Machinery Lubrication

India May - June 2015

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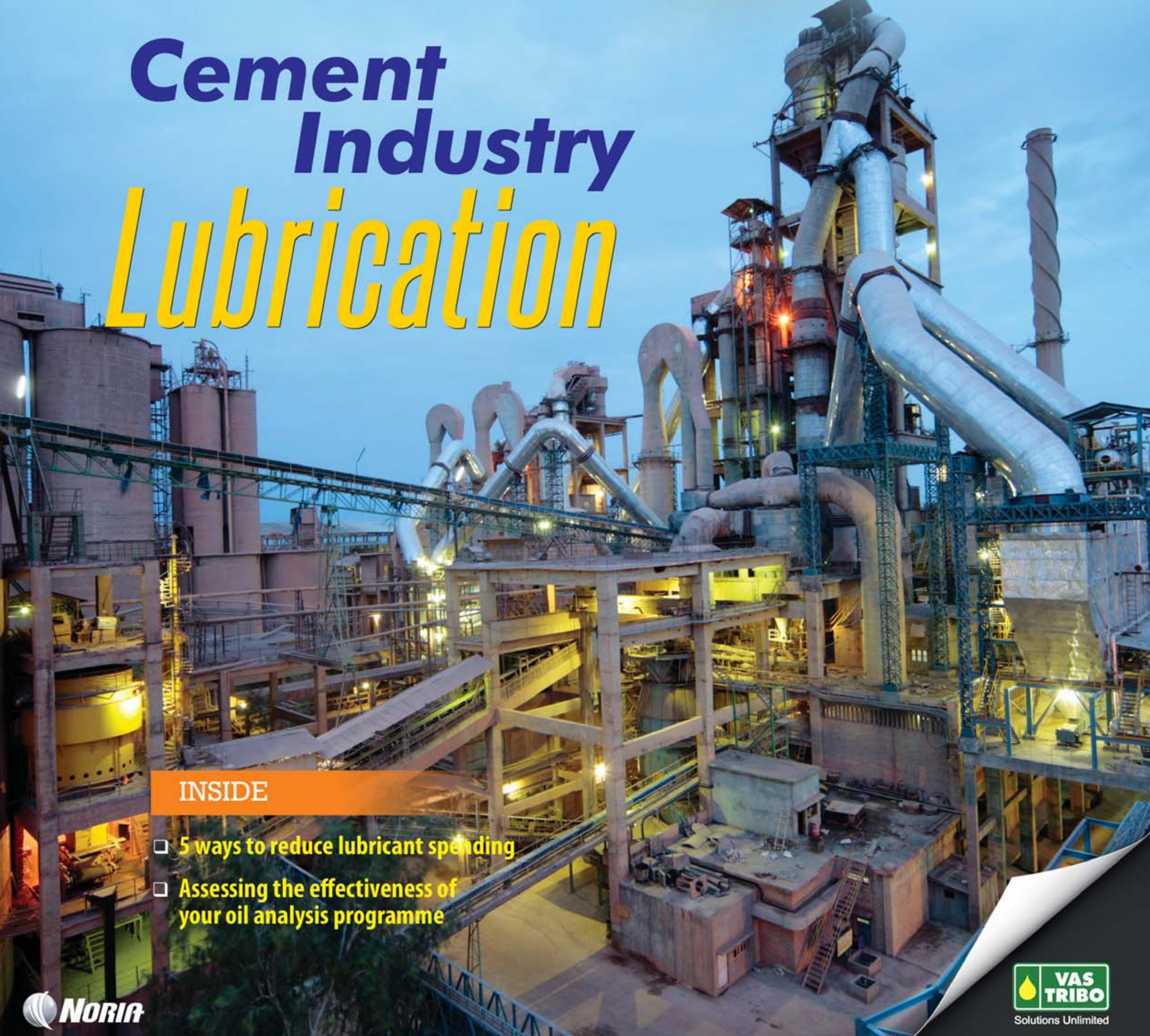
Cement Industry Lubrication



INSIDE

- 5 ways to reduce lubricant spending
- Assessing the effectiveness of your oil analysis programme

NORIA

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Machinery Lubrication India
May-June 2015

Publisher's Note

With the thrust on improvement & development of infrastructure in the country, the Cement sector is likely to get a boost. Also with multinational companies taking over a few stand alone manufacturing units, we are likely to see a systematic shift to better reliability practices. Lubrication being an integral part of reliability, more emphasis is likely to be given to Lubricants and Lubrication practices in the cement plants.

Every Cement Plant operates differently and will have its own existing lubrication strategies, preference, historical problems which are not insurmountable, Planned Maintenance requirements, management structure and type of workforce available, but there will be an optimum solution in respect of the lubricants selected, the equipment utilised to apply those lubricants, and the eventual Planned Maintenance regime, which can quite efficiently be combined with appropriate condition monitoring techniques wisely utilised. It is always advisable to analyse a large industrial plant, such as a Cement Plant, as a single entity so that both lubrication, and condition monitoring, strategies are perfectly co-ordinated with maintenance regimes to ensure that existing, or newly revised, Planned Maintenance systems are perfectly matched. In this way management can operate their plants more efficiently and make them more cost effective.

Your publication "Machinery Lubrication India" participated as Media Sponsor for 4th Base Oil & Lube Middle East 2015 (22-23rd April 2015) at Abu Dhabi and 3rd ICIS Indian Base Oils & Lubricants Conference (21-22nd April 2015) at Mumbai. Both the conferences had a host of very good speakers on topics such as economy, trends of base oil rates, logistics, lubricants, their development growth and international marketer's perspective of the Indian market, supply/demand scenario, emission norms, OEM perspective, trends and opportunities in additives and growth of synthetic lubricants etc.

This is the second issue of your magazine which is Industry specific, the first one being the Jan-Feb 2015 issue which had a cover story on Steel Plant Lubrication. We are extremely encouraged by the response and will be doing more issues which would be industry specific. We propose to have the upcoming issue (July-Aug 2015) with a cover story on "Mining Sector requirements of lubricants and lubrication services ".

We welcome readers to participate by sending their feedback & contributing articles and case studies.

Warm Regards,

Udey Dhir

JIM FITCH | NORIA CORPORATION

5 Ways to REDUCE Lubricant SPENDING

Lubricant procurement is not the largest expenditure in a typical maintenance budget. However, it is viewed as a real, tangible expense that is frequently targeted for cost reduction. When it comes to lubricants, it is unwise to pretend to save money by "buying cheap." Lubricants are the lifeblood of your machinery. Your machines' life expectancy depends largely on the quality and state of these lubricants to bathe heavily loaded frictional surfaces. Optimum reliability and lubrication must go hand in hand.

Now that you are aware of the perils of poor-quality lubricants and lubrication, let's take a look at the many opportunities to reduce lubricant spending without compromising reliability. Start by writing a simple lubricant specification for each machine. Don't rely solely on the recommendations of the equipment supplier or service manual. Instead, be bold and challenge generic or generalized statements relating to viscosity and lubricant formulation.

Once again, there is a need for caution. I'm not suggesting willy-nilly lubricant changes in an effort to enhance reliability by trial and error. There is always risk associated with changing lubricants. Smart practices, though, can quickly overcome these dangers. Risk should be respected but not feared.

The lubricant specification should be aligned with the optimum reference state for machine reliability. In constructing this specification, you should understand machine failure modes and overall machine criticality as a foundation to defining a machine's precise lubricant needs. There is a vast number of lubricant types available from both major and independent suppliers. Navigating the maze of options can be daunting but often very worth the effort. Find help if needed.

Reducing lubricant spending requires change and initiative. For many organizations, the low-hanging fruit is obvious. Below are five effective strategies for reducing your annual lubricant spending.

1. Precision Optimum-life Lubricant Selection

Optimum means optimum. Don't overspend and most definitely don't underspend. Resist the lure of cheap oil. Attempting to save money by buying economy-formulated lubricants for the wrong application is hazardous. Likewise, don't be trapped by the false promise of forgiveness. It is equally hazardous to attempt to remedy bad lubrication practices by buying expensive premium lubricants.

Beware of small differences. Selecting an optimum lubricant for a machine application is an engineering process. Small differences in lubricant performance can translate into huge differences in machine reliability and lubricant cost. Don't choose any lubricant; seek the optimum. Be conservative with the number of lubricants in your plant, though. Reduce the number of lubricants in your storeroom to a comfortable and efficient few. The number and range of lubricants you need will depend heavily on the types of machines and their operating environment.

Long-life lubricants in the right application make a lot of sense. They extend drain intervals and lower the cost and risk of premature lubricant

	GEAR OIL	HYDRAULIC FLUID	TURBINE OIL	MOTOR OIL	TOTAL
Current Annual Spending	$70,000	$120,000	$180,000	$40,000	$410,000
1. Precision Optimum-life Lubricant Selection	-$15,000	-$5,000	-$21,000	-$4,000	-$45,000
2. Proactive Lubricant Life Extension	-$13,000	-$3,000	-$12,000	-$3,000	-$31,000
3. Optimizing the Relube Interval	-$6,000	-$15,000	0	-$5,000	-$26,000
4. Reducing Package Waste	-$1,200	-$2,200	0	0	-$3,400
5. Reducing Leakage	-$500	-$22,000	0	0	-$22,500
Optimized Annual Spending	$34,300	$75,800	$147,000	$28,000	$285,100
Percent Cost Reduction	51%	37%	18%	30%	30%
Annual Savings	$35,700	$44,200	$33,000	$12,000	**$124,900**

failure. Selecting a long-life lubricant can reduce oil consumption in many cases by more than 50 percent. Still, it is important to be prudent. Don't invest in long-life lubricants for an application where they have to be changed frequently for other reasons (e.g., contamination) or where excessive leakage can't be controlled.

2. Proactive Lubricant Life Extension

In normal service, lubricants age over time in a linear fashion. Eventually, they die due to additive depletion or other causes. However, life expectancy is not only related to the quality of the lubricant but also to the type and extent of in-service exposures. The most destructive exposures are contaminants such as heat, air, moisture and water. This has been discussed extensively in the pages of *Machinery Lubrication*. Most users dismiss the opportunity to make practical exposure changes and enhance machine reliability and lubricant life. This is a pity because contamination control often constitutes the easiest and most certain savings opportunities. Go with what works.

Exposures also relate to topping up a machine that contains remnants of an aged lubricant with a new lubricant. When new lubricants are mixed with oxidized, degraded oils, they quickly degrade. You could say old, damaged lubricants are infested with diseases that can rapidly infect the new incoming lubricants.

In many cases, additives in an aged lubricant should be reconstructed. Rather than disposing of all the oil and then replacing it, a far more economical approach would be to only replace the offending degraded additive. Although this practice may bring criticism from lubricant marketers, there are reputable companies that can help make good science-based decisions.

3. Optimizing the Relube Interval

Don't change a lubricant too soon or too late. Many lubricants are changed using regimented practices or simple guesswork. This is usually the case with automotive oil and filter changes. It is also true with the vast majority of industrial lubricant applications. Frequently, lubricant sumps are purged and recharged far too soon.

Machinery » Lubrication India

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Machinery Lubrication India Volume 16 - Issue 2, May-June 2015 is published bi-monthly by VAS Tribology Solutions Pvt. Ltd. Operation Office:213, Ashiana Centre, Adityapur, Jamshedpur-831013, India.

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Use oil analysis as your metric to optimize the interval and avoid premature disposal of an expensive commodity. For instance, if the oil is analyzed at the end of a typical service interval and the remaining useful life (RUL) is found to be 75 percent, extend the interval for the next drain and charge. Keep fine-tuning the interval until an optimum interval is established with reasonable margin for error.

Many machines should not be subject to interval-based oil changes at all. Instead, their lubes should be changed "on condition" and only when there is a true need. Let the oil tell you when it needs to be changed, not the calendar. Condition-based oil changes make the most sense for large sumps of expensive lubricants and/or those requiring periodic top-ups.

In certain applications, grease lubrication can also be optimized from the standpoint of the relube frequency and amount. This can be done using grease analysis (with proper sampling) but also by inspecting used grease in bearing and motor rebuilds. The amount and condition of the grease in these bearings can offer insightful information for optimizing the relube interval and volume.

4. Reducing Package Waste

Many lubricants sold in drums and packages fail to get fully consumed. Frequently, unused lubricant is left behind in the package. Various strategies can help to minimize waste oil, including using smaller packages or bulk oil. These tactics should be optimized for the machine or group of machines in which the lubricant is used.

Another culprit of waste is the top-up container. These small containers that are carried to the point of lubricant application are often partially full when they are set aside. The oil left in the container is later questioned regarding its type and condition. This doubt commonly leads to the oil being dispensed into a waste oil container. To prevent this from occurring, make it a practice to label the condition and grade of top-up residuals.

Reducing lubricant spending **requires change** and initiative.

42%

of lubrication professionals say performance specifications are the factor that most influences their lubricant purchases, according to a recent survey at MachineryLubrication.com

5. Reducing Leakage

Leakage control makes good sense for a number of reasons. Not only are there lubricant consumption savings but also reliability and safety benefits. Don't turn a blind eye to leakage; address it early. Avoid Band-Aid fixes, and instead seek permanent and complete solutions.

The table on page 3 offers a hypothetical example of the potential for reducing lubricant consumption and overall annual lubricant spending. The opportunities vary considerably depending on the current amount of waste and inefficiency in your plant. If you are uncertain of your potential for savings, hire a specialist to perform an assessment that benchmarks your current practices to the optimum reference state (best practice).

