May - June 2020

Machinery Lubrication

INDIA

machinerylubricationindia.com

COVID-19

Lessons from Lockdown

INSIDE

FLUIDIC FORCE FOR INDUSTRIAL GROWTH

Hydraulic Oils - SERVOSYSTEM series (HLP/XLP/HLP AF/HLP-D)

- Meet International Standards with respect to vane pump wear control, demulsibility, filterability and foam control
- Possess High Viscosity Index and FZG load carrying ability to protect hydraulic systems
- Outstanding oxidation and thermal stability ensuring long service life

SERVO – India's first choice

SERVO® INDUSTRIAL OILS

100% PERFORMANCE. EVERYTIME.

Industrial Oils | Automotive Oils | Marine Oils | Greases

MLI May-June 2020

TABLE OF CONTENTS

Machinery Lubrication INDIA

COVER STORY

Lessons from Lockdown

The entire world is undergoing an unprecedented lockdown due to pandemic (Covid-19) and it has affected the world economy and industries in many ways. Here are some lessons from the lockdown.

10

AS I SEE IT

The Power of Truthful Assessments in Jumpstarting a Reliability Transformation

3

EDITORIAL FEATURES

Publisher's Note

Covid-19 scenario has thrown up completely different work challenges.

As per the International Monetary Fund (IMF), COVID-19 will result in a global recession worse than the global recession of 2008-2009. But there is light at the end of the tunnel: The IMF notes that recovery in global economic output could be as early as 2021. The Indian economy is still not well connected with the global economy as other large economies. Economic growth in the country is more reliant on domestic consumption than exports. Thus, reduced consumer spending in other economies will not have a significant impact on Indian economic growth. In addition, the reduction in crude oil prices will help reduce India's oil import bill. This will give the government more fiscal room to help revive the economy.

A lockdown was announced to avoid the spread of pandemic and businesses & manufacturing operations were instructed to shut shop. This resulted in an unstructured stoppage of operations where little or no precautions could be taken. Similar situation is prevailing during the startup of the factories. These factory startups, without taking required precautions, have resulted in avoidable accidents which have killed and injured many in and around the locations where the factories operate.

Equipment stoppage for prolonged period and startup after a prolonged closure must be done with extra care where precautions need to be observed for safety of workmen and residents staying close to the manufacturing sites. Our publication is proud to share a startup guide which not only covers the safety precautions required to be taken due to the current pandemic, but also all lubrication related checks required (check page 31 for details).

India accounts for nearly 7% of global lubricant demand. While the overall lubricant demand growth in the country has slowed in the last couple of years, it remains one of the fastest-growing finished lubricant markets in the world.

In the post-COVID-19 economy, lubricant suppliers will have to continue monitoring the environment for business opportunities and challenges arising from such market trends as increased synthetic penetration, introduction of new regulations like Bharat Stage VI, extension of oil drain intervals, changes in automotive and industrial technologies, continued EV penetration, and changing consumer preferences.

The lockdown has taught us to evolve, upgrade, be resilient to change and overcome the challenges. The nation has showed remarkable solidarity and we shall pass through this together.

We would like to thank our readers for the great response to our previous edition's cover story – "Oil Sampling and Filtering: How to Save Money and Reduce Your Carbon Footprint".

Our current issue's cover story is "COVID-19: Lessons from Lockdown" which will help our readers to make the required changes in the work planning to make sure that we are always ready to face a situation like lockdown in the future also.

You will find many more interesting & useful articles in this edition.

As always, we welcome your feedback & suggestions.

Stay Safe & be healthy

Warm regards

Udey Dhir

The Power of Truthful Assessments **in Jumpstarting a Reliability Transformation**

"Change starts by asking or investigating what's wrong. This quest begins the assessment stage of programmatic transformations in reliability."

One of the best examples of courage is the man who asks to hear what he doesn't want to hear. While it's human nature to fear or dread bad news, the wisest among us will frequently ask for it. Why? Because winners change what losers want to leave the same. Change starts by asking or investigating what's wrong. This quest begins the assessment stage of programmatic transformations in reliability. Assessments are also referred to as audits, surveys, benchmarking and gap analysis.

It can't stop there. The next step is equally difficult and perhaps moves you out of your comfort zone. You must accept or acknowledge what is wrong. Many people instinctively want to play defense. You've seen how they respond during a substance-abuse intervention. Denial may even lead to lashing out at others to shift focus. Tunnel vision and denial impair real progress.

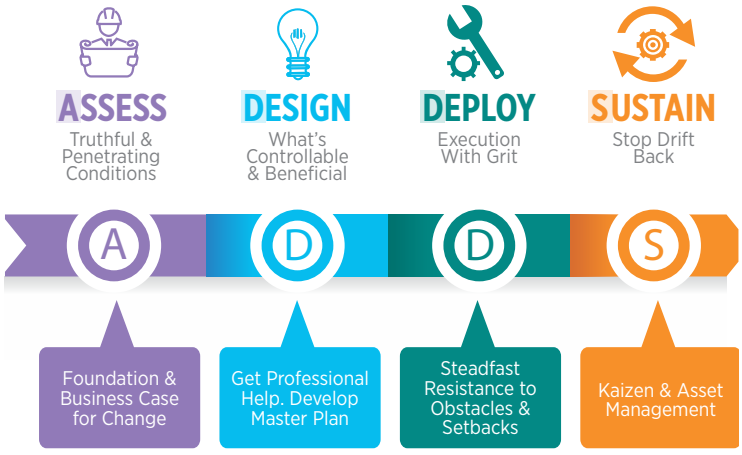


Figure 1. ADDS defines the four stages of a reliability transformation.

Acceptance initiates corrective action. The world rewards action, but any action is not good enough. Leverage the experience of others who have done what you're trying to achieve. Ensure there is no commercial bias. While do-it-yourselfers may have confidence, history has shown that many are met with a succession of scrubbed missions. It's better to learn from the mistakes of others. Swallow your pride and get a professional to coach you through the process.

Engineering and planning come before physical action or change. Make sure it's careful and detailed, in other words "good engineering." Consult standards that document the unified opinions of experts, such as ICML 55. Stack the deck by focusing first on quick kills and low-hanging fruit, especially opportunities where there is solid economic benefit.

Deployment is next. You will be met by challenges, resistance, obstacles and setbacks. Stay the course but accept the occasional necessity of moderate course corrections. Don't stop executing.

Change frequently is followed by entropy, which refers to the natural transition from order to disorder (second law of thermodynamics). Just as rocks weather and crumble, iron rusts and people grow old, new systems and practices will age, degrade and lose effectiveness. The fight against entropy is the concept behind sustainability. The best strategy here is kaizen or continuous improvement. It can't get worse if you're constantly making it better.

The programmatic transformation approach described above is the concept behind ADDS (assess, design, deploy and sustain). See Figure 1. This column will focus on the assessment stage of ADDS. Future columns will address the other stages.

Begin the Transformation Journey

Truthful assessments require well-engineered and structured audits by a competent third party, so no oil companies, equipment suppliers, onsite old-timers or drinking buddies allowed. It's important to get it truthful and to get it right. If the doctor asks you where it hurts, you must not hold anything back. This is equally true for assessments.

Noria has learned much in more than 20 years of performing assessments. The results that are reported are almost always a surprise to management and other stakeholders. Of course, no one likes being told their baby is ugly, but without the knowledge and then acceptance of what's wrong, no beneficial progress can be made. Pain can be a great source of fuel to drive your transformation.

Most assessments produce an overall score scaled 0 to 100. Low scores should not make you feel depressed or angry but rather just the opposite. View this score as a low-hanging fruit meter. The lower the number, the more accessible and delicious the fruit. High scores require more work and the need to reach further into the tree or to start climbing.

Now, why is it that low-hanging fruit is usually invisible to those who work closest to it? Often it is willful blindness or simply being unable to see what's on the tip of your nose. This also is known as unconscious selective attention. Your nose is always in view of your eyes, but yet your brain does not register its presence.

Likewise, you are exposed to many things in a plant environment that you seemingly do not see. These are things that your brain has cancelled out.

There is willful blindness, too (not wanting to see or remedy). Basically, you tell lies to yourself about what you don't want to know or believe to exist. Eventually, this puts you in a state of oblivion and unconscious incompetency. This is like kaizen in reverse.

A professional assessor or auditor is not burdened by such mental filters or blindness. He or she is trained to see it all and report what is seen. At its best, assessing is investigative, penetrating and purposeful. It's an assessment of the good, the bad and the ugly. It seeks opportunities for change and improvement.

ADDS Seeks the Controllable and the Exploitable

An assessor should search for meaningful and exploitable gaps between the current state and the optimum reference state

Machinery Lubrication India

Publisher
Udey Dhir - udeydhir@tribologysolutions.com

Creative Director
smassociates@gmail.com

Advertisement Sales (India)
admin@machinerylubricationindia.com

Advertisement Sales (US/Canada)
Teresa Dallis - tdallis@noria.com

Advertisement Sales
(All Other Countries)
ads@machinerylubricationindia.com
admin@machinerylubricationindia.com

CORRESPONDENCE
You may address articles, case studies, special requests and other correspondence to our

Operation office :

Editor
213, Ashiana Centre, Adityapur,
Jamshedpur-831013, India
email : editor@machinerylubricationindia.com
Tel: +91-657-2383238
Tel:(USA): +1-918-960-9738

Marketing Office
Rider House, 136,
Sector 44, Gurgaon-122003, Haryana
National Capital Region, India

Machinery Lubrication India Volume 47 - Issue 3, May-June 2020 is published bi-monthly by VAS Tribology Solutions Pvt. Ltd. Operation Office:213, Ashiana Centre, Adityapur, Jamshedpur-831013, India.

SUBSCRIBER SERVICES: The publisher reserves the right to accept or reject any subscription. Send subscription orders, change of address and all related correspondence to: VAS Tribology Solutions Pvt. Ltd. Operation Office:213, Ashiana Centre, Adityapur, Jamshedpur-831013, India.

(ORS). The ORS is similar to best practice but with a strong emphasis on the "optimized" state, which can vary between applications and the necessity of being measurable and/or verifiable. Refer to previous *Machinery Lubrication* articles for a more detailed explanation of the ORS.

When attained, an optimized state of reliability is achieved by practical choices that balance resource constraints, application conditions and potential benefits against the ideal. Depending on machine criticality and the potential cost of failure, you want to identify the optimized spend for reliability. You don't want excessive, wasteful spending. At the same time, you don't want to starve your machines or program of needed reliability resources.

The ORS seeks precision. For instance, which machines require 3-micron filtration, and which do not? Which machines call for premium synthetic lubricants, and which do not? Which machines need online and real-time condition monitoring, and which do not?

While an ADDS assessor searches for low-hanging fruit, several things must be kept in mind. These include the need to prioritize and focus on opportunities that are the easiest to control and change, the possible risks and potential disruption associated with change (remembering if it ain't broke, don't fix it), the cost and complexity of change, and the magnitude and certainty of potential benefit. Always consider changes that mitigate failure modes and maintenance costs. These should direct attention to opportunities based on mission-critical machines and applications.

The Most Bountiful Harvest

Assessors and condition monitoring analysts have one thing in common. They both are looking for correctable faults that produce saves before they advance to failures and costly misses. By addressing issues at the assessor level (from periodic assessments), you have far fewer faults hidden in your machines to find later at the condition monitoring level by analysts (vibration, oil analysis, acoustics, etc.). In other words, you don't have to detect what doesn't exist.

Assessments are designed to search for faults and issues of all types — specific, general and programmatic. Assessment types vary depending on the intended purpose or objective. At a more granular level, these might relate to skills, workforce, tools, methods, maintenance periodicity, lubricants, inspection, storage and handling, machine modifications, and condition monitoring. Holistically, an assessment should examine communications, documentation and records, data management, work management, asset management, reliability-centered maintenance (RCM) elements, total productive maintenance (TPM) emphasis, organizational alignment, etc.

Assessments start the ADDS process. They are proactive maintenance at their core by reducing the root causes, frequency and severity of failures. They also seek or examine the fundamental elements of a planned, structured, and organized maintenance and reliability program.

One could say it's like doing a root cause analysis (RCA) on your overall program as well as the general state of your machines. In other words, ADDS emphasizes the need to seek and deploy lasting improvements that spread benefits plant-wide, not just to specific machines. End-to-end transformations from ADDS can lead to immediate benefits, but the real purpose is more long term and systemic.

Can You Assess Culture?

I heard someone proclaim that the best reliability programs are about 80 percent culture and 20 percent everything else. At first, this may sound ridiculous or absurd. However, the more you think about it, the more it makes sense. Reliability is a behavioral science. It's driven by the actions of people — what they do and what they don't do. Culture drives these actions, as

does leadership, training and measurement. They are very much interrelated.

We've seen organizations that have a strong safety or quality culture. How do you assess and strengthen reliability culture? One of the best ways is to examine metrics or key performance indicators (KPIs) to see how they are used and presented to staff. These should include micro metrics (the trees) and macro metrics (the forest). Some should serve as lagging indicators (what just happened), while others should serve as leading indicators (what's going to happen). Your metrics dashboard is also your culture dashboard.

There is a book by Ron Moore titled *Making Common Sense Common Practice*. The theme of this book is obvious. Reliability should not be viewed as high science but rather common sense applied and sustained. This also is the central theme of the ADDS process, and it is only achieved through the completion of all four steps.

The Lion and the Gazelle

I'll leave you with one last thought. It is from an African proverb called "The Race of Life:"

"Every morning in Africa, a gazelle awakens. He has only one thought on his mind: to be able to run faster than the fastest lion. If he cannot, he will be eaten.

"Every morning in Africa, a lion awakens. He has only one thought on his mind: to be able to run faster than the slowest gazelle. If he cannot, he will die of hunger.

"Whether you choose to be a gazelle or a lion is of no consequence. It is enough to know that with the rising of the sun, you must run. This is the race of life." ***ML***

38%

of lubrication professionals use a third party to assess the state of their machines and reliability program, based on a recent poll at MachineryLubrication.com

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 also 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 the director and a 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.

