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+91 99205 11053

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Machinery Lubrication

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FINDING EFFECTIVE ONLINE TRAINING IN 2021

Publisher's Note

With the vast majority of states under a stay-at-home order due to the coronavirus, you may have started to hear a lot more about the benefits of online training.

Over the last decade, e-Learning has grown exponentially. It comes in many forms, but it's primarily used for certification training and professional development.

Today, the advantages of online training are more important than ever. Disruptions to your daily life don't have to prevent you from growing and learning. Online learning makes it simple and convenient to keep building vital skills for your future.

The opportunities available for personal and professional development are nearly endless. The demand for skilled workers is also on the rise. In times of crisis, in-person learning may be unsafe or impossible. Online training, however, continues on. With no face-to-face instruction, online courses provide a safe and effective alternative to the classroom.

Another benefit of online training is the ability to learn anytime you want. Because you don't have to schedule around specific times or days, you can work on your course whenever you have free time.

A major downside of face-to-face learning is that there's typically a limited number of sessions offered each month. The days and times of classroom sessions won't always align with your schedule. In our fast-paced world, certain priorities can conflict with training schedules and limit your options.

With online courses, you can easily manage the demands of your family obligations, job, hobbies and other responsibilities. You can sign up for courses anytime and complete them according to your desired timeline.

Also, studying from the comfort of your own home or office — or anywhere else with internet access — allows you to relax and take advantage of the flexibility of online learning. There is no need to get dressed up or travel to and from the classroom.

Online learning is a lot like having your own private tutor. There are no distractions from other participants, and the pacing of lessons is based on your comfort level. You can spend as much time as you need on the course material and go back to review at any time. Since quizzes and tests are graded automatically, you receive immediate results and feedback. That gives you more time to focus on improving your skills and learning the material.

The world is constantly changing, and one of the best ways to keep up is to continually invest in your skills. Online training provides an amazing opportunity to learn the way you want, according to your preferred pace and schedule. While the coronavirus has put a hold on in-person education, you can still turn to online education to pursue new career opportunities or grow your current knowledge and skills.

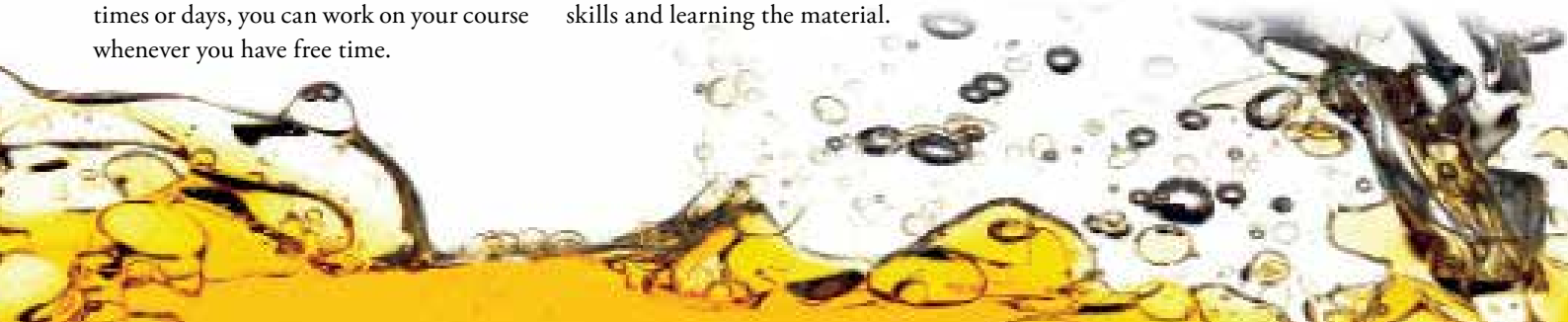
Our previous issue covered Ascent extensively with 3 levels, six lifecycle stages & 40 factors that lubrication can be divided into to and the impact they impart on lubrication excellence, machine reliability & asset management.