As previously stated, it's not necessarily about buying cheaper lubricants but rather the optimum selection of lubricants and a proactive strategy for reducing lubricant consumption. Once these efficiencies are put in place, the savings you gain will recur each year, resulting in a nice annuity with minimal effort and investment. ■

About the Author

Jim Fitch has a wealth of "in the trenches" experience in lubrication, oil analysis, tribology and machinery failure investigations. Over the past two decades, he has presented hundreds of courses on these subjects. Jim has published more than 200 technical articles, papers and publications. He serves as a U.S. delegate to the ISO tribology and oil analysis working group. Since 2002, he has been director and board member of the International Council for Machinery Lubrication. He is the CEO and a co-founder of Noria Corporation. Contact Jim at jfitch@noria.com.

CEMENT INDUSTRY LUBRICATION

The lubrication of plant in the cement industry offers some quite unique challenges. Admittedly there are numerous items of plant that are commonly found in many other industries, gearboxes and bearings for example, of which there are many and diverse types. However, it is not so much the type of equipment that is the issue in this industry but the environment in which these items of plant are operating on a daily basis, which can also vary from season to season depending on the global location of these plants. It is this parameter alone which maintenance personnel operating in the cement industry must consider very carefully when both selecting and applying lubricants, because lubricants that work well in almost identical equipment in other, perhaps not so arduous conditions, might not be so effective in this industry.

Let us consider some key applications which will hopefully throw some light on these nuances.

Quite often a cement plant is located adjacent to, or very near, a quarry so some of the raw material has to be transported from this quarry right into the cement plant and eventually into very large storage hoppers, and the transportation is most commonly undertaken by conveyors of which the most common type are belt conveyors. Even if the raw material is brought into the plant by transport from a source some distance away there will still be numerous conveyors throughout a cement plant. Such conveyors are usually driven by electric motors, some of which will be large due to the power required to pull the belts a long distance. These larger types will have grease nipples that will require greasing

It is not so much the type of equipment that is the issue in this industry but the environment in which these items of plant are operating

infrequently. There will also be greased bearings on drive shaft bearings at both the Drive End as well as the Non-Drive End and often on Tension Rolls in between. Many different types of greases are successfully used in these types of applications and the type of grease used is not as important as the frequency of greasing, purely to keep the dust out of the races, which would otherwise result in rapid wear rates. As these conveyors are often located outside and open to all weathers it is not uncommon to utilise a water resistant grease in order to attempt to prevent water ingress which, combined with the dust, would eventually lead to a very superior grinding paste.

As I have already indicated, the frequency of greasing is the most important pre-requisite and the problem often arises that greasing is not done frequently enough because of the distances between greased bearings and the height above ground level.

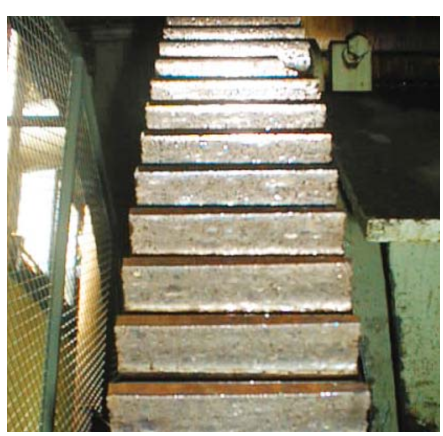
Labour availability can also add to this problem. The use of centralised greasing systems whereby a centrally located reservoir feeding numerous points through pipework, can sometimes be considered but the pipe runs could potentially be very long, so a number of these would have to be considered. The other alternative, and one that is often used, is single point grease lubricators that screw directly into each bearing and which are available in different sizes. These lubricators can be set to expel their grease over variable amounts of time to suit the application and bearing size.

The distinct advantage of these types of lubricators is that the labour

requirement to individually grease the bearings is significantly reduced, and that there is always a constant pressure on the bearing which will help to alleviate the ingress of contaminants. Their total cost throughout a plant, based on the number required would have to be weighed up against the comparative labour element, and it must not be overlooked that a proper planned maintenance system would have to incorporate their inspection on a pre-determined time schedule to make sure that they are working properly and that they have not expired. No automatic lubrication system should ever be incorporated on a "fit and forget" approach.

Conveyors are driven by reduction gearboxes of many different types but very often worm gearboxes, in order to allow the electric motor to sit adjacent to the conveyor and not to protrude too excessively. In these instances a very simple oil of the correct viscosity, which would normally be a mineral oil of I.S.O. Viscosity Grade 220 or 320 can be used, and does not necessarily have to possess extreme pressure properties. Gearboxes and bearings are also found in the numerous crushers that are located in the Infeed section of the quarry but suffer the same issues as for the conveyors in terms of dust. Here, centralised greasing systems are commonly used as the bearings are located very close to each other ensuring that the pipe runs are not too long, and the grease reservoir can quite easily be housed inside. The gearboxes are usually very large, and have a large oil capacity with the gear teeth often experiencing high shock loading, so extreme pressure gear oil is most commonly used for this reason alone. Crusher gearboxes benefit greatly from regular oil analysis and condition monitoring as the small sample required (approximately 100ml) does not affect the overall oil level and the information gained from the subsequent oil analysis can save a great deal of money in respect of un-planned downtime, and the associated costs of lost production.

There are many open gears associated with a cement plant, perhaps in Ball Mills as well as Rotary Kilns, to



Gearboxes benefit greatly from regular oil analysis and condition monitoring and the information gained from the subsequent oil analysis can save a great deal of money in respect of un-planned downtime, and the associated costs of lost production.

highlight but two, and usually there are many different types of lubricants used as well as many different methods of application. The main requirement for open gears is that the lubricant should be able to adhere for the entire revolution of the driven gear in order to offer that protection mentioned, but the only lubricating requirement is when the driving pinion is mating. Therefore, the best lubricants for these applications are purpose made open gear lubricants which ideally are sprayed onto the teeth, just before the pinion and driven gear mate, but the spray pattern is critical in order for the coverage of the mating teeth to be sufficient. Often the lubricant is sprayed directly from a barrel due to the quantity required, particularly in respect of a Rotary Kiln, and the lubricant might need to have a certain degree of heat resistance, again in respect of a Rotary Kiln, as it must not be able to melt away for that revolution.

Both grease type lubricants as well as thick oils with tackifier additives can be used, so long as they can be sprayed, and they must have the correct load carrying ability and body to withstand the potentially high loads that will be experienced. Conventional greases are not suitable, even though I have seen these being used, as they do not possess the aforementioned requirements. It is also important to inspect the gear teeth on occasions so that there is not any uneven wear taking place, which could be the result of an ineffective lubricant coverage.

Rotary Kilns provide their own lubrication challenges for both bearings and gearboxes, due to their slow rotation, high loading, and the thermal transfer of the process heat. It is quite common for the gearbox oil to operate on a circulation system utilizing both heat transfer systems and filtration. It is not unusual for the oil to be synthetic, but this is not always necessary if the flow rate is adequate and the heat transfer system efficient. Indeed, the inherent frictional characteristics of specific types of synthetic lubricants might be highly advantageous, as might be the high viscosity index offering desirable viscosity-temperature characteristics. The grease selected might also be synthetic for obvious reasons, and the selection of synthetic grease is probably more important than the selection of synthetic oil for the gearbox, as the greased bearing will not provide the same cooling effects.

There exists in a cement plant slow moving conveyors that transport the material directly from the kilns, sometimes called Clinker Conveyors, and very often they are constructed totally of metal, due to the heat experienced, and are basically a series of buckets that are hinged together. They are often carried by wheels on guide rails which will have a grease nipple in the centre which, due to their adverse operating conditions, i.e. both dusty and hot, will require very frequent greasing. Centralized greasing systems would not work in this type of application due to the constant movement of the wheels, so a system has to be installed that travels with the buckets for a short distance with the greasing probes automatically projected into the grease nipple, often in pairs. This automatic system works very well but, again, due to the many moving parts and associated sensors has to be checked on a regular basis, and accommodated within a planned maintenance system.

The lubrication of a cement plant is not difficult, but experience is required in both the types of lubricants utilized for the many diverse applications, and the method and frequency that they are applied. A common requirement for such a large business as this is for the rationalization of the lubricant stock to make lubricant application as simple a task as possible, and this can be achieved to some degree most certainly, but there are specific applications where specialized lubricants have a significant advantage and should seriously be considered. Their increased initial cost will result in larger savings in the long run due to longevity of plant life and reduced downtime, of the unplanned type. Consideration should also be given to the use of synthetic gear lubricants in larger geared drives as their potential savings on the power consumed can be significant.

The lubrication of a cement plant is not difficult, but experience is required in both the types of lubricants utilized for the many diverse applications, and the method and frequency that they are applied.

Every Cement Plant operates differently and will have its own existing lubrication strategies, preferences (maybe based on historical issues), historical problems which are not insurmountable, Planned Maintenance requirements, management structure and type of workforce available, but there will be an optimum solution in respect of the lubricants selected, the equipment utilized to apply those lubricants, and the eventual Planned Maintenance regime, which can quite efficiently be combined with appropriate condition monitoring techniques wisely utilized. It is always advisable to analyze a large industrial plant, such as a Cement Plant, as a single entity so that both lubrication, and condition monitoring, strategies are perfectly co-ordinated with maintenance regimes to ensure that existing, or newly revised, Planned Maintenance systems are perfectly matched. In this way management can more effectively operate their plants more efficiently and more cost effective.

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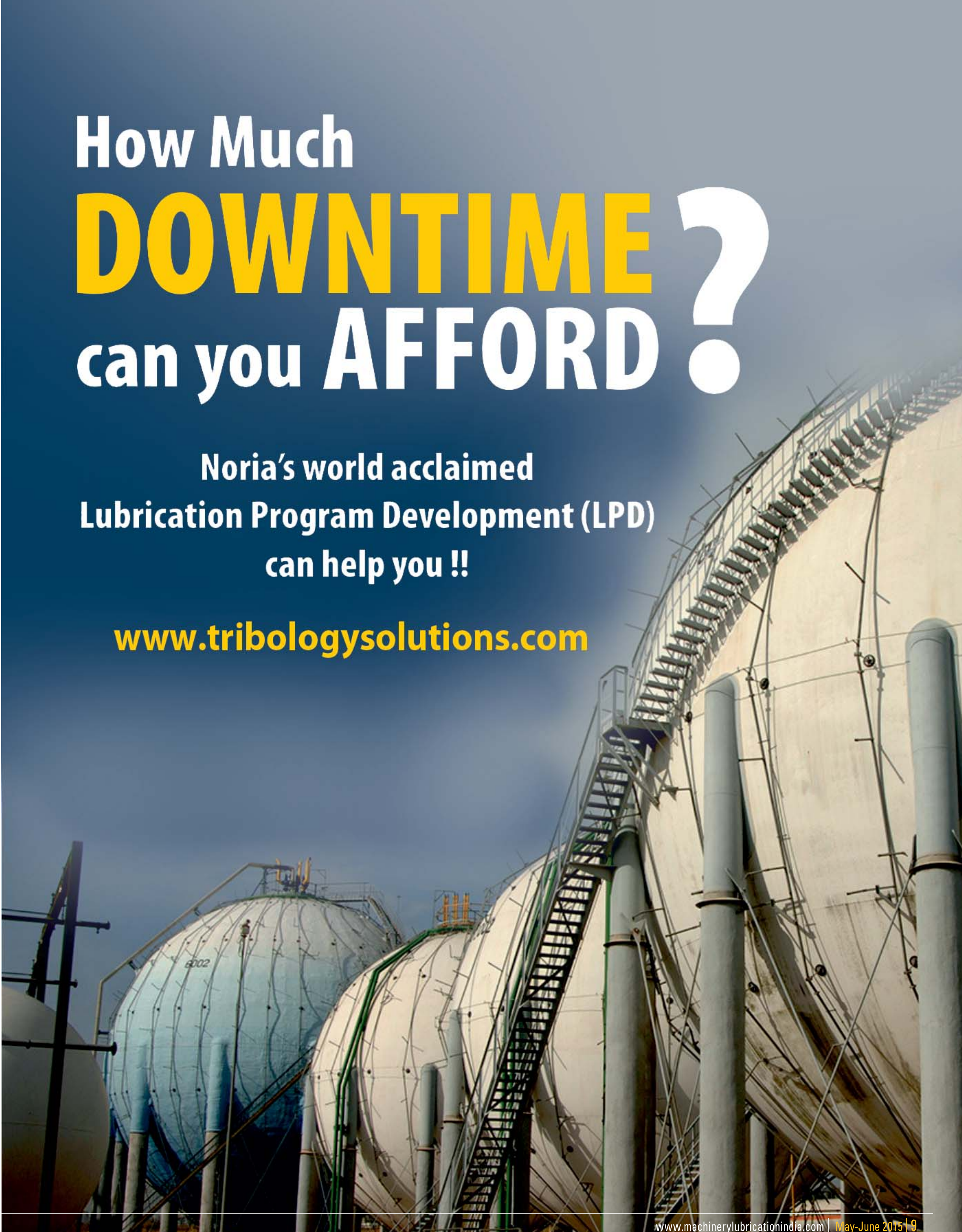
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TEST your KNOWLEDGE

This month, *Machinery Lubrication India* continues its "Test Your Knowledge" section in which we focus on a group of questions from Noria's Practice Exam for Level I Machine Lubrication Technician and Machine Lubricant Analyst. The answers are located at the bottom of this page. The complete 126-question practice test with expanded answers is available at store.noria.com.

