the reason, the plant maintenance manager who increases the time between lubricant drain intervals typically cuts related costs significantly! Extending lubricating intervals also increases production time and saves production losses due to unnecessary maintenance that might be attributed to poor lubrication practices. For these reasons, it pays to make sure your supplier has not only the right lubricants, but also a staff of lubrication technical experts to help you solve problems and tap opportunities for savings. This is because using the right lubricant and setting efficient drain intervals requires detailed knowledge of lubricants and the analytical tools to determine their condition, which often call for a level of expertise not readily available in house.

This is a typical situation where lubrication consolidation begins to show benefits. With the assistance of the right supplier, maintenance professionals can reliably identify opportunities for savings in their lubrication maintenance budget, and much more.

#### **CONSOLIDATING PAYS OFF**

A consolidated lubricant source with local distributors streamlines the purchasing and inventory tasks facing busy maintenance managers. However, lubricant suppliers providing the maximum benefit are those who offer more than just quick delivery from a range of products. A true vendor-partner will gladly provide application expertise and real-time support in the form of technical services, oil analysis, and lubrication management software to help you better manage complex lubrication maintenance issues.

In short, consolidating lubricant purchases in a single, integrated program with a knowledgeable, full-line supplier pays off in many ways. It can provide better return on capital investments, improve productivity, and make inventory management more effective. Consolidation can also lead to better preventive maintenance, better equipment performance, and more effective general management. Equally important, lubrication consolidation makes you a major customer, which justifies a higher level of technical support.

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## TAPPING THE BENEFITS OF CONSOLIDATION

Suppliers with complete lubrication packages, particularly those offering lubrication technical service, have the necessary insight into a customer's equipment and operations that enables them to recommend the best lubricant for each application. After the right lubricants are identified, the consolidated lubricant supplier should tag them. Tagging relieves maintenance workers of complex choices and tells them when lubricants must be changed. The lubricant supplier should also offer integrated oil analysis/monitoring services to assure timely lubricant changes. The end result is extended equipment life, which is critical for expensive machinery and equipment.

With help from the right lubrication supplier, better maintenance planning improves productivity by preventing unnecessary downtime. Integrated oil analysis/monitoring provides important criteria that help determine when oil drain intervals can be extended, and prevents wasteful early change outs. At the same time, superior-performing lubricants of the highest quality can pay for themselves in many instances through extended drain intervals and longer life for plant machinery and equipment. The reasons are simple. Less product use and less maintenance time means less cost.

In short, a consolidated lubrication program with the right supplier has the potential to further enhance productivity by making it easier to automate preventive maintenance routines, increase the efficiency of inventory management, and draw on local product supply to reduce on-site inventory costs. In addition, with the help of local technical support, additional savings can be accrued through lubrication management software that provides efficiency improvements through the automation of lubrication maintenance processes.

## FINDING THE RIGHT LUBRICANT SUPPLIER

How can maintenance managers find the right single source of lubrication products and services to meet all their complex needs? The first step is to look beyond lubricants to include services such as local support for technical and applications questions as well as for oil analysis and lubrication management software. This integrated package is essential to effective lubrication management. You will find wide differences among lubrication vendors in the quality and extent of this "total package." Maintenance professionals interested in tapping lubrication consolidation for savings opportunities may find it helpful to think about the following questions when evaluating potential suppliers:

### 1. HOW COMPLETE IS THEIR PRODUCT LINE?

The suppliers best equipped to meet requirements for diverse lubricating solutions are those offering a complete line of industrial lubricants, not just a "wide range" of products. Fluids for high-volume applications include hydraulic, compressor and vacuum pump, gearbox and chain, and multipurpose oils. Specialized industrial compounds such as greases, pastes, anti-friction coatings, and dispersions must be added to the mix. In addition, a wide range of base stocks is essential. Synthetics provide excellent resistance to emulsification and last longer to extend maintenance intervals. Ultra-high purity mineral oils also resist emulsification and promote improved additive performance, which results in longer life than conventional mineral oils. The full-line supplier must also be able to draw on functional additive technologies including anti-oxidant, anti-wear, and extreme temperature additives.