This was a big hit with the readers, and we have received several enquiries on how this could be implemented at manufacturing sites, utility and mining companies to enhance performance. In the current issue also, we are covering some of the other factors that we could not cover in the previous issue.

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

Please stay safe & healthy,

Warm regards,
Udey Dhir



Jim Fitch | Noria Corporation

Dust Cakes: What Causes Them and Why You Should Care

> "No one enjoys removing and cleaning this muck, which is often why dust cakes continue to grow."

We've all seen them. Perhaps some of us daily. Many take on a certain beauty, almost like a natural cave formation or a work of art. Most have organic characteristics like mosses or algae.

Dust cakes need airborne dust and oil to feed their growth. Some get their oil from escaping headspace mist, while others extract oil themselves from adjacent grease by a slow, sucking action (capillary forces) within the cake. Leaking oil from machine case joints and seams can lead to enveloping dust cakes too. The available supply of oil and dust determines the growth rate and the wrath they can impart.

No one enjoys removing and cleaning this muck, which is often why dust cakes continue to grow. We see them but we don't see them, like a dirty smudge on a carpet. After a while, they get subconsciously blocked from our view and concern. Of course, such blindness feeds a lethargic and dismissive culture that is contrary to any serious reliability effort.

A good place to start to turn things around is to understand the real danger of doing nothing or

Figure 1. Backstop breather has caked-on dirt down the elbow and along the case. This is usually due to oil mist that has migrated out of the headspace and collected on nearby surfaces. Airborne particles adhere and build up on the oil-damp surface forming layers of heavy, caky grime. Too much oil mist results in the need for frequent top-ups (oil and labor costs) and fluctuating oil level control. In many cases breathers function much better and last longer if they are positioned higher with a pipe extension. *Ref. Kevin Albert*

Figure 2. Notice how far oil from purged grease travels along the base and case wall.

Figure 3. Dust cake buildup near leak area on gear case and base. Notice sight glass and oil fill port. *Ref. Torki Ibrahim*

deferring corrective actions. After all, there is a devil within these dust cakes.

So Why Do We Care?

Answering this question is the theme of my column. It's time to give dust cakes serious attention. Of course, work environments differ, and for many industries this problem is nonexistent. For others, it's like a bad rash that keeps coming back, especially in plants where machines are outside and in contact with dry blowing air. For some, like cement plants, the cause of the dust comes from work materials and stock.

What follows are the potential consequences of leaving dust cakes unresolved.

Impaired Sound and Vision

Operators and inspectors need to be able to see the machine and its components—all of it. Dust cakes can mask the line-of-sight and dampen audible clues of machine condition.Someone should always be thinking, "What is underneath that layer of caky-grimy mass that we need to see?" Here are some examples of what your dust cakes could be hiding:

- Seals: All seals will fail eventually. Early detection of issues with seals and packings is necessary to avoid expensive bearing failures due to lubricant starvation and dirt ingression.
- Sight Glasses: Level gauges, BS&W bowls, inline sights, etc. all need to be seen and examined clearly for oil condition and level.
- Shaft Movement: Abnormal shaft and coupling movement must be detected early.
- Frame or Bolt Movement: Fasteners such as jack bolts, anchors, studs, etc. need to be easily examined for movement and looseness.
- Instruments and Gauges: These have no practical use if they can't be frequently and clearly inspected. If dial faces are obstructed by dust cakes, readings aren't taken.
- Oiler Sumps: Total-loss oiler sumps, bottles and reservoirs need to be inspected to determine adequate reserve lubricant supply.
- Inspection Windows: These are used for different purposes including checking part movement, oil ring rotation, lubricant nozzle spray, etc. Dust cakes restrict their view.
- Breathers: Restricted view of color-indicating desiccant from hydration never makes sense.
- Guards: Mesh guards on belts, chains and couplings must be clean to inspect tension and alignment of moving parts.