1. Additive depletion can be monitored with:

A) Acid number
B) Atomic emission spectroscopy (AES)
C) Voltammetry
D) Fourier transform infrared (FTIR) spectroscopy
E) All of the above

2. Some grease guns can generate up to what pressure?

A) 200 psi
B) 2,000 psi
C) 15,000 psi
D) 50,000 psi
E) 200,000 psi

3. What percentage of rolling bearing life can be lost before the oil develops a cloudy appearance due to water?

A) 25%
B) 50%
C) 75%
D) 90%
E) Cannot be determined without more information such as the lubricant type

Answers:

1. E
An increase in acid number is an indication that the antioxidant level is not able to neutralize or capture free radicals within the oil. AES is effective in monitoring the concentration of additives such as anti-wear (AW), extreme pressure (EP), detergents, etc. Voltammetry is used to monitor antioxidant additives such as aromatic amine and phenolic inhibitors. FTIR is utilized to monitor many additives by comparing used oil to new oil of the same formulation.

2. C
From a safety and reliability perspective, this is why extreme caution is required when using grease guns. Seal damage is a common problem when using such high-pressure grease guns.

3. E
Oil appears cloudy when the moisture content is within or more than the solubility limit of the oil. The cloudiness of the oil due to water varies from oil to oil, based on viscosity, demulsibility and other factors.

JEREMY WRIGHT, NORIA CORPORATION

The CHANGING Roles of LUBRICATION EXPERTS

In my travels over the last decade designing lubrication programs, I've seen a shift in the profile of lubrication experts. I can remember walking into plants where lubrication was viewed as a menial task that could be delegated to the lowest skilled employees with little to no training. Visits to these types of facilities are few and far between these days.

There has been a massive change in most companies' approach to maintenance, reliability and lubrication. Perhaps it was spurred by the economic challenges of the last few years, or maybe it was just time for a change. Regardless, organizations are having to do more with less and are finding that being proactive with maintenance and reducing their upfront operational costs can have a huge effect on the bottom line.

"In less than 10 years, the lubrication field has gone from oilers to professional careers focused on the intricacies of lubrication and oil analysis."

Today, there are many different lubrication roles. A simple search on a job-posting site will reveal a number of companies looking to fill the void in their programs which has resulted from years of undertrained, undervalued and underutilized people as well as a culture that fostered the decay of the position. Thankfully, this is now a thing of the past, as organizations are waking up to the reality that having the right person for the job could potentially save millions of dollars in lost production, machinery downtime, safety, etc. This is great news for those who are well-versed in lubrication and oil analysis. You are now a wanted, needed commodity with a limited quantity, and in business that means money in your pocket.

Let's take a closer look at these voids in the lubrication field, including some of the current positions that are available at major manufacturing facilities.

Lubrication Technicians

The frontline defense against machinery wear and failure, lubrication technicians know the best practices and perform them routinely. They are not oilers. This position makes the oiler extinct. A lube tech is a thinking worker who has mastered the skills needed to perform at an extremely high level. The benefits of having a technician who is "in tune" with the equipment and knows what it should look, sound, feel and even smell like are enormous. If these individuals can also troubleshoot issues while they are still in the proactive domain of the failure curve, they are worth their weight in gold.

Lubricant Analysts

A lubricant analyst is a condition-monitoring professional. This person is literate in the language of oil analysis and knows how to routinely extract critical reliability information from lubricants by asking a series of precise

questions. The answers will relate to the health of the machine, the oil and the contaminants it contains. Lube analysts interface with others in the lubrication field as well as analysts in vibration, thermography, acoustics, etc. Often this individual is skilled in many of the other condition-monitoring technologies, further leveraging the synergy these trades have when combined.

Machinery Lubrication and Reliability Engineers

Lubrication engineers are the mentors to lubrication technicians. They have a desk job but spend the majority of their time trying to translate what is written in engineering textbooks to what works well on the plant floor. They are a technical resource for others who need specific lubrication information. While the lube tech is out in the field practicing world-class maintenance and lubrication, the lubrication engineer is responsible for identifying the optimum reference state for equipment, documenting the procedures and training the staff so everyone is operating with the same expectations.

Lubrication Management Professionals

In the past, this role would have been part of a maintenance manager's duties, but today it requires an individual's full-time, undivided attention. Unlike the positions mentioned previously, which are technical careers, the lubrication management professional advances along a management path. Those who are cut out for management with lubrication training have a real opportunity at large plants, mills and fleet organizations as companies increasingly pull lubrication into the forefront of maintenance and operations.

17%

of lubrication professionals have the title of lubrication technician, according to a recent survey at MachineryLubrication.com

In less than 10 years, the lubrication field has gone from oilers to professional careers focused on the intricacies of lubrication and oil analysis. What do the next 10 years have in store? Will being the "lube guy" require a stint at the local university to learn the knowledge necessary to bring value to the company? Obviously, technology will advance. When will the lubrication technician carry a pocket-sized oil analyzer that can rival today's offsite laboratories? Those days are coming, and with the realization of the value that these seemingly simple tasks can bring to an organization, they are coming at an exponential rate.

About the Author

Jeremy Wright is the vice president of technical services for Noria Corporation. He serves as a senior technical consultant for Lubrication Program Development projects and as a senior instructor for Noria's Machinery Lubrication I and II training courses. He is a certified maintenance reliability professional through the Society for Maintenance and Reliability Professionals, and holds Machine Lubricant Analyst Level III and Machine Lubrication Technician Level II certifications through the International Council for Machinery Lubrication. Contact Jeremy at jwright@noria.com.

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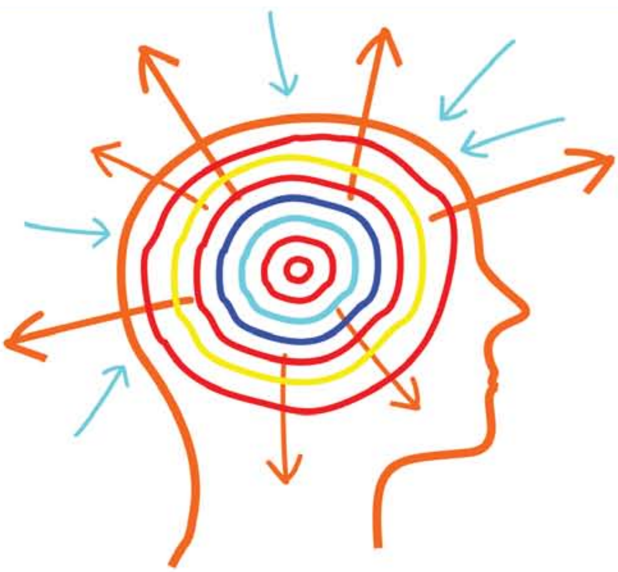
Training Calendar 2015

Kolkata	19-21st November	Essentials of Machinery Lubrications
Chennai	23-25th November	Practical Oil Analysis
Mumbai	26-28th November	Advanced Oil Analysis



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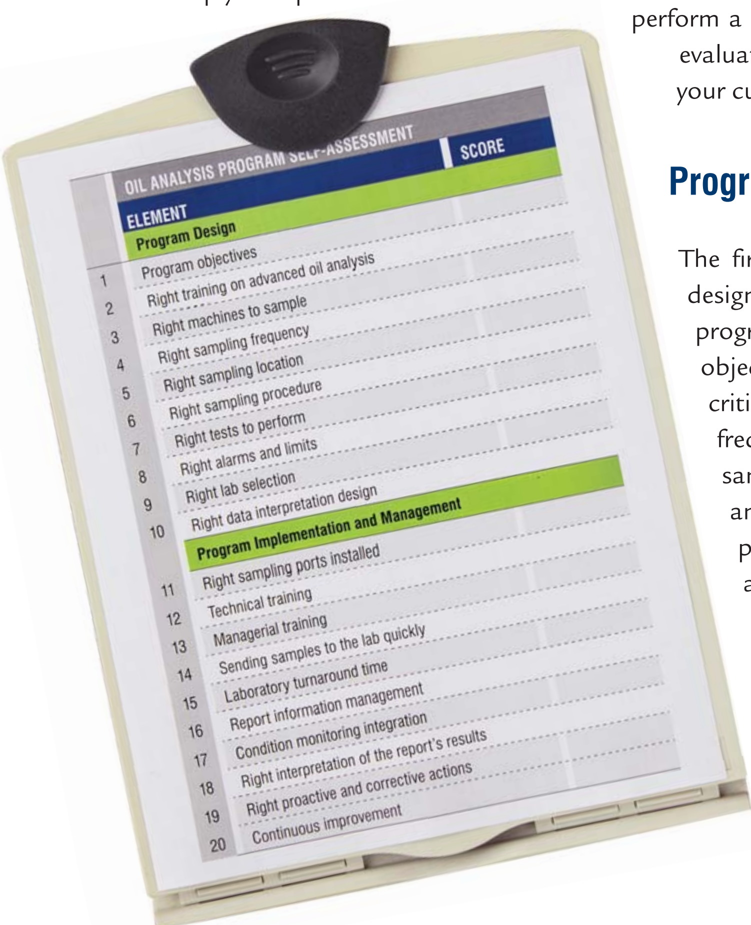
ALEJANDRO MEZA, NORIA CORPORATION

ASSESSING the Effectiveness of YOUR OIL ANALYSIS Program

How effective is your oil analysis program? To determine the answer, it is necessary to conduct a self-assessment of your program's design and management. Many oil analysis programs have limited potential because of a lack of vision. This may be the result of insufficient training or not understanding the capabilities of oil analysis. Too often the person responsible for the oil analysis program has simply accepted a program proposed by the lubricant vendor or a third-party laboratory, assuming that it will be suitable for the organization's needs. While this assumption is not always wrong, the question becomes whether the program has been appropriately customized for the plant's machine conditions, equipment criticality and reliability objectives.



This article will describe how to perform a quick self-assessment to evaluate the effectiveness of your current program.

Program Design

The first step is to assess the design of your oil analysis program, including the objectives, training, machine criticality, sampling frequency, test slates, sampling locations, alarms and limits, sampling procedures, lab selection, and data interpretation.

Establish whether the program has a predictive or proactive focus, or if it is designed to maximize oil change intervals. Is analyzing incoming oil part of the program? It is also essential to provide the appropriate training to the program manager so he or she can work with the laboratory to design and understand the program's goals and features.

The machines included in the program should be based on their criticality, which is defined according to the costs, maintainability, safety and environmental risks or concerns.

Sampling procedures must be executed reliably to ensure consistency of the oil samples. Sampling intervals should be set in relation to several parameters such as machine criticality, environment severity, oil age and machine age. Because oil contaminants vary in concentration at different points in a machine or lubrication system, it is critical to choose the best sampling locations. Once the sampling point is identified, it may be necessary to install a sampling port.

Test slates should be chosen according to the program objectives and equipment criticality. Tests can be focused to analyze lubricant health, contaminants and wear debris, and can be classified as routine and exception tests.

Alarms and limits should alert you when a specific parameter is beyond the normal condition. They may be based on the original equipment manufacturer's recommendations and historical information but should be validated and adjusted to the specific machine's characteristics.

The laboratory selection must take into account technical capabilities (tests and experience), quality assurance, information management, customer service and cost. Data interpretation should be generated from the failure modes and metallurgy of the machine. While there are typical failure modes for machines, a specific analysis should be conducted for critical machines according to their operating conditions.

Program Implementation and Management

Your program's implementation and management should also be evaluated. These elements include the sampling ports installed, training and skills management, sending samples to the lab, the laboratory's turnaround time, condition monitoring integration, results interpretation, proactive and corrective actions, and continuous improvement.

When implementing the program in the field, one of the first actions should be to install sampling ports in the correct locations with the necessary devices that allow taking a clean, reliable sample.

Training must be offered at different levels of the organization. Practical/procedural training should be required for technicians or operators who will take and label samples. Technical and interpretative training should be given to engineers or technicians who will interpret the information and confirm the actions to take. Managerial training should be provided to managers and supervisors responsible for the program's implementation, execution and continuous improvement.

> Through regular assessments, you can revitalize your oil analysis program and maximize its potential.

Samples need to be sent to the laboratory within 24 hours after being obtained. The ideal laboratory turnaround time is 24 hours from the time the sample is received until the report is sent. Quickly sending samples to the lab along with a short turnaround time will be valuable in case there is an abnormal condition that requires prompt action.

The lab's reporting software should have the ability to analyze trends for better detection of potential failures as well as access historical information for continuous feedback. Failure detection capabilities can be enhanced when two or more predictive technologies are combined, such as vibration analysis and oil analysis.

Appropriate interpretation should come from the data interpretation design along with knowledge of the current operating conditions for the particular machine. When abnormal conditions are reported, specific actions must be taken. Simple actions may include filtering or changing the oil when it is contaminated, while more complex actions may involve investigating the root cause of the contamination to eliminate it.

Be sure the program is reviewed periodically or whenever there are changes to the plant's machines, lubricants, oil analysis results or reliability objectives.

Program Assessment

A self-assessment can be completed by scoring each of the 20 essential elements (shown on page 54) on a scale from 1 to 4. A score of 1 would indicate that the element hasn't been considered or there is no information on whether it has been included in the program design/implementation. A score of 2 should be recorded when there is little evidence that the element has been considered. A score of 3 signifies that appropriate documentation is available showing that the element has been considered for the program. A score of 4 would suggest that the element has been considered, discussed and documented for the program design/implementation. The final score is the sum of the 20 individual scores.