### 2. HOW WELL DOES THE LOCAL REPRESENTATIVE UNDERSTAND MY NEEDS AND THE LUBRICATION REQUIREMENTS OF MY EQUIPMENT?

Effective lubricant consolidation demands technical support from local representatives who understand both lubricants and operating conditions in common industrial equipment. Air compressors, for example, put unique demands on lubricants. Typical operating temperatures around 98.8°C accelerate reactions between compressed oxygen and impurities, especially those found in mineral oils. The resulting rapid oxidation causes a sudden increase in viscosity and lubricant failure. Mineral oils in air compressors generally last only 1,000 hours. By comparison, a synthetic compressor oil, specially formulated for air compressors, lasts around 12 times as long.

Other applications impose their own requirements. Food processing equipment subject to daily washdowns, for example, requires gearbox and conveyor chain lubricants that resist emulsification. The knowledgeable consolidated lubricant supplier understands such applications and knows the right lubricants to use at the right time. Their expertise helps maintenance professionals avoid mistakes in lubricant selection and application that can shorten equipment life and stop production. And, they can also help install lubrication management software and show how it can help achieve additional efficiency improvements.

### 3. DOES THE SUPPLIER OFFER OIL ANALYSIS?

To gauge the condition of industrial lubricants in service, an integrated oil analysis program is essential to compare each lubricant with its own performance benchmarks. Effective analysis tracks multiple critical wear-related characteristics of oil in service by comparing the results with previous reports, and notes the

trends. As an essential part of a lubricant consolidation program, oil analysis helps identify contamination, lubricant degradation, and abnormal machine wear. Industry-accepted tests reveal the presence of metal particles, water, and other contaminants.

While oil analysis alone cannot predict mechanical failures, testing can identify abnormal conditions that indicate lubricant aging, and/or whether it is abnormal. In so doing, analysis provides criteria to take preventive action that may reduce the potential for "larger" equipment problems, which could result in greater expenses and unnecessary downtime.

The wise use of oil analysis data can play an instrumental role in significantly lowering overall costs associated with oil changes, and help extend equipment life. Analysis, for example, can prevent needless, costly oil changes dictated by simplistic predictive time interval schemes while, in other instances, provide criteria that may lead to savings by extending oil drain intervals. In addition, trend data can provide criteria for the design and rationalization of preventive maintenance routines that lend themselves to computer-based management.

## 4. DO THEY OFFER LUBRICATION MANAGEMENT SOFTWARE?

Lubrication management software is a relatively new offering in Europe that is not widely available, but is worth considering if you have the computer infrastructure to support it. The best programs automatically track, schedule, and plan routes for thousands of lubrication operations to provide you with accurate, cost-effective maintenance of plant lubrication. They automate the lubrication management function by exploiting and complementing oil analysis, collecting trend data and developing responsive lubrication schedules for specific equipment.

A typical large plant, for example, requires maintenance managers to track a complex schedule of lubricants and applications. There are generally two types of maintenance software on the market. One covers general plant maintenance and the other is strictly dedicated to lubrication. While general maintenance software cannot manage complex lubrication programs, dedicated lubrication management software can generate actionable lubricating information. In so doing, it helps reduce lubrication errors by automatically generating information that helps coordinate daily maintenance routines in the most efficient manner possible. The software also identifies opportunities to more efficiently schedule lubricant orders and reduce inventory.

Be sure the dedicated lubrication management software provides three key functions. First, it should centralize lubrication requirements and protocols for an entire plant. It should catalog what lubricant is required when and how it should be applied for every lubrication point in the plant. The database should provide a proactive preventive maintenance tool that can save time, reduce risk of errors, and make it easy to record completed lubrication tasks.

Second, effective lubrication management software should help you create and schedule lubrication routes for thousands of points within your plant. In addition, scheduling software can generate lubricating work orders and monitor the performance of lubricants and maintenance employees.

Finally, dedicated lubrication management software should help you broaden lubrication schedules and records to cover multiple sites.

## CUT COSTS, EXTEND EQUIPMENT LIFE

In a complex manufacturing operation, commodity lubricants bought from many suppliers are easy to take for granted. This is a mistake that can compromise productivity and profitability. The consolidation of lubricant purchasing with the right supplier can help manage and enhance a key maintenance function. However, the selected vendor must offer a complete solution in the form of a full line of lubricants and fluids backed by local distribution and technical support. The package should include detailed oil analysis services, and lubrication management software to track lubricant scheduling. The key difference between a full-service lubricant supplier as a partner rather than a vendor is the ability of a locally supported total lubrication program that enables maintenance managers to truly cut lubricating costs and extend the lives of costly equipment.

