May_June 2021

Machinery Lubrication

INDIA

machinerylubricationindia.com

ASCEND™ TO LUBRICATION EXCELLENCE

NORIA

VAS TRIBO
Solutions Unlimited

ML May-June 2021

TABLE OF CONTENTS

Machinery Lubrication INDIA

EDITORIAL FEATURES

Publisher's Note

Cut, Cut, Cut the maintenance budget is always on the wish list of any progressive organisation. There could be many strategies that the reliability team could follow to achieve the goal, but one of the important aspects (often ignored) is having a closer look at one's lubrication processes, procedures, and hardware.

The potential bottom-line benefits of proper lubrication are often overlooked. This is true throughout the industrial world and in countless applications from power, cement, paper, steel, petrochemical, railroad , off highway, wind turbines and many other applications using rotary equipment . If no effective lubrication program is in place, an operation is not likely to be cost effective on the basis of maintenance, lube consumption & cost of downtime.

Conversely, the right lubrication process can provide opportunities to improve profitability by reducing costs and boosting reliability, increasing the overall life cycle of equipment, and, ultimately, turning out products at a more competitive rate.

For Decades, organizations have been bombarded with information and endless case studies of the benefits of implementing an effective lubrication program. The benefits associated with this program reach out wider than the equipment reliability, plant availability gains, and the reduction operating costs in most industrialized plants. These gains can also increase the entire business effectiveness by improving risk-safety, environmental integrity, energy efficiency, product quality, and customer service to mention a few.

An effective lubrication program should produce significant benefits in plant reliability and equipment availability. Conducting an internal or external assessment of your existing lubrication program and comparing it to industry "Best Practices" will provide a needed gap analysis for identifying both strengths and weaknesses. Once identified, a focus on improvements can be made that yield optimal performance from your lubrication program.

However, the simple task of conducting a comprehensive lubrication survey may be all it takes to get an organization on the path of lubrication excellence and will provide a roadmap for continued success.

This issue focuses on how to rollout an effective lubrication program by breaking up the entire lubrication into 3 stages, 6 lifecycle stages and 40 factors and then analyze the entire program in totality. This process has been found highly effective in identifying the weaknesses of the program and how to build a world class lubrication program.

Our previous issue with cover story on Risk Management for Lubricated Machines was well received by the readers. Several of whom wrote to us about their thoughts on the subject.

As always, we look forward to your valued suggestions and feedback.

Warm regards,
Udey Dhir

By Gerardo Trujillo & Jim Fitch

ASCEND™ to Lubrication Excellence

Many organizations aspire to achieve the state of lubrication excellence. This is indeed a lofty goal, but not beyond the reach of a focused and determined team. What defines lubrication excellence has not always been clear until Noria gave rise to the Ascend™ methodology. Its application and purpose go beyond mere definition. It has become a powerful tool and metric to evaluate, design, implement and control the essence of the lubrication excellence transformation. Ascend™ is the North Star that illuminates the guiding path that gets us there.

Identifying the starting point on the journey to lubrication excellence always requires evaluating current practices to contrast with lubrication best practices, which Noria calls the Optimum Reference State (ORS). Once the gap is identified, it is necessary to establish an optimal road map that ensures that resources, effort and time are allocated to targeted initiatives that produce the highest return on investment.

This requires prioritization based on lubricant lifecycle logic and the impact of improvements on machine reliability and other organizational objectives. Once the process is started, it is necessary to measure progress, continue the transformation plan, identify deviations, and ensure that improvements are sustainable.

Ascend™ is a necessary evolutionary advancement over the conventional radar chart (or spider chart) that for years was considered a standard to evaluate the lubrication process. By incorporating this new approach across the lubricant lifecycle, alignment with the requirements of the ISO 55001 and ICML 55.1 standards can also be achieved. Additionally, it responds to business objectives of many users who want to implement a lubrication program that enables superior plant reliability.

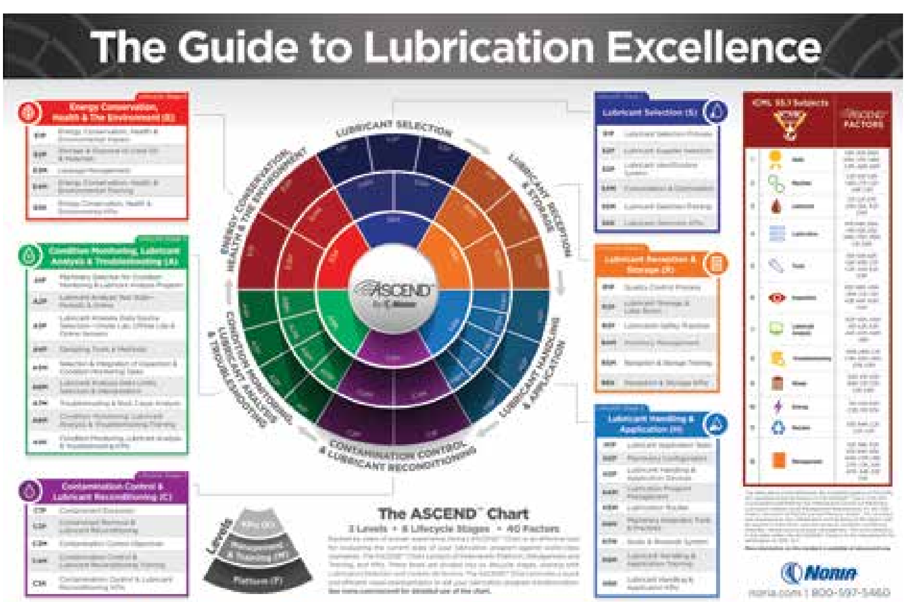
The Ascend methodology is backed by years of proven field experience, attention to the needs of industry, alignment with lubrication practices, and international asset management standards. Finally, it is driven to execution by our genome of innovation and continuous improvement.

Lubrication Lifecycle Stages

Ascend uses six lifecycle stages that follow in chronological order: selection, reception, application, management, analysis and disposal. It integrates the importance of each of these stages and the impact they impart on lubrication excellence, machine reliability and asset management.

Following the lubricant life cycle, for the first time, allows users to correlate their day-to-day activities at each stage with fundamental business objectives and how each stage functions individually as a part of the whole in executing correct principles of lubrication.

Ascend underscores the importance of selecting the right lubricant, with



The Ascend™ Wall Chart

Machinery Lubrication India

Publisher
Udey Dhir - udeydhir@tribologysolutions.com

Creative Director
smassociates@gmail.com

Advertisement Sales (US/Canada)
Brett O'Kelley - bokelley@noria.com

Advertisement Sales
(India/all other countries)
Jhumpa Mukherjee - 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 52 - Issue 2, March-April 2021 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.

performance specific to the requirements of the machine and its operational context. But it doesn't stop there. It also needs to arrive in the correct condition, be stored in the correct way, be applied to the machinery in the right place and at the correct frequency. Precision lubrication also includes application of the correct amount, with the right tools, by a person with the right knowledge and skills. Lastly, there is a fundamental need for contamination control of lubricants and using lubricant analysis as a metric on the state of lubrication and overall machine health.

The life cycle stages are shown as angular wedges on the Ascend chart:

- Lubricant selection (S)
- Lubricant reception and storage (R)
- Lubricant handling and application (H)
- Contamination control and lubricant reconditioning (C)
- Condition monitoring, lubricant analysis and troubleshooting (A)
- Energy conservation, health and the environment (E)

Factors and Management Levels

In the Ascend methodology™, lubrication activities across the lifecycle of the lubrication process are divided into 40 Factors (see Table 1. Ascend Factors). Each of these factors is interrelated to one or more of the 12 areas of the lubrication plan as specified in clause 5.0 of the standard ICML 55.1 *Asset Management Requirements for the Optimized Lubrication of Mechanical Physical Assets.*

However, it should be noted that these 40 factors do not all share the same weight in design and implementation of the lubrication strategy. Therefore, to emphasize and clarify these differences, the factors are arranged into three levels (See Figure 1):

- Platform (P)
- Management and Training (M)
- Performance Indicators (K)

Platform factors are considered the foundation of the program and are aimed at controlling risks, ensuring performance

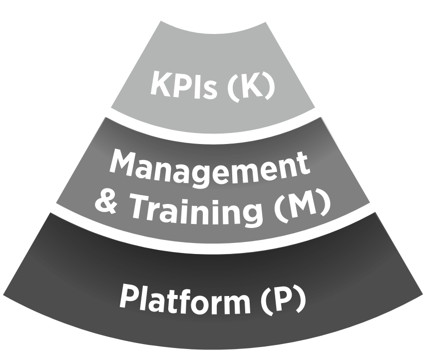


Figure 1 Three levels of Ascend™

Lifecycle Stage 1

Lubricant Selection (S)

S1P	Lubricant Selection Process
S2P	Lubricant Supplier Selection
S3P	Lubricant Identification System
S4M	Consolidation & Optimization
S5M	Lubricant Selection Training
S6K	Lubricant Selection KPIs

Lifecycle Stage 2

Lubricant Reception & Storage (R)

R1P	Quality Control Process
R2P	Lubricant Storage & Lube Room
R3P	Lubrication Safety Practices
R4M	Inventory Management
R5M	Reception & Storage Training
R6K	Reception & Storage KPIs

Lifecycle Stage 3

Lubricant Handling & Application (H)

H1P	Lubricant Application Tasks
H2P	Machinery Configuration
H3P	Lubricant Handling & Application Devices
H4M	Lubrication Program Management
H5M	Lubrication Routes
H6M	Machinery Inspection Tools & Practices
H7M	Goals & Rewards System
H8M	Lubricant Handling & Application Training
H9K	Lubricant Handling & Application KPIs

Lifecycle Stage 4

Contamination Control & Lubricant Reconditioning (C)

C1P	Contaminant Exclusion
C2P	Contaminant Removal & Lubricant Reconditioning
C3M	Contamination Control Objectives
C4M	Contamination Control & Lubricant Reconditioning Training
C5K	Contamination Control & Lubricant Reconditioning KPIs

Lifecycle Stage 5

Condition Monitoring, Lubricant Analysis & Troubleshooting (A)

A1P	Machinery Selection for Condition Monitoring & Lubricant Analysis Program
A2P	Lubricant Analysis Test Slate—Periodic & Online
A3P	Lubricant Analysis Data Source Selection—Onsite Lab, Offsite Lab & Online Sensors
A4P	Sampling Tools & Methods
A5M	Selection & Integration of Inspection & Condition Monitoring Tasks
A6M	Lubricant Analysis Data Limits Selection & Interpretation
A7M	Troubleshooting & Root Cause Analysis
A8M	Condition Monitoring, Lubricant Analysis & Troubleshooting Training
A9K	Condition Monitoring, Lubricant Analysis & Troubleshooting KPIs

Lifecycle Stage 6

Energy Conservation, Health & The Environment (E)

E1P	Energy Conservation, Health & Environmental Impact
E2P	Storage & Disposal of Used Oil & Materials
E3M	Leakage Management
E4M	Energy Conservation, Health & Environmental Training
E5K	Energy Conservation, Health & Environmental KPIs

Figure 2. 40 Ascend™ Factors

and sustaining the program over a long span of time. These factors are tactical and as such need to be implemented first.

Management and Training factors are activities that enable the needed resources, provide planning and scheduling and deliver condition monitoring of lubricants and machines. At this level, staff education and skills development activities are included. These are the day-to-day lubrication activities that are supported by all platform factors. The Key Performance Indicators (KPIs) level is the one that allows measurement of efficiency and effectiveness of the activities in a lubrication program and continuous improvement thereafter.

Each factor has been assigned an alphanumeric code for convenient identification. The code has been developed using three digits: the first refers to the Lubrication Lifecycle Stage, the second is the factor number within the stage and the third denotes the Management level. For example, the S3P element is the third Factor in Lubricant Selection Stage and is located at the Platform level.

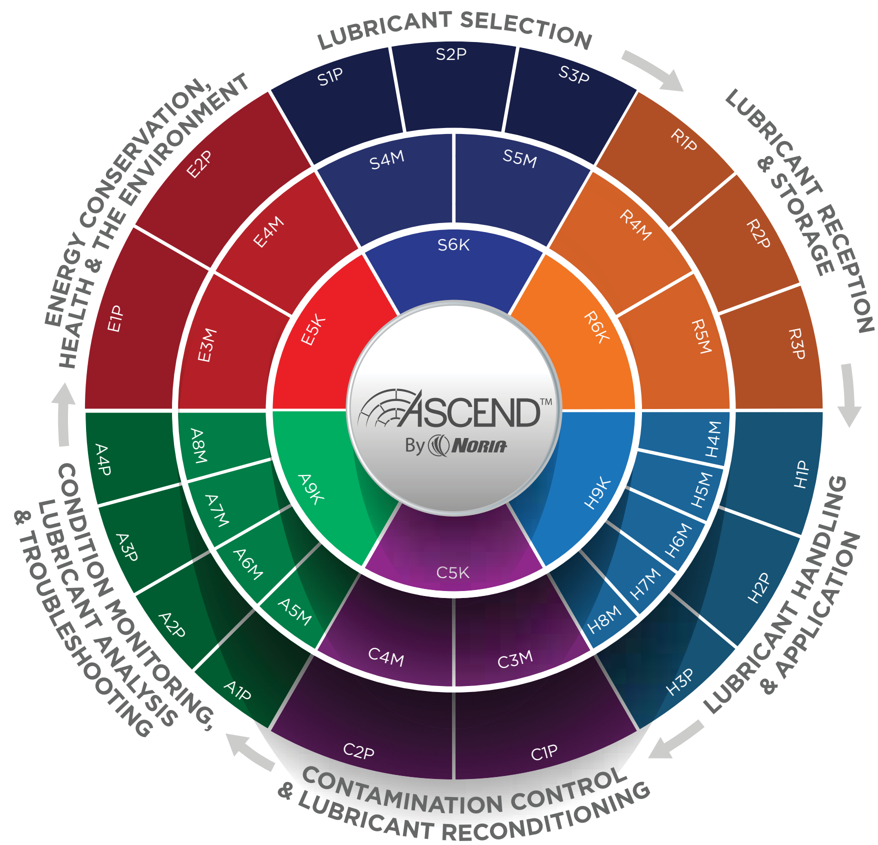


Figure 3. The Ascend™ chart

Using Ascend to Track the Transformation

The Ascend™ methodology uses Six Sigma's DMAIC (Define, Measure, Analyze, Improve and Control) tool to assess the maturity of the lubrication program from an established starting point through the transformation plan. The Optimum Reference State is defined based on the requirements of the ICML 55.1 standard. ORS compliance is assessed through inspections, measurement, verification and interviews.