Impaired Heat Transfer

Heat is a fundamental enemy of machine reliability, both the cause and effect of so many failures. Dust cakes form a thermal insulating blanket around the machine surface that impedes the ability for internal heat to escape and to be known. This causes the heat to build within the machine which can lead to an assortment of runaway problems. Many relate to the

Figure 4. Large gearbox (4 reduction stages) used in a steel mill. Leakage around oil pump went unnoticed, ignored or just deferred for later repair. Little by little the gearbox drained of oil resulting in a thick dust cake. Oil pressure gauge was obstructed by the cake. *Ref. Ronald van Druten*

Machinery Lubrication India

Publisher
Udey Dhir
udeydhir@tribologysolutions.com

Creative Director
Sumita Maniktala
smassociates@gmail.com

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

Advertisement Sales
(India/all other countries)
Kaustav Das
kaustuvdas@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

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infamous Arrhenius Rate Rule (for every 10C increase in temperature, life is cut in half).

- Reduced Oil and Grease Life: Arrhenius Rate Rule (ARR) related to base oil and additive life.
- Short Seal Life: Heat degrades seals more rapidly, causing them to harden, glaze, crack, crumble and loose elasticity.
- Higher Rate of Corrosion: Most forms of corrosion are temperature sensitive.
- Shorter Filter Life (thermal fatigue): Many types of filters experience thermal fatigue leading to cracks and rupture.
- Shorter Motor Life: A 10C increase in temperature cuts electric motor life in half.
- Viscosity Starvation: Abnormally high lubricant temperature thins the oil (less viscous) which can cause higher rubbing, galling and abrasive wear.
- Inhibited Film Strength: Heat can prematurely deplete important additives such as antiwear and antiscuff additives.

Contaminant Ingestion

The closer contamination (dirt and water) get to ingression points, the bigger the problem. Dust cakes hold particles near critical interfaces at seals, joints, hatches, ports and other high-risk ingression zones.

- Grease Fittings: In many cases, caked-on dirt is so thick that grease nipples cannot be seen. The activity of cleaning the region prior to relubrication can cause particles to get pressed into the grease nipple port. Regreasing can then drive these particles into the core of the bearing where harm is waiting to be done.
- Fill Ports: Oil mist cakes around fill ports and hatches place particles in close proximity to the opening during routine servicing (top-ups, oil changes, sampling and inspections).
- Dirty Breather Media: Dust cakes packed around breathers interfere with air flow, in and out. Inhaled air across or through dirt can cause surge ingression of particles and lead to frequent need for breather replacement.
- Sump Sediment: Over time dust cakes that draw particles into the machine result in sediment buildup on the bottom of sumps, reservoirs and gear cases. Over time there can be more sediment in the sump than oil. The oil level gauge may show a full charge, but that is often not the case. Half the oil means half the oil's service life.
- Short Filter Life: The job of the filter is to remove particles from oil. The more particles are permitted to ingress the harder the filter has to work to keep up with ingression. The result is shorter filter service life plus the added cost of labor to replace them.

Dust Cakes Extract Oil from Grease

A lesser-known problem associated with dust cakes is grease dry-out. Oil can be extracted from grease if there is either an absorbent path or a gravitational path. This is easily observed by placing a dollop of grease on absorbent cloth or paper. A portion of the base oil from the grease will be wicked out of the thickener. This hardens the grease, impairs mobility and reduces the oil content needed for lubrication.

Dust cakes around exposed grease zones on bearings, gearing, hinge-pins etc. will have a similar effect. It's not much different than applying Oil-Dri (calcium bentonite) on an oily workshop floor or driveway. Fine dust cake particles that build up have high surface area. They slowly draw oil out of the grease in the machine. The more oil that is extracted, the more dust particles will collect, forming an increasingly thick cake. Resulting drier and harder grease inside the bearings, etc. will potentially have impaired lubricant flow, lubricant film strength, restricted part movement and obliterated oilways and glands.