When and How to Adjust a Load-sensing Hydraulic Pump

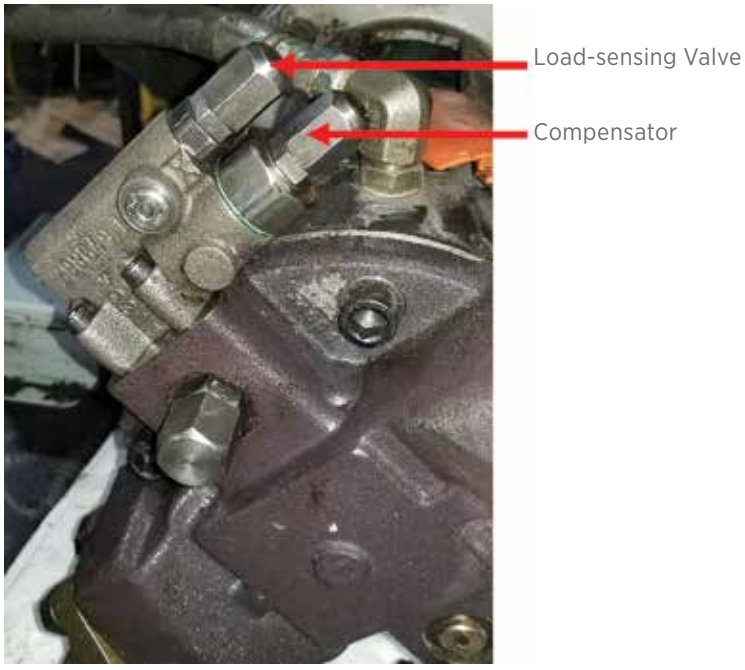
"The most common reason to adjust a load-sensing valve is because someone unfamiliar with the pump has mistakenly attempted to set the maximum system pressure by adjusting the load-sensing valve instead of the compensator."

Variable-displacement pumps are used in hydraulic systems where the flow requirements vary. This usually means the system has several actuators and, depending on the current cycle of the machine, the number of actuators moving at a given time will fluctuate. The most common type of variable-displacement pump is the pressure-compensating pump.

Pressure-compensating Pumps

Pressure-compensating pumps are designed to deliver only the amount of flow required by the system to maximize efficiency and avoid heat generation. The compensator is adjusted to a pressure somewhat higher than that required to move the system's heaviest load.

A pressure-compensating pump will deliver its maximum flow until the system pressure reaches the compensator setting. Once the compensator setting is reached, the pump will be de-stroked to deliver only the amount of flow that will maintain the compensator setting in the line. Whenever more flow is demanded by the system (such as would occur when an additional actuator begins to move), the pump will increase its stroke to meet the new flow demand. Whenever the system flow needs to decrease (such as when one or more actuators are stopped), the pump stroke is reduced. When the system is stopped completely, the pump stroke is reduced almost to zero. It will stroke only a very small amount or whatever is required to maintain the compensator setting



The compensator and load-sensing valves on a pressure-compensating pump can look almost identical.

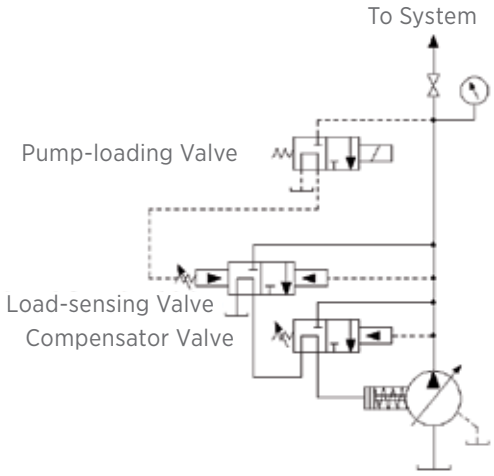


Figure 1. A typical configuration of a pressure-compensating pump

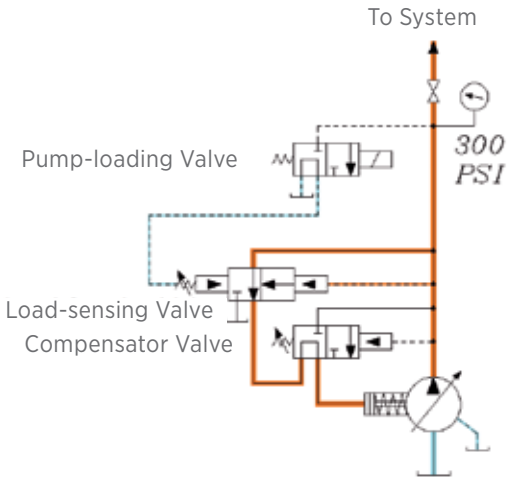


Figure 2. When system pressure shifts the load-sensing valve and directs pressure to reduce the pump stroke, the pressure drops to the load-sensing setting of 300 psi.

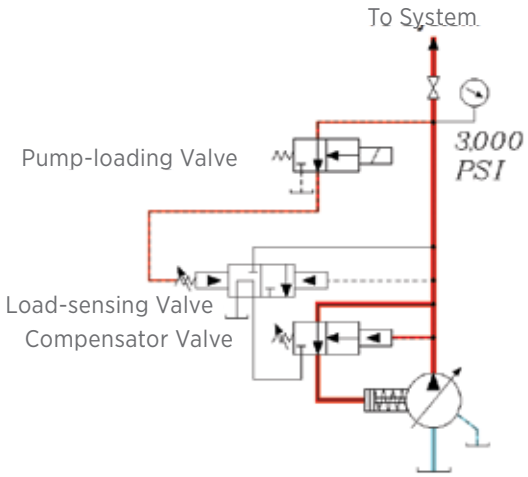


Figure 3. System pressure shifts the compensator valve to de-stroke the pump exactly the amount necessary to limit system pressure to the compensator setting.

in the line, overcoming any system bypassing or leaks. While a pressure-compensating pump is efficient, the standby pressure remains high.

Adjusting Pressure-compensating Pumps

Adjusting a pressure-compensating pump is quite simple. With all flow blocked and the system idle, the compensator valve is adjusted to the desired pressure. However, some pressure-compensating pumps have two valves mounted on the pump body. The two adjustments can look nearly identical. This type of pressure-compensating pump is called a load-sensing pump. The second adjustment is called either a "load-sensing" valve or "flow-compensator" valve.

A load-sensing pump is designed to reduce its pressure to a much lower standby level whenever the system is idle. This can conserve energy and reduce heat and wear in systems that spend a significant amount of time in an idle condition. The two separate pressure adjustments allow setting the compensator valve to the required maximum system pressure and the load-sensing adjustment to a much lower standby pressure.

Whenever the system is moving a load, the high-pressure adjustment limits the system pressure. For instance, as a cylinder is extended, pressure in the system will build as necessary to move the load. Eventually, the cylinder reaches the end of its stroke, and flow is blocked. When the flow is blocked in this fashion, the system pressure can build no higher than the setting of the compensator, but until another load is to be moved, there is no need for the system pressure to be kept so high.

Most load-sensing systems have a pump-loading directional-control valve of some sort that can place the system in an idle condition until it is necessary to move another load. When the pump-loading valve is shifted, the system pressure drops to the much lower load-sensing valve setting.

A load-sensing valve usually is smaller than the compensator valve and typically mounted directly on top of the compensator. The compensator valve is closer to the pump. The load-sensing valve is factory preset and normally does not need to be adjusted during the initial pump setup. In most pumps, the factory preset is approximately 200-300 pounds per square inch (psi).

The most common reason to adjust a load-sensing valve is because someone unfamiliar with the pump has mistakenly attempted to set the maximum system pressure by adjusting the load-sensing valve instead of the compensator. This not only can result in unstable system pressure but in some cases can also void any warranty on the pump.

A typical configuration of a pressure-compensating pump is shown in Figure 1. A pump-loading valve is used to determine whether the system is idle or prepared to move a load. The pump-loading valve is de-energized whenever the system is idle. Pilot pressure on the left-hand side of the load-sensing valve

is then released to the tank. The pilot line on the right-hand side of the load-sensing valve is connected to the pressure line at the pump outlet. System pressure shifts the load-sensing valve and directs pressure to reduce the pump stroke so that system pressure drops to the load-sensing setting of 300 psi, as illustrated in Figure 2.

When a load is to be moved, the pump-loading valve is energized. This directs pilot pressure to the left side of the load-sensing valve, keeping it from shifting. System pressure shifts the compensator valve to de-stroke the pump exactly the amount necessary to limit system pressure to the compensator setting, 3,000 psi as shown in Figure 3.

To make the pressure settings, always adjust the load-sensing valve first. The pump should be deadheaded by closing the manual hand valve. With the pump-loading valve de-energized, pressure will build only to the current setting of the load-sensing valve. Adjust the load-sensing valve to the desired pressure.

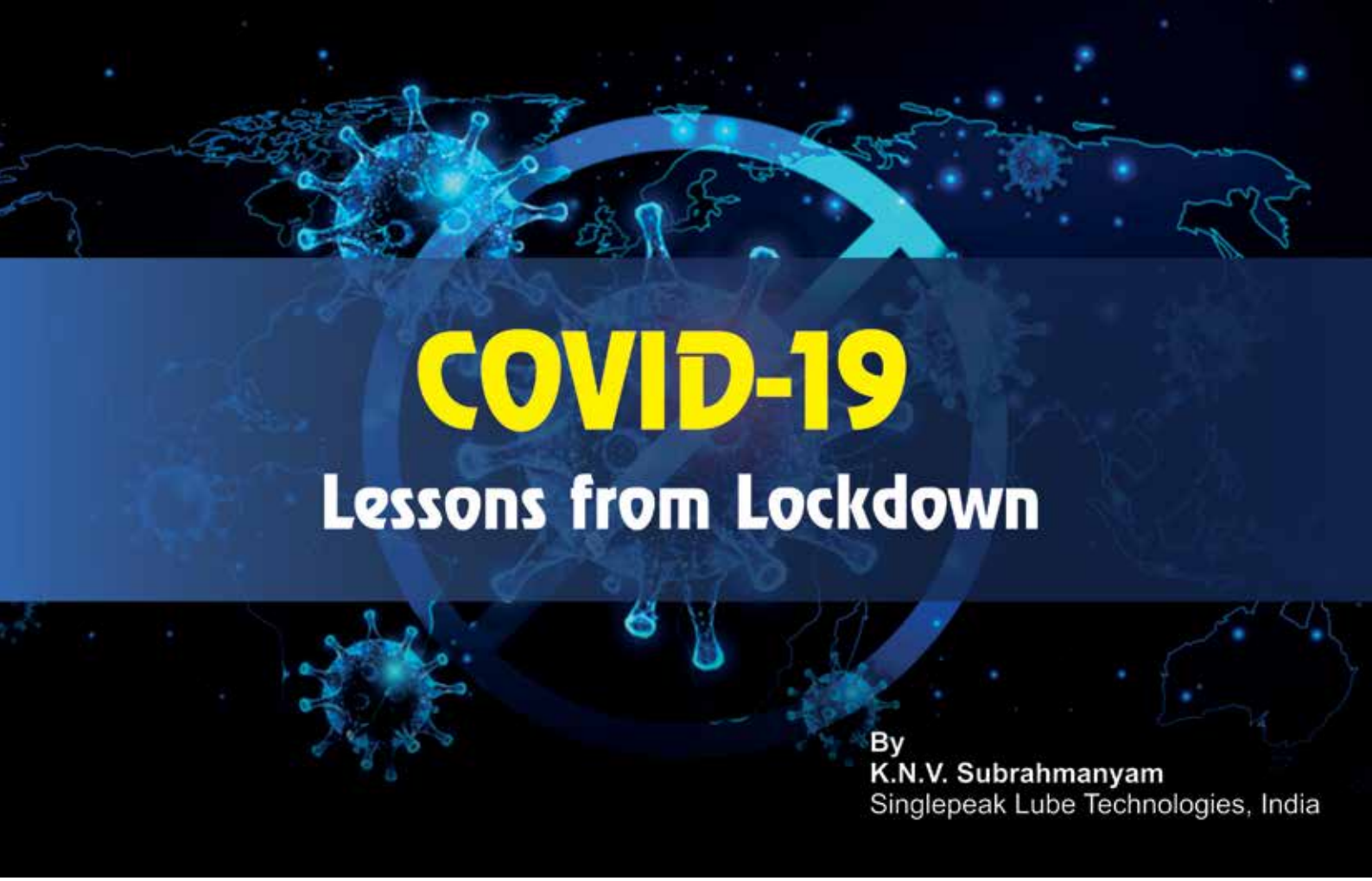
Once the load-sensing valve is set, energize the pump-loading valve. System pressure will then build to the current compensator setting. Adjust the compensator to the desired setting. Open the manual valve, and the system can be placed back into service.

There are several variations of this design. Sometimes a throttle valve will be used to determine if a load is available. The pressure drop that results when oil moves through the throttle valve signals the need for higher system pressure.

Another common variation is to use the load-sensing valve in conjunction with a proportional relief valve connected in series. Standby pressure will then be determined by the sum of the load-sensing pressure and the electronically controlled setting of the proportional relief. In more complex arrangements such as this, hand valves should be installed that can be opened or closed to deadhead the load-sensing valve and also to release its pressure to the tank to enable setting the pressure. ***ML***

About the Author

Jack Weeks is a hydraulic instructor and consultant for GPM Hydraulic Consulting. Since 1997 he has trained thousands of electricians and mechanics in hydraulic troubleshooting methods. Jack has also taught radio-wave propagation for the U.S. Air Force and telecommunications equipment operation and repair for the Central Intelligence Agency at American embassies overseas.



COVID-19
Lessons from Lockdown

By
K.N.V. Subrahmanyam
Singlepeak Lube Technologies, India

The entire world is undergoing an unprecedented lockdown due to pandemic (Covid-19) and it has affected the world economy and industries in many ways. This has thrown many challenges to different types of industries. The Indian economy is estimated to have lost over 32,000 crores (US$4.5 billion) every day during the first 21-days of complete lockdown.

Many industrial establishments depends on external agencies/workforce (outsourcing) for maintenance activities including preventive, predictive, lubrication based, condition monitoring, operations, etc. This may be due to economic reasons or to avoid long term commitment of employment. The concept of outsourcing has become so popular that even oil condition monitoring and machinery lubrication activities have been outsourced in most major industries. No matter what, current industrial lubrication schedules have been compromised due to Covid-19 challenges because of the limited resources, stocks/ parts availability, etc. This may not lead to immediate failures but surely may affect future operational activities. We must accept that despite the move towards automation, significant lubrication related activities are still performed manually.