Differences between required ORS performance and current performance are analyzed by the Ascend methodology to prioritize the implementation plan based on impact on business objectives and reliability. In the assessment phase, Ascend not only provides the maturity of each factor based on the degree of compliance (completeness) but also provides a list of specific improvements aimed at complying with the ORS in each of the 40 factors of the lubrication process. It identifies the critical actions needed to ensure that the process is sustainably implemented with suitable controls.

The maturity of the lubrication process factors is assigned by Ascend using the traffic light code, where compliance less than 30% is assigned a red color, compliance between 30 and 90% is assigned a yellow color, and factors that meet the ORS by 90% or more are assigned a green color. (see Table 2. Maturity of the Ascend Factors).

The Global Compliance level of Ascend (ACL) is a holistic indicator of maturity of the lubrication program in general. The ACL is not the average maturity of the 40 factors, but a sophisticated calculation based on a proprietary mathematical algorithm that includes a Balanced Score Card (BSC) of the lubrication process and the maturity of each of the factors. The active ACL value is displayed in the center of the Ascend Chart.

The Ascend Chart

As seen in Figure 3, the Ascend methodology is represented by a Chart consisting of the six stages of the lubrication process life cycle and the three management levels which also shows the degree of maturity and compliance with ICML 55.1

Implementation Priority and Execution Plan

The Ascend™ Chart naturally provides an intuitive way of implementation based on the maturity of the factors at the different levels, but also has a built-in mathematical algorithm based on the Balanced Score Card (BSC) of the lubrication process, the sequence and relative weight of each factor and its degree of maturity identified in the assessment, to calculate the Priority Impact Number (PIN). The PIN is an excellent aid in establishing the transformation road map by determining which factors should be implemented first, based on lifecycle logic, their contribution to business objectives, and plant reliability.

The Business Case for Ascend

The implementation of lubrication excellence is supported by numerous real world case studies that have been published in Machinery Lubrication magazine. However, a successful case study requires that each process step is validated based on the investments made relative to financial returns within a designated timeframe.

The Assessment Phase of Ascend™ explores the costs of the lubrication program and estimates the effect of current lubrication practices on maintenance budgets, operating budgets and overall productivity. This seeks to identify the financial impact represented by current lubrication practices and is part of the cost-benefit analysis that must be made to justify the investments required to implement lubrication excellence. Project financial analysis tools are used and reported such as Internal Rate of Return (IRR), Net Present Value (NPV) and Payback Period (PP). These tools develop the business case to present to management as part of the project approval process.

Such a proactive approach to lubrication excellence implementation makes these improvement projects less risky and easier to justify necessary investments.

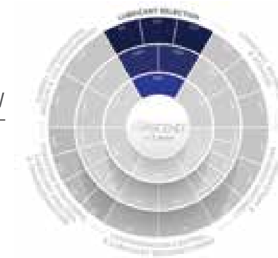
Lubrication Excellence Transformation

Each improvement implemented under the guidance of the initial Ascend evaluation report contributes to ORS compliance and a change in Factor maturity. Ascend™ has built-in simulation tools that show the result of individual initiatives to improve the maturity of each Factor in the ACL global compliance indicator.

Whether using the PIN or the simple logic of Ascend, the process of transformation towards excellence in lubrication should be directed to improve those priority factors immediately, concentrating the efforts on the red and yellow elements located in the Platform level. By identifying priorities, improvement projects can be targeted at a few factors at a time, allowing for better distribution of resources and measuring the start and end of each improvement project. In many cases, these mini-projects can bring economic benefits and increased reliability that will serve to give credibility to the project, build trust in the team and support the implementation of the rest of the project.

Some organizations that are aware of the importance of lubrication of excellence may elect to embrace a global lubrication process transformation project and achieve benefits in a shorter timeframe. If this is the case, years of proven experience allow us to support the industry in the process of implementing lubrication excellence through sophisticated tools, software and specific recommendations to execute a project along the shortest path without deviations or distractions. ML

Wes Cash | Noria Corporation



Making Critical Decisions: Selecting the Best Lubricants for Your Program

"There are very few decisions that have a more direct impact on machine health, down-time and your maintenance budget than choosing what oil or grease you should be applying"

Perhaps the most fundamental process in a lubrication program is selecting which lubricant to use. This decision is of the utmost importance. There are very few decisions that have a more direct impact on machine health, downtime and your maintenance budget than choosing what oil or grease you should be applying to your equipment. Lubricant selection goes beyond just selecting a mineral or synthetic lubricant. You must also carefully select additive packages, thickener types, base oils and even suppliers. Each lubricated component is engineered to do a specific task. In the same way, we must be able to choose a lubricant that is engineered to protect that component to the best of our ability.

Proper lubricant selection involves many steps and typically includes people in different roles. There are things that must be done tactically at the plant level and strategically at the management level. Effective metrics must be put in place to ensure the process stays efficient and to help identify areas of improvement. As you may imagine, with so many involved, training is essential to ensure everyone understands the importance of selecting and purchasing the proper lubricant. Just one small mistake can be catastrophic when an incorrect lubricant is applied to the wrong machine.

This lifecycle can be segmented into six main factors. These factors detail the most important tasks and goals for each step in the lubricant selection process.

The tactical or platform level factors are:

- Lubricant selection process (S1P)
- Lubricant supplier selection (S2P)
- Lubricant identification system (S3P)
- The management factors include:
- Consolidation and optimization (S4M)
- Lubricant selection training (S5M)

Finally, there is a single factor for Lubricant Selection KPIs (S6K).

To better understand the entire process, we must first understand the individual factors. Each factor can be broken down into a series of steps or process that must be documented and reevaluated for continuous improvement. We'll discuss each factor in more depth in coming articles but the information below will serve as a general overview of each.

Lubricant Selection Process (S1P)

Lubricant technology is constantly changing. With improvements in refining techniques, additive chemistry and metallurgy, our selection process must likewise stay up to date and evolve. To develop a robust lubricant selection process, you must first understand the equipment you are going to lubricate. The process should begin with a detailed survey of equipment and operating conditions. We need to understand the parameters of the machinery such as speed, load, operating temperature and contamination likelihood. These are all fundamental parameters, but other items are often overlooked, such as process contaminants, internal coatings or seal materials, food grade or environmentally sensitive requirement and a host of others.

To properly select the optimum lubricant, you will have to balance all the parameters discussed above with price and availability of the oil or grease. You also have to ensure that the chemical make-up of the lubricant lends itself to longevity and doesn't degrade or damage internal surfaces due to additive, thickener or base oil interferences within the machine. While the OEM typically recommends a lubricant initially, great care must be taken to ensure the recommendation is valid in your unique operating environment. Often adjustments must be made in viscosity, base oil or even additive packages based on the operational context of the equipment.

Lubricant Supplier Selection (S2P)

The relationship with your lubricant supplier is vital to ensuring the ongoing sustainability of your lubricant selection process. Choosing the correct lubricant supplier will enable you to have the proper lubricant, at the proper times, in the proper volumes, with the proper support. The supplier should be consulted with and involved in any performance or cleanliness guarantees that exist for incoming lubricants. We want to ensure the lubricant arriving at our facility is clean, defect free and is not cross-contaminated with other lubricants. The supplier should be able to support any technical issues identified in the plant and provide lubricant analysis for any lubricant that is in use in critical machinery.

While many organizations simply select their supplier based solely on price, the ideal selection criteria would be a weighted blend of several parameters. The supplier's logistics capabilities, supply chain, storage capability, delivery mechanisms, troubleshooting, capacity and of course—price. Some additional items are crucial, especially for critical lubricants. Certificates of analysis for bulk lubricants and documented quality assurance standards are a good example of this. These items should be documented and periodically reviewed and updated before selecting a new supplier. This will aid with future lubricant contracts and help formalize the supplier selection process. Also, a solid relationship with your lubricant supplier can aid in the next lifecycle of Reception and Storage.

Lubricant Identification System (S3P)

Lubricants can get accidentally mixed through several different steps of handling, storage, application or even delivery. In order to mitigate any accidental cross contamination, a robust labeling system must be developed and deployed throughout any facility. All things coming in contact with the lubricant should be labeled with the corresponding tag or code. The hallmarks of an excellent lubricant identification system would include the use of a generic code as well as the use of a unique color and shape for each lubricant. It is important to use generic codes and not product names because the product or supplier may change, which would then require the relabeling of the entire facility. The use of colors and shapes help with accuracy when selecting the proper lubricant from storage and throughout the application process.

The system doesn't have to be complex. In fact, the simpler it is, the better. The end goal is to ensure the correct lubricant gets applied. There are many options readily available for identifications with many of them aligning with standards such as ISO 6743 to aid in the grouping or defining of lubricants. A system like this would also make switching suppliers an easier exercise as the standardized code could be shared with potential suppliers for them to match to their products.

Consolidation and Optimization (S4M)

As stated earlier, OEMs will often recommend a lubricant for use in their equipment. If we simply purchased what was recommended, our storeroom would be full of lubricants that may get used very infrequently. The same would be true if we selected a lubricant based upon engineering calculations for each specific point. There has to be a balance between the needs of the equipment, the ability of the lubricant and the number of lubricants in your facility.

The goal of optimization and consolidation is to minimize the number of lubricants in use and select the ones that will provide the best protection and lifespan for your equipment.

We want to use as few lubricants as possible to minimize the risk of cross-contamination, improve our storage ability and decrease the volume of lubricant that may go stale in storage. Typically, savings associated with consolidation are significant and can be used to fund ongoing improvements for the lubrication program as a whole. Diligence and care must be taken during consolidation efforts to ensure lubricants aren't over-consolidated which may lead to the use of a non-qualified lubricant in an application. This also requires ongoing oversight as new equipment is installed or lubricant suppliers are changed overtime.

Lubricant Selection Training (S5M)

Lubricant selection typically involves staff from maintenance, engineering and procurement. Each person involved in the process needs to have training in the fundamentals of how lubricants perform, physical and chemical properties as well as any environmental or regulatory compliance issues. This should not be a one-size-fits-all approach and should be tailored to the job function. For instance, purchasing would need to understand some of the performance characteristics to ensure they are getting the correct quotes and selecting the proper vendor. Engineering would need to be trained to ensure they are selecting the proper viscosity or additive package. Maintenance would require training related to the safety or regulatory compliance of the lubricant. Depending on the level of involvement and ownership of the lubrication program in you plant, the training may include representatives from other departments as well.

Lubricant Selection KPIs (S6K)

The adage "what gets measured gets done" holds just as true in lubrication as it does in other fields. Each lifecycle of your lubrication program will require metrics or key performance indicators (KPIs) to help guide and evaluate the effectiveness of the individual lifecycle or the lubrication program as a whole. For lubricant selection, it is common to track items such as compliance of the lubricant identification system, number of technicians trained, current number of lubricants, supplier on-time deliveries, as well as a host of others. Whenever building metrics for any system, start with a list of questions you want answered. This will help guide the metrics to make sure they are impactful to your organization.

While lubricant selection typically doesn't receive much attention, you can see how it can influence the robustness of your lubrication program. Remember, if you don't start with the correct lubricant the rest of the lifecycle of that lubricant or machine will likely be impaired. Take a walk through your plant or your lube room and try to identify what all lubricants are in use and how many you actually have. This activity may surprise you and show that there are opportunities to save money and eliminate waste right under your nose. ***ML***

About the Author

Wes Cash is the Vice President of Services for Noria Corporation. He serves as a senior technical consultant for Lubrication Program Development projects and as a senior instructor for Noria's Oil Analysis I and Machinery Lubrication I and II training courses. He holds a Machinery Lubrication Engineer (MLE) Machine Lubrication Technician (MLT) Level II certification and a Machine Lubricant Analyst (MLA) Level III certification through the International Council for Machinery Lubrication (ICML). Contact Wes at wcash@noria.com.

Travis Richardson | Noria Corporation

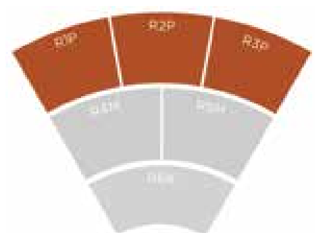
What Your Lube Room Says About Your Lubrication Program

> "One of the most common misconceptions about lubricants is that new oil is clean oil."