Self-Assessment Interpretation

Programs with scores of 80 and higher are working well but still may have a few areas that can be enhanced. An implementation plan that addresses specific issues can help you achieve greater reliability. Programs that score between 50 and 79 have their strengths, but several aspects need to be corrected. Programs scoring below 49 have a number of opportunities for improvement. Scores in this range indicate that you may be missing critical information from your machines.

Regardless of your current score, there is always room to improve. Through regular assessments, you can revitalize your oil analysis program and maximize its potential. ■

About the Author

Alejandro Meza is a senior technical consultant with Noria Corporation. He has more than 20 years of experience in the lubricant industry, technical services, quality assurance, training, consulting and development in the United States, Brazil, Mexico and the Americas region. Contact Alejandro at ameza@noria.com to learn how Noria can help you assess your oil analysis program.

SUZY HITCHCOCK, ICML

HOW Clopay Plastics Sustains Lubrication EXCELLENCE

As a global leader in hygiene and healthcare products with plants in the United States, Germany and Brazil, Clopay Plastics remains a prime example of long-term championing of machinery lubrication excellence. One of the company's U.S. facilities is located in Augusta, Kentucky. This small town of 1,700 people along the Ohio River is known mainly for being George Clooney's hometown, or so it used to be. Each passing day, more people are coming to Clopay's site to speak to its celebrity – Scotty Lippert.

While Lippert may have never set foot in a Hollywood studio, he has certainly earned recognition in industry. His plant has been classified as a benchmark for lubrication and has had visitors from Fortune 500 companies and eight countries come to hear about Clopay's lubrication practices.

Lippert's role as a lubrication systems leader played a large part in the Clopay site earning the International Council for Machinery Lubrication's inaugural John R. Battle award for excellence in lubrication. Clopay Augusta is also the only plant to win both ICML awards, having received the Augustus H. Gill award for excellence in oil analysis. In addition, Lippert was named the Kentucky Manufacturing Employee of the Year in 2007 and had his name and accomplishments read in Washington, D.C., as part of the official congressional record. This marked quite a three-year rise for both Clopay and Lippert.

"Winning the awards was just the cherry on top of the cake, because the actual logic behind what we did was to improve reliability and keep people employed by producing a quality product on time, and that makes for future business," Lippert says. "Lubrication is the cornerstone of any successful maintenance program. We have made great strides in reliability at our plant, but continuous improvement is always on our mind. When it comes to machine reliability, the competitive world demands it, as do our customers."

In Lippert's area, as in many corners of the world, there are a number of industries but a general lack of in-depth lubrication training.

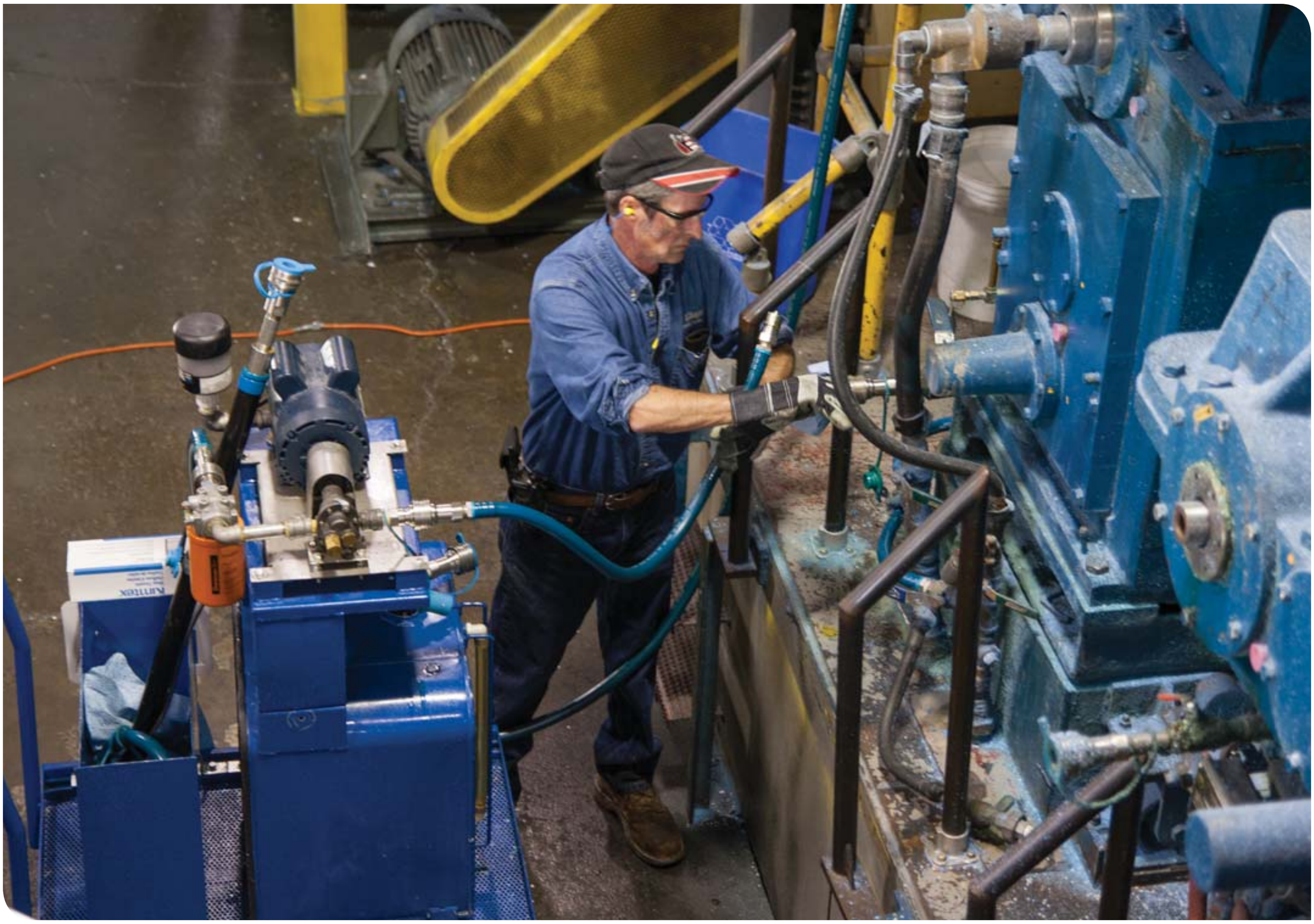
"When some local industry contacted our nearby community college for classes in lubrication, the community college asked me to teach a course in lubrication," Lippert recalls. "When I asked them how they got my name, I was told the local industry knew me as certified and having a benchmark lubrication system."

Lippert credits a lot of his success to the support he has received from management.

"Clopay had performed lubrication for over a half century the same way," he says. "After my training and ICML certification, changing the culture of lubrication practices was challenging. Without the support of management in our maintenance department, it would be practically impossible to do it. Fortunately, we've had nothing but support from our maintenance manager, who understood that if proper lubrication practices were performed, reliability of the machinery would greatly increase. We have most certainly seen that in our plant."

Before training, automatic lubrication was unheard of in Lippert's plant. Now the site has more than 50 automation units in service, not counting single-point lubers.

"It was common practice to change the oil in our critical gearboxes twice a year," Lippert notes. "Since changing oil brands, adding proper filtration to the gearboxes, oil sampling and offline filtration, we are now going on 13 years without changing the oil by using oil analysis to determine oil condition. This has been a tremendous savings. Although I do not have a monetary



value, it is in the thousands."

Receiving ICML certification and the two ICML awards has changed Lippert's career and how his organization is perceived, including by customers.

"Winning the awards was great," Lippert says. "It shows others how hard we've worked to achieve better reliability. Especially on customer and ISO audits, they recognize a lot of work and improvement in our maintenance practices. We have several Fortune 500 companies as customers who come in and do audits. As of today, every company that has audited the Augusta plant has labeled our lubrication program as a benchmark and has come back to us for guidance in setting up a world-class lubrication program."

Over the last eight years, Clopay Augusta has seen a 70-percent drop in bearing and water pump failures. Besides improving its lubrication program, the plant has also incorporated alignment and vibration analysis.

"What is more impressive to us is that we have been able to sustain the 70-percent drop in failure rates," Lippert adds. "I have seen some companies not stay on top of maintenance programs and fall back into old habits."

A few years ago, Lippert started receiving calls and emails from bearing vendors wanting to know why their bearing purchases had dropped dramatically.

"They thought I had switched vendors," he says. "I'd say this is a true sign of lubrication excellence."

To find out how your organization can win one of ICML's recognition of excellence awards, visit www.lubecouncil.org. To submit a nomination, email your plant information to info@lubecouncil.org.

WES CASH, NORIA CORPORATION

How to Get the MOST from Your PARTICLE COUNTER

Particle contamination is known to cause countless machine failures. One of the best tools to measure and understand this root cause is particle counting. Few facilities utilize the power of this test to its full potential and instead just look at the counts as a way to gauge oil cleanliness. By understanding what the particle counter is telling you and employing proper sampling locations, you can make better use of the information in your oil samples.

The **benefits** of particle counters are **truly limitless** as long as you are conscious of what you are doing and understand the results.

One of the most basic forms of proactive maintenance in a lubrication program involves setting target cleanliness levels for different machine types. More often than not, the ISO 4406:99 particle count levels are used for this objective. While this may offer a quick classification of the oil's cleanliness, you should delve deeper into the numbers to see what truly is occurring.

The ISO standard looks at three different particle size ranges: 4, 6 and 14 microns. However, most particle counters can provide information for several more sizes, sometimes up to 100 microns. These counts are then compared to the Renard series table to establish standard particle count values such as 18/16/12.

Although it is a good practice to set goals and targets based upon these numbers, if your focus is only on the ISO code, you may fail to consider the results from the particle counter. Generally, for every increase in the ISO code, the amount of particles in the oil sample doubles. However, since the chart is arranged as a series, there may be as few as one more particle that raises the ISO code or as many as four times the number of particles. Therefore, it isn't always sufficient to use this number to drive your actions.

4 µm	6 µm	14 µm	ISO Code
1,301	321	41	18/16/13
2,500	640	80	18/16/13
2,501	641	81	19/17/14
5,000	1,300	160	19/17/14

4X as many particles (1,301 → 5,000); one more particle (2,500 → 2,501)

Knowing the individual particle counts and from where the oil sample was extracted will be essential for your oil analysis program. When a report comes back from the lab, it is easy to look at the ISO code and determine a course of action. However, if you examine the individual counts, you can begin to gauge whether the actions you are taking to achieve your cleanliness targets are effective.

For example, say you have a system that is decontaminated with a portable filter cart. The goal is to clean the system to an ISO code of 18/16/13. Your reports continue to show a higher ISO code of 19/17/14. Normally, you might think the oil is still dirty and that you should continue filtering, but upon checking the individual particle counts, you see that you are only a single particle away from achieving the goal. With another quick round of filtering, you can reach your target.

52%

of lubrication professionals say their plant utilizes a particle counter, based on a recent survey .

Monitoring individual particle sizes can provide other important information. For instance, take the case of filter performance. A number of filters on the market are touted as 3-micron filters, but not all of them have the same efficiency for capturing particles at that 3-micron size. This is commonly referred to as the filter's beta rating or beta ratio. By using a particle counter and taking samples before and after the filter, you can look at the individual particle counts to help determine the filter's true efficiency and micron values.

This practice can also help you select filters for specific machines and understand a filter's life expectancy. If you analyze particle counts before and after the filter, you can evaluate whether the filter is deteriorating in service. The farther apart the particle counts, the better the filter is performing. The closer the numbers are, the worse the filter is functioning.

For systems without permanently mounted filters or even those that are periodically decontaminated with a filter cart, the particle count can help monitor the size of the contaminants found in the machine. This test can ensure that the seals and breathers are doing their jobs. If the particle counts are increasing and the metal amounts are relatively unchanged, you can be fairly confident that dirt is the contaminant causing the increase.

One of the most common mistakes when using a particle counter is failing to properly agitate the sample prior to introducing it to the machine. Remember, particles settle to the bottom of the sample bottle and must be agitated to resuspend them. Otherwise, you cannot ensure that you are getting representative information. The ASTM D7647 standard outlines some of the criteria for agitation with the use of optical particle counters. Depending on the sample volume and the viscosity of the fluid, the agitation time may range from only a couple of minutes to as much as 10 minutes. This is why it is important to leave headspace or ullage in the sample bottle.

While it is possible to agitate or shake a sample by hand, if you have a number of samples to run through the machine, this could take a long time. A paint shaker can make the process easier. Simply mount a sample bottle to the paint shaker, throw the switch and walk away for a couple of minutes. The shaker will resuspend the particles so you can be sure that you are getting accurate results from which to draw conclusions.

It no longer is uncommon to see a particle counter in a lube room. Decades ago, this technology was reserved only for laboratories. Of course, using a lab to run a particle count test is perfectly acceptable, but you can improve your turnaround time by performing this test onsite.

The benefits of particle counters are truly limitless as long as you are conscious of what you are doing and understand the results. These devices have come a long way over the past decade in both their accuracy and affordability. There are now many makes and models available that can work well, provided they are handled with care.