Covid-19 Challenges to machinery lubrication

1. Safe work environment for all as every life is important
2. Managing the Lubrication activities & PMs with the minimum workforce (contractual & company employees)
3. Optimizing and prioritizing the Lubrication activities
4. Managing proper utilization of lubricants, spare parts, labor, etc.
5. Contamination control measures
6. Routine oil analysis to understand the lubricant health condition, components wear, and contamination monitoring
7. Filtration challenges
8. Achieving compliance of lubrication PMs with the minimum workforce
9. Re-Greasing activities
10. Fluid management activities-Disposal etc.
11. Well trained/multi-skilled/ lubrication personnel availability

Current Covid-19 situation will not just last during the lockdown but may continue to have its impact for times to come wherein social distancing, use of pandemic specific PPEs, and utilizing minimum workforce in factories would become a norm.

Certain scenarios with Covid-19 in routine lubrication activities:

- Imagine a situation where an oil change decision is needed based on the oil analysis report and the operations at the external oil laboratory have been

severely disrupted due to lockdown. Even after the partial opening of the lab, the transportation of samples continues to be a challenge.

- A case when critical bearings require timely regreasing and this cannot be accomplished without the lube technicians (in most cases with existing practices).
- Filtration activity requires assessing the pre-contamination levels prior to the filtration activity.

As we could see the dependency on the routine activities are still with the external workforces in most industrial segments, Covid-19 working conditions challenges us on how we accomplish the lubrication tasks on time with limited resources. This situation might force the primary focus on the critical assets whereas non-critical assets are less prioritized unless they report an issue. In routine times itself, we strive a lot to reach more than 90% of compliance of PMs. Current lock-down conditions with less workforce and resources impact the compliance and result in a compromise on certain activities.

With the current challenges, it is essential for the lubrication teams to expand their arms not only for adhering to the routine lubrication management, but also to ensure, there is no lubrication related downtimes. Lubrication personnel need to perform their roles and responsibilities smartly to ensure lubrication reliability. They need to look for the opportunities of new technologies or methods which can help reducing or minimizing the workforce involvement and be able to get more data (on line viscosity, moisture content, particle counts, ferrous debris measurement, oil quality degradation indicating parameters) from the critical assets. RCM or Reliability Centered Maintenance is an effective approach for determining the appropriate strategy based on understanding of equipment failures data.

Remember

Lubrication related failures are about 70% in most industrial equipment.

How do we prepare for the future?

1. People preparedness- Extensive training on Machinery lubrication – Basic to Advanced level, Industry-specific lubrication oriented.
2. Lubrication methods improvement-SOPs
3. Practicing and developing strict Lubrication Program Development-Continuous improvement by monitoring the Lubrication reliability goals versus achieved, leading to further opportunities to reach world-class lubrication reliability standards.
4. Upgrading the Critical Assets lubrication monitoring with the best available In-line measurements, AI & IIOT solutions.
5. Encouraging portable oil analysis instruments usage as a first step measurement.
6. Onsite oil analysis implementation.
7. Reducing human intervention in certain PMs using real-time data management and visual monitoring tools.

Even though much-improved lubrication management/methods and oil analysis monitoring techniques have been available since long, most industries even today stick to the practice of ''Business as Usual" or routine approach. The big shift from the current practices to the world-class best practices is the need of the hour. This time can be best utilized to evaluate the best lubrication practices of critical assets as well as non-critical assets and to upgrade these practices to build lubrication reliability.

Role of Lubrication training

While we have been undergoing lubrication training for quite a long time, thanks to organizations like Noria, ICML, STLE etc. for keeping us updated about the best lubrication practices being followed around the world with a systematic approach to Reliability centered maintenance. Question is, to what extent we are successful in applying the best practices to our equipment. Reality is that training participants get excited about knowing the best practices and benefits in extending the machine reliability. However, they couldn't implement the changes in the actual conditions due to financial obstacles, business as usual-behavior, OEM warranty related issues or unable to convince senior management. Approved lubrication training helps the lubrication personnel to avoid common mistakes like over lubrication, under lubrication and related issues. Specific industry training will ensure systematic and reliable execution of lubrication activities. These trainings will focus more on that particular industry critical assets management in terms of lubrication reliability. Lubrication training also helps the lubrication teams to set up their own onsite oil labs because they know what is important to measure and control.

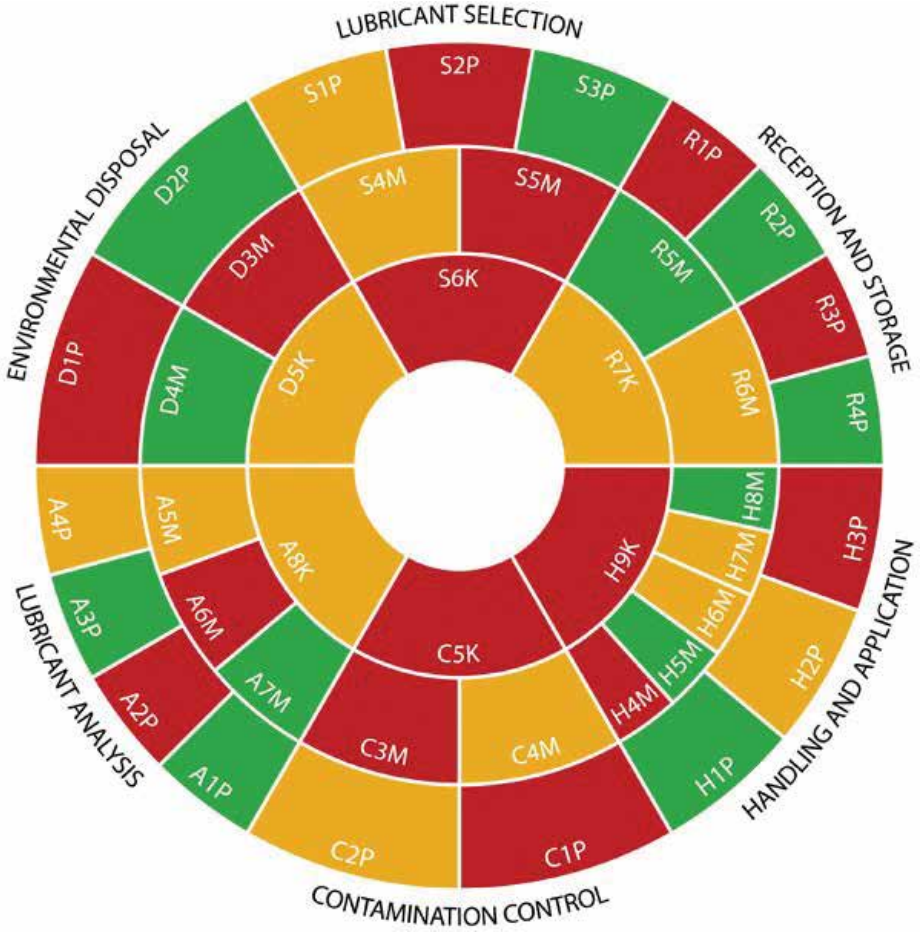
Does Lubrication Program Development concept really help combat Covid-19 situation?

It is important to realize lubrication management is different from lubrication program development. Lubrication management is all about managing the

day-to-day lubrication activities in a systematic manner. Often, we might not have proper KPIs for the lubrication management in many industries. Lubrication Program Development is what makes us future ready to be able to compete with world class lubrication standards wherein, our reliability goals are set high, so that we follow the best possible lubrication practices with minimal workforce.

A small example is the Utilization of IBC's in large industrial complexes (Steel, Petro-chemical, Refineries, etc). Intermediate bulk containers (IBC) that can be set up in individual departments of large industrial complexes which helps to establish local lube storage at the department level and will ensure to deliver the clean lubricants out. Using IBCs Lube technicians can significantly avoid going to the main stores every time when they need some lubricants. Simplified process requires minimum workforce and leads to effective execution of lubrication tasks. The cost of IBCs can be justified in terms of increased lubrication reliability and reduced man-hours etc.

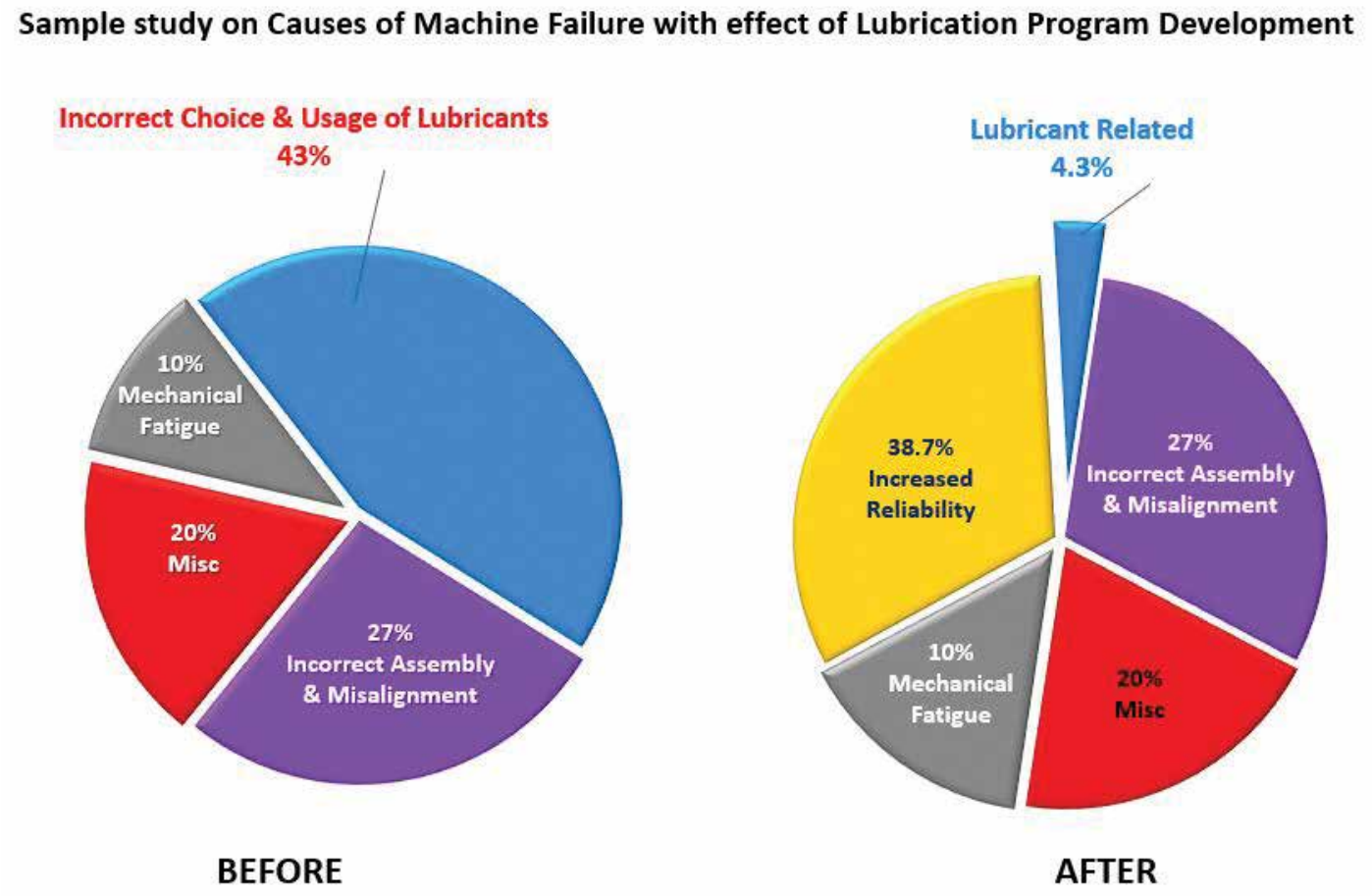
A realistic Lubrication Program Development audit will help you to understand where your current lubrication practices for a critical equipment stands and advice you the necessary changes needed to achieve the world class best practices. This roadmap will help you extending the machine reliability, greater uptime, and reduced maintenance costs.



Pic courtesy- Noria Corporation

The key questions to lubrication enable reliability are what type, how much, and how often? Answering these questions will be the key to start your lubrication excellence program. Some basic steps to be followed to achieve PM program success:

- The OEM manual is an important source of information for building your preventive maintenance schedules. The lubrication section of the manual should describe the locations on each machine that should be lubricated, the type of lubricant to use at each location, the quantity of lubricant to be applied and how often to apply the lubricants.
- The lubrication routines should be scheduled preferably in a CMMS. Regardless of the system used, the maintenance department's daily lubrication activities should be organized. Responsibility should be assigned for each lubrication function.
- Verify that the lubricants being used meet the OEM recommendations for fluid type and viscosity. Never deviate from these recommendations.
- Use only clean containers to transfer lubricants. If possible, pre-filter the lubricant as it is being added to the system.
- Maintain recommended system temperatures. Generally, industrial systems are designed to run most efficiently with bulk fluid temperatures of 110–130 °F (43–55 °C).
- Test the fluid periodically (at least every two months) to determine its physical and chemical conditions. If a change in appearance is noted, check the fluid immediately. Water content and pH of water-based fluids should be checked frequently. If a major failure occurs, test the fluid before the system is restarted. Residual contamination from a breakdown may prompt another failure.



Pic courtesy- VAS Tribology Solutions

- Change filters when indicating devices denote plugging of the element, or when fluid analysis reveals a change is needed.

Oil Condition Monitoring

The importance of regular oil analysis is invaluable if implemented correctly. Most of the mechanical and lubrication related failures can be well identified in early stages with regular oil analysis.

Current Lockdown made it clear that every industry (medium or large scale) should implement some basic onsite oil analysis testing as a firsthand measure. We need to accept the fact that in normal conditions oil analysis reports takes an average time of 2 weeks and considering the present situation it will not be easy to get the reports within the required time.

Onsite oil analysis test facilities may not be necessarily sophisticated and expensive as it is needed to confirm the most vital physio-chemical properties for judging the oil condition. Investment for setting up the onsite oil lab depends on the type of industry, size and other factors.

These days many service providers are setting up the oil labs on rental basis too and with thier expert analysts at site. Investment depends on industry size, type and other factors.

Key benefits of On-site oil analysis

- Adequate oil analysis data helps the maintenance team to efficiently manage the critical equipment and condition-based oil changes can be implemented resulting in optimized resources and work force.
- Effective oil analysis at site ensures quick results in less than 48 hours and can help the maintenance team to plan cost effective maintenance outage to ensure a minimum downtime for critical equipment.
- One major advantage of on-site oil analysis is that it helps the lubrication personnel in detecting the potential failure mode in the early stages of failures. This data can be helpful in understanding the life cycle management costs and in calculating the MTBF.