Whether you are eating out at a restaurant or preparing a meal at home, you expect your food to be handled with care and safe to eat. But most people rarely think about the rules and regulations that keep food safe for consumers. Think about it: the food you eat has been grown and harvested, sent to a plant to be processed and packaged and then shipped to a store or restaurant for you to purchase. This process may have taken many days and covered a thousand miles, but every step of the way, care has been taken to make sure your food is safe. Otherwise, the consequences to people's health could be high. Even if all the care in the world is taken, if one step in the chain fails to use good practices, all the previous safety steps are worth nothing.

What if lubrication programs treated their lubricants with the same care as food processors treat their food? The lubricant reception and storage lifecycle is a vital part of a lube program. A lot of work goes into to selecting the proper viscosity, base oils and additive packages before a lubricant is brought on-site. If that lubricant is not cared for in a certain way on site, it could compromise the lubricant and invalidate the lubricant selection efforts. Let's look at how the Lubricant Reception & Storage Lifecycle

Platform Level

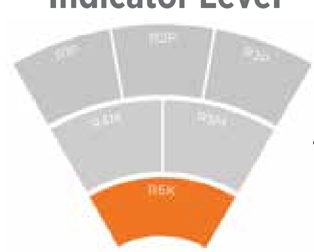


- **R1P** – Quality Control Process
- **R2P** – Lubricant Storage & Lube Room
- **R3P** – Lubrication Safety Practices Management

Management Level

- **R4M** – Inventory
- **R5M** – Reception & Storage Training KPI's

Key Performance Indicator Level



- **R6K** – Reception & Storage

Stage can help by going through all three levels: Platform, Management and KPI's—as well as the factors within each level.

These factors are made up of criteria that guide how lube rooms should be constructed, procedures for how they should be received and best practices for lubricant management. There is a lot of depth to these factors, but for now let's take a broad overview of them.

R1P – Quality Control Process

With the high demand for products these days, machines need to run longer, faster and in some cases both at once in extreme conditions with as little downtime as possible. One way this can be achieved is to ensure that every time we add lubricants to a machine, these lubricants are healthy and ready to perform. One of the most common misconceptions about lubricants is that new oil is clean oil. In fact, this is often not the case. Many new lubricants are still too dirty to put in any machine. Lubricant cleanliness is one of many reasons why the quality control process should start before lubricants ever arrive on a site's receiving dock. There are many steps to ensure you are getting healthy lubricants each time you receive them. Agreements with the lubricant supplier should state the lubricant cleanliness expectations, overall lubricant performance properties and how lubricants should be delivered. Once lubricants arrive, checks and verifications should be performed on the packages and oil analysis might even be performed to gain more understanding about the lubricants condition.

A quality control process is put in place to ensure that all lubricants delivered are ready to perform. In the end, it costs less to have clean quality lubricants delivered than to have dirty lubricants arrive and try to filter them onsite. A plan should also be put in place for when lubricants don't meet the plant's criteria and must be sent back to the vendor.

R2P Lubricant Storage & Room

It is often said that the heart of any lube

program is the lube room. If a lube room is in disarray and bad practices are in place, you can bet that the same is true of the overall program. As stated earlier, if a lubricant makes it onsite in good condition but the lube room storage practices expose it to contaminants, then all previous efforts have been wasted. All tasks performed inside the lube room should have procedural steps to safeguard against this potential problem.

When a plant is built, the lube room is generally not the number one priority. Consequently, lubricants are sometimes stored outside and scattered throughout the site. Lubricant storage areas should be able to keep a lubricant cool, clean and dry at all times. This may include adding climate control to keep lubricants at certain temperatures and adding walls or roofs to keep contaminants out. Generally, cleanliness and proper storage of all lubrication related tools are also key requirements of a top-notch lube room.

R3P Lubrication Safety Practices

As with all other work performed onsite, safety should be considered a priority in a lubrication program. Before almost any job is performed, technicians go through training and may even fill out job safety analysis sheets. Lubrication related equipment can be very dangerous. For instance, a grease gun can create up to 15,000 pounds of pressure and if the hose of the grease gun bursts, a grease injection injury can occur. Another portion of personnel safety that should be considered is the methods used to move lubricants around the lube room, such as forklifts and barrel dollies, to prevent personnel injury.

Every lubricant being stored in the lube room should have an SDS (Safety Data Sheet) readily available that will list the hazards of the product and safety precautions to follow. This will also give information such as the composition of a lubricant, first aid and firefighting measures. Lubricants stored inside the lube room should be clearly labeled so personnel know which SDS corresponds with a particular lubricant. Sufficient spill containment equipment should be kept in the lube room to be able to properly stop and clean up lubricant spills. As spill containment and general safety practices impact the health of the people and the environment, these are also reviewed in the final Lifecycle Stage (see this issue's article: Saving Energy, Money, and the Environment with Ascend, pg 28 for more).

R4M Inventory Management

Lubricants, like many other things, have a shelf life. After an extended period of time some lubricants may not meet intended performance requirements. Controlling inventory and having minimum and maximum volumes set up will help mitigate this. When lubricants arrive onsite, they should be labeled with the date on which they arrive. FIFO (First in First Out) storage methods should also be closely followed. This method brings older lubricants to the front of the line so they can be used first and keeps the newly arrived lubricants towards the back. Lubricants should have a predefined shelf life and a procedure should be put in place that addresses what to do if a lubricant is stored onsite longer than its shelf life.

R5M Reception & Storage Training

Many times, personnel are put in positions with high expectations, yet no proper training is provided to make sure both they and the program succeed. From the very moment lubricants are brought on-site, the personnel handling them should be trained to do the tasks they will be performing. Training with the addition of procedures will help ensure that all tasks are done properly.

A few examples of training in reception and storage might include:

- How to inspect lubricants brought on-site (may include oil analysis)
- How to practice FIFO to avoid lubricants being stored for extended periods.
- How to read and access SDS on-site so that if there is an accident involving the lubricant, this can be readily available.

R6K Reception & Storage KPIs

To measure and track the success of the lubrication reception and storage practices, Key Performance Indicators (KPIs) should be used. KPIs will show where the program is strong and will also provide evidence on where the program might need more attention. There are a few different measurements that can be taken in this lubricant lifecycle.

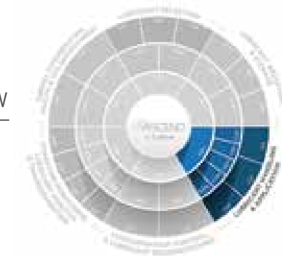
A percentage of the new lubricant deliveries arriving according to plant standards will help grade the lubricant supplier. If lubricant cleanliness goals for new deliveries are consistently being met, then you would probably keep the supplier. However, if lubricants are not meeting standards, you might consider finding a different supplier. Keeping a measurement of the lubricant inventory rotation can help redefine lubricant minimum and maximum volumes needed on-site. Training KPIs can help determine if and when training is needed for a successful program.

Lubricant Reception and Storage Success

In the lubricant reception and storage lifecycle, there are many key factors that can help a lubrication program be successful. To achieve this, crucial stakeholders such as the lubricant supplier, warehouse personnel, and the lubricant technicians must be considered. Training and detailed procedures explaining how tasks should be performed and how to protect a lubricant's health are crucial to any great lubrication program, and to the overall reliability of any plant. ***ML***

About the Author

Travis Richardson is an associate technical consultant for Noria Corporation. He holds a Level II Machine Lubrication Technician (MLT) certification and a Level II Machine Lubricant Analyst (MLA) certification through the International Council for Machinery Lubrication (ICML). Contact Travis at trichardson@noria.com.



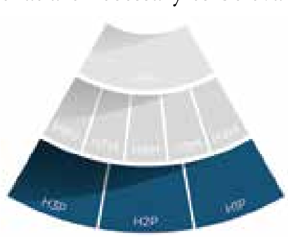
Juggling Systematic Gap Reduction within Lubricant Handling

> "The Lubricant Handling and Application section is unique in that it is heavily involved in the lubricant's "cradle-to-grave process"

While all six Lubricant Lifecycle Stages within The Ascend Chart play a significant role inside program ownership, one that specifically stands out with regard to site improvement and systematic gap reduction is Lubricant Handling and Application.

The **Lubricant Handling and Application (H)** section is unique in that it is heavily involved in the lubricant's "cradle-to-grave" process and frequently relies on on-site employee engagement and interaction. Since this is the case, it is vital to understand, identify, optimize and maintain for overall lubrication program development.

But what exactly should the Lubricant Handling and Application aspects of a lubrication program encompass? As we begin to look at this Lifecycle Stage, we will go through the three tiers, called levels, that structure the chart and each of the specific factors that are necessary to be evaluated and augmented.



Platform Level

Upon reviewing each level, we initially take a look at the first and broadest level of ownership, known as the Platform level. The collection of factors at the Platform Level across all Lifecycle Stages is the foundation upon which the lubrication program is executed. For those within the Lubricant Handling and Application Stage, it encompasses all activities actually being completed on the plant floor itself and can be referred to as the "boots on the ground" tier. Specific factors to discuss in this section are **Lubricant Application Tasks (H1P), Machinery Configuration (H2P) and Lubricant Handling and Application Devices (H3P).**

The effectiveness with which **Lubricant Application Tasks (H1P)** are carried out on the plant floor plays a direct role with regard to asset reliability. These tasks should always consider three fundamental parts:

- The safety of the individual performing the job
- The ergonomics of the job being completed which aids in the maintainability of the asset
- The desired ORS (Optimum Reference State) of the asset

Application tasks should be designed so that there is limited exposure of the lubricant to the environment while supplementing reliability. Common examples of lubricant application tasks could include oil and grease replenishment, lubricant changeouts, lubricant flushing as well as periodic lubricant hardware replacement in the form of breathers, filters and other miscellaneous consumables. Each of these specific lubrication tasks should have detailed work instructions or procedures with precise allocated time requirements including logistics that help continue to drive the standardization and optimization of work orders. As with most other plant floor activities, the training, coaching and assessing of lubricant application tasks should be carried out systematically and revised over time.

The proper **Machine Configuration (H2P)** for lubrication-specific needs at a site is something that is almost always overlooked upon initial installation. Site personnel tasked with the integration and installation of new equipment are often challenged, and rightly so, by cost control measures. While the concept of this practice seems ideal, this can be somewhat myopic in nature if not fully understood. Often only the initial purchase cost is considered, rather than the entire life-cycle cost of the asset. EEM (Early Equipment Maintenance) and FMEA (Failure Modes and Effects Analysis) strategies should be reviewed and a MOC (Management of Change) process should be implemented to standardize and enhance asset configuration based on reliability, safety, and ergonomics.

It is fairly common to see established lubricant dryness and cleanliness reliability goals for all lubricated assets made visible through oil analysis. While this is great practice, the same level of thought and detail should be considered and executed during the lubricant handling process from storage to the asset itself. Poor **Lubricant Handling and Application Devices (H3P)** create an unsolicited opportunity for contamination that may compromise the integrity of the lubricant prior to it ever entering the asset. Understanding this challenge—what the process looks like, what variables must be considered and how it can directly affect the reliability of the asset—play an imperative role in the uptime of equipment.

Management Level

After reviewing the previous Platform Level regarding actual work being completed on lubricated assets and components in the field, we now need to turn our attention to the management of these workings. The Management Level is necessary when providing direction towards lubrication excellence as it works to strive for the fulfillment of an organizational goals and objectives. Specific Factors to discuss in this section are Lubrication Program Management (H4M), Lubrication Routes (H5M), Machinery Inspection Tools and Practices (H6M), Goals and Reward Systems (H7M), and Lubricant Handling and Application Training (H8M).

All lubrication activities should be managed in such a way that past, present and future tasks can be scheduled, monitored, controlled and executed as required. The utilization of management software also aids in the understanding of the site's lubricated assets as well as all of the specific lubrication points included within the program. It is important to understand the holistic functionality of the management software and the integration opportunities available between it and the site's CMMS (Computer Maintenance Management System). Failing to utilize an electronic tool for **Lubrication Program Management (H4M)** makes it extremely difficult to dynamically perform these tasks and can put the site at risk for tasks being performed at the wrong frequency or not at all.

We have covered lubrication-specific tasks in detail and now will begin to take a look at grouping these tasks together in the form of **Lubrication Routes (H5M)** to be completed through work orders. The routes themselves provide logic to the planning and execution of these tasks over time all while allowing feedback of the lubrication program as a whole.

Route development should be well thought out, organized and logistically reasonable to optimize the time available for individuals to perform them. Routes can be build based on lubricant type, task frequency, plant floor location and machine serviceability among other influencing variables. While it is ideal to establish lubrication routes and minimize changes, some deviation is necessary from time to time. It is ideal to structure a system such that it lends itself to be dynamically changed based on workload and resources availability. Also, it's worthwhile to consider reviewing lubrication routes on an annual or biannual basis. This should be done by individuals across the program from scheduling to execution to optimize frequencies and stay in alignment with other continuous improvement practices.

The inspection of assets with regards to your lubrication program is often a practice that is executed but in an abbreviated manner. **Machine Inspection Tools and Practices (H6M)**, while somewhat time intensive, can be extremely productive when performed properly. Knowing specifically where and how to look, having a keen eye on what is considered abnormal and understanding what troubleshooting detail to report can provide pivotal information when avoiding a failure. Much like lubrication tasks, inspections work best when standardized and carried out in detail. All lubrication inspections on-site should have detailed work instructions of the who, what, where, when and why.