Impaired Condition Monitoring

I've talked about the importance of having an unrestricted line of sight for visual inspection of all machine surfaces. Dust cakes also interfere with the ability to properly perform condition monitoring data-collection tasks. For instance, there needs to be visible spots and hookups for taking vibration and temperature readings. "I wonder where the last guy took the readings for good comparison?" Clean surfaces are also needed for ultrasound, thermal imaging, stroboscope checks and motion amplification. Proximity probes function best under clean conditions too.

Dust Cakes Hide Warnings and Other Important Data

Many machine surfaces and adjacent objects will contain posted signs or other warning labels that are intended to remind personnel of safety concerns in the area. If these are not kept clean, the dust cakes can build up, making their presence go completely unknown. Better to keep these signs legible and avoid an injury event than to find out that dust was the root cause after the fact. Even nameplates, lubricant labels and maintenance data plates that are posted on the machine will go unnoticed if covered by dust cakes. This can lead directly to impaired lubrication and maintenance activity performance.

Whack-a-Mole

Exterior contamination and dust cakes telegraph the wrong message to staff and encourage a culture counter to machine reliability. Many plants, by the very nature and/or location of their business, fight a seemingly unending battle with dust cakes, like a game of whack-a-mole. That said, turning a blind eye makes things so much worse and has a compounding effect. Having an honest understanding of the real costs and downtime associated with proactive (keeping machines clean) versus reactive (cycle of repeated repair and despair) is a good start. ***ML***

Special thanks to Tor Idhammar (IDCON), Torki Ibrahim (Yanbu), Kevin Albert (SULP) and Ronald van Druten (IJSSEL) for images and other contributions to this article.

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 books. He serves as a U.S. delegate to the ISO tribology and oil analysis working group. Since 2000, 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.

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By Bennett Fitch

FINDING EFFECTIVE ONLINE TRAINING IN 2021

What are you really doing when you buy a training seat? For some, it's just another annual budget item that needs spending. Another, more honest answer that we have heard some version of many different times is, "Well, if I have to go to a training, I might as well sign up for one in Vegas!"

A useful training and a great destination, what's not to like? Unfortunately, destination trainings aren't exactly on the menu for many maintenance and reliability professionals in 2021. Even as circumstances change and more companies re-instate travel budgets, many are using this past year as an opportunity to evaluate what their training priorities really are.

Some have cut back on training because they see no simple way to get it done without exposing employees to unwanted risk. Others have adapted and found better, more focused and more efficient ways to train.

Bad Training Insurance

"Well, it's in Vegas" really is the most honest answer. It's common for people to use the destination as "bad training insurance." The logic is simple: if you pick a good destination, even a bad and completely useless training feels like less of a waste. I think most of us might be guilty of this from time to time.

Many trainings do turn out to be so terrible that the destination is the only thing that saves the trip—at least you can still grab lunch with industry people and talk shop, right?

But these days it's not so simple.

If you're trying to achieve a specific reliability or maintenance goal at your facility or looking for a way to improve your own career options, you might be out of luck. Many online trainings in the post-COVID-19 era are hardly more than pre-recorded PowerPoint presentations with a disembodied voice you can barely hear through your computer speakers.

But still, we know that the right training—one that's engaging, cutting-edge, and practical—can be inspiring and provide a new perspective. Often, people find that training creates a

> While there can be little dispute that knowing how to perform a task is important, in my experience understanding the why, ensures commitment to the task at hand.”

“lightbulb moment” that helps you see new solutions for your biggest problems. The right training can even help you find a new direction in your career. It can transform teams from the inside and improve the overall maintenance and reliability culture within your organization.

Training and Educating – What’s the Difference?