A particle counter can be a great tool in any lube technician's arsenal. If you haven't explored the possibility of purchasing one, you should.

8 Proactive Maintenance Uses for Particle Counting

1. Routinely verify that in-service oils are within targeted cleanliness levels.
2. Check the cleanliness of new oil deliveries.
3. Quickly identify failed or defective filters.
4. Confirm that seals and breathers are effectively excluding contaminants.
5. Confirm that systems are properly cleaned and flushed after repair.
6. Confirm that new hydraulic system are cleaned and flushed before use (roll-off cleanliness).
7. Identify the improper use of dirty top-up containers and poor maintenance practices.
8. Identify the need and timing for portable filtration systems.

About the Author

Wes Cash is a senior technical consultant with Noria Corporation. He is a mechanical engineer who holds a Machine Lubrication Technician (MLT) Level II certification and a Machine Lubricant Analyst (MLA) Level III certification through the International Council for Machinery Lubrication (ICML). Contact Wes at wcash@noria.com.

CII

6th edition of

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- Understanding Lubrication and it's Types
- Comparison and Selection of Lubricants
- New Development in Lubrication Technology
- Increasing Bearing life by proper Lubrication

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- Gear Box Lubrications (Diagnosing Problems, Measurements, Replacements, Effective Maintenance)
- Bearing Lubrication
- Reducing Transformer Vibrations
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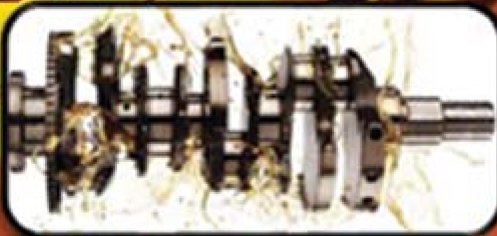
Oil Database Management

Case Studies





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ELIZABETH NELSON, ANALYSTS INC.

Preventing Premature Engine Failure with Coolant Analysis

Almost everyone knows how important a properly maintained lubrication system is to optimum engine health, but what most people don't understand is that engine coolant and the cooling system are just as critical to engine design, maintenance and optimum performance.

The demands of today's Tier-4 engines have dramatically changed cooling system design and coolant formulation. These heavy-duty diesel engines produce a tremendous amount of power from a relatively small package, placing greater demands on the cooling system to absorb heat transferred from the engine, transmission and hydraulic fluids. At the same time, cooling systems have become smaller and operate at higher temperatures, pressures and flow rates, making efficient heat removal and adequate metal protection even more challenging.

While oil analysis is an invaluable condition monitoring tool, it tells you very little about what is happening inside the cooling system. Coolant analysis provides the rest of the story by pinpointing coolant and cooling system issues that can lead to premature engine failure.

Cooling System Criticality

An estimated 50 percent of all engine failures are associated with problems in the cooling system. Once initiated, these problems can spread through the lubrication, hydraulic and transmission systems, damaging components, causing scale, clogging passages and forming deposits. Yet the cooling system is the least understood and most neglected of these systems.

Cooling system problems can potentially reduce the life of components within all machinery, which makes maintenance of these systems essential for achieving optimum machine performance and longevity. Coolant analysis takes the guesswork out of maintaining these systems. Implementing a predictive maintenance program that includes analyzing the in-service coolant has proven to optimize reliability, decrease unscheduled downtime, reduce in-service failures and field repairs, establish proper coolant drain intervals, increase component lifespans and control equipment costs.

Conventional vs. Extended-life Coolants

Coolant analysis is recommended for both conventional and extended-life coolants. Fluid design cannot prevent or correct the mechanical issues or chemical reactions that impact cooling system performance. Air and combustion gas leaks, localized overheating, hot spots or electrolysis can chemically alter or destroy the coolant and its inhibitors. Changes in coolant composition may cause chemical reactions that can damage metals and result in premature component failure. Mechanical problems and chemical reactions affect conventional and extended-life coolants equally, and neither fluid formulation can correct the root cause of a mechanical problem.

Inhibitor and glycol levels should be analyzed regularly not only to ensure adequate system protection but also to identify any mechanical issue or chemical reaction that could result in catastrophic engine or component failure.

An effective fluid analysis program should address the four primary goals of coolant analysis: preventive maintenance, predictive maintenance, root cause analysis and life-cycle management.

Preventive Maintenance

Small problems with the coolant or cooling system can become catastrophic component or system failures if left unchecked. Regular coolant testing and analysis can determine:

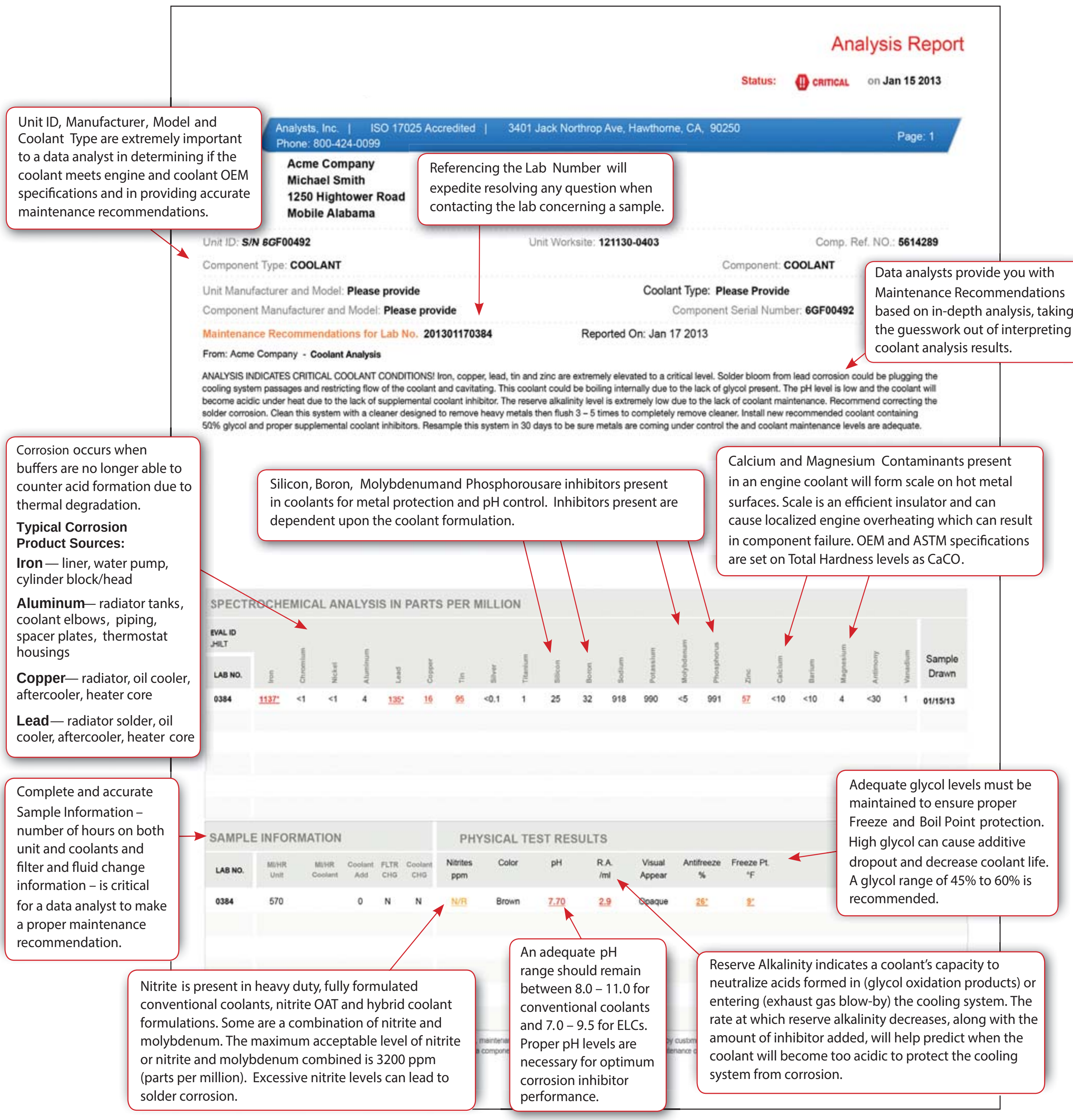
- If the coolant is suitable for continued use or needs to be replenished or replaced (a laboratory can identify proper fluid change recommendations).
- If coolant mixing has occurred.
- If contaminants are present that can cause the formation of scale or acids.
- If additive depletion is compromising metal protection.

Predictive Maintenance

Coolant analysis can help in predicting impending failures by noting abnormalities and trends in test results. Trends can pinpoint mechanical and formulation concerns that may jeopardize the life and longevity of the system and its components. These issues often involve the formation of acids and scale, contamination ingression, electrical ground problems and localized overheating or hot spots.

Root Cause Analysis

When an engine or cooling system component failure does occur, coolant analysis at the proper intervals can identify the root cause of the problem, such as a blown head gasket, electrolysis, a blocked coolant line or an exhaust gas recirculation (EGR) system failure. Once the root cause has been determined, an experienced data analyst can make informed recommendations for correcting the problem and assist in establishing fluid



Analysis Report

Status: CRITICAL on Jan 15 2013

Analysts, Inc. | ISO 17025 Accredited | 3401 Jack Northrop Ave, Hawthorne, CA, 90250 Page: 1
Phone: 800-424-0099

Acme Company
Michael Smith
1250 Hightower Road
Mobile Alabama

Unit ID: S/N 6GF00492 Unit Worksite: 121130-0403 Comp. Ref. NO.: 5614289
Component Type: COOLANT Component: COOLANT
Unit Manufacturer and Model: Please provide Coolant Type: Please Provide
Component Manufacturer and Model: Please provide Component Serial Number: 6GF00492
Maintenance Recommendations for Lab No. 201301170384 Reported On: Jan 17 2013
From: Acme Company - Coolant Analysis

ANALYSIS INDICATES CRITICAL COOLANT CONDITIONS! Iron, copper, lead, tin and zinc are extremely elevated to a critical level. Solder bloom from lead corrosion could be plugging the cooling system passages and restricting flow of the coolant and cavitating. This coolant could be boiling internally due to the lack of glycol present. The pH level is low and the coolant will become acidic under heat due to the lack of supplemental coolant inhibitor. The reserve alkalinity level is extremely low due to the lack of coolant maintenance. Recommend correcting the solder corrosion. Clean this system with a cleaner designed to remove heavy metals then flush 3 – 5 times to completely remove cleaner. Install new recommended coolant containing 50% glycol and proper supplemental coolant inhibitors. Resample this system in 30 days to be sure metals are coming under control the and coolant maintenance levels are adequate.

SPECTROCHEMICAL ANALYSIS IN PARTS PER MILLION

EVAL ID JHILT

LAB NO.	Iron	Chromium	Nickel	Aluminum	Lead	Copper	Tin	Silver	Titanium	Silicon	Boron	Sodium	Potassium	Molybdenum	Phosphorus	Zinc	Calcium	Barium	Magnesium	Antimony	Vanadium	Sample Drawn
0384	1137*	<1	<1	4	135*	16	95	<0.1	1	25	32	918	990	<5	991	57	<10	<10	4	<30	1	01/15/13

SAMPLE INFORMATION / PHYSICAL TEST RESULTS

LAB NO.	MI/HR Unit	MI/HR Coolant	Coolant Add	FLTR CHG	Coolant CHG	Nitrites ppm	Color	pH	R.A. /ml	Visual Appear	Antifreeze %	Freeze Pt. °F
0384	570		0	N	N	N/R	Brown	7.70	2.9	Opaque	26*	9*

maintenance procedures for preventing a recurrence.

Life-Cycle Management

Coolant analysis not only can detect deficient maintenance practices, but it can also assist you in implementing corrective actions to ward off issues within the cooling and lubrication systems, as well as provide indications of shortcomings in equipment operational practices and maintenance procedures.

Combining Coolant Analysis and Oil Analysis

When reviewing a coolant analysis report, it is important to evaluate it in concert with the oil analysis performed at the same maintenance interval. The effects of engine overheating may be evident in both oil and coolant samples. Remember, cooling system deficiencies affect all systems, including the engine, transmission and hydraulics.

Engines

High coolant temperatures can cause high oil temperatures, reducing the oil's operating viscosity and thereby its hydrodynamic lubricity. This leads to oil oxidation and eventual engine wear. This could be evident in ring sticking, piston glazing or varnishing, and valve wear, which often masks the fact that a cooling system problem was a contributing factor.

Transmissions

An overheated cooling system can also shorten transmission life. Transmission disc slippage may occur as a result of reduced oil viscosity at elevated temperatures. Transmission slippage creates more heat, which causes oil oxidation, and a vicious cycle is established.

Hydraulics

Hydraulic pumps and motors become less efficient at elevated temperatures and may reduce the life of valves, pump slippers, barrels, plungers and seals due to reduced oil viscosity and oil oxidation.

Engines, transmissions and hydraulics are often repaired with no consideration given to the possibility that a serious cooling system problem may have precipitated the issue. As a result, the same failures happen again and again. Coolant analysis can dramatically improve machine performance, reduce unnecessary repair and replacement costs, and extend the life of equipment by optimizing the condition of the mechanical systems involved and the fluids that keep them running.

About the Author

Elizabeth Nelson is the coolant program manager for Analysts Inc. She can be reached at enelson@analystsinc.com.