While often overlooked, **Goals and Reward Systems (H7M)** have their place in reliability as well. If individuals involved in the lubrication program do not have clear objectives, complacency can set in even among the best employees. As plants begin

to build upon or reinvent their lubrication programs, one of the initial steps should be identifying site role models to recruit into the program, establish long-term goals and further identify more granular short-term goals needed to complete long-term ones. Rewards for meeting and exceeding goals within the program offer incentives to do the right thing, even when no one is looking. While monetary incentives are considered to be a quick motivational tool, there are other rewards that can possibly yield even better long-term results. Augmenting the morale of the site can be accomplished through the visual awareness of program improvements on small team project wins via bulletin boards, newsletters and lunch-and-learns. Changing the culture from a "firefighting mentality" through reliability advancements in lubrication yields lasting results that create a sense of pride in the organization for years to come.

It is common to see lubrication handling and application tasks being performed in the plant based solely on the knowledge handed down over the years through apprenticeship. While the utilization of site knowledge is invaluable, formal education and training in the field and classroom should be coupled with this experience to reach lubrication excellence. Understanding the role lubrication plays in equipment uptime, properly training individuals on best practice versus traditional practice and establishing a **Lubricant Handling and Application Training (H8M)** plan to correct these poor practices drives the standard of expectations.

This execution can be correlated to the process of learning to swing a golf club. Most untrained newcomers to the sport will likely develop poor techniques early on. Bringing in a trainer can help combat these bad habits. One of the first things a trainer will focus on is the proper technique of a structured swing. Through repetition over time, the golfer develops the proper swing pattern, which leads to better overall performance. Training in the workplace works in much the same way. This progression generally results in some retraining of experienced individuals in troubled areas and minimizes the concern that poor practices may be passed on to newer individuals during the onboarding. Identifying proper technique and understanding the benefit of correct lubrication practices sets the tone for a more reliable tomorrow.

Key Performance Indicator Level

By now we should have a sound understanding on the importance of the groundwork laid during the Platform level as well as the ownership involved during the Management level. The final level, Key Performance Indicators (KPIs), aids in qualifying investment or focus on an area of the process. Some key aspects of launching new KPIs are:

- Data should be easily attainable
- KPIs should be agreed upon by the majority of stakeholders in the program
- KPIs should have standardized update frequencies

During the initial development or revitalization of a lubrication program, there should only be a few sound KPIs established. As the program advances, the KPIs should advance as well.

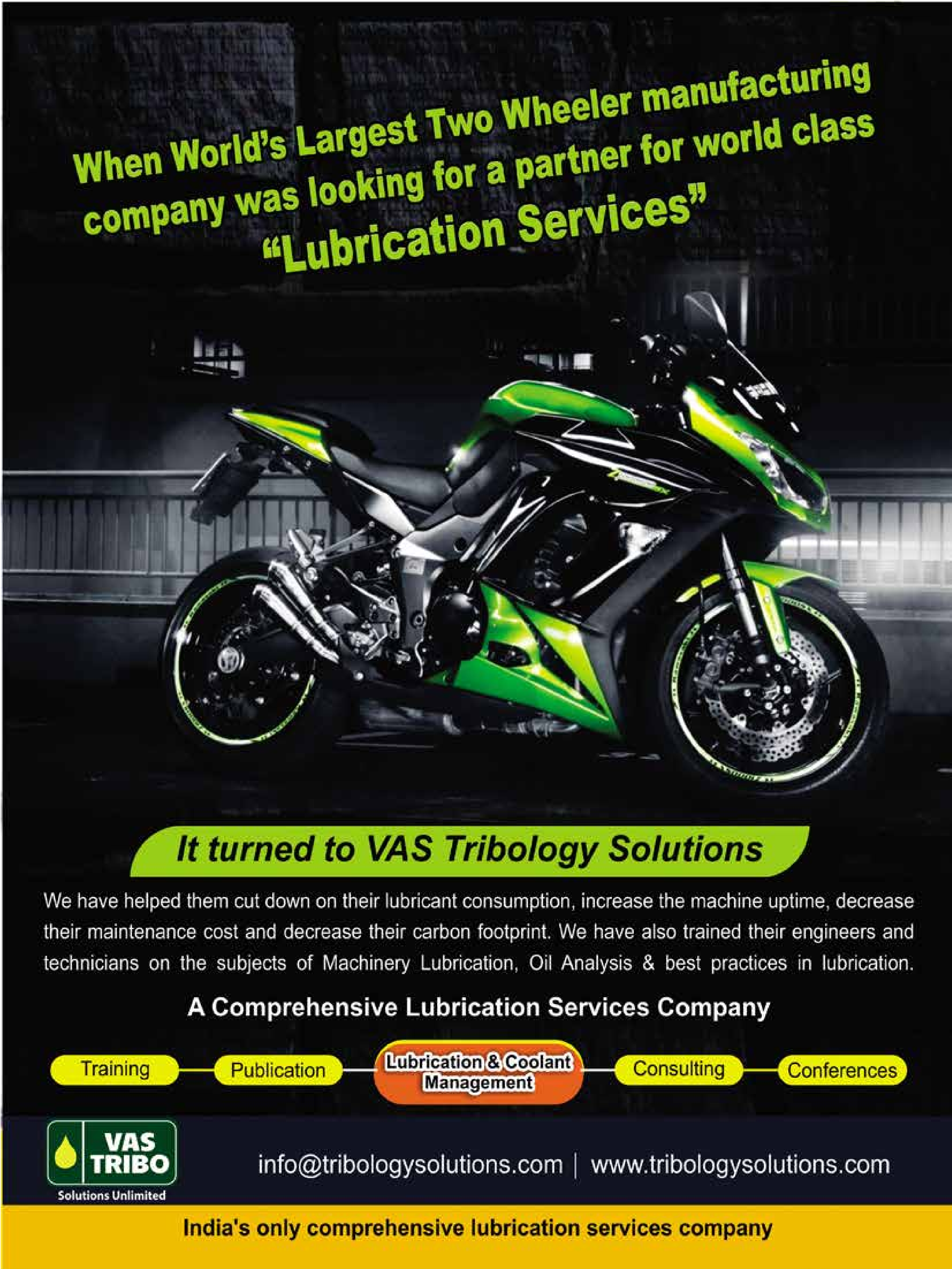
The **Lubricant Handling and Application KPIs (H9K)** provide an intermittent measurement of each of the factors mentioned above in the Platform and Management levels. The completion of tasks, performance of tasks and inspection, and the systematic evaluation of a lubricant handling training plan are just a few examples of popular metrics associated with this particular factor. Focusing on these specific values aids in driving the overall lubrication program effectiveness.

Conclusion

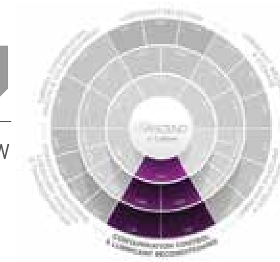
After reviewing the intricate details of the Lubricant Handling and Application Lifecycle Stage, it should be abundantly clear why this aspect is imperative when striving for lubrication excellence. Understanding the importance and need for each of the three Levels, as well as what goes into properly classifying the Factors included involved in each Level, safeguards the holistic program integration and leads to a clean, "well-oiled" and optimized lubrication and reliability program. ***ML***

About the Author

Matthew Adams is a technical consultant for Noria Corporation, concentrating in the field of predictive maintenance. He has experience in multiple condition-based maintenance technologies and focuses the majority of his attention on lubrication program development, training and general consulting. Matthew holds Machinery Lubrication Engineer certification (MLE) a Machine Lubricant Analyst (MLA) Level III certification and a Machinery Lubrication Technician (MLT) Level I certification through the International Council for Machinery Lubrication (ICML). Contact Matthew at madams@noria.com to find out how Noria can help you maintain the compressors at your facility.


When World's Largest Two Wheeler manufacturing company was looking for a partner for world class "Lubrication Services"
It turned to VAS Tribology Solutions
We have helped them cut down on their lubricant consumption, increase the machine uptime, decrease their maintenance cost and decrease their carbon footprint. We have also trained their engineers and technicians on the subjects of Machinery Lubrication, Oil Analysis & best practices in lubrication.
A Comprehensive Lubrication Services Company
Training
Publication
Lubrication & Coolant Management
Consulting
Conferences
VAS TRIBO
Solutions Unlimited
info@tribologysolutions.com | www.tribologysolutions.com
India's only comprehensive lubrication services company

Paul Farless | Noria Corporation



Fighting Back Against Lubricant Contaminants

"Contamination control and lubricant reconditioning is one of the most important lifecycle stages on the Ascend Chart."

Contamination control and lubricant reconditioning is one of the most important lifecycle stages on the Ascend Chart. Contaminant exclusion and removal are somewhat obvious when it comes to extending the life of the lubricant and machine, but this part of the chart should be looked at as an in-depth guide to contamination control. Starting with the Platform level and working inward accomplishing tasks and goals throughout each factor increases the performance of the lubrication, assets and even personnel within the facility. Let's jump right into the three levels of contamination control and get a good overview of how this lifecycle stage progresses through the ascend chart.

The Platform Level: Contaminant Exclusion and Removal

The outermost ring is called the Platform level. This level is considered the foundation of the contaminant control section. These two factors are the low-hanging fruit or first-step actions that should be taken when building a lubrication program. The first factor, **(C1P) Contamination Exclusion**, is crucial to the longevity of a lubricant. Keeping contaminants out of the lubricant may at times be more challenging, depending on the environment of the asset. There could be steam or spray nearby, it could be a humid coastal environment or an extremely hot or cold environment. All of these conditions can allow contaminants to enter the lubricant in one way or another. One of the first actions should be to review the current documentation and procedures. This includes the proper steps on topping up lubricants, initially filling new equipment and implementing

hardware such as desiccant breathers and quick-connects at the fill and drain ports. If the facility is unable to install hardware due to scheduling a shutdown or personnel workload, the next alternative should be to at least use dedicated sealable and refillable containers or use disposable funnels to top-up or fill your machines. Contaminant exclusion really means to take the steps necessary to prevent contaminant ingression. As stated in a Machinery Lubrication article by Jim Fitch, "the cost of excluding a gram of dirt is probably only about 10 percent of what it will cost you once it gets into your oil." When some contaminants do make it into the lubricant, which will happen because no program is perfect, the facility will need to consider the next Factor of this life-cycle stage, **(C2P) Contamination Removal.**

The purpose of contamination removal is to remove contaminants as quickly as they enter the machine. Now, removing contaminants can be tricky if the proper equipment isn't utilized. The point is not only to extract the current contaminants from the lubricant but also keep new contaminants from entering the reservoir or sump during the process of removal. This factor directly compliments contaminant exclusion to provide balance in the program and increase the life of the lubricant. This may require the use of a mobile filtration unit such as a filter cart, or even a stationary filtration unit on critical or large oiled assets. Also, implementing lubricant cleanliness standards will guide operators on how clean the lubricant must be, the frequency of periodic filtration and establishing a baseline of facility lubricant cleanliness for future reference. Most OEM machines either don't have filtration or the current filter isn't capable of reaching the cleanliness standards required by the facility. At this point, it is best to assess the current filtration efficiency, add new or additional filtration devices or review and change the target particle size of the cleanliness standard. Once a facility has implemented new strategies of contamination exclusion and removal, it is time to start looking into the next factors at the Management level.

The Management Level: Contamination Control Objectives and Training

The middle ring, known as the Management level, contains factors that enable personnel to manage processes, resources, scheduling and monitoring of lubrication tasks. These factors are everyday activities and are based on the performance of the factors at the Platform level. This level is truly about managing a contamination control program, establishing sustainable contamination control objectives and ensuring the core training for contamination control is provided.

Contaminant Control Objectives (C3M) should be set consistent with facility reliability objectives, machine criticality, fluid environmental severity and the sensitivity of critical components to specific contaminants. When talking about machine reliability, lubrication should be among the first considerations to come to mind. If the contaminant control objectives aren't synonymous with the plants reliability objectives, therein lies the first problem. Reliable machines start with having reliable lubricants. Lubricants are much more reliable when they are kept clean, cool and dry. Secondly, understanding the machine's specific criticality is key. The higher the criticality, the more goals or standards the plant should set for contamination control for that specific machine. Monitoring machine component life extension is a practical way to estimate the benefits of a contamination control program. Ultimately, this can help justify the investment in machinery redesign, the actions required to proactively control the entry of contaminants and the installation and maintenance of the removal mechanisms.

The next factor on the journey to reaching lubrication excellence at a facility is **Contamination Control Training (C4M)**. This will require a change in the way the technicians view the importance of contamination and the impact it has on their machines. We all know lubrication technicians or maintenance technicians who have done things a certain way for a very long time and may be stuck in their old ways. Training is a subtle way to open the eyes of everyone who attends and create a shared awareness of the need for change. With respect to the traditional way of doing things, training is important not only to the technicians but for the operators and other supporting roles within the facility. Proper training is an essential ingredient when changing the culture of the program and facility as a whole. Something that a lot of facilities talk about is getting their techs to "buyin" to a new lubrication program and new way of operating the facility. Training can be a great way to expose the incredible benefits of a great lubrication program. Not only to teach, but to explain why some tasks that may seem insignificant or tedious can actually make everyone's job a little easier in the long run. If the plant can keep contaminants out of their machines, the machines will last longer and perform better. Procedures, objectives and trainings can be tough changes and we all know that change doesn't happen overnight. While there may be some successes early on, the biggest benefits come from years of sustained change. For contamination control to stay sustainable, the final level dives into key performance indicators.