Industry-leading organizations use up to 10 percent of working-hours training their employees to ensure that the necessary knowledge and skills are always fresh on their minds and clearly understood.

But how much of this training is truly understood? Does it provide value as intended? How do you evaluate training offerings to know which to choose without sitting down and taking the training yourself?

How to Find Useful Training in 2021 and Beyond

The short answer is—look at those who are adapting. These days, you can’t afford to waste time or money on bad training. And right now, those great destinations like Miami, San Diego, or Vegas are not even on the table to save a bad training.

Look for companies offering trainings that help you solve specific problems or achieve specific goals. If the company website has no information about the training besides the title and price, it’s probably best to steer clear.

Google is your friend in times like these—the best training options these days are online and, most importantly, they are LIVE. Not something that is outdated and stale, but those trainings that are engaging and provide real interaction.

While the idea of training on Zoom probably doesn’t fill you with excitement or confidence, there are innovators out there who have built studios, hired production staff and created full-scale virtual classrooms, complete with live instructors and peer discussions.

We teach trainings like this often. While there is always a minute or two of awkward silence at the start of every Zoom class, it doesn’t take long for everyone to realize we can all speak to each other as if we were in a physical classroom. With quality virtual classrooms you can start having real, impactful conversations almost immediately.

Essentially, those involved in an online class are not receiving full value for their training dollars unless everyone is engaged and conversation is happening.

What Makes Training Worth Your Time

So how can you make sure that you are not simply wasting money and time on training for yourself or your employees — regardless if it’s lubrication, oil analysis or any other subject area?

First, the difference between “training” and “education” should be recognized. Training is about imparting new skills, but education is a more comprehensive word for training that connects the dots to what’s going on back at the plant. Education offers practical information and ultimately provides real answers that convert to real value for years to come.

You can teach a technician how to visually inspect the oil level in a gearbox or how to use an ultrasonic device to assist in regreasing, but a training that educates goes beyond skills. Education teaches about the *why* behind the skill. That knowledge of the context, benefits and needs related to the issue provides tremendous value to an organization. It’s all about knowing the *why* behind the *what*.

Of course, we must put what we learn into practice. Unless the new skill is practiced and connected to other aspects of the person’s job, it is likely to atrophy over time, rendering the training a waste of time.

In organizing skills-based training, a direct one-to-one correlation needs to be made between the tasks a technician will be asked to perform, and the appropriate training module for the job.

Education is About the “Why”

Now, back to the *why* behind the *what*. True education is about teaching why certain tasks or

activities provide value, and why a change in the way a task is currently performed is important.

Take for example a visual oil level check of a splash-lubricated gearbox: the education component of training this task to a technician is explaining more than just why the correct running oil level is maintained. That may be obvious to most. But the education takes it further and dissects how each individual condition observed, such as the color changes, cloudiness, floating particulates, or foam, can be the crucial early indicator to a precipitating failure mode.

Training, however, might be able to provide further diagnostic value through qualitative or quantitative assessment of the situation, perhaps by conducting a simple field test for water content or a static sit test for aeration.

Education is just as critical to success as training. While there can be little dispute that knowing how to perform a task is important, in my experience understanding the why ensures commitment to the task at hand.

Few of us like to be told what to do without some explanation as to why. Like brushing our teeth in the morning rather than sleeping in a few extra minutes: we routinely brush our teeth because of the why. Yes it's nice to have that "minty freshness," but more importantly, it helps to prevent tooth decay.

Just like training, education should be tailored toward the intended result. In that way, you'll be spending your time, money and attention on something with a clear purpose and a goal to aim for. If results are not achieved, perhaps it's time to start searching for a new training or a new training provider. ***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.