Lube monitoring sensors with Artificial Intelligence (AI) enabled

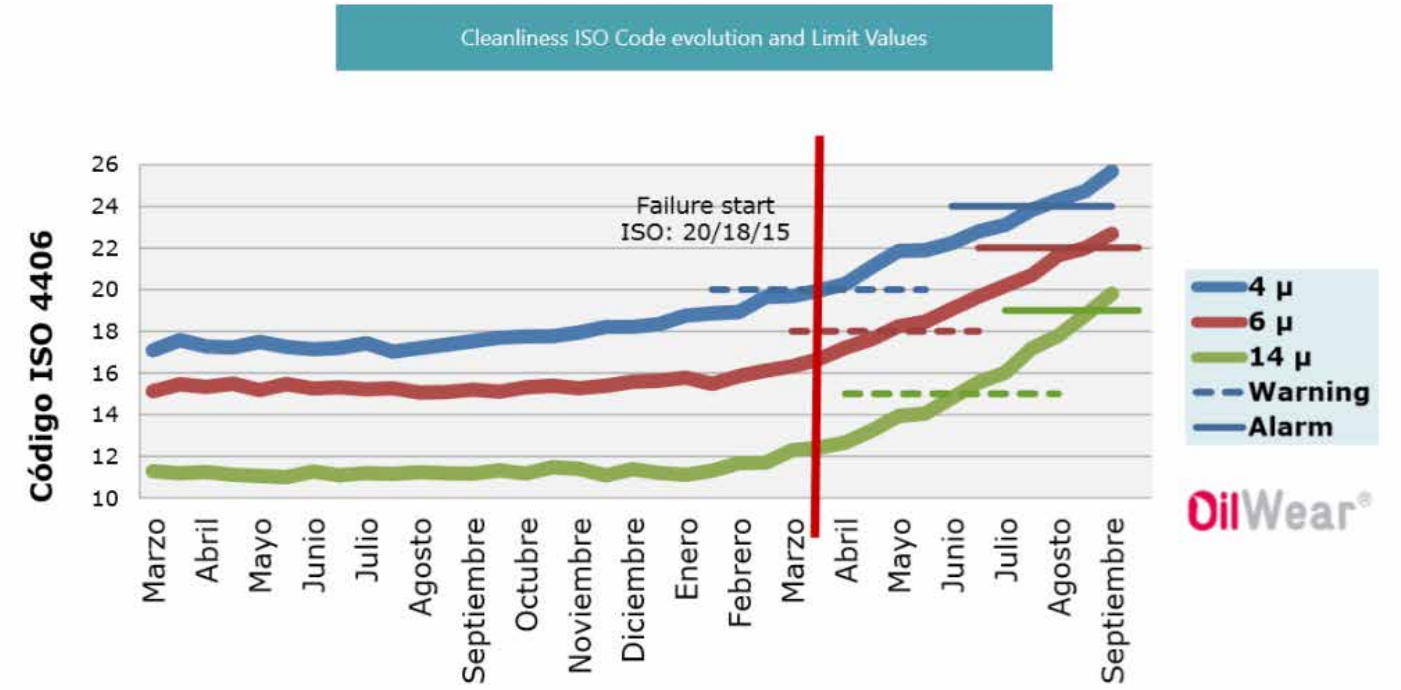
We often come across many online sensors and automation solutions by various reputed manufacturers; the best time to implement them is during the project stage however their usability and importance can be observed for existing critical machinery also.

Ultimate Industry 4.0 may not be commercially viable across all the industries considering the ROI and other factors. However senior management should always support these options which can reduce human intervention and provide a continuous real time data that will help in identifying the impending failures even before the scheduled oil analysis can indicate. This is the best time to assess the Reliability Centered Maintenance concepts and automation of certain measurements on the appropriate assets to fight against such unexpected situations keeping future in mind.

Pic courtesy- Atten2 Advanced Monitoring Technologies

We understand and agree that contamination is the major root cause of the lubricated machinery failures. Contamination monitoring helps to extend the lube life, components reliability and results in reduced maintenance expenses. In case of highly sensitive critical hydraulics-control valves, servo drives, solenoid valves etc, we still measure contamination by sending oil samples to an external lab or by onsite particle count activity which needs workforce to move through the entire area and collect the contamination readings.

In-line contamination monitoring sensors are highly affordable and are available with



Pic courtesy- Atten2 Advanced Monitoring Technologies

most reputed manufacturers. Real time contamination monitoring data helps in performing the filtration activities on time and avoids unnecessary filtration work. Clean oil and better lubrication translates into extending its reliable and reduced maintenance costs. Contamination monitoring data can always be collected in real-time with the help of various wireless modes (cloud based) or by connecting to your SCADA or other communication systems.

Greater responsibility

Lubrication personnel should take greater responsibility now to handle the current situation to ensure no compromise on lubrication reliability. This can be achieved by identifying all opportunities for improvement that will sustain the operations of our critical equipment. Assessment of all critical equipment for possible changes in terms of contamination monitoring, wear debris monitoring and oil health monitoring by the ways of real-time sensors based monitoring, developing the primary oil monitoring facilities on-site, installation of permanent representative sampling ports, visual examination tools, etc.

Educating the lube team is a key step in launching your lubrication program. The operators and mechanics who are personally responsible for lubrication must be suitably trained. Individuals who are indirectly involved in the lubrication program should also have at least a basic awareness of the program's goals, primary benefits, and its procedural requirements.

To be assured of our lubrication program effectiveness requires the measuring of selected parameters and the continuous trending of the data over a period. One of the parameters may be as simple as the number of failures due to poor lubrication or a ratio of the number of lubrication-related failures per total failures.

Pic courtesy- Singlepeak Lube Technologies

Do you know?

There are breathers with AI enabled, which can indicate what should be the right time to change them and how much is the contamination level.

There are Sensors which can define the oil health condition based on AI by observing the base oil changes due to the oxidation effects.

Quite capable sensors with AI enabled can even tell you about what type of wear patterns are developing in your equipment by AI assisted wear particle shape identification and severity monitoring.

Key areas to examine and look for a solution...

☑ Lubricants consolidation to reduce the number of grades/brands that we use- Proper assessment must be made to ensure limited grades/brands of lube oils/greases to use in the industry. We need to be ready with the data of existing lubricant's compatibility of equivalent grades of different manufacturers so that in case of urgency, oil change or sweetening of oil can be handled with care and confidence.

☑ Need to observe the advantage of synthetic oils- Although synthetic lubes are relatively expensive, they perform very well in certain extreme temperatures, pressure, shear, and loading conditions. They assure longer intervals of oil changes (if effectively managed) with minimum losses and help minimize maintenance costs and time.

☑ Critical bearings must be observed for automatic grease dispensing systems so that their reliable operation is well assured.

☑ As we go back to the basics of machinery lubrication, contamination is the greatest cause and effect of machine failures. Fundamentally major critical equipment must be observed for inline contamination monitoring solutions to take the necessary action without any delay. Remember the in-line particle counters are quite inexpensive when considering the huge cost of downtime, production losses, etc.

☑ Onsite oil analysis- Implementing a simple patch test kit on the site is itself the first step to onsite oil analysis. Not all the onsite oil monitoring lab options are expensive, their cost depends on the type of the industry and the level of oil monitoring that we want to implement. You might need a sophisticated oil lab in case your industry is of power generation or petrochemical/refinery type. While a cement or steel industry might need minimum test facilities.

☑ For small to medium scale industries, implementing patch testing kit does an excellent job in understanding the oil contamination and sometimes machine wear too.

☑ Having minimum portable instruments for testing viscosity, moisture, total acid number (TAN) will be sufficient to be confident of the lubricant health condition.

☑ For monitoring the high-speed rotary equipment and critical gearbox applications, New generation FT-IR (Fourier transform infrared spectrometer) instruments along with portable viscometers can accurately address the lubricant deterioration due to oxidation and can help to decide the frequency of oil top-up. These instruments are simple to operate and do not require much knowledge to operate and interpret the results.

☑ Critical assets must be inspected for opportunities to install inline wear monitoring sensors. These sensors can get us extremely useful information even before it is revealed in routine oil analysis.

☑ Bottom wear debris monitoring- Many large/heavy-duty equipment generates higher amounts of ferrous debris and it settles at the drain/bottom of the equipment. Because they are sturdy, heavy-duty in operational nature, often they might not show up failure symptoms with routine condition monitoring. There are proven sensors available and can be fitted at the bottom location to monitor the wear debris generation and these sensors are capable of distinguishing the large and small particles separately to tell you when should we take up the right inspection call clubbed with routine outages.

☑ Ferrography- Most critical assets can be considered for AI-based real-time wear debris analysis sensors that can give you the most accurate information about the type and severity of wear.

☑ Integrated approach of the oil condition monitoring can always be complemented with Vibration

analysis, thermography and ultrasound technologies. While monitoring the high temperature applications, monitoring the thermal patterns along with oil analysis can provide very useful information on the lube deterioration with temperature effects. Similarly, implementing ultrasound analysis in lubrication activities can help in identifying the oil leaks, air leaks, potential contamination ingress sources and can also ensure right greasing practices for critical slow speed applications.

- ☑ Most importantly, the lubrication personnel of any industry must be well trained not only in lubrication activities but also have to be aware of the other condition monitoring technologies so as to look at the opportunities for continuous improvement to be able to minimize the human intervention.

Needless to mention, human life is invaluable and we need to protect each other. At the same time we need to ensure reliable operation of our machines so as to keep the wheels of the economy running.

About the Author

K.N.V. Subrahmanyam is a Mechanical Engineer and certified CAT-III Lubrication Specialist from ICML, USA, has 20 years of rich experience in lubricant monitoring and lubrication management with hands-on experience of machinery lubrication related issues with various industrial segments like Cement, Steel, Petrochemical, Power generation & Manufacturing, etc. He is currently working as Chief Technical Officer at Singlepeak Lube Technologies, Vadodara. Contact him at subrahmanyam.knv@single-peak.com.

Micro-Ceramic Technology: Pushing the Limits of Lubrication

Lubricants are responsible for helping the world move and it is accurately stated that "Lubricants are the blood and lifeline of all machinery" and for this reason lubricants are an important element of study in tribology and machine maintenance. In fact, one of the primary reasons for machine failure is improper and inadequate lubrication, which results in major industrial shutdowns. Industrial shutdowns not only severely affective commercial profitability they also negatively affect the GDP of country, especially, when the demand/availability of high quality lubricants is not adequate and improper lubrication is common. For this reason lubricants are one of the fastest evolving and most researched technologies in the world.

Global industrial growth and increased demands are forcing lubricant evolution as said growth and demand have been accompanied by tightening environmental regulations, depletion of fossil fuels, occupational safety concerns, and tightening mechanical tolerances. These challenges have forced lubrication engineers and researchers to seek and develop a new generation of lubricants with a heavy focus on additive technology. Additives are one of the main building blocks of lubricants and now in an attempt to meet new demands focus is shifting from standard additive to Nano-additives. One of the newest additives being researched, especially for use in greases, is hexagonal boron nitride (h-BN), commonly called micro ceramic or white graphite. Advances in the field of nanotechnology have now allowed lubrication engineers and tribologists to better compare the effects of h-BN to conventional mineral oils and additive packages. h-BN nanotechnology has specifically been improved to a point where h-BN, an environmentally neutral additive, can be emulsified with high quality engine and gear oils. [1]

As mentioned, h-BN has been the focus of several major lubrication studies and its potential has become very clear. Some studies for reference include:

1. Wan et al. [1] dispersed Nano h-BN in SE15W40 and reported a synergistic reduction in friction coefficient of 27.7%-76.7% in comparison to SE 15W40 without h-BN.
2. Abdullah et al. [2] also dispersed h-BN and Al2O3 in engine oil (SAE 15W40) and reported better friction and wear reduction properties of h-BN dispersed oil as compared to Al2O3 dispersed engine oil.
3. Celik et al. [3] on the wear performances of AISI 4140 in the presence of Nano h-BN dispersed in SAE 10W, a significant wear reduction of 65% and an improvement of 14.4% coefficient of friction was observed. Additionally, it was reported that the surface roughness of the mating pairs were lower in case of h-BN added oil.
4. Pawlak et al [4] dispersed h-BN in grease and compared the tribological properties with a other commercial greases. It was observed that at 5% and 10% vol h-BN dispersed grease samples exhibited less scar depth, surface damage and a better frictional coefficient than the existing commercial greases tested.
5. Kimura, Y., Wakabayashi, T., Okada, K., Wada, T., & Nishikawa, H. (1999). Boron nitride as a lubricant additive. Wear, 232(2), 199–206.
6. Gachechiladze, A., Tsagareishvili, O., Margiev, B., Rukhadze, L., Darchiashvili, M., & Chkhartishvili, L. (2018). Nanopowdered h-BN as a Wear-Reducing Eco-Friendly Material. Handbook of Ecomaterials.