The Key Performance Indicators Level: Contamination Control KPIs

Key Performance Indicators (KIP) are used to identify certain areas or objectives that require attention and estimate the benefits of implementing strategy to achieve machine life extension and its associated economic value. These KPIs are focused on the effectiveness of contamination control implementation and overall sustainability. When considering a lubrication progam as a whole on the path to lubrication excellence, this would be one of the top metrics to assess overall success. At this level, the program should be in full swing and operating smoothly. These indicators should also include a measure of the compliance of contamination control training and education in the facility.

Contamination control is one the most important lifecycle stages on the Ascend chart. Combining resources and implementing various procedures, hardware and objectives to achieve all three levels of this lifecycle stage can be a daunting task, but with the right technicians and the right attitude, world class lubrication excellence is within your facility's grasp. ***ML***

About the Author

Paul Farless is an industrial service technician for Noria Corporation. His duties include collecting data and preparing reports for the engineering team. Prior to joining Noria, Paul worked as an automotive maintenance technician for an auto-repair service company. He also served four years in the U.S. Navy as a gunner's mate third-class petty officer and as a seaman deckhand, where he was responsible for the troubleshooting and maintenance of electromechanical and hydraulic systems. A detail-oriented team player, Paul works well in fast-paced environments and uses his military background to excel and maximize efficiency.

Listen to Your Lubricant

> "The wisest among us know that relentless measurement is a key enabler to forward progress and change."

Arguably, more change has occurred related to lubricant analysis and condition monitoring in the past 30 years than all other areas of lubrication. Why does this make sense? The wisest among us know that relentless measurement is a key enabler to forward progress and change. Measurement leads us to awareness and finally to action (tangible results). Of course, there are many other factors that share in importance too. These are thoroughly mapped on the Ascend™ Chart.

There are nine critical factors in this Condition Monitoring, Lubricant Analysis and Troubleshooting Lifecycle Stage of the Ascend chart. Each one is important enough to justify a feature article describing its purpose and application. And honestly, one or more articles on each of these subjects can already be found at machinerylubrication.com. What has become clear after years of working in the lubricant analysis field is that the concept of best practice is not as intuitive as one would expect at the outset. As a result, from my observation, the vast majority of oil analysis and inspection programs fall miserably short of their full potential.

Therein lies the opportunity and low-hanging fruit ready for harvest. Even those who have benefited from training often seem to struggle with anything more than fragmented execution. We are fully aware that knowing is not the same thing as doing. The Ascend Methodology was devised specifically to enable user organizations to succeed in full and successful execution, each stage, each level, each factor. The roadmap is clear, the journey and execution remains with you.

Listen to your oil… listen to your machine. Lubricant analysis and inspection serve as the most important metric of a lubrication program. I often say, "it's darn hard for there to be a problem with the machine without the lubricant knowing about it first." So, let's examine the oil the right way, again, again and again. The story is being told but we must listen and act.

Platform Level Factors

One of the basic principles of the Optimum Reference State (ORS) is optimization. That's fundamentally how the ORS is different than from expressions like "best practice" or "precision lubrication." This means not all machines and not all condition monitoring tasks should be treated the same. Many decisions are driven (or should be) by fundamental concepts derived from criticality analysis and Failure Modes Effects Analysis (FMEA). From real awareness gained from these two analyses, we can move from guessing to decisions made with greater confidence and certainty.

When machines are viewed in the context of criticality and failure modes, the decision of whether to include them in a lubricant analysis program becomes abundantly clear. This is **Machinery Selection Factor (A1P)** related to inspection tasks, oil analysis, ultrasound and many other condition monitoring activities. There are a number of Lubricant Analysis Data Source options too, such as online monitoring, portable instruments, onsite labs, remote labs and numerous mixtures and variations. This is addressed in **Factor A3P**.

Once a machine has been included in an oil analysis, inspection and condition monitoring program there is a need to know the Lubricant Test Slate for routine and exception samples. This is the objective of **Factor A2P**. Condition monitoring must be strategic and intentional. This is a bit of an engineering exercise starting with FMEA. Basically, every highly-ranked failure mode needs to have one or most more lubricant tests, inspections and other condition monitoring tasks assigned to it for early detection and remediation. After all, that's the essence of condition-based maintenance: to detect active failure modes before they become advanced and precipitous failure modes.

The last Platform level factor in this lifecycle is **Sampling Tools and Methods (A4P)**. To some, this may seem trivial in importance compared to other factors. However, lubricant analysis is constructed from an integrity chain. The strength of the chain is no greater than the strength of the weakest link. So, what is the most common weakest link? It's the sampling process; where, how, when, what tools, etc. The user organization is totally responsible for this step which is the equivalent to laboratory raw material. The finished goods (data) from oil analysis process can be no better the quality and timeliness of the sample supplied to the lab.

Management and Training Level Factors

At the Management and Training level there is a need to **Select and Integrate Inspection and Condition Monitoring Tasks (A5M).** This both unifies and optimizes the condition monitoring program. Data should converge to establish a recognizable and accurate picture of the state of lubricants and machines. Don't expect that all the data needed can be available from a single bottle of oil. Condition monitoring activities should all work towards a common goal.

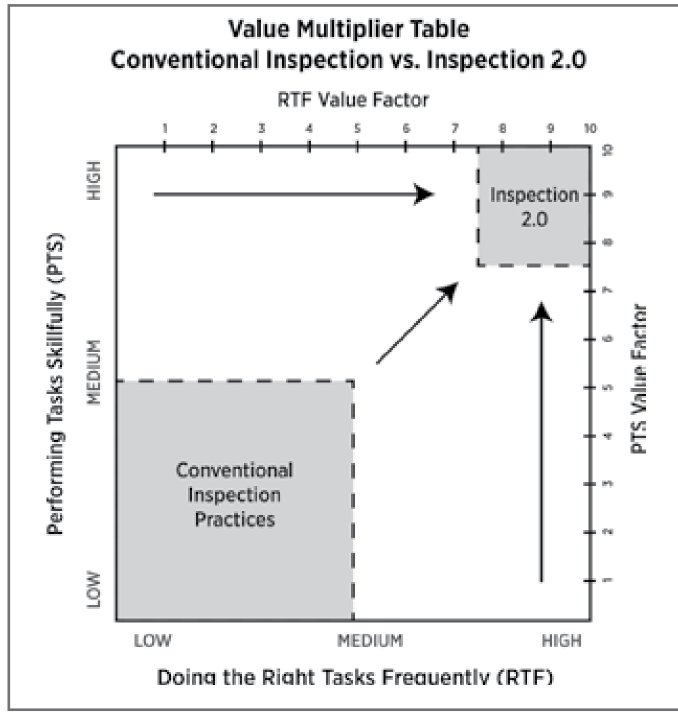


Figure 1: How value can be translated from skillful and frequent inspections.

Without a doubt, inspection is a powerful and central part of condition monitoring. When well-designed and executed, perhaps 75% of all on-condition work orders are the direct results of motivated, inquisitive and skillful inspectors. To some, inspection might be viewed as somewhat archaic or pedestrian. But the reality is quite the opposite. Inspections deploy human sensors for which modern technology has no better substitute. Most importantly it leverages the supercomputer in the brain of every human data collector.

This is the concept of Inspection 2.0 discussed extensively in Noria training courses and on the pages of Machinery Lubrication magazine. It takes the old concepts of inspection and recalibrates them in the context of today's reliability and condition monitoring culture. It puts emphasis in on examination skills and periodicity. See Figure 1.

You could say that inspection provides the eyes and ears for everything that condition monitoring can't detect and is a default detection scheme during the intervening days when no technology-based condition monitoring occurs. In other words, inspection fills in critical gaps where there is detection blindness of the technologies and schedule blindness for the time periods between use. Higher inspection frequency and more intense examination skills (by the inspector) significantly increase condition monitoring's ability to detect root causes and symptoms of various states of failure.

The following are a few core elements related to Inspection 2.0:

- **Operator-driven.** With Inspection 2.0, operators accept serious ownership in machine reliability. This is very similar to Total Productive Maintenance, that stresses the maintenance and reliability is everyone's responsibility.
- **Examination Skills.** Condition-based Maintenance (CBM) requires the continuous awareness of the meaningful conditions given off by the machine. It doesn't care how these conditions become known or understood. Hence, there is a basic need to condition awareness regardless of how this information is discovered, i.e., by inspection or technology-based methods.
- **The Power of Frequency.** It's far better to know a fault now by a rather crude means of detection than later with a great degree of accuracy using high technology.
- **Root Cause Oriented.** A root cause is not a disease but it leads to a disease. Once machine wear has occurred we can't reverse the loss (wear metal for instance). Inspection has the potential to be very proactive and less reactive.
- **Fault Bubble Oriented.** Contrary to what the name implies, sudden death failures do emit subtle symptoms that if detected could reduce the damage and consequences of failure. This requires inspection frequency for sure but also the ability to detect and respond to the weakest of failure symptoms.
- **Lasting Deployment**. Inspection 2.0 is culture-driven. Once solidly in place, it has inertia and sustainability.

Data interpretation from condition monitoring can be aided considerably using alarms and limits. When done effectively, the analyst can focus largely on reportable conditions that fall outside of normal ranges. Software and algorithms can help immensely to facilitate the process of **Factor A6M, Lubricant Analysis Data Limit Selection and Interpretation**. Various alarm techniques can be used to fulfill the requirements of different oil analysis objectives. Although counterintuitive, world class oil analysis programs seek more alarms and better alarms.

Troubleshooting and Root Cause Analysis (RCA) should also be given due importance and is **Ascend Factor A7M**. Understanding and learning from both impending failure and postmortem failure is necessary to prevent future failure. Programmatic efforts are needed to instill proper organizational culture among reliability teams to carefully study and document failure. There is no better teacher.

The expression "we earn what we learn" doesn't just apply to individuals but also organizations and the departmental thrusts within organizations. Education is a fundamental to growth and progress. The degree of plant reliability varies in proportion to team education and team culture. Condition Monitoring, Lubricant Analysis and Troubleshooting Training will have a huge impact on program success. This is **Ascend Factor A8M.**

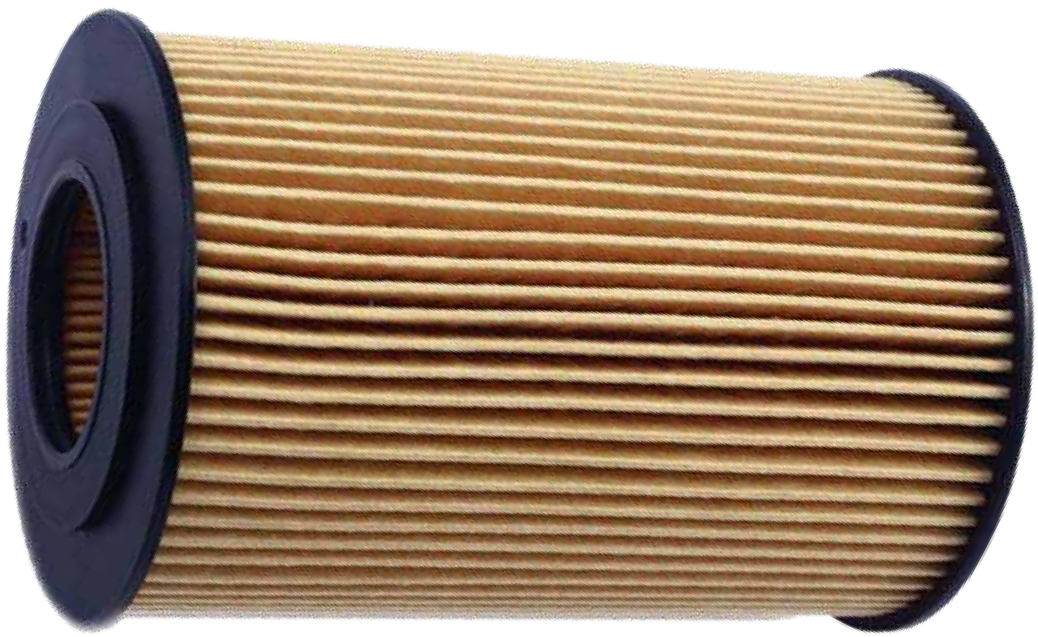
Key Performance Indicator Level: The Metric of the Metric

I said previously that lubricant analysis, inspection and condition monitoring together function as an essential metric on the state of machine health and overall machine reliability. This should be used to full potential and value. One way to attain that objective is to also apply metrics or KPIs on how well oil analysis is performing. How can we track its alignment to the Optimum Reference State? There are so many excellent Condition Monitoring, Lubricant Analysis and Troubleshooting KPIs to consider. **This is Ascend Factor A9K**.

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.

The "Lube-Tips" section of *Machinery Lubrication* magazine features innovative ideas submitted by our readers.



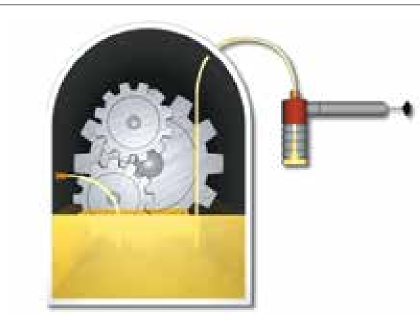
Quick Filter Check

When checking differential filter clogging indicators, be sure that the pilot holes in the filter body (the ones that feed the indicator with oil pressure) are clear of debris. This will help ensure you are receiving the correct signal.

Unusual Breather Treatment

Washing down machinery with water often results in desiccant breathers becoming saturated with water. One solution is to put pantyhose over the breather. Though it may look silly, it repels the water yet allows air to move through it and is easier than training personnel over time.