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- 1 Rasmussen, Eric (June 1998). Rethinking Lubrication Management. Plant Services: Putman Media.
- 2 Ibid
- 3 Rasmussen, Eric (January 1998). A Practical Approach to Lubrication. Maintenance Technology: Applied Technology Publications Inc.

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## NEWS FROM THE BRITISH LUBRICANTS FEDERATION METALWORKING FLUIDS PRODUCT STEWARDSHIP GROUP

The British Lubricants Federation - Metalworking Product Stewardship Group (BLF MWFPSPG) was first presented to the general public and industry during the MACH 2002, Birmingham. What has happened since?

BLF MWFPSPG Chairman, Bert Boomkamp from Cimcool Industrial Products B.V., reports.

You may recall the main objectives for the formation of this group were: -

1. That the current environment within the EU demanded that manufacturers of metalworking fluids provide products that are both safe to use and ecologically acceptable.
2. A potential existed for legislation and regulation to significantly affect the formulatory approach to these already complex products in the near future.
3. BLF PSG members wanted to promote technological advancements and safe use of our products to MWF users.

To help achieve objective 3) BLF MWFPSPG participated actively with the Health and Safety Executive in producing a new guidance manual 'Working Safely with Metalworking Fluids Good Practice Manual'. The manual was introduced to industry and metalworking fluid users through a programme of UK-wide road shows at which many BLF MWFPSPG members gave presentations.

BLF MWFPSPG members actively promote this good practice guidance as a matter of course. The KEY message from this guidance - shown below - will contribute to safer working practices.

Correctly managing your metalworking fluids will reduce the risk of ill health, prolong the life of the fluid, increase tool life, and improve machining performance.

It is planned that this good practice guidance will be further promoted during MACH 2004 at which BLF MWFPSPG will again have a stand. Please make to time to come and visit us, you are already invited!

The BLF MWFPSPG group actively holds discussions about metalworking fluid components. Working in conjunction with a supplier of Medium Chain Chlorinated Paraffins, David Margaroni from the BLF and assisted by Andy Litchfield of Morris Lubricants have produced a report, containing information, which can be used in a submission to the UK Chemical Stakeholder Forum.

Another important current issue concerns boric acid, BLF MWFPSPG have issued a Information Sheet, 'Boric Acid in Metalworking Fluids' written by Brian Tuohy from Polartech in close cooperation with Jonathan Rainer from Borax, BLF MWFPSPG members will be issuing the content of the Boric Acid in Metalworking Fluids Information Sheet directly to metalworking fluid end-users.

For the future, work is continuing on several projects, in particular the completion of the BLF MWFPSPG public website where more information can be made generally available.

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## INFORMATION SHEET

### BORIC ACID IN METALWORKING FLUIDS

Boric acid is currently the subject of much discussion regarding possible changes to the way it is classified and used. Here is a summary of the view of the metalworking fluids industry, produced by the British Lubricants Federation Metalworking Fluids Product Stewardship Group.

#### What is Boric Acid?

Boric acid is a compound of boron that is often used as a raw material in water-mix metalworking fluids. It has been used widely for many years and it has wide-ranging benefits that improve the quality of different aspects of the fluids.

Boric acid in metalworking fluids is often reacted with other raw materials to form different groups of compounds, most commonly amine borates. Boric acid compounds are also supplied as additives. Key benefits in metalworking fluids are corrosion protection, pH buffering and hard water compatibility.

#### Proposals

The European Commission is currently considering boric acid, borax and specific sodium borate salts for possible classification and labelling. If implemented, they would be labelled as Harmful with risk phrases R62 and R63. No other compounds of boron would be included in the decision.

This proposal is being actively challenged based on more than a century of data and experience demonstrating that there are no existing products or exposures - even among people who mine and refine boron compounds - that pose any known risk to humans. The current situation is that boric acid remains unclassified and will continue to do so until such time as the proposals are adopted by the EU Commission and incorporated into national legislation.

#### Uses of Boric Acid

Boric acid is used in over 150 industrial and consumer applications that include such uses as: agriculture - where borates are an essential micro-nutrient for all plants, ceramics, a variety of glass products, cancer treatment, food preservation, eyewashes, flame retardancy and a fuel system in hydrogen fuel-cell cars.

#### Conclusion of the British Lubricants Federation Metalworking Fluid Product Stewardship Group

Although the borate industry is urging the EU to re-consider the proposals, it cannot be ruled out that these proposals might be implemented. In that case, their potential impact on metalworking fluids would fall into the following areas:

#### • END USERS

No effect, provided that the boron in the fluids is either in forms that are not proposed for classification, or is in the form of boric acid at levels below the threshold concentration for classification and labelling. The proposed classification would only have an effect on products not fulfilling these requirements.