BENNETT FITCH | NORIA CORPORATION

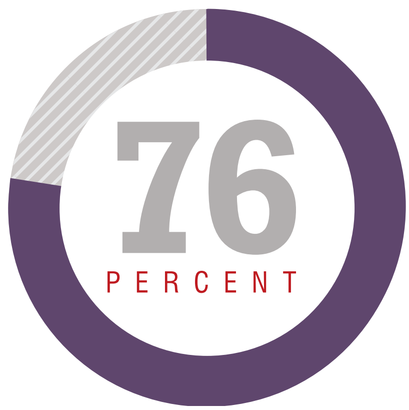
Why You Should BE Measuring AIR CONTAMINATION in Oil

While many people may be familiar with particle counters and the techniques for measuring moisture in an oil sample, few are aware of the methods for assessing the amount of air in oil or even that air is a serious form of contamination. In certain situations, air contamination has the potential to be very destructive, and its effects on oil and machinery deserve more attention.

Air can be challenging to quantify. It may exist as a contaminant in the following states: dissolved, entrained, free and foam.

The normal level of dissolved air for mineral oils is 10 percent by volume. High levels of dissolved air from pressurized oil accelerates additive depletion and oxidation.

Entrained air can be characterized as unstable, suspended microscopic air bubbles in oil, which results in clouding of the oil. Entrained air has the potential to impact the oil's compressibility, heat transfer, film strength, oxidation, cavitation and varnishing (microdieseling). As an oil sample sits on a counter, the entrained air may rise to the surface. This is true for any oil in a machine that allows time for detrainment.



of lubrication professionals say their plant does not measure the air content in oil, according to a recent survey at MachineryLubrication.com

Free air may be found wherever there are trapped pockets of air in dead zones, high regions and stand pipes. It can affect hydraulic compressibility, corrosion, vapor lock (retarded oil supply) and loss of system controls.

Foam occurs when the oil is more than 30 percent air. It may be seen on the fluid surfaces of highly aerated tanks and sumps. Excessive foam can ooze out of a machine and/or cause hydraulic compressibility issues, corrosion, vapor lock and loss of system controls.

Although all states of air in oil can be harmful, entrained air has arguably the greatest potential to cause damage, as it can increase foam potential, oxidation, pump cavitation, varnishing, erratic hydraulic response and fluid flow, and even overheating.

Tools for Measuring Air Contamination

A number of tools are available for measuring air quantities in oil. One type of device is designed to measure the air content within hydraulic lines. It works by creating a vacuum in a collected volume of oil. This vacuum separates the entrained and dissolved air from the oil. Once the air is expelled from the oil, the resultant oil volume is compared to the original volume to calculate the amount of entrained or dissolved air.

Another type of instrument can be used to measure aeration for online monitoring. The principle behind this technology is based on X-ray transmission. Oil circulates through a chamber, which allows the instrument to perform online measurements. Data is reported in standard conditions such as 20 degrees C and 1 bar.

Other devices offer quick testing for entrained air by measuring the pressure changes in a compression piston chamber. These instruments are effective for industrial use to determine where a trouble spot exists on a line.

Methods to Test the Air

In addition to measuring the concentration of air in an oil sample, a variety of tests can be performed to

TEST	OBJECTIVE/ SUMMARY	APPLICATIONS	TYPICAL RESULTS LOW	TYPICAL RESULTS HIGH
Air Release ASTM D3427 or IP 3B	Test determines the tendency of an oil to retain entrained air. Compressed air is blown into sample. Time required (minutes) for air to be reduced to 0.2% by volume determined by density (hygrometer).	Most industrial oils and hydraulic fluids	5	200
			Minutes (Low result is preferred)	
Foam Tendency/ Stability ASTM D892	Test determines a lubricant's ability to resist foam formation and dissipate foam quickly.	Most industrial oils and hydraulic fluids	Low Tendency/ Stability	High Tendency/ Stability
	Sequence I - A 190-ml sample of oil is heated to 50°C and cooled to 24°C. A diffuser (aquarium stone) is immersed in the sample with air flow of 95 ml per minute for 5 minutes. The tube is disconnected and the volume of foam immediately recorded. Then the sample is allowed to stand for 10 minutes, and the current foam volume recorded.		50/0 (Low is preferred)	200/50
	Sequence II - A 180-ml sample of oil is immersed in a 93°C bath. A diffuser is immersed in the sample with air flow of 95 ml per minute for 5 minutes, recording the foam volume at the end of the blowing and settling period.		50/0 (Low is preferred)	300/100
	Sequence III - After the 93°C test has been completed, remove any remaining foam by stirring the sample. Remove the sample from the bath and cool to a temperature below 20°C. Place the cylinder in the 24°C bath and repeat the Sequence I procedure.		50/0 (Low is preferred)	500/250
High Temperature Foaming D6082-11	Sequence IV - A measured quantity of sample is heated to 49°C for 30 minutes and allowed to cool to room temperature. The sample is transferred to a 1,000-mL graduated cylinder, heated to 150°C and aerated at 200 mL per minute with dry air for 5 minutes with a metal diffuser. The amount of foam generated before disconnecting the air, the amount of static foam at optional times after disconnecting the air, and the time for the foam to collapse are measured and the percent increase in total volume calculated.	Lubricating oils (specifically transmission fluid and motor oil) at 150°C	50/0 (Low is preferred)	300/100

assess other air contamination factors. For instance, the air-release test can be used to determine the tendency of an oil to retain entrained air. It is based on ASTM D3427. Compressed air is blown into an oil sample using a defined method. The time required for the air to be reduced to 0.2 percent by volume is then measured. While the oil's viscosity will be one of the main factors in the air-release time, other variables related to the base oil formulation can influence these results as well.

Another method measures an oil's ability to separate from water. In the ASTM D1401 standardized procedure, the test oil is mixed with equal parts water and left in a graduated cylinder to separate. The faster the separation time the better. Although this is the most common test for demulsibility, the ASTM D2711 method is typically more effective for lubricants with viscosities above ISO 220.

Air contamination has the potential to be very destructive, and its effects on oil and machinery deserve more attention.

Oils with air-handling concerns usually have demulsibility problems. In other words, the causes of impaired demulsibility are often common to air-handling issues as well.

A third alternate test is based on ASTM D892. For this foam tendency/stability test, air is blown into an oil sample to produce foam. The foaming tendency and stability are then measured at 24 degrees C, 93 degrees C and then again at 24 degrees C. The initial foam volume is measured after each blowing (foam tendency) and again five minutes later (foam stability). See the table above for more details on this procedure.

Although testing an oil's air content may never be part of a standard test slate for routine sampling, this does not mean that it is unnecessary. Because of the nature of aerated oil, the air concentration that can be tested depends on the time in which it is allowed to sit undisturbed. This makes the typical method of testing oil, like collecting oil in a sample bottle, nearly irrelevant for air concentration testing. Testing for air is all about timing, so if any of these methods are to be applied, be sure to know the unique design requirements.

Regardless, a particular machine condition or recognized operating state can be more than enough cause to investigate and quantify air contamination. If foam is a persistent issue or an excess amount of aerated oil is seen through an oil sample inspection or sight glass, a careful investigation should be conducted to determine the source of the issue. There may be an easy solution, such as using a more appropriate lubricant formulation, or it may be more challenging, such as a machine design error. In any case, it's important not to overlook this valuable information, because air contamination can have very destructive effects. ■

About the Author

Bennett Fitch is a technical consultant with Noria Corporation. He is a mechanical engineer who holds a Machine Lubricant Analyst (MLA) Level III certification and a Machine Lubrication Technician (MLT) Level II certification through the International Council for Machinery Lubrication (ICML). Contact Bennett at bfitch@noria.com.

Petromin Corporation enters Indian Lube Market

Dr Mujahid Saleem , Director BMS Oils & Lubes India welcoming Mr. Sameer M Nawar, President, Petromin Corporation, KSA

Mr. Sameer M Nawar, President, Petromin Corporation, KSA with thier India product range at the Annual Dealers Conference in Jaipur.

Petromin Corporation, the oils and lubricants multinational from Saudi Arabia, organized a Press conference on 3rd May 2015 at Jaipur followed by a polo match as a part of their Sales and Distributors Meet, India 2015.

Petromin specialize in automotive, industrial and marine lubricants. BMS Oils & Lubes have been given distribution rights in India for Petromin Corporation products. Dr Mujahid Saleem & Dr. Shivraj Singh Rathore are directors of BMS Oils & Lubes

Petromin has been launched in 7 states of India with 53 distributors since the time it started its operations in India. Petromin Corporation claims that it is the only company which blends 100 percent Virgin Oil this being the USP it is mentioned on each and every package of Petromin product a consumer buys. Products are imported directly from Saudi Arabia. Petromin has introduced more than 150 SKU's in the Indian market and is planning to increase its product range in future. All Petromin products are appreciated by trusted automobile makers, industry leaders and fleet owners all around the globe for its superior performance in all extreme weather conditions.

Mr. Sameer M Nawar - President, Petromin Corporation, Jeddah (KSA) and Mr Imran Mufti – Vice president Marketing and Sales were both present for the Meet at Jaipur. Mr. Nawar expressed his satisfaction with the performance of BMS Oils and Lubes and anticipates a bright future for Petromin in India.

. Petromin expects 2 per cent of Indian lube market share within the next four years.

Peabody's Lazarus Translates Training into Oil Analysis Success

WITH MORE THAN 60,000 GALLONS OF BULK LUBRICANTS AND 1 MILLION GALLONS OF BULK DIESEL FUEL TO MONITOR, the oil analysts at Peabody Energy's North Antelope Rochelle Mine (NARM) must be experts in their field. Training and certification have become the backbone of the company's vision for establishing a world-class oil analysis program. Ted Lazarus has been with Peabody Energy subsidiaries for 19 years, with the past eight years as an oil analyst in the reliability department. In addition to analyzing nearly 500 oil samples and reviewing more than 50 filter analysis reports on a weekly basis, Lazarus and his team of analysts provide training to the entire mine on the storage and handling of lubricants and fuels, as well as education on the fundamentals of lubrication.

Name
Ted Lazarus
Age
45
Job Title
Oil Analyst
Company
Peabody Energy's North Antelope Rochelle Mine (NARM)
Location
Gillette, Wyo.
Length of Service
Length of Service
19 years

Q: What types of training have you taken to get to your current position?

A: I have attended training courses for oil analysis through Noria Corporation as well as several seminars related to the field of oil analysis.

Q: What professional certifications have you attained?

A: I am currently certified as a Level III Machine Lubricant Analyst through the International Council for Machinery Lubrication.

Q: What's a normal work day like for you?

A: Our oil analysts are involved in every aspect of the maintenance function at NARM, from heavy mining equipment to the processing plant. We work closely with planning and scheduling along with the technicians on the floor. We monitor all assets daily through oil and filter debris analysis and offer assistance as needed in root cause failure analysis.

Q: What is the amount and range of equipment that you help service through lubrication/oil analysis tasks?

A: We currently monitor more than 300 individual assets and nearly 3,000 separate components. Our assets include a fleet of 60 ultra-class 360- and 400-ton haul trucks, 27 bulldozers, 13 motor graders, 11 electric shovels, four ultra-class loaders, two walking draglines and numerous pieces of support equipment and plant gearboxes. Our components range from 20-cylinder industrial engines and diesel engines to hundreds of individual hydraulic, transmission and final drive systems.

Q: On what lubrication-related projects are you currently working?

A: We are currently working on our diesel fuel cleanliness standards by improving our bulk tank filtration to meet tougher original equipment manufacturer (OEM) requirements. We are also upgrading our bulk lubricants to comply with upcoming Environmental Protection Agency (EPA) emissions standards for Tier-4 engines. We are always looking for advanced methods to improve our filter debris analysis program on our industrial engines, and we are currently developing a centrifuge cake analysis program on our engines as well. Our coal prep plant is installing state-of-the-art filtration and breather systems on all production gearboxes to improve reliability and extend the life of the lubricants we are using.

Q: What have been some of the biggest project successes in which you've played a part?

A: Just in the past year, I participated in the design and construction planning of our new multi-million-dollar bulk lube storage facility. I helped develop and implement the use of filter debris analysis on all of our industrial diesel engines. Since 2008, when we implemented the program, we have nearly doubled our budgeted engine life in several fleets.

Q: How does your company view machinery lubrication in terms of importance and overall business strategy?

A: Our company views machinery lubrication as a critical part of our overall maintenance program. Through a comprehensive oil analysis program and a well-developed hydrocarbon management program, we are able to show significant savings in maintenance costs every year that in return contribute to the company being one of the lowest cost coal producers in the world.

Q: What do you see as some of the more important trends taking place in the lubrication and oil analysis field?

A: Given the fact the majority of my time and expertise are spent in the monitoring of our industrial diesel engines, I would say some of the most important trends I am seeing are in the up-and-coming lower emissions standards that are challenging the industry. The ultra-low-sulfur diesel fuels and exhaust gas after-treatment processes that will be required in the Tier-4 engine designs have also led to significant changes in oil and fuel formulations. In addition, the use of full-flow spin-on oil filters is giving way to more efficient centrifugal filtration units, which in turn has changed the way we view standard oil analysis and filter debris analysis.

Q: What has made your company decide to put more emphasis on machinery lubrication?

A: Several things have brought machinery lubrication into the spotlight in our company. I would say the largest contributor is communication. We have leadership that is second to none. Our reliability department is relatively young, being assembled in the past five years. The strong leadership and management of our department has been the vehicle that has enabled our successes to be communicated to both the site management and corporate management levels. Having that level of leadership and team members who are truly experts in their fields has given us the credibility with senior management to trust in what we do.