7. Erdemir, A. Solid lubricants and self-lubricating films, Chapter 22, Handbook of Modern Tribology,CRC Press, 2001, pp. 787-818

While the benefits of h-BN are clear it is important to compare it to the existing and common dry lubricants/additives: molybdenum disulfide, Teflon (PTFE), and graphite. It is important to recall that while commonly called "white graphite" h-BN exhibits many different properties than graphite in regard to thermal stability, oxidative stability, and electrical conductivity. The main isolating benefit of h-BN is its high thermal stability. One study by [5] Kimura et al [6] confirmed that h-BN is quite favorable in high temperature applications. After conducting tribological tests, they reported that h-BN dispersed paraffinic mineral oil exhibited better anti-wear properties than the oil without any h-BN particles at high temperatures. While Graphite and molybdenum disulfide provide lubricity up to 400°C h-BN is able to provide added lubricity up to 1000°C [7].

h-BN in Comparison to Moly, Graphite, and Teflon

1. Temperature Stability

a. Micro-Ceramic Max Working Temp 1000°C (1832°F) over 2x higher than molybdenum disulfide, Graphite, and Teflon

Solid Lubricant	Max Working Temperature
Micro Ceramic	Over 1,000° Celsius
Graphite	450° Celsius
Molybdenum Disulfide	350° Celsius
Teflon (PFTE)	260° Celsius

2. Oxidative Stability

a. h-BN has an extremely high oxidative stability (over 1000°C in open air)

3. Chemical Stability

a. h-BN is chemically inert and environmentally neutral, making it an ideal oil additive

b. h-BN does not produce toxic byproducts or emissions

4. Insulating properties

a. h-BN has applications as Semiconductors and has a significant insulating property

b. Prevents electrical transfers [ex. electric motors] between conducting metallurgical surfaces by forming a non-conductive film

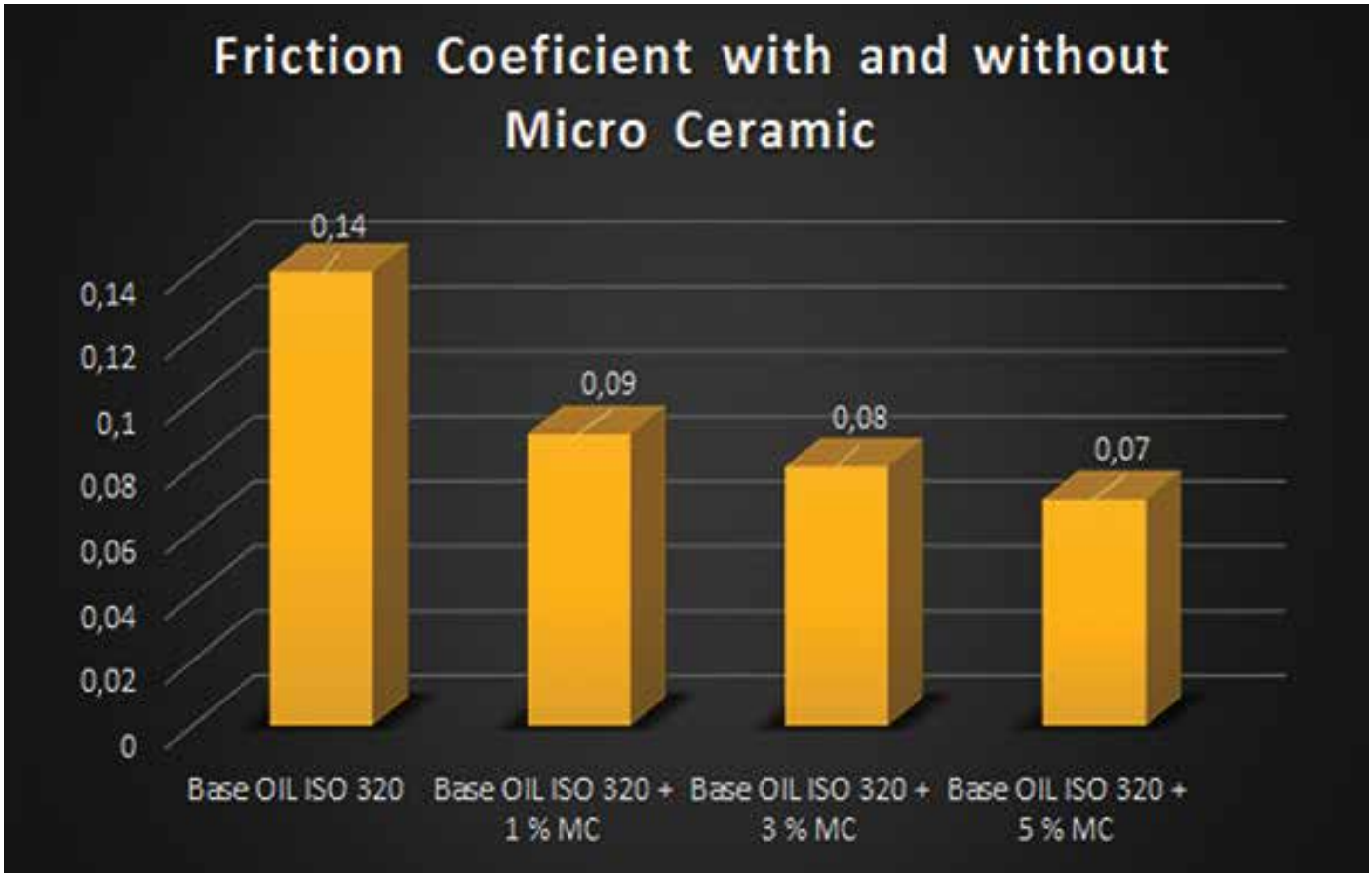


Figure 1 Frictional coefficient of micro additive dispersed ISO 320 oil

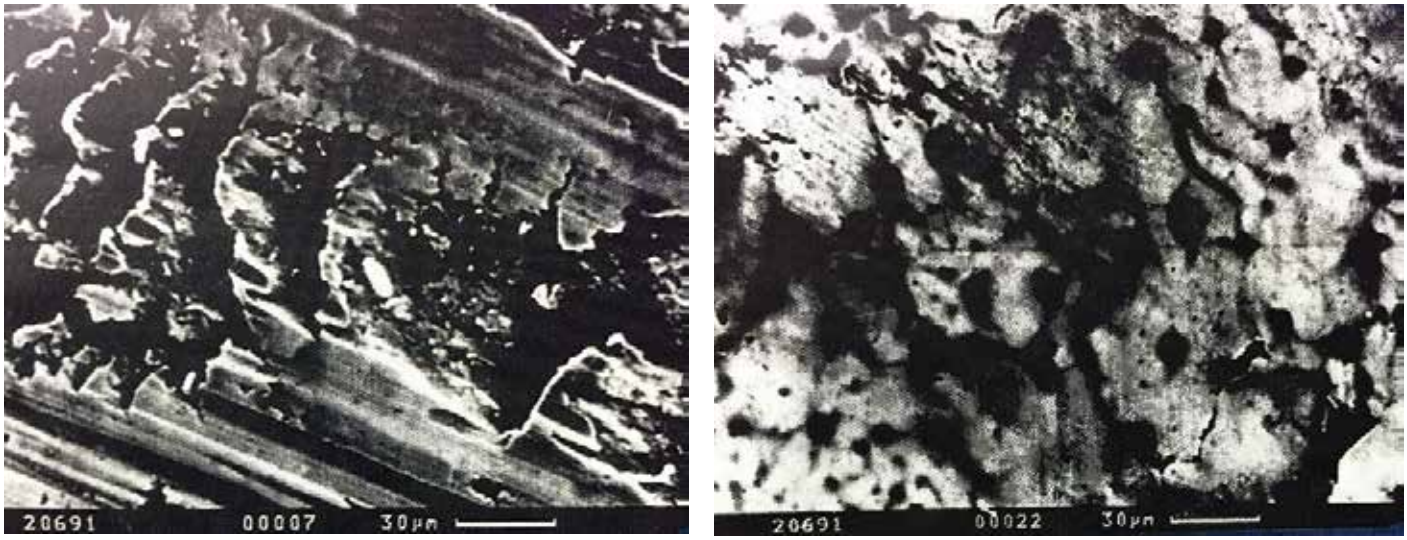


Figure 2 (a) Bearing surface without micro ceramic particles indicating 20-25% surface to surface contact (b) Bearing surface with micro ceramic indicating 75-85% surface to surface contact

c. Minimizes raceway damages caused by fluting (Electric Arcing) in rotating components.

5. Adhesion

a. h-BN is highly adhesive to metallic surfaces and forms a protective film on the contacting metal surfaces.

Tribological properties of micro ceramic added into mineral oil:

Figure 1 shows the friction coefficient of micro ceramic (h-BN) dispersed in ISO 320 base oil. Nearly a 50% reduction in friction coefficient was observed with the presence of 5% micro ceramic particles. Tribological studies of these Micro Ceramic Nano sized solid lubricants as an additive for greases exhibited a reduction in wear by 30 – 70 % at various loads. Further results obtained using a 4 ball bearing and a pin on a disc tribometer showed a reduction in wear scar of up to 20 % proving micro ceramics ability

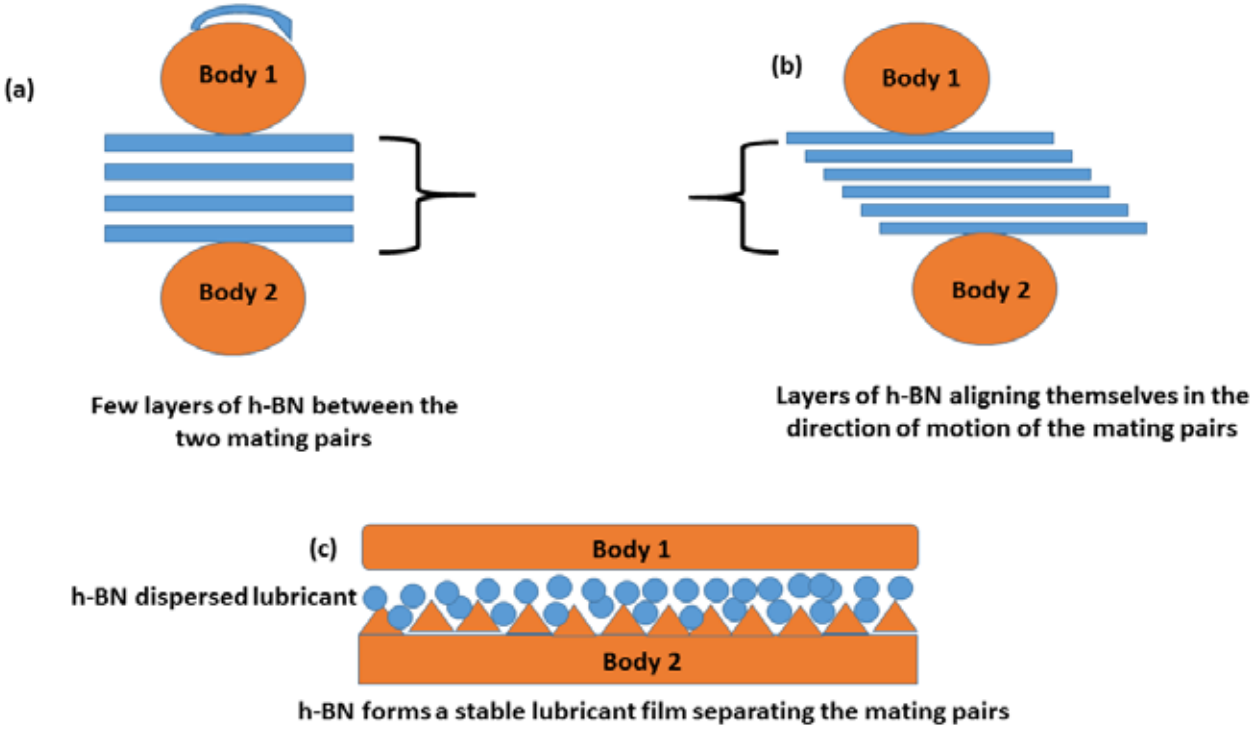


Figure 3 Lubrication Mechanism of micro ceramic (h-BN) dispersed lubricant

to reduce wear and withstand the stringent demands of new mechanical equipment. The advantages of h-BN (micro ceramic) as a grease additive are especially clear in high temperature applications where greases are used and commonly fail to provide adequate lubrication.

The high affinity of the micro ceramic particles and their ability to form stable lubricity films under extreme pressures aid in reducing the friction and wear between the contacting metal surfaces. Figure 2 indicates the magnified bearing surfaces treated with/without micro ceramic dispersed oil. With boring and honing the surfaces still only have about 20-25% surface to surface contact, which results in both wear and friction (Figure 2a). However, Figure 2b shows how micro ceramic adheres to the porous surface structure and increases surface to surface contact. With the introduction of a micro ceramic additive, surface to surface contact is increased to nearly 75-85% and friction and wear are reduced as the surface contact is h-BN on h-BN, not metal on metal.

Why the structure of h-BN is so effective?

The molecular structure of h-BN is that of layered lattice, covalently bonded hexagonally with the different layers having weaker Van der Waals bonds. The two types of bonds composing h-BN make it a dynamic lubricant. The covalent bonding holding each layer together makes h-BN extremely durable and able to withstand high pressures and high temperatures. The weaker Van der Waals bonds are not as durable as covalent bonds, however, they benefit h-BN by allowing it to "shed" layers and fill porous metal surfaces without changing surface dimensions. The weaker Van der Waals bonds also allow layers of h-BN to slide past one another freely with very minimal resistance. This is shown visually in the tribological pairs as seen in Figure 3a and Figure 3b. Further to that, h-BN forms a stable lubricant film on the tribo pairs and provides low friction during operation (Figure 3c). This, in combination with its high thermal rating make h-BN an excellent additive for greases, especially in industrial applications where a wide temperature range is experienced. The potential of h-BN as an industrial grease additive is further confirmed by Pawlak et al [4]

About the Author

Walter Wagner, Owner of Wagner-Spezialschmierstoffe GmbH & Co. KG, Germany, is the Patent Holder in this Technology since 1994. Contact Walter At: wagner@wagner-german-oil.com

Co-Authors: Wesley Kolbe, Owner AET Systems, Inc ,USA; G R P Singh , Tata Steel, Jamshedpur ; Dr.Shubrajit Bhaumik, Dept. of Mech. Engg., SRM Ins. Sci. and Tech (Ktr), Chennai and Arupanjan Mukherji, Business Manager India and ME, Wagner -Spezialschmierstoffe GmbH & Co. KG. Germany

Bennett Fitch | Noria Corporation

Determining the Required **Cleanliness Level of Hydraulic Systems**

> Creating a required cleanliness level (RCL) target is only the first step of a complete proactive maintenance contamination control strategy."

Lubrication's biggest enemy is contamination, especially solid contaminants like dirt. Once contamination gets into the oil, it becomes a crux to lubricant failure and ultimately machine failure. A robust reliability program would not be complete without an action plan to help minimize contamination in lubricants.

While all lubricated machines are prone to the pitfalls of contamination, hydraulic systems are of particular interest, as they experience unique operating conditions and often require components that are inherently contaminant-sensitive. How contaminants affect the reliability of hydraulic systems has been the focus of hundreds of studies over the last few decades. For a brief history of E.C. Fitch's crucial involvement in understanding the influence of contamination on hydraulic systems, see the sidebar on the next page.

Today, hydraulic system manufacturers and end users are more aware of the contaminant sensitivities of machine components. However, while the "why" has been expressed and openly discussed, the "how" is not as widely understood. This not only would include how to reduce contaminants in the system but also by how much.

In hydraulic systems, the proactive measures of fluid contamination control — both exclusion and removal of contaminants — require an investment beyond just the equipment. Typically, an optimized approach includes a combination of both. With exclusion being the first line of defense, it almost always is more cost effective to keep contaminants out rather than to remove them after they are in the oil. It has been estimated that it costs at least 10 times more to remove a gram of dirt than it would to exclude it in the first place.