#### • PRODUCERS

Manufacturers handling classified raw materials would be required to review their risk assessments and health and safety data in the light of the revised classifications.

The above information is an industry view that is believed to be correct at the date of issue (June 2003) and was produced by BLF Metalworking Fluids Product Stewardship Group. It gives a brief summary of extensive studies and discussions. More information on this and other health, safety and environmental issues are available from your BLF MWFPSPG member company supplier.

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Continued from LUBE 55, LUBE-TECH 28.

## WORLDWIDE PERFORMANCE SPECIFICATIONS FOR DIESEL ENGINE OILS

**Table 2b**  
**Global Engine Oil Service Specification DLD-1, DLD-2, DLD-3**

Characteristic	Test Method	Test Name	Requirements	Limits		
				DLD-1	DLD-2	DLD-3
<b>Bench Tests</b>						
Viscosity grades		Kinematic Viscosity	SAE J300 Latest Active Issue	xW-50 xW-40 xW-30	xW-30 xW-20	xW-50 xW-40 xW-30
Shear stability	ASTM D 3945 CEC L-14-A-93	Bosch Injector Test	Viscosity after 30 Cycles, measured at 100 °C, mm <sup>2</sup> /s	xW-50 xW-40 xW-30 xW-20	-- -- ≥ 8.6 Stay in grade	Stay in grade Stay in grade Stay in grade --
Viscosity at high temp. & high shear rate (HTHS)	ASTM D 4624 / D 4683 / CEC-L-36-A-90	HP Capillary Viscometer / Tapered Bearing Simulator / Ravenfield	High Temperature / High Shear Rate Viscosity, mPa.s	3.5 Min.	xW-30 2.9 min xW-20 2.6 min	3.5 Min.
Evaporative loss	ASTM D 5800 CEC L-40-A-93	NOACK	% Mass Loss, Max	15 for 10W-x or lower 13 for others	15	13
Sulfated ash	ASTM D 874	Sulfated Ash	Mass %, Max.	1.8	1.3	1.6
TBN	ASTM D 4739 / D 2896	TBN	mg KOH/g, min	10	-	-
Corrosion	ASTM D 6594	Corrosion Bench Test	Used Oil Element Content above Baseline, ppm, Max.	Copper 20, Lead 120, Tin 50	- - -	Copper 20, Lead 120, Tin 50
Corrosion	ASTM D 6557	Ball Rust Test	Average gray value, min	100	-	100

**Table 2c**  
**Global Engine Oil Service Specification DLD-1, DLD-2, DLD-3**

Characteristic	Test Method	Test Name	Requirements	Limits			
				RE 1	RE 2	RE 3	RE 4
<b>Bench Tests</b>							
Oil / elastomer Compatibility (2)	CEC-L-39-T-96	Variation after 7 days fresh oil, No presaging					
		Hardness DIDC	points, max.	-1/+5	-5/+8	-25/+1	-5/+5
		Tensile Strength	% max	-40/+10	-15/+18	-45/ +10	-20/+10
		Elongation rupture	%, max	-50/10	-35/+10	-20/+10	-50/+10
		Volume variation	%, max.	-1/+5	-7/+5	-1 /+30	-5/+5
Foaming tendency	ASTM D892 without option A	Sequence I (24°C)	Tendency / Stability, ml. max. After 1 Min. settling	10 / nil			
		Sequence II (94°C)		50 / nil			
		Sequence III (24°C)		10 / nil			
Foaming - High Temperature	ASTM D 6082	Sequence IV (150°C)	Tendency / Stability, ml. max. After 1 Min. settling	100 / nil			

(2). Use either complete Daimler-Chrysler requirements (VDA 675301, 7 days, 4 materials (NBR: NBR34 DIN 53538 T3 (100 °C); FPM: AK6 (150 °C); ACM: E7503 (150 °C); AEM: D 8948/200.1 (150 °C)) + CEC RE3 according to requirements above, or complete CEC requirements according to above + DC requirements for AEM. The Elastomer Compatibility Limits are those stated in ACEA 2002 European Oil Sequences and apply to the elastomer batches available at that time. Consult the most recent ACEA Oil Sequence publication for the information on the limits with current more recent elastomer batches. New CEC RE3 material and limits are to be developed and added to CEC requirements as soon as possible.