JOHN MARTINEZ, TATE AND LYLE

ROOT CAUSE ANALYSIS: From Detection to Implementation

Root cause analysis is an important component to any maintenance department. Its goal is to eliminate the source of equipment failures, not simply the symptoms, in order to prevent those issues from recurring. Performed correctly, it can reduce problem areas in the plant and allow for more consistent, stable production.

Setup and Documentation

When beginning a root cause analysis, you will need to be able to capture all failures that require investigation. There should be a system for viewing all of the failures that have occurred over a set period of time. For larger plants, this information should be reviewed daily. In smaller plants, weekly or monthly may suffice, depending on the number of failures and the frequency of their recurrence.

After evaluating the failures over time, your next step is to determine when a root cause analysis is necessary. A quick way to do this is to establish a trigger or a desired service life for your equipment. This can be measured in months or years and will be different for each equipment type. An example would be using a baseline of three years for motors and one year for a pump. With these guidelines, any motor failure in less than three years and any pump failing in less than one year would call for an analysis to be performed. The lone exception would be for critical equipment. If an extremely critical piece of equipment fails, a report may be required.

Create a Database for Tracking Failures

Once you have a list of failures, begin tracking the number of failures and the status of the analysis. To do this, you will need to create a database where all root cause reports can be viewed in one place. At the very least, the database should include the equipment number or name, the date of the failure, the date of the last failure, the area where the equipment is located, the notification or work order number, a brief explanation of the failure, possible solutions and the name of the person responsible for the solution.

An example of this type of database is shown on page 30. Please note that not all the information will be readily available and may not be entered into the database until much later in the investigation. However, as much information as possible should be included to help establish which facts are already known.

Gather Equipment Information and History

The next part of the process may be the most critical. Gather as much

Photographs provide the best way to show the magnitude of a failure.

information as possible, including what happened during the failure and the equipment's failure history. Find out what has been tried previously to correct the problem. If these solutions did not work, you will save time by not trying them again.

Utilize all of your resources. Talk to electricians, mechanics, shift personnel, operators, clean-up crews and anyone with knowledge of the equipment. These individuals may offer important clues as to why the problem occurred and possibly even solutions or suggestions for improvements. This is imperative if the failure happened on the weekend or on a specific shift. Speak to those who worked during the shift for details on how and why the failure happened when it did. Start the process as soon as possible. The sooner you start, the more accurate the information will be and the easier it will be to recover or remember.

Next, check your plant's system that tracks equipment failures. You should be able to see the frequency of the failures and can then ask questions, such as does this failure occur in a periodic timeframe or a specific time of day/year, i.e., every three months, only at night, in the winter, etc. If the analysis is performed early enough, you may be able to observe the equipment while it is still running and on the verge of failing, e.g., a leaking pump that has not yet been changed. You can then evaluate the equipment's running conditions, some of which may be a source of damage.

In addition, always inspect the equipment when it is disassembled to determine which components failed and to look for signs of damage not visible from the outside. These might include indications of overheating, lack of lubrication, misalignment and vibration.

Be sure to take pictures and document everything. Use a notebook or tablet and a digital camera. You can't remember everything that happened or exactly how it looked, especially if you are writing the report days or weeks later. A photograph is also one of the best ways to show how bad the failure was to those who did not see it.

Writing Reports

When writing the report, remember that you want readers to be able to understand and follow everything being presented. Avoid technical words or overly complicated terminology. Keep it simple and stick to the facts. The report may be read by a large number of people who do not have the same experience or specialized knowledge that you do.

Do not include anyone's name. Instead, use only job titles unless you need to assign a name to the solution. The report should not become a blame-game or finger-pointing exercise. You also do not want to alienate any individuals because they may not offer you information the next time you are investigating a failure.

Include the photographs taken while gathering information. If someone does not believe a condition or problem exists, there is no denying it when you have a picture of it. Be sure to write captions to help describe what is shown in the photographs in case an object or situation is not easily recognizable.

Every report should at least include the equipment information, the date of the current and last failure, an explanation of the failure and the findings with an idea of the root cause, an explanation of the past history, the proposed solution, an assignment of a person(s) to the solution, and appropriate data to help explain the failure (pictures, graphs, trends, etc.).

Reviewing Reports

Schedule a meeting to review all the reports and to come to an agreement as to what the solution should be. Send the reports in advance of the meeting to give everyone a chance to look over and discuss the issues and possible solutions beforehand. This is better than first presenting the reports during the meeting and not allowing individuals to conduct their own research or investigation.

ROOT CAUSE ANALYSIS RECORDS								
DATE OF FAILURE	WORK ORDER #	DATE OF LAST FAILURE	AREA	EQUIPMENT ID NUMBER	FAILURE DESCRIPTION	SOLUTION	PERSON RESPONSIBLE	DATE COMPLETED
01/02/2014	90057499	01/18/2013	ALC	P-5680 Ferm. 80 Recirc. Pump	Seal leaking	Pump operation	Doyle Baxter	01/31/2014
01/02/2014	90056756	10/15/2013	BRG	C-4514 Pellet Airbelt	Take-up roll bearing failed	Research bearing type	Kenny Evans/ Kurt Bradley	NOT DONE
01/03/2014	90057464	12/02/2013	REF	P-6926 Car Wash Return Pump	Seal failed	Power monitor option	John Martinez/ Jeff Mitchell	02/25/2014
01/03/2014	90057353	03/25/2013	W/M	M-3107 3rd Grind Mill #1 (Fixed End)	PdM bearings impacting/ packing failed	Look into new packing/ adjusting packing	Kurt Bradley/ Matt Prock	NOT DONE
01/06/2014	11071264	01/14/2013	REF	P-6640 Raffinate MR Feed Pump	Seal failed	Change seal type on 3,600-rpm pumps	Kenny Evans/Matt Prock	02/03/2014

An example of a database for tracking equipment failures

Attendance at the meeting should be mandatory for area managers and engineers, maintenance managers, maintenance coordinators (both electrical and mechanical), area process supervisors and key process technicians, mechanics and electricians. Attendance may be optional for the operations manager, plant manager and planner. You can establish the meeting's importance by having the plant and operations manager question absent managers and engineers as to why they were not in attendance.

Review each report, even if the failure was small, to make everyone aware of what happened and what is being done to prevent future failures. Come to an agreement on what the next steps should be so it is the entire group's decision rather than just one person's idea. Now you have a team of 10 to 20 individuals who are invested in the results.

The frequency of your meetings should depend on how severe the failures are and how many have occurred. The more failures, the more often you should have meetings to discuss the problems.

Implement and Track Changes

Changes should be monitored by a lead person (usually a maintenance or reliability engineer). This person will create a method to track changes and observe what did or did not work. The team will also need to assign an individual and a date for completing the proposed solution. The lead person will then contact this individual to determine if the change has been made and if it was successful.

A meeting should be scheduled for the lead person to review the solutions with the team. This will allow the group to understand what has been done to solve the problem and if the suggested action worked or if additional time or resources are needed. Similar to the database created previously, a simple document can be used to chronicle which ideas have been implemented and which remain to be carried out.

Success Stories

As you continue your root cause analysis program, be sure to use success stories to credit yourself, your team and the overall plant. Not everyone is aware of the changes you have made or the problems that the team has solved. Making this known to team members will show them how their efforts are making a difference and having a positive impact. Try to spread the word plant-wide in a newsletter or as a topic in a plant meeting. The more people who are cognizant of the effect that the root cause team has had on their job, the more willing they will be to provide you with information and suggestions to help in your investigations.

Following are a few success stories that show how root cause analysis not only can impact a plant's bottom line but also make workers' jobs easier.

Wet Mill Sump Pump

A wet mill sump pump failed on average every two to three months over a three-year span. The solution was implemented in July 2011, and no failures have occurred since. While this was not a huge cost savings, it was a nuisance to both mechanics and technicians. Previously, mechanics had to replace the pump four to six times a year, and technicians had to walk in 4 to 6 inches of wet slop each time the pump failed.

Wet Mill Gearbox

A wet mill gearbox was failing every three to four months over a two-year span. The failures would upset the process system and reduce production by 40 percent whenever the conveyor was down. In February 2011, the maintenance team designed a new seal. The gearbox has not failed since.

Finished Product Pump

A finished product pump failed every three months over a five-year span. After many attempts to fix it, the problem was finally corrected in May 2012. The pump was then replaced in November 2013. The correction prevented five failures before the pump was replaced for a savings of more than $400,000 when factoring in product reduction during the 12 hours the system would be down.

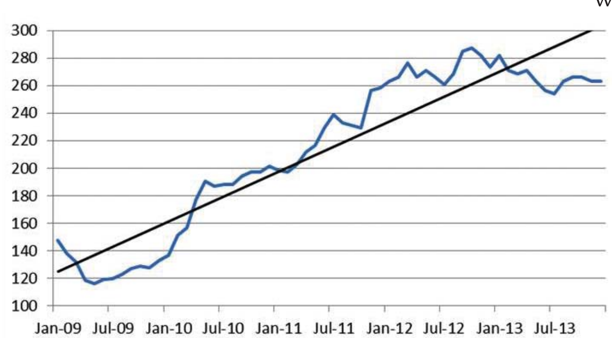
Finished Product Recompressor

A finished product recompressor was rebuilt and modified over a five-day shutdown. When the compressor was started, onsite oil analysis found water in the oil. Root cause analysis showed that the heat exchanger had developed a leak while it was down. The oil analysis saved more than 18 hours of downtime for a savings of $140,000. This did not include the possible damage to the new equipment.

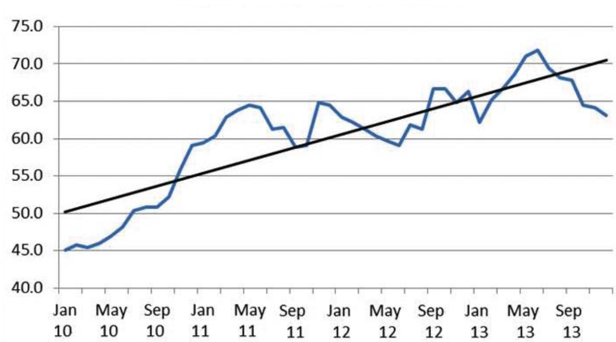
Pump and Motor MTBF

Through root cause analysis, better lubrication practices, vibration and oil analysis, an improvement in mean time between failures (MTBF) for both pumps and motors was achieved. Since MTBF was tracked in 2009, pump life increased from 50 months to 63.2 months as of December 2013. This was an increase of almost 25 percent in pump life over five years. The motors had an even greater increase of 78 percent from 148 months in January 2009 to 263.5 months in December 2013.

2010-2013 Pump MTBF - Loudon Plant



2009-2013 Motor MTBF - Loudon Plant



These examples show how root cause analysis can lead to improvements in mean time between failures for a plant's pumps and motors.

Final Thoughts and Suggestions

A root cause analysis program can offer benefits for almost any plant. It eliminates repeating problems and allows you to focus on other issues. Always try to gather as much information as possible. If you don't solve the problem the first time, the additional information may be useful for a future solution.

Along those same lines, you should include as many people as possible in the root cause meeting. This will enable you to form a team of people who care about the problem and are involved in the decision-making or changes. Although you may come up with a solution, it doesn't necessarily mean that it will get accomplished. You must follow up on the suggestions and assign individuals to each of them for accountability. If someone is not tracking the changes, they will never be completed.

Concentrate on the easy wins and the critical big problems. The easy wins will get some buy-in from other areas of the plant, which will cause others to want to be more involved in the solutions. The critical problems are those that will have the most impact on the plant, either the most repeated failures or the most savings if eliminated.

In terms of costs, track the savings from the changes that have been made during the analysis. You may not track every single change but be sure to include the more valuable ones. This will give you the opportunity to justify the program's value.

Form a team to help gather information and come up with solutions. If you try to do it all on your own, you will not succeed. There are simply too many items to track and changes to make. While you would like to have the entire plant as part of your team, utilize trusted technicians and maintenance personnel who have shown some interest. Provide feedback on how they have helped, when the changes will be made and if they were successful. The more of an impact they feel they have, the more they will want to help.

As you create your team, don't focus on whose fault it was but rather on what the problem is and how to reach a solution. In the end, the goal is to eliminate the source of the issues instead of the person who did the wrong thing.