One principle to consider is the optimum reference state (ORS), where each lubrication decision strives for optimization by considering all relevant factors, such as cost, safety, downtime, component sensitivity, etc. This principle can be applied in the context of contamination control as well. On one extreme, you could get carried away by investing excessively in filtration practices to ensure the machines are kept clean. On the other end, you could attempt to save money by making no investment in contamination control, but the result likely would be unreliable operations and eventually unexpected, premature downtime. Choosing the right amount to invest in contamination control to optimize your return on investment should be the goal.

How Clean?

How clean should your systems be? You must decide what your motives are. What is the system's failure history? Is the consequence of downtime too great? This is a strategic maintenance decision. In theory, you are attempting to minimize the net effect between the investment and the correlated savings from improved reliability. In other words, the cost that goes into the oil's cleanliness should be at such an amount that any more or less investment would increase the overall net effect. In reality, this exact amount is impossible to pinpoint, but with some considerations of the known factors, you can determine a required cleanliness level with some confidence of the benefits.

In some instances, the benefits of cleaner oil may not outweigh the means, but for the vast majority, the failure of these machines incurs too much risk to not invest in some level of contamination control. In this case, the required level of oil cleanliness can be calculated.

FLUID POWER PIONEER

Dr. Ernest C. Fitch (1924-2011), also known as "Bucko," first began his involvement in fluid power in the early 1950s when he started the fluid power academic program at Oklahoma State University. This topic become the focus of his career. In 1956 and into the 1960s, he was awarded major contracts in fluid power research by NASA and the U.S. Air Force to study the effects of contaminants and investigate contamination control test methods for hydraulic systems. During the decades that followed, his contributions became a cornerstone in an industry that was quickly revolutionized by the benefits of contamination control. He continued his industry-leading research for more than 30 years, served on many standards committees, and authored several books and more than 200 technical papers. His Fluid Power Research Center provided the research for many ISO standards used today in this industry, including those for particle counters, filter beta ratings and fluid sampling procedures, to name just a few. An extended account of his life can be found at MachineryLubrication.com.

Dr. Ernest C. Fitch Timeline

1954 Initiated the fluid power academic program at Oklahoma State University

1956 Received first contract for research in fluid power

1958 Awarded U.S. Air Force contract to study fluid contamination in aircraft hydraulic systems

1962 Awarded a six-year contract from NASA as a result of a report entitled "Basic Science Program in Filtration Mechanics"

1966 Graduated first doctoral student (Roger H. Tucker) in contamination control

1969 U.S. Army initiated contamination control program with the basic Fluid Power Research program

1970 Fluid Power Research Center approved as the new name for the program by Oklahoma State University

1973 Began serving on standards committees, including the National Fire Protection Association (NFPA), SAE International, ASTM, American National Standards Institute (ANSI), ISO, BSI Group, North Atlantic Treaty Organization (NATO), European Committee for Hydraulics and Pneumatics (CETOP), and Hydravlika

1976 Named fluid power industries professor by the Oklahoma State University Board of Regents

1978 Published first edition of "Fluid Contamination Control"

1988 Retired from Oklahoma State University

The industry's culmination of this cleanliness question has given rise to many methods over the years, one of which is outlined in the ISO 12669 standard. Following is a more detailed discussion of this method along with options for how to best implement it.

Required Cleanliness Level

As mentioned previously, it's not realistic to assume that someone can "clean up the oil" to the point where all contaminants are removed. Every step cleaner requires a greater maintenance cost, either with better equipment or more time and labor. So, before you start working in one direction, you must establish a target to optimize the costs. This target is the required cleanliness level (RCL).

The RCL is derived from a calculation involving several factors, including the machine's components, operating conditions and environmental influences, among others. Figure 1 shows the resulting plot between the calculated sum of contributing factors and the RCL represented using the ISO 4406 cleanliness code. For those unfamiliar with the cleanliness code, the three range numbers, such as 15/13/10, correspond to the number of contaminants greater than 4, 6 and 14 microns, respectively.

The calculated sum of contributing factors is known as the total weight. These factors, six in total, each have their own weighting table and are summarized below.

Working Pressure and Duty Cycle – This scale, from 1 to 8, is not only defined by the range of working pressure but also by the level of inconsistency the system pressure experiences during operation. The more consistent and lower the pressure, the lower the number. The greater the variations and pressure, the larger the number.

Component Contaminant Sensitivity – This scale, from 1 to 8, looks at the types of components to which the hydraulic fluid is exposed. The most sensitive components, such as valves and pumps, should be the primary consideration. For example, a high-performance servo-valve will warrant a higher weight factor because of the potential for contaminants to jam the spool against the valve block due to the clearance and pressure differentials.

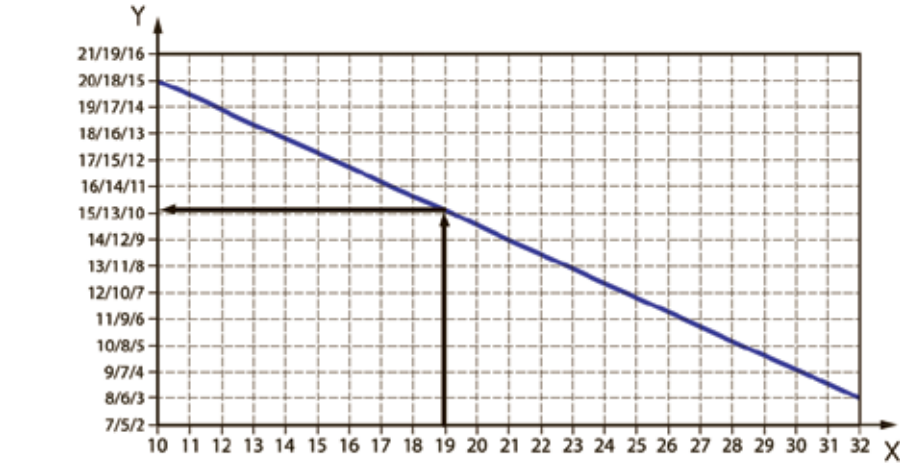


Figure 1. Resulting plot between the calculated sum of contributing factors and the RCL represented using the ISO 4406 cleanliness code

System Life Expectancy – This scale, from 1 to 5, requires an expected life-cycle time (in hours) of the hydraulic system. The longer the system is expected to remain in service, the greater the control of contamination should be. If significant contamination is perpetually permitted to remain in the system over an extended period of time, the degree of damage it may cause is greater.

Total Cost of Component Replacement – This scale, from 1 to 4, takes into consideration the types of components in the system, primarily by the amount of labor and cost it would take to replace them. Larger components and more complex systems usually warrant a higher weight factor.

Cost of Downtime – This scale, from 1 to 4, depends on the equipment's overall impact on production. It might be the most intuitive consideration. If production is not impacted by the component, then the weight factor remains low. The more disruption to production and overall downtime costs caused by a system failure, the higher the weight factor.

Risk – This scale, from 1 to 6, is similar in consideration to the cost of downtime, but instead of a production risk, it is a safety risk. This is associated to potential hazards that might be created for individuals in the surrounding area as a result of a system failure. (Although the ISO 12669 standard does not explicitly list environmental impact as a factor, I would suggest this risk factor to consider the environment as well.)

After the weights for the six categories have been determined, all the contributing factors can be totaled to a single number. This number can then be correlated to an ISO contamination code as a target for the hydraulic system's RCL. In general, this approach should be appropriate for most

applications. However, it is still a guideline, not a hard and fast rule, especially when the RCL is at the ends of the scale where ISO contamination codes are high (above 20) or low (below 10).

If the calculated RCL suggests 20/18/15 as the target for the system, the incoming oil might be cleaner than this level, in which case doing nothing to clean the oil may be acceptable. If the oil is considerably cleaner than the target, it might be worthwhile to keep the oil at this level rather than permitting it to become more contaminated. After all, the cost to keep contaminants out of the oil may only be about 10 percent in comparison to what it takes to filter them out.

On the other hand, if the calculated RCL is extremely low, such as 10/8/5 or less, it will require more than just filtration to accomplish the goal. This may not be realistic given your machine's environment. As stated earlier, the net effect across both the investment in cleaner oil and the return in benefits must be minimized.

Understanding ISO 12669

ISO 12669 is designed for hydraulic systems, although the essential strategy can be adapted for application in other lubricated systems. This standard reviews the need for setting targets on solid particulate contamination levels only. Therefore, it does not include a cleanliness target level consideration for soft insolubles, water or any other contaminants. The standard is also intended to provide considerations of fluid cleanliness for the initial flushing requirements, manufacturing process, assembly, commissioning and operating filtration requirements.

When component considerations are relevant in calculating the RCL, the component manufacturer can offer recommendations as to the equipment's sensitivities and the suggested RCL weight factors. Likewise, filter manufacturers can give recommendations on the RCL weight factors when they have developed evidence correlating the filtration methods and hydraulic system applications.

The contaminant sensitivity tests for components originated from studies conducted at the Fluid Power Research Center of Oklahoma State University in the 1970s. These studies, along with a U.K. Department of Trade and Industry (DTI) survey, helped emphasize the importance of hydraulic fluid filtration as a more effective strategy for component life extension.

In the late 1990s, the British Fluid Power Association's technical committee on contamination control was instrumental in developing early methods for determining the RCL. This provided influence on the conclusive weight factors applied in the current ISO 12669 standard.

Proactive Maintenance in Three Easy Steps

Cleaner oil extends the life of your machines by keeping the frictional zones less exposed to the dangerous effects of contaminants. When the effort to achieve this is carefully optimized, the return on investment can be a significant advantage, even a competitive advantage. Creating this RCL target is only the first step of a complete proactive maintenance contamination control strategy. Following are the three steps:

1. Set the cleanliness target. This can be determined through experience and optimized with a methodology such as what is outlined by ISO 12669 along with the optimum reference state. The target should ultimately reflect your reliability objectives.

2. Take specific actions to achieve these targets through a two-pronged approach, reducing ingression and improving filtration. Reducing ingression is more cost-effective but not a perfect standalone solution. Combining this with improved filtration is necessary for any critical application.

3. Measure contaminant levels frequently with oil analysis. As the saying goes, what gets measured gets done. Knowing the contamination history is vital to a sustainable program. Contamination levels are a leading indicator, while the wear and failure rates are a lagging indicator. Proactive measures can be justified and reinforced with more data to validate the cause and effect. It's recommended that these types of results be posted openly for everyone involved to understand. ***ML***

References

ISO 12669:2017: Hydraulic fluid power — Method for determining the required cleanliness level (RCL) of a system

Fitch, Jim. (2006). "A Conversation with Dad — Pioneer, Educator and Mentor in Fluid Contamination Control." *Machinery Lubrication*

Fitch, E.C. (1988). *Fluid Contamination Control,* Fourth Edition. FES Inc.

About the Author

Bennett Fitch is the director of product development and Lubrication Program Development (LPD) services for Noria Corporation. He is a mechanical engineer who is certified as a Level III Machine Lubricant Analyst (MLA III), Level II Machine Lubrication Technician (MLT II) and as a Machinery Lubrication Engineer (MLE) through the International Council for Machinery Lubrication (ICML). Contact Bennett at bfitch@noria.com to learn how Noria can help you develop and manage your lubrication task routes.

ICML Expands Membership Options and Benefits

"ICML is revamping its membership packages to allow greater flexibility and benefits for organizations and individuals."

With the recent rollouts of the Machinery Lubrication Engineer (MLE) certification and ICML 55 standards for lubricated asset management, the International Council for Machinery Lubrication (ICML) has ushered in a new era of purpose and consistency for thousands of lubrication and oil analysis practitioners. Along with these successes, ICML is revamping its membership packages to allow greater flexibility and benefits for organizations and individuals who wish to support ICML's mission, collaborate with peers, gain promotional exposure and secure exam discounts.

WHO IS AN ICML MEMBER?

Many people believe if they hold an ICML certification of any kind that they are automatically an ICML member, but this is not the case. ICML certification is not the same as ICML membership. However, certification does qualify an individual to further engage with ICML as an associate member with other benefits.

The basic primer for ICML's new membership offerings can be found on the organization's website. Full and supporting members are client companies and organizations that plan to sponsor exam sessions during the year, while partner members are entities whose goals and/or audiences overlap with ICML but who have no plans to sponsor exams. Associate members are individuals with active Machine Lubricant Analyst (MLA), Machinery Lubrication Technician (MLT), Laboratory Lubricant Analyst (LLA) or MLE certifications who have paid a nominal fee for additional recognition opportunities.

While ICML's new membership structure remains subject to ongoing revision, following are some of the more obvious changes:

MEMBERSHIP LOGOS

ICML wants its members to be recognized for their affiliation with the organization, so specialized logos are offered that help make it easy to publicize their membership status. Full and supporting members use a "member" logo, while partners and associates have their own eponymous logos. These can be displayed according to guidelines defined in ICML's stylebook.

PROMOTIONAL OPPORTUNITIES

Branding and communication are important, but not every member has the tools to pursue such activities. ICML can help its members in these areas.

Audience Presentations

When ICML pursues speaking opportunities at conferences, or

when it considers hosting webinars or tweet-chat events, the organization first turns to its full and partner members as potential co-participants. Such co-presentations make these types of speaking engagements more interesting and informative for audiences. ICML is open to a variety of venues and formats, as it seeks to help generate exposure and discussion.

Database e-Blasts

For the first time, ICML will allow certain member categories to send approved emails once or twice a year to the organization's contact database. Of course, participating members will not have direct access to the database. Instead, ICML staff will work with qualified members to produce e-blasts or newsletter blurbs that are relevant to the organization's candidates and certificants. Previously, ICML only conducted email outreach for conference organizers whom it supported as a media sponsor.

Newsletters

Active members can now take advantage of ICML's quarterly newsletter which reaches an ever-growing candidate database. The newsletter offers exposure to ICML members and can feature guest authors.

MEMBER OBLIGATIONS

The best relationships are two-way streets, especially when you are working together to gain exposure, credibility, goodwill and accountability. To that end, ICML has certain expectations of its members that are designed to benefit everyone.

Guest Authors

ICML's full, supporting and partner members must each supply at least one guest author to participate regularly in a blogging/article rotation. If there is an expert on your company's team who enjoys sharing relevant content, this is a great way to be active, whether contributing to blogs, magazine articles or other non-commercial content. ICML's marketing department will direct online traffic to such content through social media and other channels.

Committee Seats

A full-member organization must also name one representative to serve consistently on an ICML board committee for one year. This is an excellent opportunity to network with industry experts and contribute directly to ICML's priorities, plans and projects.