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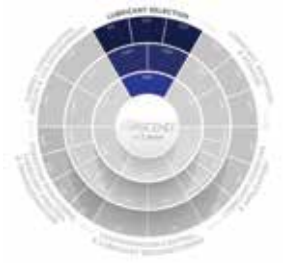

The Argument for a Single Lube Supplier

> this process should be viewed as an opportunity. It is a chance to form a strategic relationship with an outside organization that will help you achieve goals, not only in lubrication, but in reliability as well. ”

While choosing the proper lubricant is the first important step in any lubricant selection process, a similar amount of consideration should be given to picking the correct lubricant supplier as well. Your objectives or reasons for switching lubricants or adding a new lubricant to your inventory are also important parts of your decision. In fact, this process should be viewed as an opportunity. It is a chance to form a strategic relationship with an outside organization that will help you achieve goals, not only in lubrication, but in reliability as well.

Partnership

The ideal lubricant supplier should be more of a partner in success rather than a transactional figure. The process of purchasing lubricants should be thought of as a partnership in the supply chain of the oil or grease that needs to be applied to the machinery. The supplier plays a key role in this partnership. The lubricant manufacturer likely

ships their product to their suppliers, who hold an inventory of those products on hand to be delivered to their customers when demand arises. This means there are warehousing activities for packaged lubricants that must be performed properly as well as decontamination and contamination control best practices that must be adhered to for any bulk lubricants.

Since the supplier will be handling all the lubricants prior to them arriving at your plant, you want to make sure they share your vision and goals for controlling the lubricant properties and storage conditions. While this may sound trivial, it does ensure that the partnership aspect of the relationship isn't overlooked. There are many services and processes that the supplier may be able to offer that make the work much more manageable for your on-site lube team. This mutual relationship helps ensure that the supplier, the customer and the equipment all win.

Why you may want one supplier

There are many reasons why it is common for facilities to use multiple lubricant suppliers. For some, there are specialized pieces

of equipment that may take specialized lubricants or specific brands. When these lubricants are outside the normal brands your supplier carries, it is common for plants to use multiple lubricant suppliers to cover these needs. When new equipment is under a warranty period and the lubricant is specified by the manufacturer, some are reluctant to deviate from that specification as well.

Ideally, the plant should have a single lubricant supplier that is able to provide all the lubricants necessary to cover the normal usage in the plant. Some take it a step further and select a single supplier of lubricants corporate-wide instead of relying on regional agreements to be established. Regardless of the scope of the change or its motivation, there are many benefits to having a single supplier rather than multiple.

Reduce the number of vendors

Having multiple vendors creates more work for accounting, purchasing and receiving teams. By reducing the number of lubricant vendors, you streamline the whole purchasing and receiving process.

Reduce the number of discrete purchase orders

Each purchase order represents an item that must be tracked, accounted for and closed out. It requires staff oversight as well as administration to ensure they get issued and charged against properly. Having a single supplier creates an opportunity for a more open purchase order with less oversight required.

Improve pricing though consolidation and volume buying

As you purchase from a single supplier, there are opportunities to consolidate your product inventory and potentially negotiate volume discounts based upon your usage. This is even further magnified when the contract involves a corporate account rather than just a single plant account.

Improve access to service through consolidation

Most suppliers will have technical specialists to provide support or service to accounts that purchase their lubricants. Often, their time is prioritized based upon volume or purchases per account. Having a single supplier could move you into having a more direct line to technical specialists or even having a dedicated specialist for your account.

Improve quality of products purchased

It is common to put quality standards in place for lubricants being delivered. You may want to request a specific cleanliness or dryness of incoming lubes as well as a preferred delivery method. Working with a single supplier may allow you to get "fresher" lubricants as opposed to inventory that may have become aged and possibly compromised while sitting in a warehouse.

Improve delivery commitment

Lead time on lubricants and product-on-hand can become issues, especially during unplanned events such as leaks or failures. Working with a single supplier to have enough stock or a more direct line to the lubricant manufacturer can help mitigate these risks.