Oil Sampling Pointer



For reservoirs, drop-tube oil sampling is rarely the ideal method. However, if it cannot be avoided, it is important to consistently sample as close to the active fluid zone as possible. Measure the stand-off distance desired from the bottom of the sump and attach the drop tube with wire ties (or other suitable method) that distance from the end of a rod. Consistency in the sample location will help make the analysis results more suitable for trending.

Use Lube ID Tags

Consider using equipment lube tags to avoid adding the wrong oil to a machine. These identification tags decrease the possibility of error by inexperienced lube techs, facilitate training of new technicians and reduce confusion associated with switching suppliers. Use color- and/or shape-coding wherever possible. Whether plastic, stainless steel, aluminum or coated paperboard, these tags can indicate the lubricant's name and viscosity, and can be affixed to each reservoir. *ML*

Did You Know?

Additional tips can be found in our Lube-Tips email newsletter. To receive the Lube-Tips newsletter, subscribe now at machinerylubricationindia.com

Have Some Tips?

If you have a tip to share, email it to admin@machinerylubricationindia.com

Saving Energy,Money and the Environment with Ascend™

" The high solubility of varnish at different lubricant temperatures makes varnish contamination a complicated problem to tackle. "

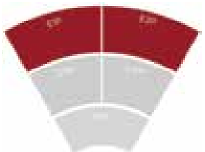
By this point in the Lubricant Lifecycle Stages, it quickly becomes evident that there are numerous variables going into each lubrication decision. Even the most granular lubrication topics can easily become complex with endless factors. But your time is valuable. It isn't always the best idea to "go down that rabbit hole." We must use the right tools and proven methodologies to help make these lubrication decisions more efficiently, prioritize them and keep us on the right track.

Ascend™ was created to organize these lubrication decisions from a holistic perspective. The Ascend Chart puts this into a clear visual. It is a reminder of where efforts need to be focused to avoid losing sight of the full lifecycle of a lubricant and the factors that affect it. The end goal of all this is to achieve key reliability objectives and increase overall profitability. The lifecycle of a lubricant starts with Lubricant Selection, followed by a Reception & Storage, Handling & Application, Contamination Control (incl. Reconditioning) and Condition Monitoring (incl. Oil Analysis and Troubleshooting). Last, but not least, is Energy Conservation, Health & The Environmental Impact.

Part of this final stage logically focuses on the end-of-life of a lubricant, how we handle and dispose of used oil and related materials. Other topics included in this stage have dotted lines to many other factors across the Ascend™ Chart, such as health and safety. All of this will be discussed. This Lifecycle Stage has five Factors, listed below.

- E1P - Energy Conservation, Health & Environmental Impact
- E2P - Storage & Disposal of Used Oil & Materials
- E3M - Leakage Management
- E4M - Energy Conservation, Health & Environmental Training
- E5K - Energy Conservation, Health & Environmental KPIs

The first two are part of the Platform Level, the second two are part of the Management Level and the final Factor is dedicated to Key Performance Indicators.



Platform Level

During the lubricant selection process in the first stage, there are many fundamental considerations regarding the selection of the base oil, viscosity, thickener type, oxidation resistance, thermal stability and so on. These are determined based on the tribological needs of the machines. Nevertheless, each lubricant in application has ancillary attributes that can make crucial impacts on energy conservation, the health of individuals and the environment. The associated risk to these considerations has the opportunity to limit or even control the selection of the lubricants all together. Let's first take into consideration Energy Conservation.

Energy Conservation

Minimizing or eliminating friction is a key function of the lubricant. When the incorrect lubricant is selected or when the lubricant isn't properly applied (either manually or through an automatic delivery mechanism), the machine has to work harder and consume more energy to overcome unnecessary friction. Take incorrect viscosity for example: both too high a viscosity and too low a viscosity can result in increased energy consumed and waste.

- Too little viscosity means machine surfaces in relative motion are under-protected, leading to mechanical wear and premature component failure.
- Too high viscosity can cause higher fluid friction, leading to heat generation and premature lubricant failure, which can in turn leads to premature component failure.

Aside from extending machine life by using a properly selected lubricant, there is a direct opportunity to conserve energy. The driving component of an asset, typically an electric motor, has to work hard enough to keep a shaft rotating with enough torque to overcome all sources of friction. A steady balance of lubricant properties during lubricant selection and deploying various condition monitoring strategies can help keep this on track. Additionally, the delivery method of a lubricant to the frictional surfaces is a factor itself. For example, in a bearing that is manually regreased, the interval should be thoughtfully calculated for optimization. Or alternatively, an automatic method may be deployed for more frequent and precise grease delivery at lower volumes. This holds true for other lubricated components. Energy conservation depends greatly on the selection lubricants and the lubrication system. So whether it is oil or grease, synthetic or mineral, manually or automatically lubricated, balance is key.

Health & Environment

Next, the impact on the health of people or the impact on the environment should be reviewed when selecting lubricants and lubrication systems. The level of risk in this case could very well be more relevant than considerations of machine life extension or general cost savings. As we estimate risk to health and the environment, it is a combination of the probability of occurrence and the resulting consequences. If lubricants selected have a known negative effect when in contact with people or the environment, this would be the consequence. These would include attributes such as toxicity, microbial growth, combustibility, biodegradability and high temperature, among others. The greater the negative effect, the greater the consequence.

The probability is determined based the likelihood of lubricant exposure. If the combination of the consequence and probability are high, the overall risk to people or the environment could be high. Additionally, the lubrication system itself should be considered directly as a possible safety risk (also discussed in the Reception & Storage Stage). Such is the case on lubrication systems with pressurized fluids, electrical energy, mechanical energy, etc.

Therefore, careful selection of either the lubricant with less negative effects or a lubrication system that is more effective at minimizing these negative impacts is key. Addressing the Energy Conservation, Health & the Environment factor should be foundational to a lubrication program, hence why it is part of the Platform level.

Storage & Disposal of Used Oil & Materials

As lubricants degrade, they are disposed of unless they are deemed suitable for reconditioning (overviewed in the Contamination Control and Reconditioning Stage). Typically, after a drain or purge of used lubricant from a machine, the used lubricant should be brought to a well-labeled storage container until it is removed offsite by an appropriate contractor. Other materials, such as filters and rags, may also be contaminated with this used lubricant and should also be handled similarly and appropriately.

Just like any other lubricant and storage practices, there are various risks that could be associated with used lubricants and a range of actions needed to minimize the risks. Having careful steps and procedures for these activities is important. In addition to these considerations as general guidelines, many organizations have policies and rules that must be followed. Outside of those, there are local and even federal laws and regulations regarding the handling and storage of these used lubricants to consider. This could include regulatory bodies such as the EPA, OSHA, MSHA and others.

Management Level

Leakage Management

One of the silent killers at a plant is the quiet, steady leak of oil from a machine. Such leaks can often go unnoticed, uncorrected and often result in lubricant starvation. This is why daily inspections on lubricated components and installing quality, easily inspected sight glasses are so important. Some equipment, if critical enough, may even require built-in level monitors that provide real-time feedback if a leak occurs. Nevertheless, when leaks do occur, having procedures to handle oil leaks is important to minimize the risk to people, the risk to the environment and unnecessary costs.

Large or small, leaks can become costly fast. Here are some costs associated to a leak:

- The cost of new oil added to the machine (plus expedited fees and delivery charges)
- Leak source detection tools and labor
- The mechanical wear from lubricant starvation on the machine
- The loss of production of machine during shut down
- The labor and materials to clean up leaked oil
- Additional cleanup costs if uncontained and lubricant contaminates an ecological area (including any possible fines and penalties)
- The disposal costs of the leaked oil and the materials used to clean up
- Energy, labor and material costs to pump new or and possible flushing requirements
- Possible additional oil analysis costs to verify new lubricant conditions
- Possible waste any final products contaminated with leaked oil

In addition to monitoring for leaks, certain steps should be followed when leaks do occur. This may include labels, used of dike materials and prioritized/scheduled remediation actions. Prioritization could consider equipment criticality, volume (and cost) of the lubricant and ease of repair. After leaks are remedied, a detailed leak report should be documented, including any findings from a Root Cause Analysis performed to avoid a repeated event.

Training

Leakage Management protocols help minimize risk. To accomplish this, role-specific training is required. This is also true for Handling Used Oil & Materials and managing all aspects of Energy Conservation, Health and Environment. All plant individuals will need some core training to ensure there is awareness to the risk to human health a lubricant may pose. For those handling the lubricant and making lubricant selection decisions, such as lubrication technicians, reliability engineers and lubrication program managers, additional training should be expected for leak management procedures and the impact lubricants may play in energy conservation or the environment.

Key Performance Indicators (KPIs)

Making good lubrication decisions becomes much easier when key observations from past activities are applied to future considerations. Monitoring performance variables and establishing these as metrics help with this process and creates a pace for continuous improvement. The last factor in this stage are the KPIs for Energy Conservation, Health & Environment. These will include various leading and lagging indicators on how well the plant is making improvements. For example, there could be metrics to compare the volume of lubricants applied to machines versus the volume of lubricant disposed. Over time, the difference indicates how much lubricant has leaked or been otherwise consumed.

Simply tracking oil usage and disposal can be trended to help monitor for efficiency gains and waste reduction as lubrication practices are optimized to require less lubricant changeouts. Similarly, other KPIs should be considered for monitoring safe disposal practices and energy conservation. Marking events where lubricants were known to negatively impact personnel health or the environment can also serve as a learning opportunity for future prevention.

In Conclusion of the Lubricant Lifecycle

Lubricant is a key component of machine design. In addition, what lubricants are used and other lubrication decisions can make critical impacts on cost, labor, uptime and safety through their effects on energy conservation, health of people, the environment, leak management and more. It's better to keep track of processes and policies to ensure proper practices are being followed. Like with other Factors in the Ascend Chart and throughout the lifecycle of a lubricant, we must document these concerns in a Corporate Lubrication Standards Manual and present it openly for clear communication. The more care and consideration you put into lubrication decisions, the more equipment reliability and overall profitability will increase. **ML**

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 holds a Machine Lubricant Analyst (MLA) Level III certification and a Machine Lubrication Technician (MLT) Level II certification through the International Council for Machinery Lubrication (ICML). Contact Bennett at bfitch@noria.com.

GRP Singh | Tata Steel

Reduction In Mill Chock Bearing Failures At Merchant Mill

Introduction

Tata Steel & Grease Manufacturer team jointly completed the project of bearing failure reduction in Merchant Mill stand work roll bearings. Based on detailed investigation, this report was completed as part of Planned Engineering Service (PES) program. The performance monitoring of grease was started after detailed study of the application, historical data collection and grease comparison study between old and new grease in the application.

Situational Background

The purpose of Merchant mill is to produce TMT (Thermo Mechanically Treated) bars. The mill uses billets, that are casted in LD #1.

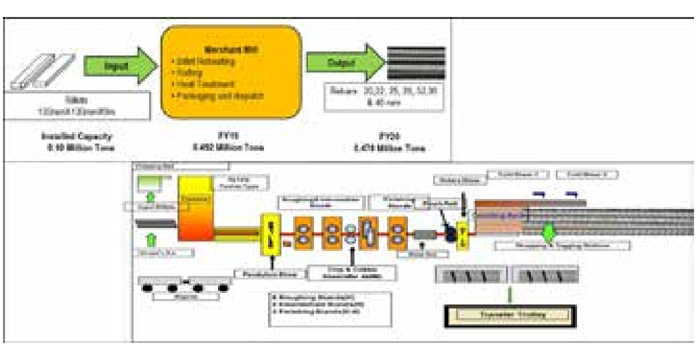
Tata Steel Merchant mill has 14 rolling stands. All are horizontal stands except 15 and 17 which are vertical stands.

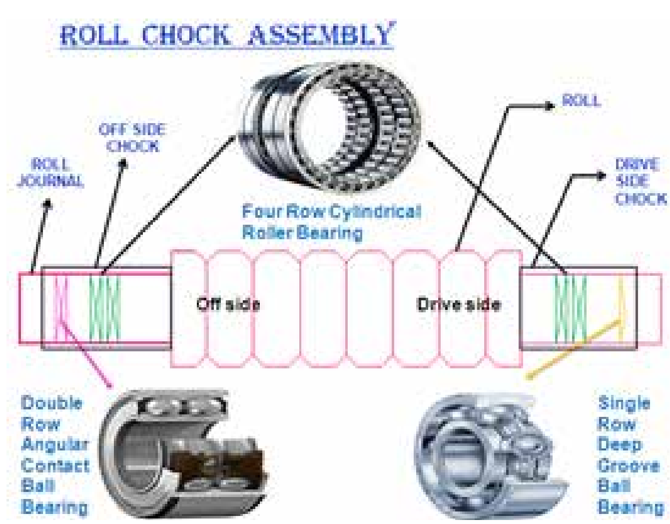
In roughing and intermediate stand work roll bearing lubrication application, Calcium Sulphonate thickener Grease with base oil viscosity 320, was being used. Due to the continuous passing of red hot billet through work roll, heavy water spray is used in the application to cool down the rolls. As a result, grease was not staying in the bearing and it was getting washed out from application to the floor. Tata Steel had 17 bearing failures in the year 2012 due to above reason. On an average, each bearing failure leads to about 4-6 hours delay in production. Each hour of delay leads to loss of approximately 55 tons production.

Also grease consumption was very high, ~ 8 drums per month. Grease is transferred from drum to application by centralized lubrication system (CLS) with the pump pressure of 110 kg/cm².