Case Studies

A full-member organization must work with ICML to develop and complete one case study during the year. This cooperative effort will result in a document that both organizations can use for promotion on websites and at conferences. This can go hand-in-hand with co-presentations.

ASSOCIATE MEMBERSHIP FOR CERTIFIED INDIVIDUALS

Certified practitioners have always been at the core of ICML's mission. Once again, the organization offers a membership level for those individuals who want to help support ICML while enjoying a few extras. Remember, certification alone is not the same as membership. So, while a certified professional can display a certification logo next to his or her name, only an associate member in good standing can display the associate member logo. Associates also qualify for nomination to any certificant recognition program initiated by ICML. Finally, in the online listing of ICML's current certificate holders, the organization highlights the names of those who have gone the extra mile to support ICML as associate members.

ICML will be considering additional benefits as well, and suggestions are welcome. For instance, the organization is looking into partner discounts offered by fellow members along with an online job forum.

PRE-EXISTING BENEFITS

As ICML changes its membership packages, the organization still plans to continue a number of pre-existing member benefits, including certification exam discounts and voting rights.

Certification Exam Discounts

When a full or supporting ICML member registers a candidate for a certification exam, that organization basically receives its money back in the form of discounts, which can be applied to exams or recertification fees. Even after these discounts have been exhausted, all other member benefits, opportunities and obligations continue for one year.

Voting Rights

Full and supporting members in good standing are allowed to cast one vote each on certain matters specified by ICML's board of directors, including the election of board members. These votes can be cast electronically on a case-by-case basis.

ICML believes dynamic membership involvement encourages organizations and practitioners to take ownership of their lubrication objectives, enhance their leadership and communication skills, and learn from one another. Visit ICMLonline.com to review all the membership package options and consider what might work best for you and your organization. ***ML***

Daniel Rader | L3 Harris Technologies, USA

How Lubrication Excellence Can Make Your **Plant More Cost-Effective and Productive**

"Place your plant on a path toward lubrication excellence and watch it become one of the most cost-effective parts of your organization."

There is a widely held belief among salespeople and customer-service professionals that it's easier to maintain a customer than it is to find a new one. Data backs this up, revealing that the process of acquiring a new client can cost as much as 25 times more than investing the same time and resources in keeping an existing customer. Most research shows that a much smaller investment in maintaining customers can yield even greater results, with as little as a 5 percent increase in spending on existing customers resulting in nearly double the profits.

This also holds true for lubrication practices. It's far better to wisely invest your time and resources in existing equipment than it is to just swap out "bad" machines for new ones. The key lies in how you approach maintaining and operating the equipment. Simply throwing more money at the existing problems won't necessarily help. You need to view improving machinery life holistically.

The three main cost areas most organizations consider are parts, labor and downtime. Everyone budgets these items, but ultimately they are all reactive measurements. The true cost can only be seen after the maintenance events have already occurred. However, there are ways to project or estimate how the changes made in your procedures and equipment while

driving your lubrication program toward excellence will impact overall profitability.

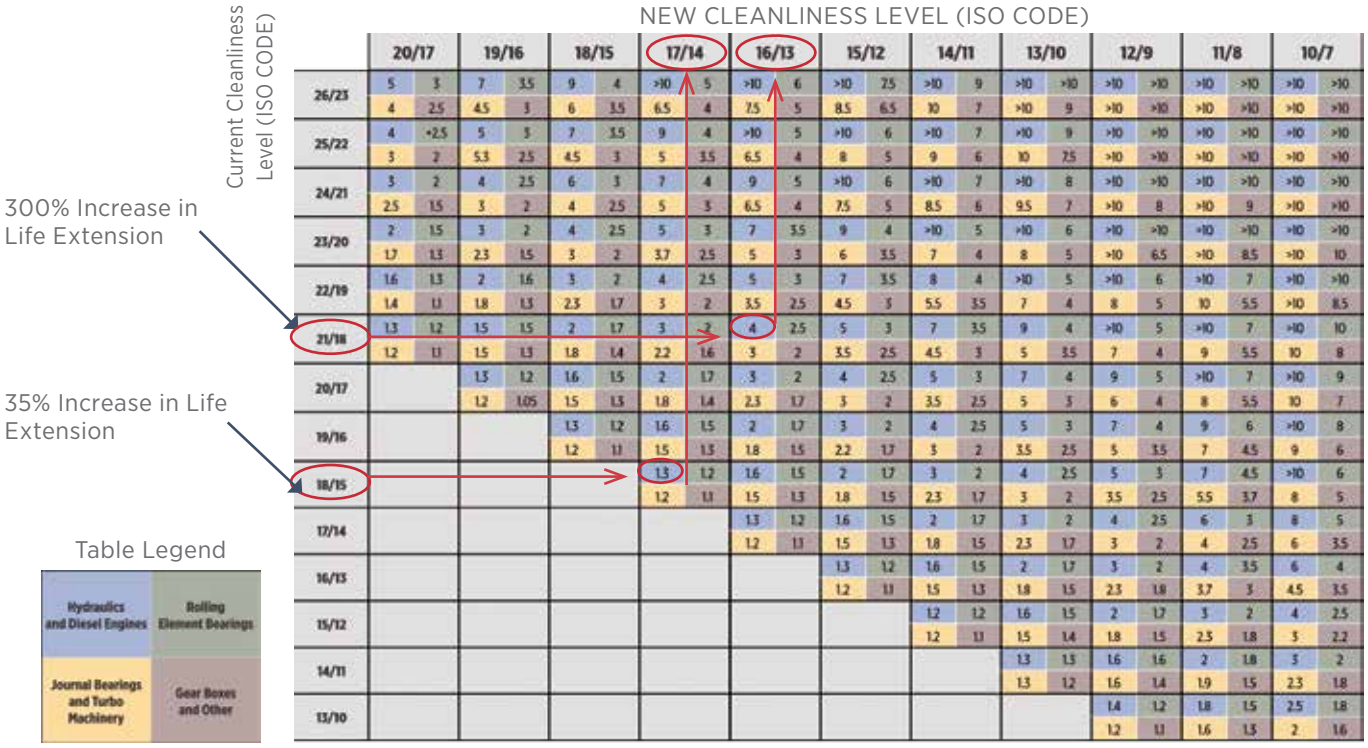
As seen in the chart on the next page, it can be conservatively estimated that a 10 percent reduction in maintenance is equivalent to a 40 percent increase in sales. From a manpower/overhead perspective, it seems obvious that improving maintainability should be the desired goal. In most ways, cost-effectiveness and productivity are tied together. A machine that runs more often should be more profitable in that it is achieving its desired operational purpose and not drawing the attention of the maintenance team for additional parts or labor. Therefore, it makes sense to approach the larger cost-improvement issue from a standpoint of how to reduce equipment downtime by preventing lubrication-related failures.

Ernest Rabinowicz, a professor at the Massachusetts Institute of Technology (MIT), published a study showing that 70 percent of machine failures can be attributed to lubrication-related problems, with 50 percent for mechanical wear and 20 percent for corrosion. It's apparent that using the right oils and greases and maintaining them inside the proper operating conditions will go a long way toward correcting or preventing most mechanical failures at your job site.

			Approach A		Approach B	
	BEFORE		10% MAINTENANCE COST REDUCTION		40% SALES INCREASE	
	$	% of Sales	$	% of Sales	$	% of Sales
Sales	$100	100%	$100	100%	$140	100%
Maintenance Costs	$20	20%	$18	18%	$28	20%
Material, Labor, G&A, and O/H	$75	75%	$75	75%	$105	75%
Profit	$5	5%	$7	7%	$7	5%

Impact of maintenance on overall profitability

Noria generally breaks down the journey to lubrication excellence into six categories: lubricant selection, reception and storage, handling and application, contamination control, lubricant analysis, and environmental disposal. This article will focus on the first five categories and provide examples of how to improve in regard to overall lubrication



Machine life-extension table

excellence and cost-effectiveness. While environmental disposal is critical, it's not necessarily a good place to look for cost savings.

Lubricant Selection

Selecting the proper lubricant from the beginning is the most important step you can take to improve machine productivity. Your equipment's needs will drive the selection process, but having a thorough understanding of different lubricant properties will allow you to pick the optimum solution.

Three types of base oils make up all lubricants: mineral, synthetic and vegetable. Synthetic-based oils tend to cost more upfront but have more consistent properties and are therefore more stable. Additionally, some synthetics can be used in hazardous plant conditions outside the specific considerations of the machine in question. For example, many synthetic-based oils have a higher flash point and are thus less susceptible as a fire hazard. If your plant operates at higher temperatures (from the climate or a process), it likely will be beneficial to switch to a synthetic oil. Similarly, most synthetics have a lower pour point and are better for machines starting up in very cold conditions. Again, synthetics often cost more initially, but by having better fluid properties and a longer useful life, they can pay for themselves in short order.

The most important property to consider when selecting a lubricant is the viscosity, and the first place to look for assistance when choosing the viscosity is the equipment manufacturer. Even if the manufacturer's recommendation is not always the best advice, it is the best starting point to determine the base range for the machine. For instance, an oil-pumping system may be designed to operate at around 125 degrees F, but at certain times it can run as high as 155 degrees F due to certain plant conditions. The manufacturer's guide only takes into account the normal operating temperature of 125 degrees F in its viscosity recommendation.

To ensure your lubricant remains viable, select an oil that meets both the minimum and maximum operating conditions and has a viscosity index (VI) that can withstand condition changes. If you work in a climate that is particularly hot or cold, the manufacturer's recommended lubricant may be incorrect solely because it is assumed the machine is operating in more temperate climates.

Temperature is an important factor to consider, because lubricant life is closely tied to operating temperature. Reducing the oil's operating temperature by 18 degrees F will double its life expectancy. This means fewer oil changes as well as less labor and downtime. If the system operating temperatures can't be changed, a similar (but lesser) result can be achieved by making certain that the selected lubricant has the right VI

additive to allow for all environmental and climate conditions.

There are many other additives and fluid properties to be considered for a specific machine application, but accounting for the viscosity and VI is the most effective means to improve lubrication. Some lubricant vendors can supply oil and grease with almost any desired package of properties. An easy way to produce cost savings at this stage is by simplifying your overall lubrication order. You may discover that you were needlessly purchasing a more expensive oil or grease. More likely, you will find that most machines can safely use the same type of oil and grease, and another area of savings can be established simply by ordering fewer lubricant types overall. Even if it costs a little more to adjust the oils and greases ordered, savings will be realized when machinery downtime decreases.

Reception and Storage

After selecting the correct lubricant, the next step is to ensure that it remains the correct lubricant. That is, you want to prevent contamination by taking steps to keep it out of the lubricant or removing contaminants as early as possible. You have taken the time to choose the right lubricant and additives, so do not allow the climate, environment or mishandling to disrupt your oils and greases.

The simplest way to control contamination is to not allow it into your lubricant in the first place. You might say this is easier said than done, but keeping your oil and grease clean, cool and dry is not as complicated as some would have you believe.

To prevent contamination, your lubricant storage should be the first area you address. Remember, the act of excluding a gram of dirt or debris will cost approximately 10 percent of what it will take to filter it out once it's already inside. There's no way to accurately calculate how much more expensive it would be if it contributes to machine failure, but needless to say it would be considerably higher.

Be sure to check the seals and lids on all drums and totes. Minimize the oil's exposure to air and weather by storing lubricants indoors or at least under a roof. Verify that all oil systems are properly sealed. Inspect lines and tanks for leaks, rust or other signs of failure. Hatches and closures should be fully shut and not obstructed by hoses, dipsticks or other instruments. Your lubricant storage area should also be routinely cleaned. After all, if it's dirty outside, it's more likely to get dirty inside.

Purchasing new storage equipment or improving your existing storage may not seem like an obvious way to enhance the cost-effectiveness of your site. A study by Monash University estimates that it only costs 25 cents per gallon to get oil to an acceptable level of cleanliness (14/13/11 by ISO 4406) to initially store or use. However, cleaning contaminants out of your oil can significantly increase your equipment's lifespan.

As seen in the table above, improving your oil by only one ISO 4406 cleanliness level will increase machine life by 35 percent. The cleaner it gets, the longer the machine will not suffer lubrication-related failures. The longer the machine goes without failing, the less downtime, parts and labor are needed. In other words, a small investment in cleaning your oil initially will yield huge savings over time by no other means than a reduced rate of failure and downtime.

Handling and Application

Closely related to storage, lubricant handling and application is another area where a little precaution in your practices can go a long way toward improving your results. The key with any task that involves transporting lubricants is to do whatever it takes to keep them sealed and protected from the environment, as well as to have proper procedures in place.

For example, a common means of contamination is when two lubricants are mixed together. This can happen in storage or application, in large quantities and in small. Different oils have different additives, and mixing lubricants together can cause them to work at cross purposes.

Oils can become mixed from something as simple as using the same jug or filter cart to transfer lubricants. It can also result from poor labeling of drums and totes, so consider a unique lubricant identification

system (LIS) to separate and categorize all lubricants in the plant.

Having all containers and ports marked with clearly visible and discrete identification tags helps prevent accidental cross-contamination. If nothing else, seeing the tag will force operators and maintainers to take a second look at the system as well as the lubricants and application tools they brought with them.

The cost-benefit increase in handling has everything to do with not making things worse. As mentioned previously, cleaning your oil is relatively cheap and can help extend lubricant life.

Contamination Control

In most cases, dirt, debris and other unwanted contaminants eventually will find their way into your lubricant. Being prepared to remove them is the next best way to control contamination in your systems. This can be as simple as installing filtration on existing ports on the tanks, motors, gearboxes and other lubricated equipment. If this level of machine modification is out of reach at this time, connecting a filter cart to your system and setting it to run once a day or even once a week can keep an oil system incredibly clean.

Desiccant breathers offer a passive way of cleaning and improving your oil. These can be installed on most system vents with minimal labor and are great visual aids for determining oil health. It's easy for any operator to spot when a breather is consumed, as the color changes usually are quite drastic, and swapping out a bad one is not a difficult task.

More extensive equipment changes can be made as well, such as installing permanent filtration and sampling paths. Sight glasses, particularly near the fill point, are excellent tools for viewing the oil without it having to leave the system. Dust protection covers can be installed on most grease fittings, as can purge points to allow for the expulsion of old or bad grease when new lubricant is added. There's also a bevy of alarms, gauges, meters, and other bells and whistles on the market. The cost-benefit to you will be derived from how well the machine improvements warn you of a lubricant-related failure or how effective they are in preventing or treating it. Early detection gives you time to decide how to fix the problem. Scheduled repairs are almost always cheaper than an urgent job.