Questions to Ask About New Lubricant Suppliers

Choosing a supplier is not a decision to be made lightly. It shouldn't be based solely on price, but rather a collection of many variables to ensure that you are getting the quality or product and service that you need. Each facility or corporation may have different opinions on what would be the most important aspect of a lubricant supplier. It is important that you develop a selection committee and decide what factors will go into your decision process. Once the factors are decided on, they should be weighted and then you can begin to interview prospective suppliers and determine which one is the best fit for your organization. Below are some questions to ask yourself when selecting a supplier.

What are the supplier's capacities?

The supplier should not only be able to produce enough finished lubricant, but also have the packaged inventory to meet the normal demands of the plant or the corporate account. This normally isn't an issue if the supplier manufactures their own lubricant. If they rely on a third party to manufacture the products, it can cause some problems on occasion.

What blending facility locations are available?

Ideally the blending plants of the finished lubricants will be geographically convenient

in relation to the plant. Having a blend facility within a day's drive can help with emergency deliveries and certainly mitigate issues with extensive lead times for products. It is also good to have multiple blending facilities to help with additional capacity if needed.

What are their distributor warehousing standards?

The distributor network of the supplier should be analyzed, not only for proximity in relation to the plant but also their quality assurance standards. The distributors should understand the importance of cleanliness and supplying fresh lubricants that are unaltered by storage conditions. Performing audits on the distributor warehouses is a great plan to ensure they are handling the lubricants in an ideal manner.

Do they have a global supply chain?

This is very important for corporate agreements that span multiple continents. There are lubricant suppliers that have a global reach, but there are many that don't. If you are building a global corporate contract, this item should be highly considered in the decision process.

Do they offer similar products, such as fuels, chemicals, or solvents?

Many of the same benefits that come with a single lubricant supplier can be extended to using a single supplier of other materials. If the chosen supplier can provide other products that further streamline your supply chain, you may find even greater benefits. Other products, for example, can be process chemicals, solvents, fuels and other items that may be used outside the standard lubrication program.

How diverse is their product line?

To help ensure that the supplier has products that not only meet all your current machinery needs, you may look to see how diverse the full product catalogue is as it pertains to planned future growth areas of your facility. For instance, if you are planning to take on fleet maintenance of mobile equipment or are adding a new production line that requires food-grade lubricants, selecting a supplier with a broad product line could increase efficiency and save money.

Are they approved by your OEMs?

If you have equipment that is under warranty or prefer to stick with recommended lubricants from the OEM, you may want to select a supplier that has approvals from the equipment manufacturer. This can help avoid any issues when it comes to claims or even assuage the fears from engineering staff when installing new equipment.

Do they specialize in your industry?

Some suppliers produce specialized lubes for certain industries, processes, or even equipment. Asking if the candidate has any specialized lubricants can help in your decision. Also, the specializations may also be in the service or technical support aspects of their business. Both of these can be of benefit to your plant if your staff is lacking the knowledge and understanding of lubricants and lubrication.

What packaging and bulk delivery options do they offer?

Ease of delivery and transport of the lubricant within the plant impacts manpower, and potentially quality of the lubricant. The supplier should be able to deliver the lubricant in the appropriate volumes and in the appropriate container option to make reception and handling easier on your staff.

What is their reputation for quality and service?

This should be based on customer references as well as any reviews that can be found with trusted organizations. Choose a supplier that not only meets all the other demands of the contracts but also has a good reputation for quality and customer service.

What experiences have you had with this supplier in the past?

If you have used the supplier in the past, make a list of the pros and cons of their service and quality. Also review your current lubricants to determine if you are already utilizing a significant volume of a particular brand. These can guide the decision to determine if a single supplier is a good fit for your organization.

While there are many aspects to selecting a lubricant supplier, ultimately it is a decision that you must make to benefit your equipment, staff, and organization as a whole. Few partnerships have the ability to impact the reliability of your machinery more than your lubricant supplier. Building a relationship that is founded on quality products and quality service can serve as a foundation for a world-class lubrication program. With a great lubricant supplier and a detailed development plan, you can achieve the transformative cost savings and reliability improvements of world-class lubrication in your plant. ***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.