Recommendation

Detailed study of the application and suffering points were diagnosed.





EHL Calculation was also done with the help of EHL calculator tool to assess the correct grease viscosity selection.

EHL Calculation:

Roughing Stand Bearing- 24156 CC/W33
RPM- 50

Operating Temperature- 45 Deg C

Specific film thickness is considered to be 2 for ensuring full film lubrication to prevent bearing wear.

It was found that 460 Cst viscosity grease is required for the bearings for full film lubrication.

Tata Steel decided to use a new generation grease of base oil viscosity 460 Cst at 40 deg C with Lithium complex thickener NLGI 1 (centralized lubrication system) for roughing and intermediate stand work roll bearing application. Tata steel and grease manufacturer did a detailed comparative study between the existing and new grease which is as follows:
For more accurate comparison of properties of both the greases, Tata Steel took NLGI 2 grease in both the cases because the existing grease used in the mill was NLGI 2.

The new grease demonstrates better shear stability performance over the existing grease formulation, as indicated by the extended penetration (ASTM D217, 100K strokes).

In terms of load bearing capability both the greases have almost same value as measured by Timken OK load test.

Inputs

Bearing Type	Spherical Roller Bearing
Bearing Designation	24156
Composite Surface Roughness	0.356 µm
Constant Inner Ring	0.000837
Bearing Speed	50 rpm
Inside Bore Diameter	0.28 m
Outside Diameter	0.46 m
Target Specific Film Thickness	2
Bearing Operating Temperature	45 °C
Lubricant Type	Mobilgrease XHP Series

Outputs

Lubricant Parameter	514.61
Thermal Correction Factor	0.97
Lubricant Parameter with Thermal Correction Factor	453.21

After implementing the same, Merchant Mill was able to reduce the grease consumption by 38% and bearing failure by 70% with increase in productivity.

Due to the below four (4) reasons, Tata Steel achieved the above benefit
1) Reduced bearing failure
2) Reduced grease consumption
3) Excellent grease pumpability through centralized lubrication system (CLS)
4) Enhanced safety and environment friendly operation

1. Reduced Bearing Failure

Very good water tolerance helps to maintain consistency which can lead to increased bearing life and reduce corrosion related failures.

Optimum base oil viscosity provides increased bearing protection even at high temperature operation.

2. Reduced Grease Consumption

The new grease is an excellent choice for extreme conditions like moisture environment, high temperature, and shock load in steel mills applications.

The polymer fortified Lithium complex technology is giving excellent tenacity. The new grease is adhesive in nature which is providing improved water spray off resistance and excellent lubricant endurance.

Used old grease in Roll Chock

Used new grease in Roll Chock

Outstanding mechanical stability

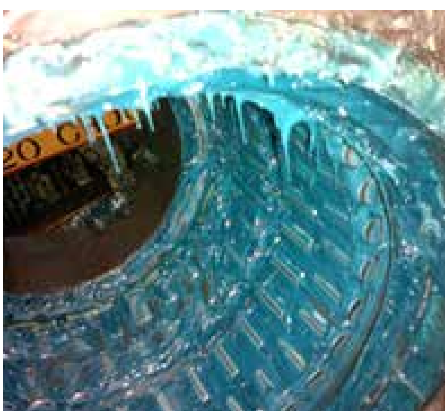
The proprietary Lithium complex thickener is highly resistant to mechanical shear which contributes less softening of grease

Summary of test parameters and fresh grease comparison				
Sr. No	Parameters	Test Method	New Grease	Existing grease
1	Base oil type		Mineral	Mineral
2	Thickener type		Li- complex Polymer fortified	Calcium Sulfonate
3	Base oil viscosity at 40 deg C	ASTM D 445	460 cst	320 cst
4	Penetration 60X	ASTM D 217	280	292
5	Shear Stability, Extended penetration 100K	ASTM D 217	285	323
6	Timken OK load test	ASTM D 2509	50lb	55lb

and reduced leakage even in the presence of water.

A used grease sample of both the grease was sent to Lubricants Technical Support (LTS) Laboratory, Sarnia, Canada for analysis.

High pressure water exposure of bearing in the Mill



New grease showing good tackiness

The result shows that there is no measurable shear observed in the new grease even after work in actual plant application.

The detailed result is as follows:

Table 1

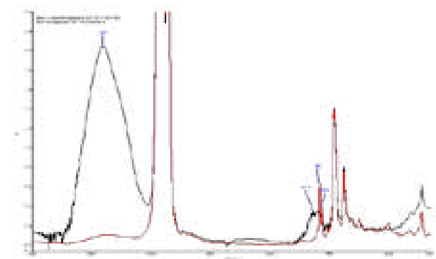
Analysis Summary of used Grease Samples Submitted

Test		
Product	New Grease	Old Grease
Sample Description	Used Grease	Used Grease
Appearance	Free Water, Smooth, Non-Homogenous	Free Water, Some Fine Grit, Non-Homogenous
Karl Fischer Water, %	14.4%	30.5%
60x Worked Penetration (1/2 scale), mm/10	323	323
Water Washout 79C (average wt. Loss), %	18.9	44.5
Elemental Analysis by XRF (wt %)		
Aluminum	Trace	0.01
Calcium	0.05	1.08
Chlorine	0.01	0.01
Copper	0.01	Trace
Iron	0.02	0.25
Magnesium	0.01	0.01
Manganese	Nd	Trace
Nickel	Trace	Trace
Phosphorus	0.1	0.04
Potassium	Trace	Trace
Silicon	Trace	0.01
Sodium	0.05	Nd
Sulphur	0.81	0.83
Zinc	0.19	Trace

Note: XRF results are semi-quantitative. Only elements detected are reported.
Nd = not detected. Trace = very low detection that cannot be accurately quantified

Visual Comparison of the grease shows better condition of new grease (blue color) with higher tackiness.

Figure 1 - FTIR Spectral Overlay of the Used new grease Sample (1628188, in Black) and a Fresh new grease Reference (in Red)



The used/in service samples submitted were analyzed to determine their properties and conditions and are shown in table 1 above. Both samples received showed free water contamination which was observed as well in several of the completed tests.

Water wash out testing was completed in accordance to ASTM D1264. Each sample is placed in a test bearing the before weight is calculated. Water is sprayed onto the bearing for 60 minutes at 79 deg C. After the sample is dried for 15 hours, the weight loss is calculated. The value reported is an average of the percentage of grease lost in three runs of the test. It should be noted that due to the high-water content of the samples submitted, these results may be higher than typical results from fresh or unused grease. Based on the samples submitted, the used new grease showed better water washout performance compared to the competitive used grease.

Elemental analysis was completed using X-Ray Fluorescence (XRF). The new grease results are similar to the typical properties of this grease except for the presence of sodium. This could be again due to the water contamination. Both samples showed some wear metals (iron, copper and aluminum) but in relatively minor quantities.

The used new grease submitted was analyzed as received by infrared spectroscopy (FTIR). In Figure 1, the FTIR spectrum of the used new grease sample is shown with a fresh reference new grease spectrum. The two spectra show the similarity of the lithium complex thickener, however due to the gross water contamination in the spectrum of the used sample some variations were observed.

Used grease analysis was again conducted by Grease Manufacturer in March 2019 for further assessment of the grease performance. No deteriorated performance was observed in the used sample from performance and elemental analysis.

The used grease sample was found to be of acceptable consistency as in-service grease sample. Besides, no other significant contamination except water ingress or system wear was detected in the used grease sample based on the elemental analysis.

Results:

Some free water was observed in the arrived sample. Used grease sample had a smooth texture with no obvious sediment observed. The used grease sample had penetration test result consistent with the typical fresh product. Significant content of water was detected in the used grease sample. The used grease sample also had noticeable decreased dropping point compared to the typical fresh product, which is possibly related to the water contamination. Elemental analysis was performed through XRF, the test results indicated normal levels of additives in the used grease sample with the presence of small content of iron and copper.

The used grease sample (2450124) was analyzed as received by Fourier transform Infrared (FTIR) Spectroscopy and the resulting spectrum is shown along with an electronically stored reference spectrum of fresh grease. The overlay indicates the presence of lithium thickener as expected. The presence of water is also identified in the used sample as determined by infrared spectroscopy.

Lab Data Summary

Test	Units	2450124
Product		Special Lithium Complex Grease
Sample Description		Used Grease Collected from the Bearings
Karl Fischer Water	ppm	53203
Penetration Half Scale; 60x	mm/10	339
Dropping point	°C	161
XRF-Semi		
Copper		0.01
Iron		0.05
Phosphorus		0.15
Silicon		Trace
Sulfur		1.03
Zinc		0.25

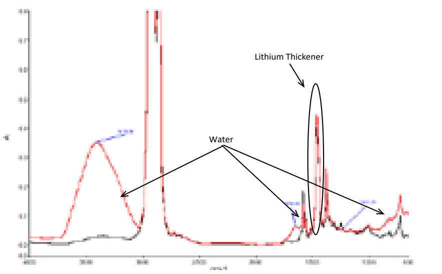
Note: XRF results are semi-quantitative. Elements not detected have been omitted. Trace refers to elements detected in concentrations too low to accurately quantify. The concentration/presence of sodium may be impacted by the presence of zinc in a sample.

Appearance of New Grease Sample as Received

Appearance of the Used Grease Sample

FTIR Spectral Overlay of Used Grease Sample (2450214, in Red) with an Electronically Stored Reference of New

Grease (in Black)



3. Excellent grease pumpability through centralized lubrication system

NLGI 1 new grease has very good pumpability even at low temperature condition. As a result, grease can reach at every place of the application for better bearing protection.

Grease pump for Centralized grease system

4. Enhanced safety and environment friendly operation

4.1 Less grease consumption means less slippage hazards

A large amount of grease getting into the system means large amount of grease disposed in the surrounding areas presenting more slippage hazards to mechanical maintenance team.

By decreasing grease consumption, slippage hazards will decrease significantly

4.2 Less bearing failure means increased human safety

More number of bearing failure means more manpower involvement to the running equipment.

By decreasing number of bearing failure, human safety is increased significantly.

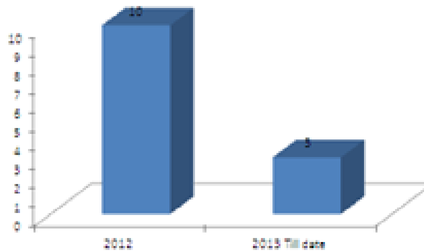
4.3 Less waste grease means more environment friendly operation

High consumption of grease means more waste grease disposed and accordingly more impact on environment.

CONCLUSION

After implementing the polymer fortified Li complex new blue grease recommendation, Tata Steel Ltd Merchant mill could reduce

✓Reduced bearing failure (10 nos. in 2012 to 3nos. in 2013 till date for stand 1 to 10)
✓Reduced grease consumption (8 barrel/month to 5 barrel/month)
✓Enhanced productivity of the mill



Merchant Mill Bearing Failure: Stand 1 to 10

MONETARY SAVING		
Revenue Enhancement	Productivity increase	Rs 3,080,000
Expenditure Reduction	Reduced grease consumption Reduce bearing failure	Rs 220,400
	TOTAL SAVING PER YEAR	Rs 3,300,400

the grease consumption by 38% and bearing failure by 70% with increase in productivity for an annual savings of INR 3,300,400 (US$ 55000).

About the author:

GRP Singh is Head, Quality Assurance Group, Tata Steel. He is a Gold Medalist from BIT, Mesra and has presented / published over 50 technical papers in conferences / journals. He is also associated with several professionals bodies like Condition Monitoring Society of India, Institution of Engineers, Tribology Society of India etc.

Lubrication® INSTITUTE
www.lubrication-institute.com

MASTERCLASS IN LUBRICANTS BLENDING & QUALITY ASSURANCE

LIVE ONLINE & INTERACTIVE

This 4 day training course will provide an in-depth understanding of the principles, economics and flexibility of lubricant blending plants and how to operate a lubricants blending plant efficiently and economically.

Benefits

1. Strategies for optimizing existing lubricant blending plant facilities.
2. Covers latest developments and trends in lubricant blending and the advantages and disadvantages of different lubricant blending equipment, facilities and operations.
3. Quality control and importance of testing components and products for each blend.
4. Product compatibilities & techniques to avoid or minimize problems with lubricant blending and product quality.
5. QA aspects in lubricant product filling, packaging and warehousing.

Who should attend ?

1. Lubricant formulators
2. Blending plant managers and operators
3. Entrepreneurs manufacturing lubricants
4. Lubricant specialists
5.quality assurance professionals
6. Blending equipment and packaging manufacturers

Email: info@lubrication-institute.com | www.lubrication-institute.com | +91-9431117604

Gulf Oil Lubricants exploring opportunities in EV charging space

Hinduja group company, Gulf Oil Lubricants India has partnered with Gulf Oil International for investing and exploring opportunities in the electric vehicle charging space. Gulf Oil Lubricants India Ltd (GOLIL) has entered into an agreement with Gulf Oil International (GOI) to participate and co-invest in Gulf Oil International's recent investment along with the Clean Growth Fund (CGF - a UK venture capital fund) in a UK-based smart energy and electric vehicle technology company Indra Renewable Technologies.

The charging station market, as per estimates, is expected to have a good potential in coming years, wherein around 50-60 per cent is expected to be in residential charging solutions which is where Indra is positioned to play, the release added. "With the evolving EV space in India, where charging options will become an important decision criterion, we are excited about this association," said Ravi Chawla, Managing Director and Chief Executive

Gulf India will become a shareholder with CGF and GOI in Indra, alongside OVO Group, which provided seed capital and technical support to Indra via Kaluza, its technology business. The prime focus for Gulf India would be passenger car and light commercial vehicle residential charging segment with Indra's smart chargers while it

evaluates opportunities in the two-wheeler segment.