Lubricant Analysis

Analyzing the lubricant is how you can tell if your program is effective. Tracking contaminants and fluid properties over time is not only the best way to determine how your oil is doing but is also the best early indicator of machine failure. For example, a sudden appearance of metal particles in an oil sample is likely due to excessive wear and a pending failure. Without analysis, there might not be a way to detect this failure ahead of time.

Proper sampling goes hand-in-hand with lubricant analysis. Drawing the correct sample size while keeping the sample as sealed as possible is similar to any other lubricant-handling task. Design your analysis program by identifying the questions you want answered about your equipment and lubrication systems. Adjust the sampling frequency as you see parameters improve or decline. Collect larger samples for more robust analysis and root cause findings. Your lubricant vendor may have a reputable laboratory and be able to analyze your oil at a reasonable rate.

From a cost-effectiveness standpoint, lubricant analysis offers the essential feedback that helps you adjust and budget for work in the future. A steady and predictable lubrication program provides the maintenance team with the necessary information to plan for today and tomorrow. Better planning is more efficient and allows for labor resources to be accounted for on any given day.

40%

of lubrication professionals consider contamination control as the most important factor in achieving lubrication excellence, based on a recent survey at MachineryLubrication.com

Bottom Line

Many of these recommendations may seem more like sunk costs than profitable suggestions. There's not a lot of instant profit or savings in implementing a labeling system or installing filters, breathers and other equipment. The impact is not always immediately seen. It can take time for your system to adjust to a new equilibrium after improvements have been made, but studies consistently show the bottom-line impact will be significant.

Research published by the Institute of Mechanical Engineers determined that for every $1,000 invested in proper lubrication practices or improvements, the average savings yielded was $40,000, or a return on investment (ROI) of 3,900 percent. Similar studies comparing lubrication practices to other condition monitoring technologies, such as thermography or vibration analysis, found oil and grease condition monitoring programs to be worth at least four times the other options over a three-year period. As previously discussed, it has also been shown that the ROI for cleaning oil to extend machine life is tremendous.

Ultimately, the proof is in the pudding. There are countless examples of successful lubrication programs making small initial investments and reaping huge rewards. Place your plant on a path toward lubrication excellence and watch it become one of the most cost-effective parts of your organization. *ML*

About the Author

Daniel Rader is a Reliability Engineer at L3 Harris Technologies, USA. A Certified Maintenance and Reliability Professional (CMRP) through the Society for Maintenance and Reliability Professionals (SMRP), he holds Level I Machine Lubrication Technician (MLT I) and Machine Lubricant Analyst (MLA I) certifications through the International Council for Machinery Lubrication (ICML).

TEST YOUR KNOWLEDGE

This month, *Machinery Lubrication* 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. Water separation from oil (demulsibility):

A) Can be roughly determined with a kitchen blender.
B) Cannot be determined in the field.
C) Can be determined using a patch test.
D) Is not important enough to worry about with a field test.
E) Can be determined using a calcium hydride kit.

2. FTIR can provide reliable information on:

A) Oxidation and soot
B) Wear metals
C) Viscosity and acid number
D) Particle counts
E) Oil density

3. The benefit that is achieved with the use of a hard-piped sampling valve (minimess) is:

A) Dead volume is minimized
B) Flushing is easy to do
C) Sampling is clean due to the threaded dust cap
D) There is low risk of leakage
E) All of the above

ANSWERS

1. A
The test can be prepared easily by mixing the used oil sample with water at room temperature. The mixture should be blended for 2 minutes at high blending speed and then poured into a graduated cylinder. Demulsibility can be assessed by evaluating the oil zone, cuff zone and water zone after a certain period of time.

2. A
FTIR is an effective tool to monitor multiple oil parameters such as oxidation, soot, nitration, glycol, etc. There are special instruments to measure wear metals, viscosity, acid number, particle counts and oil density.

3. E
A minimess sampling valve is ideal because the amount of dead volume (stagnant oil) in this type of sample port is minimal. Therefore, flushing is easy and does not require draining large amounts of oil. This type of sample port is designed to prevent leakage and is normally clean because of the threaded dust cap.

INDIA'S HEROES ON THE ROAD

As the COVID-19 pandemic spreads, the world's eyes are on the doctors and nurses working hard to save lives. Yet, there is another frontline of workers – the ambulance drivers, police and those delivering basic necessities including food and medicine, who are also doing their bit in helping fight the pandemic and contain its spread.

In India, **GoMechanic** and **ExxonMobil** have stepped up to support them and their vehicles. ExxonMobil Lubricants (India) is the official mobility partner of GoMechanic, a branded network of technology-enabled service centres. Under its #OpenForHeroes initiative, GoMechanic is working in collaboration with state authorities to keep emergency vehicles, such as ambulances, police vehicles and even utility services like water and sewage, moving.

"Emergency and essential services cannot afford to stop, even more so when India is under lockdown," said Kushal Karwa, the co-founder of GoMechanic. "We feel it is our duty to ensure that our frontline workers get access to the best service and the need of the hour is to keep their vehicles running. With our #OpenForHeroes initiative, GoMechanic wanted to show its appreciation for these real-life heroes by helping them in the best way we can."

ExxonMobil's role is ensuring that GoMechanic service centres have the much-needed lubricants to support the maintenance work. "Every effort counts in bolstering India's fight against COVID-19. These frontline workers are risking a lot to keep us going, and we are committed to GoMechanic's initiative that helps them get around and make their lives easier," said Rupinder Paintal, Director of Market Development, ExxonMobil Lubricants (India).

The service currently operates across nine cities in India, supporting frontline responders in the National Capital Region, Mumbai, Pune, Bangalore, Hyderabad, Chandigarh, Jaipur, Ahmedabad and Chennai.

COVID PANDEMIC: CHALLENGES AND OPPORTUNITIES FOR BASE OIL REFINING AND OPERATIONS

COVID-19 pandemic has affected all the sectors of the economy worldwide and being an integral part of all economies, Oil and gas industry cannot remain unaffected. The article here analyses the impact of COVID on base oil refining and lubricants and possible solutions to tackle the challenges posed.

CHALLENGES AHEAD:

COVID has thrown many challenges to the base oil refining and related industries. Some of the challenges for refining and lubricants/base oils are as follows:

- Impact on the capacity of refineries- whether and for how long will they reduce their capacity
- Current and future refinery projects may become uncertain
- Whether economics or politics or both will determine which refinery shuts down and which one starts up
- High stock levels may cause base oil prices to remain lower for longer, exacerbating the normal base oil lag as crude and refined products recover.
- 2021 could be a very poor margin year-particularly if demand recovery is lagging.

According to recent reports,the demand of oil had dropped significantly in the second quarter of 2020 as compared to the second quarter of 2019. This has led to sharp reduction in global refinery throughput. The recovery in demand can be expected only in 2021.But even with a strong recovery in 2021,demand will still be around 2 million B.D. which is below 2019 levels. As a result of this decline in demand , base oil production may fall commensurately, even as refining capacity grows across the world. Subsequent decline in production may lead to to lower capacity utilisation of the existing refineries. IHS Markit projects year on year crude run decline of 17.0 MMb/d in 2Q2020, leading to 5 year low utilisation levels till 2021.

Another impact can be seen in the decline of base oil prices across the world. Crude and refined product prices have declined by 60-70% from January to April 2020,however spot base oil prices fell only 15-35% over the same period but this figure may reach to 60-70% in near future.

Additionally, refining margins on high-yield products like aviation turbine fuel, motor spirit and high-speed diesel have plummeted and are expected to remain weak over the near term. However, oil marketing companies would fare better than stand-alone refiners because of higher marketing margins for some products.

The next challenge Oil companies are going to face is loss and damage to their inventory. Hence proper inventory management including sound storage and handling practices will become even more crucial now.

COVID will have similar impact on Lubricant Industry as well since it is closely related to refinery business. Lubricants demand is expected to decline by upto 20% for 2020 with much sharper decline in Q2 and Q3. Transport segment lubricants will see more pronounced decline, while the effect on the non-transport segment is likely to be less severe but longer-lasting.

In addition to above, it will also have an impact on current and future refinery projects which may become uncertain so they need to be rationalised accordingly.

WAY AHEAD :

Some of the probable solutions for refiners amid these challenges can be as follows.

- Product mix diversity: Refineries who have ventured into producing petrochemicals like waxes and specialities etc for example ,will be less prone to the losses due to decline in demand of oil.
- Reliability and operational availability: Refineries with better reliability , lesser downtime and good maintenance practices will be able to minimise their cost of production as well as their operating expense inefficiencies.
- Better integration with Fuels refinery: The better the integration of refineries with fuel refineries,the better it will be for them.
- Regional location of refineries: Refineries in certain regions having geopolitical tensions alongwith COVID pandemic may face more grave challenges in carrying out operations in a profitable manner.

Let's hope the industry is well prepared to face the "new normal".

Training Matters.

"Machines Don't Just Die... They're Murdered"

Much of this can be avoided by ensuring proper lubrication of your equipment. Train yourself and your team on the finer points of lubricants, lubrication & reliability through "world-class" Noria trainings on Machinery Lubrication & Oil Analysis to avoid unplanned downtime at your facility.

Course	Date	Location
Essentials of Machinery Lubrication (MLT I / MLA I)	16 - 18th June	Delhi
Machinery Lubrication Engineering (MLE)	14 - 17th Sept.	Mumbai
Advanced Oil Analysis (MLA III)	7 - 9th Dec.	Mumbai
Advanced Machinery Lubrication (MLT II)	10 - 12th Dec.	Mumbai

ICML

With International Council For Machinery Lubrication (ICML) Certification

Website : www.lubrication-institute.com
E-mail : info@lubrication-institute.com

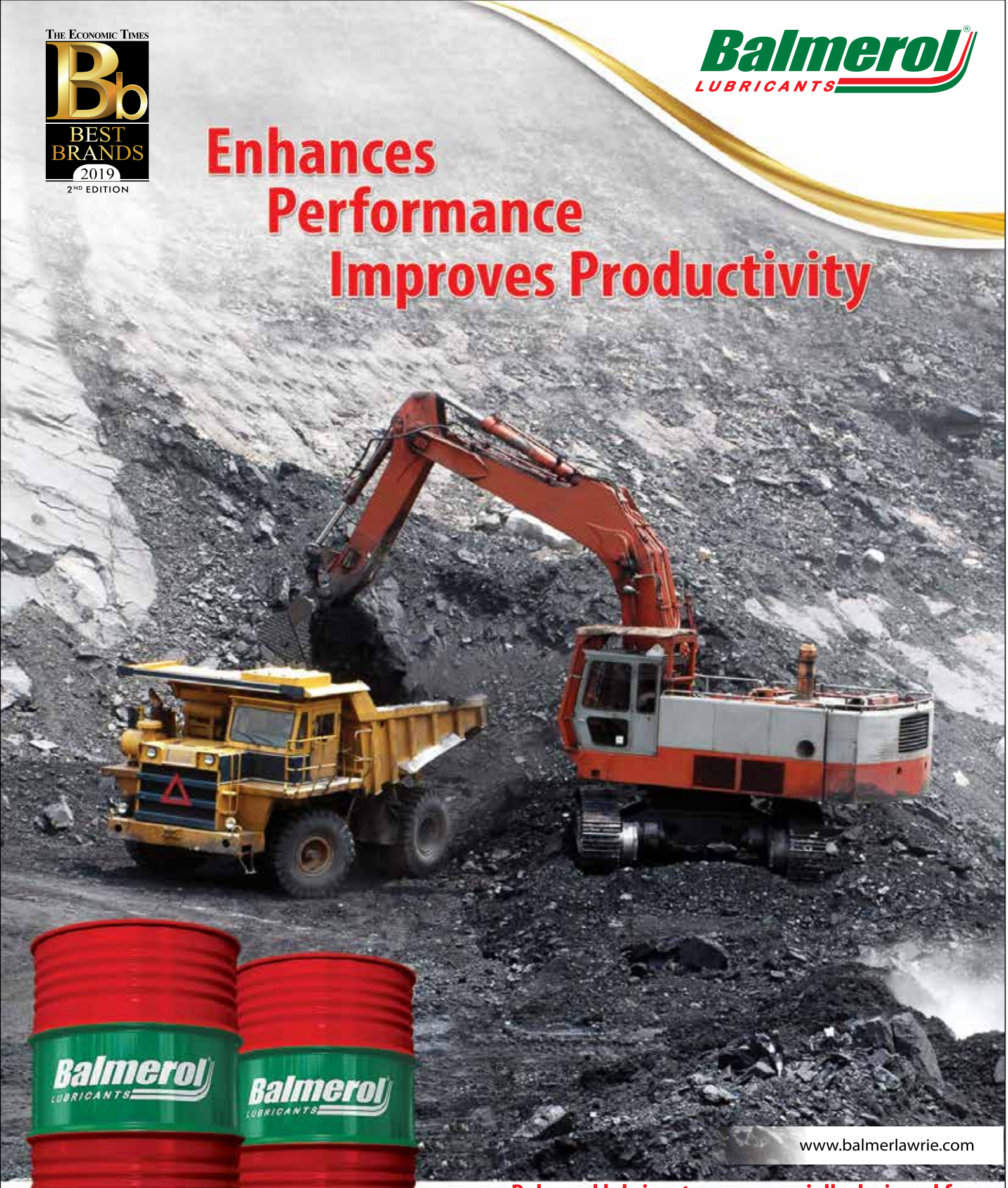
Lubrication INSTITUTE
www.lubrication-institute.com

NORIA

THE ECONOMIC TIMES
BEST BRANDS
2019
2ND EDITION

Balmerol®
LUBRICANTS

Enhances Performance Improves Productivity



www.balmerlawrie.com

Balmerol lubricants range specially designed for Mining & Construction equipment

Protomac TC 10W & 30 : Power shift Transmissions / Hydraulic Fluid - Dumpers ❑ **Ultima C14 Plus 15W-40 :** Engine Oil for all equipment **Protomac H SPL 46 & 68 :** High Viscosity Index Hydraulic Oil for Dumpers, Excavators & Other varied applications ❑ **Unitrans / OIB Oil :** Transmission cum Hydraulic oil for backhoe loaders, Axle oil for front loaders ❑ **SC-HT :** Grease for dumpers ❑ **Liplex HD/HDX :** High temperature heavy duty grease for off-highway equipment's ❑ **Liprex EP :** Grease for off-highway equipment's - Pins & Bushes