Finally, relay to everyone involved that root cause analysis is performed to help everyone at the plant. The more people believe this and see the difference that it can make, the more they will want to be involved. More importantly, when they realize how it can help them, they not only will give you more information, but they also will come to you with their problems because they know that you produce results. ■

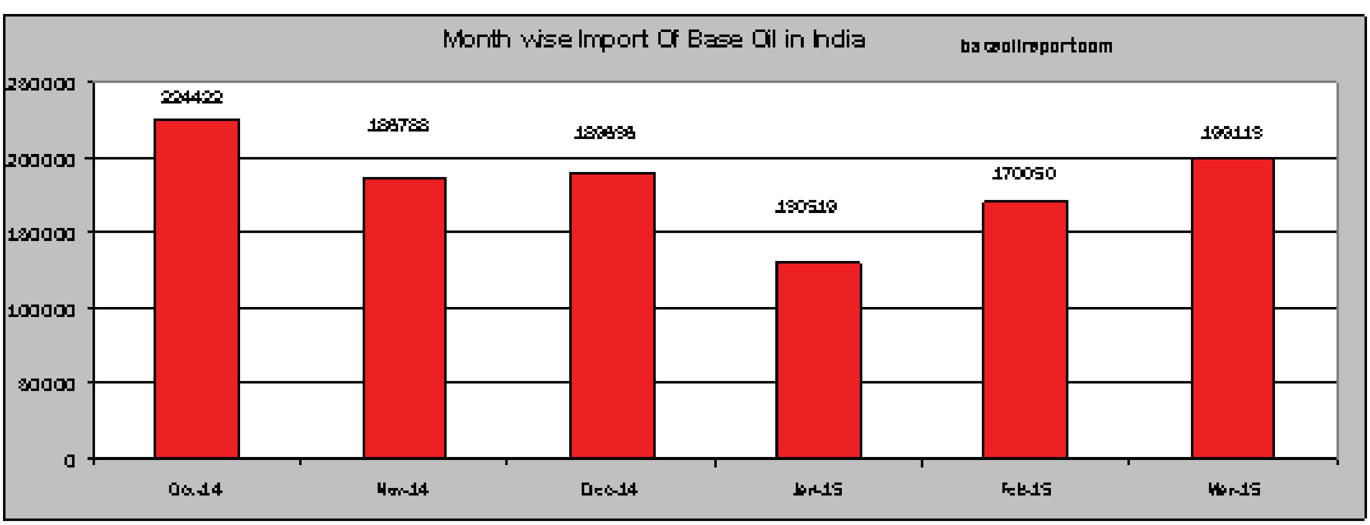
DHIREN SHAH

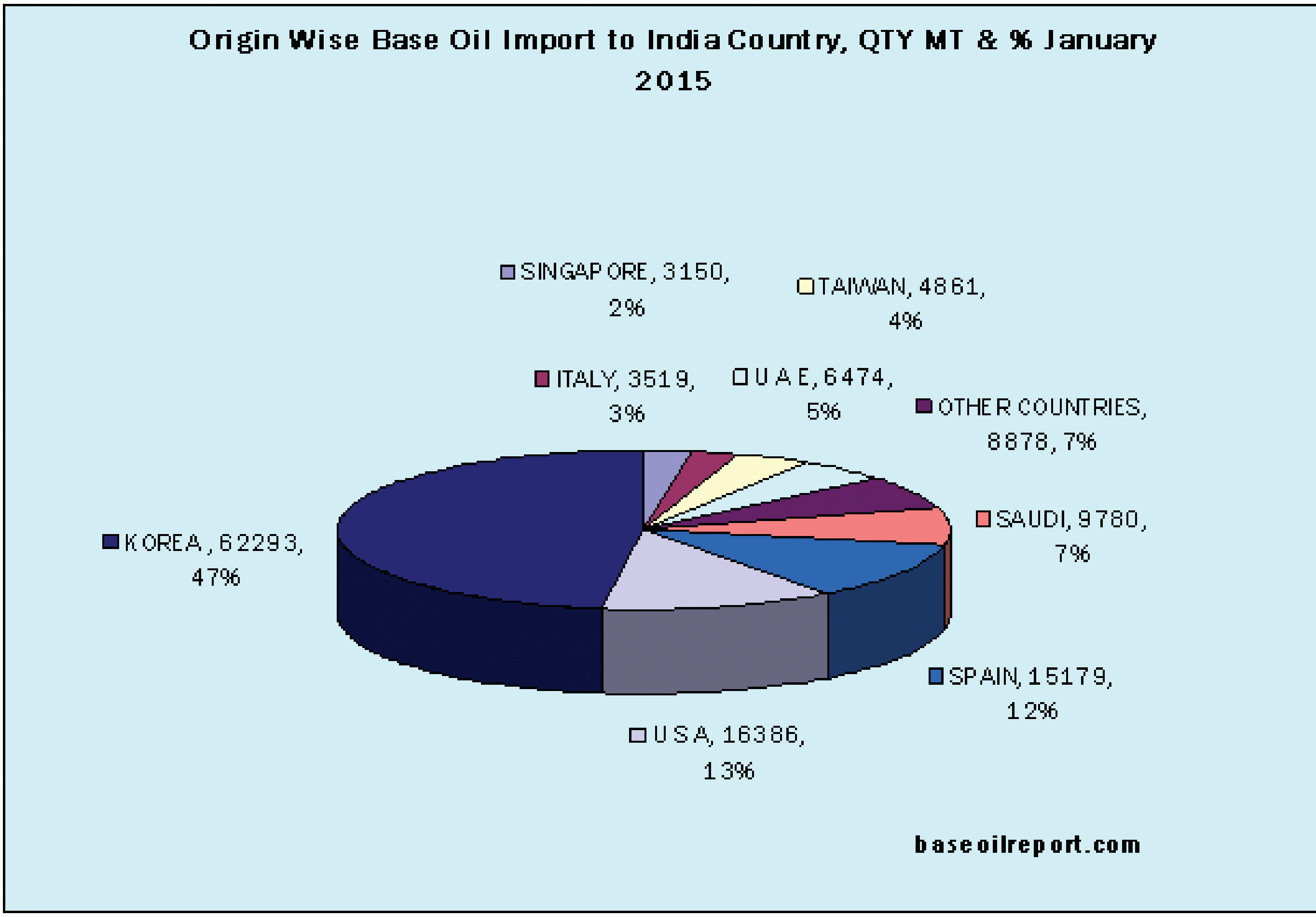
BASE OIL REPORT

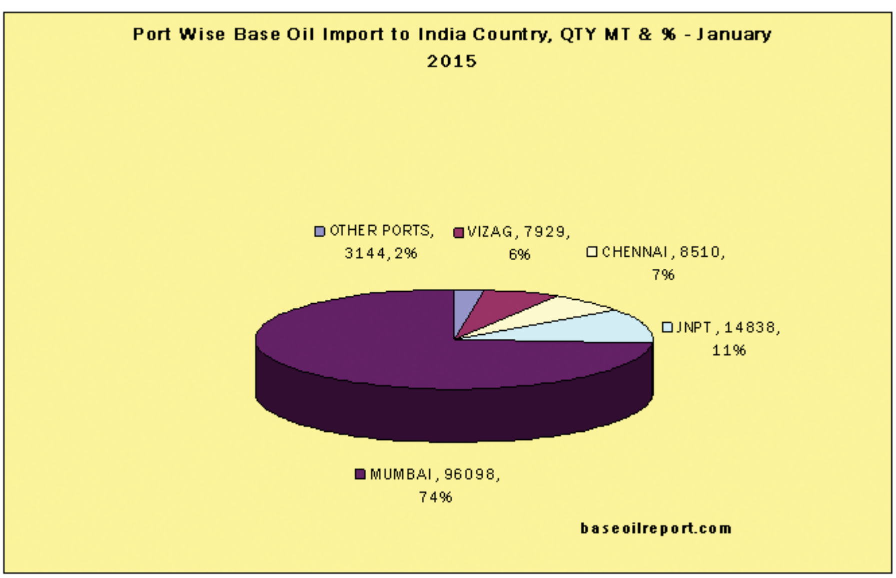
During the last few days crude-oil futures moved in a narrow price range in early Asian trade, with gains capped by worries about a recovery in U.S. shale-oil production and as OPEC's meeting draws closer. On the New York Mercantile Exchange, light, sweet crude futures for delivery in June traded at $59.92 a barrel, up $0.23 in the Globex electronic session. July Brent crude on London's ICE Futures exchange rose $0.16 to $66.97 a barrel. Nymex crude ended 0.5% higher last week and has been up for three consecutive weeks, while Brent crude gained 1% last week and has been up for seven of the past nine weeks. Oil-price gains were capped due to some weak U.S. economic data from last week and on worries U.S. shale production could recover quickly if prices kept on rising. Last week's Baker Hughes U.S. drilling rig-count also lost momentum, falling by 8 rigs to 660 rigs, the smallest fall in 23 weeks. "Reports suggest certain shale formations (such as Eagle Ford and Bakken) are starting to add rigs, which is further weighing on sentiment," ANZ Bank said. ICE gasoil for June changed hands at $613.75 a metric ton, up $2.75.

Base Oil Group I & Group II CFR India prices:-

Month	Group I - SN 500 Iran Origin Base Oil CFR India Prices	N-70 Korean Origin Base Oil CFR India Prices	J-150 Singapore Origin Base Oil CFR India Prices	HYGOLD L 2000 USA Origin CFR India Prices
January 2015	USD 750 - 760 PMT	USD 735 - 745 PMT	USD 760 - 770 PMT	USD 770 - 775 PMT
February 2015	USD 635 - 645 PMT	USD 655 - 660 PMT	USD 680 - 690 PMT	USD 685 - 695 PMT
March 2015	USD 590 – 600 PMT	USD 635 - 640 PMT	USD 665 - 670 PMT	USD 670 - 685 PMT
April 2015	USD 620 – 630 PMT	USD 665 - 670 PMT	USD 695 - 700 PMT	USD 700 - 715 PMT
	Since January 2015, prices have gone down by USD 60 PMT (9%) in April 2015.	Since January 2015, prices have decreased by USD 65 PMT (9%) in April 2015.	Since January 2015, prices have dipped down by USD 65 PMT (8%) in April 2015.	Since January 2015, prices have gone down by USD 60 PMT (8%) in April 2015.







We can see that when Compared to the previous month i.e. February 2015. Base Oil import of the country has increased by 13% in March 2015. Compared to the same month last year i.e. March 2014, Base Oil import has gone up by 17% in March 2015.

The Indian base oil market remains steady with inventories at optimum levels with surplus of imported grades. During the month of March 2015, approximately 199113 MT have been procured at Indian Ports of all the grades, which is 17% up as compared to Feb 2015, Major imports are from Korea, Singapore, USA, UAE, Iran, Taiwan, France, UK, Netherlands, Japan, Italy, Belgium, etc. Indian State Oil PSU's IOC/HPCL basic prices for SN – 70/N – 70/SN – 150/N -150 marked up marginally by Rs. 0.80 per liter, while SN - 500/N - 500 is jumped by Rs.3.00 per liter. Bright Stock price is up by Rs. 1.70 per liter. The prices are effective May 01, 2015. As per the information there is no change in the prices for the second half of current year. Hefty Discounts are offered by refiners which are in the range of Rs. 15.00 – 17.00 per liter for buyers who commit to lift above 1500 MT. Group I Base Oil prices for neutrals SN -150/500 (Russian and Iranian origin) are offered in the domestic market at Rs. 44.70 – 44.80/45.70 – 45.95 per liter, excise duty and VAT as applicable Ex Silvassa in bulk for one tanker load. At current level availability is not a concern.

The Indian domestic market Korean origin Group II plus N-60–70/150/500 prices at the current level have been marginally up. As per conversation with domestic importers and traders prices reflects minimal changes for N – 60/ N-150/ N - 500 grades and at the current level are quoted in the range of Rs. 44.65 –44.95/46.30 – 46.60/47.80 – 48.40 per liter in bulk respectively with an additional 14 percent excise duty and VAT as applicable, no Sales tax/Vat if products are offered Ex-Silvassa a tax free zone. The above mentioned prices are offered by a manufacturer who also offers the grades in the domestic market, while another importer trader is offering the grades cheaper by Rs.0.35 – 0.45 per liter on basic prices. Light Liquid Paraffin (IP) is priced at Rs. 44.95 – 45.40 per liter in bulk and Heavy Liquid paraffin (IP) is Rs.49.50 – 50.50 per liter in bulk respectively plus taxes extra.

Export of Light & Heavy White Oil

Argentina	Algeria	Australia	Bangladesh	Brazil
Bulgaria	Cambodia	Chile	Djibouti	Egypt
Finland	Greece	Guatemala	Indonesia	Iran
Italy	Jordan	Kenya	Kuwait	Malaysia
Mozambique	Myanmar	Nepal	New Zealand	Nigeria
Pakistan	Peru	Philippines	Poland	Russia
South Africa	Senegal	Singapore	Spain	Sri Lanka
Taiwan	Tanzania	Thailand	Turkey	UAE
UK	USA	Ukraine	Vietnam	Yemen
Yugoslavia				

Export of Transformer Oil in January 2015

Bahrain	Bangladesh	Brazil	Indonesia
Iran	Korea	Malaysia	Morocco
Nepal	New Zealand	Nigeria	Oman
Paraguay	Peru	South Africa	Saudi Arabia
Singapore	Syria	Tanzania	Thailand
UAE	Vietnam		

About The Author
Dhiren Shah is a Chemical Engineer and Editor – In – Chief of Petrosil Group

हिन्दुस्तान पेट्रोलियम

HP

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Lithium Soap Multipurpose Grease For Plain And Anti-friction Bearings Which Leads To Longer Bearing Life. Lithon M-2 Contains Molybdenum Disulphide Making It Suitable For Lubrication Of Splined Shafts

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Lithium Base Complex Grease For Ball And Roller Bearing Lubrication. Suitable For High Temperature Application Upto 190 Degree Centigrade.

LIMAPLEX HTX

Available in NLGI 2, 3

Calcium sulphonate grease for high Temperature application encountered In steel plants - bearing lubrication.

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Extreme Pressure Grease For Heavy Loaded Bearings. Both Plain & Antifriction Type Operating At Moderate Speeds & Temperatures Upto 70 Degrees Centigrade Used In Roll Bearings Of Rolling Mills.