The market is also expected to disrupt with new technologies such as V2G (Vehicle to Grid) chargers which are already developed by Indra and could support the power requirements of individual homes as a backup and also opportunities to form partnerships with potential microgrid solution providers in the future.

Indra's home-grown R&D and technology and OEM approvals will be critical success factors in this endeavor.

Gulf Oil Lubricants India Ltd. markets a range of automotive and industrial lubricants, greases, 2-wheeler batteries, among others and has presence across over 100 countries.

Shell ordered to reduce carbon emission

At a court room in The Hague, judge Larisa Alwin read out a ruling which ordered Shell to reduce its planet warming carbon emissions by 45% by 2030 from 2019 levels

"The court orders Royal Dutch Shell, by means of its corporate policy, to reduce its CO_2 emissions by 45% by 2030 with respect to the level of 2019 for the Shell group and the suppliers and customers of the group," Alwin said.

Earlier this year Shell set out one of the sector's most ambitious climate strategies. It has a target to cut the carbon intensity of its products by at least 6% by 2023, by 20% by 2030, by 45% by 2035 and by 100% by 2050 from 2016 levels.

But the court said that Shell's climate policy was "not concrete and is full of conditions... that's not enough."

"The conclusion of the court is therefore that Shell is in danger of violating its obligation to reduce. And the court will therefore issue an order upon RDS," the judge said.

The court ordered Shell to reduce its absolute levels of carbon emissions, while Shell's intensity-based targets could allow the company to grow its output in theory.

"This is arguably the most significant climate change related judgment yet, which emphasizes that companies and not just governments may be the target of strategic litigation which seeks to drive changes in behavior," said Tom Cummins, dispute resolution partner at law firm Ashurst.

Shell said that it would appeal the verdict and that it has set out its plan to become a net-zero emissions energy company by 2050.

CLIMATE LITIGATION

The lawsuit, which was filed by seven groups including Greenpeace and Friends of the Earth Netherlands, marks a first in which environmentalists have turned to the courts to try to force a major energy firm to change strategy.

It was filed in April 2019 on behalf of more than 17,000 Dutch citizens who say Shell is threatening human rights as it continues to invest billions in the production of fossil fuels.

"This is a huge win, for us and for anyone affected by climate change", Friends of the Earth Netherlands director Donald Pols told Reuters.

"It is historic, it is the first time a court has decided that a major polluter has to cut its emissions," Pols added.

Michael Burger, head of the Sabin Center for Climate Change Law at Columbia Law School said that "there is no question that this is a significant development in global climate litigation, and it could reverberate through courtrooms around the world."

Burger is also a lawyer representing local governments in the United States in climate change lawsuits, including against Shell.

Shell, which is the world's top oil and gas trader, has said its carbon emissions peaked in 2018, while its oil output peaked in 2019 and was set to drop by 1% to 2% per year.

While its climate targets surpass those of its U.S. rivals such as Exxon and Chevron, which ignore emissions from the combustion of its fuels, the Anglo-Dutch company's spending will remain tilted towards oil and gas in the near future.

A rapid reduction in its carbon dioxide emissions would effectively force it to quickly move away from oil and gas.

BASE OIL REPORT

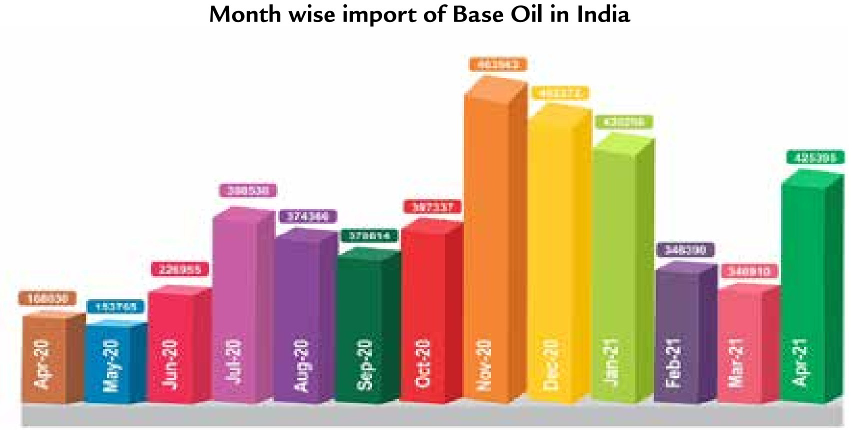
Indian energy demand is taking a big hit as Covid-19 runs rampant across the country. But uncertainty around when the virus wave will subside and the lack of a unified government response has left the oil industry in the dark as to how quickly consumption might pick up again. The demand destruction over the last couple of months has been less severe than last year, when the government imposed the world's biggest national lockdown. However, the lack of a coordinated effort to shut down activity to halt the virus's spread will likely lead to a longer, although less pronounced, economic slump. Diesel and gasoline, which account for more than half of oil consumption in India, are bearing the brunt of localized lockdowns. Sales of the two fuels at the three biggest retailers are about a third lower so far in May compared with pre-virus levels two years earlier. That's not as bad as April 2020, however, when demand nearly halved. This time round, more factories have remained open and cargo movements between states haven't been as badly affected.

India Exported 29947 MT of Light & Heavy White Oil in March 2021. Most of the Base Oil was exported to Kenya, Tanzania, Brazil and Bangladesh with smaller quantities exported to Latvia and Chile. Some of the largest Light & Heavy White Oil exporters during the month were Panama Petrochem Ltd with 8213 MT, Gandhar Oil Refinery (India) Ltd with 5301 MT, Savita Oil Technologies Ltd with 4401 MT, Savita Oil Technologies Ltd with 3645 MT, Apar Industries Ltd with 3645 MT, Raj Petro Specialities Pvt Ltd with 2687 MT & Indian Oil Corporation Ltd with 2600 MT.

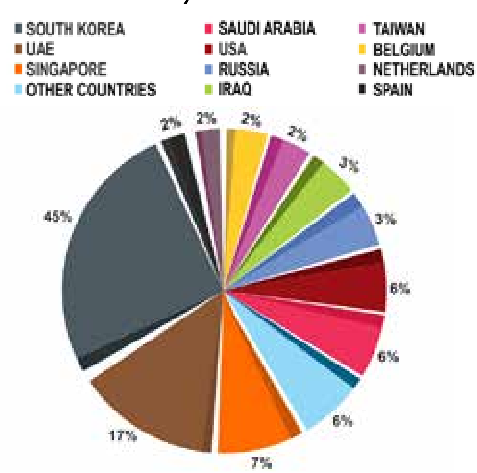
India Exported 2943 MT of Transformer Oil in March 2021. Most of the Base Oil was exported to Saudi Arabia, Bangladesh, Turkey and Indonesia with smaller quantities exported to Qatar and Algeria. Some of the largest Transformer Oil exporters during the month were Apar Industries Limited with 1671 MT, Savita Oil Technologies Limited with 568 MT and Raj Petro Specialities Pvt. Ltd. with 464 MT.

Dhiren Shah
(Editor – In – Chief of Petrosil Group)
E-mail- dhiren@petrosil.com

Month wise import of Base Oil in India



Origin wise Base Oil import to India, Country and %- March 2021



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

Month	N- 500 Korea Origin Base Oil CFR India Prices	SN-150 Iran Origin Base Oil CFR India Prices	N - 70 Korea Origin Base Oil CFR India Prices	RPO Drums (Aromatic Extract) CFR India Prices
Mar-21	USD 775 – 805 PMT	USD 810 – 830 PMT	USD 755 - 780 PMT	USD 1020 – 1045 PMT
Apr-21	USD 880 – 925 PMT	USD 915 – 965 PMT	USD 860 - 895 PMT	USD 1230 – 1255 PMT
May-21	USD 990 – 1030 PMT	USD 980– 1010 PMT	USD 885 - 920 PMT	USD 1380 – 1430 PMT
	Since March 2021, prices have increase by USD 220 PMT (28%) in May 2021.	Since March 2021, prices have increase by USD 175 PMT (21%) in May 2021.	Since March 2021, prices have increase by USD 135 PMT (18%) in May 2021.	Since March 2021, prices have increase by USD 373 PMT (36%) in May 2021.

2021 RELIABLEPLANT
CONFERENCE & EXHIBITION

Learn From Experts.
Build Your Network.
See the Possibilities.

Reliable Plant is Back in 2021

Reliable Plant is back in October 2021 with more unique opportunities to learn from world-class reliability leaders, lubrication experts and many other subject matter experts in the industry.

For more than 20 years, the Reliable Plant Conference & Exhibition has been the only place where the optimal mix of technical excellence, cutting-edge technologies and proven solutions for the maintenance and reliability industry come together to share insights.

See the Possibilities

The true value of Reliable Plant is not only the world class learning, it's the conversations that happen after class, around the lunch table or in the exhibit hall that can create that "light bulb moment." When a mix of everyone from operators to upper-management attends Reliable Plant, new possibilities open up for reliability and maintenance teams.

Ready for a more reliable plant? Join the reliability leaders gathering in Louisville, Kentucky on October 19 – 21 at Reliable Plant 2021.

About the Conference

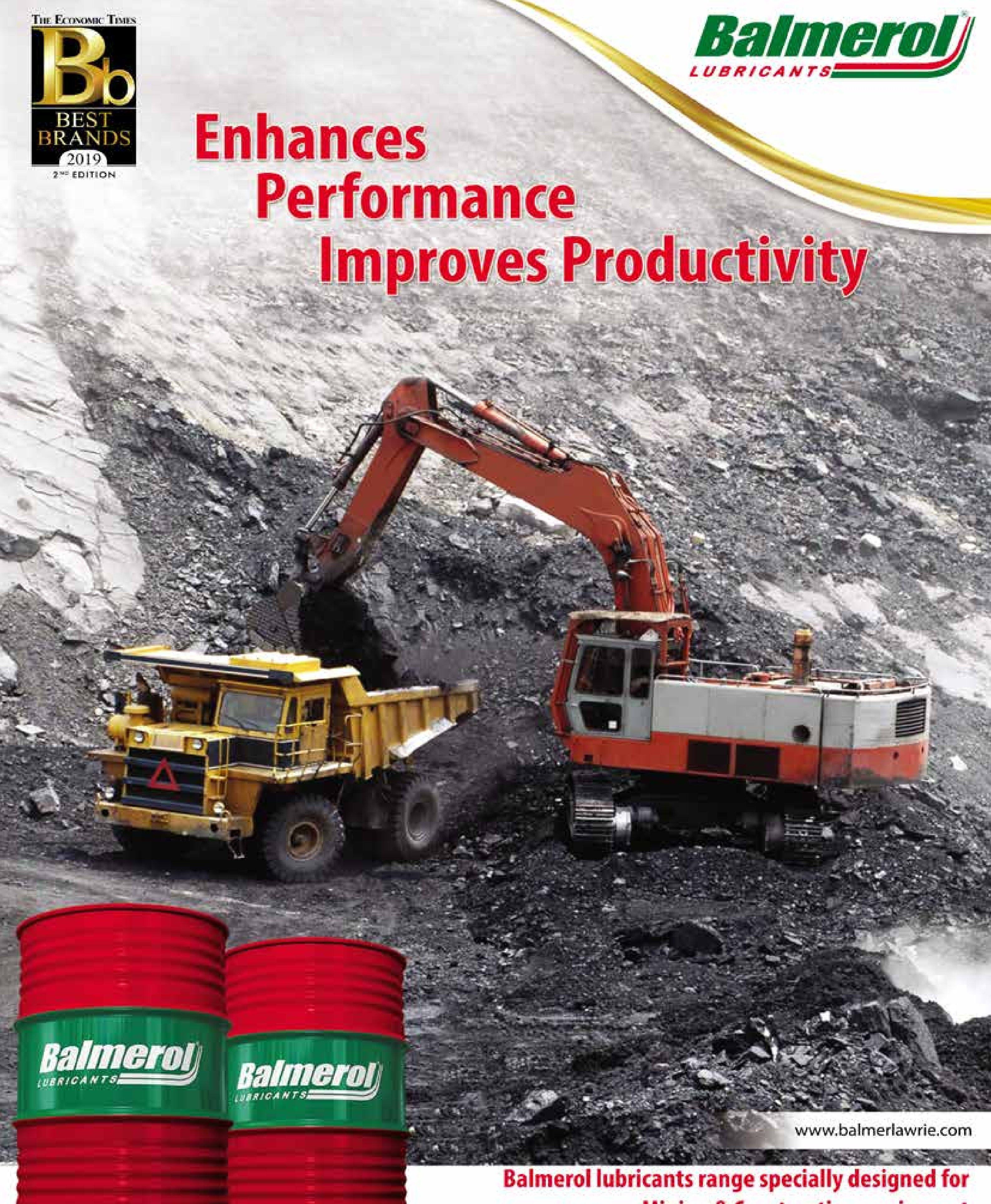
Spanning four days, Reliable Plant 2021 includes workshops, learning sessions and case studies designed to upgrade the skills and knowledge of attendees. The conference will also feature approximately 130 exhibitors in a more than 200,000-square-foot exhibit hall inside the Kentucky International Convention Center.

For more information visit **Conference.ReliablePlant.com.**

SAVE THE DATE

#ReliablePlant2021

MEDIA SPONSOR: Machinery Lubrication



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