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Store, Plan, Execute, Excel:

(R2P) Lubricant Storage and Lube Room Factor Overview

> "In many ways, the future of your lubricants is the future of your machinery."

Around the industry these days, we all hear similar things about keeping in service lubricants clean, cool and dry. But what about the lubricants that aren't in-service yet? Those lubricants are just as (if not more) important to keep clean. In many ways, the future of your lubricants is the future of your machinery. Just as you store spare parts properly so they are ready for service without compromise and at a moment's notice, your lubricant storage should be a top concern for your facility's lubrication program. The way a facility stores and prepares their lubricants for service says a lot about the facility's lubrication program. On the Ascend™ Chart, the Lubricant Storage and Lube Room (R2P) Factor is included on the Platform Level of the "Lubricant Reception and Storage" Lifecycle Stage. This identifies R2P as a foundational factor to lubrication excellence.

The first thing a technician should think about when receiving new lubricants is, "What are the quality control processes for reception?" But for the purposes of this article, we will assume perfect quality control processes are in place so we can focus on the lube room and storage aspect of lubricant reception.

So, now that the technician has properly received the new lubricants, it's time to think about storing them properly. But where? Maybe that back corner of the lot, or out by the old maintenance shop? Either way, they can just be propped up out in the open and exposed to the elements, right? Wrong. Believe it or not, such circumstances are quite common at the average facility, but they are far from world-class storage practices.

Having a dedicated space to properly store and handle lubricants is critical to keeping the lubricant ready for service because doing so prevents lubricant contamination and degradation. This allows the lubricant to not only to perform better for longer, but it also allows the overall machine to perform better, leading to less repair work, less downtime and smoother operation. Put plainly, every plant needs a lube room.

Building A Lube Room

Building a great lube room is

essential to a great lubrication program. Think of the lube room as your facility's War Room. This is where the planning and strategizing happens. This is where the battle for best lubrication practices is won! The lube room is also good for other lubrication-related tasks like inspecting oil filters or topping up, storing and cleaning sealable and refillable containers. It all starts with the lube room or lubricant storage space; the size of the room depends primarily on the size of the plant and the number of lubricated assets, but there are some basic requirements for a proper lube room:

- Solid walls and a roof
- Well-ventilated space
- Sealed concrete floors with non-skid finish
- Conspicuously marked aisles, work areas and equipment locations
- Climate and humidity controlled (dehumidifiers, air-drying systems, etc.)
- Safety measures in place, (e.g. first aid kits, fire extinguishers or fire suppression system, eyewash station and conspicuously placed evacuation routes).
- Work bench
- Computer station for lubrication and maintenance tasks and inventory
- Clean and orderly environment

Now that the space requirements are established, the true potential of the lube room can be found through consistently utilizing best practice storage and handling solutions. You will need the right equipment to properly outfit the lube room to prepare for short- and long-term storage needs. Each facility should outfit the lube room to accommodate the amount of lubricated assets in the facility and the quantity requirements of each of the assets. A working list of lube room equipment for most facilities would be:

- Storage racks for drums
- Bulk oil containers w/ dispensing system
- Fire safe cabinets for storing and organizing greases and other small-quantity lubricant containers
- Storage rack or cabinet for sealable and refillable containers
- Filter carts, each filter cart being dedicated to one lubricant to prevent cross-contamination.
- Proper disposal receptacles for oily rags and used oil.
- Reclaimers to recondition used oils
- Oil and grease transfer pumps
- Maintenance supplies such as rags, various fittings, spare filters, reservoir screens, absorbent materials to control spills, desiccant breathers etc.

Every successful lube room should also have defined policies and procedures in case of spills, wastage, accidents or any unexpected lubrication issues. Organization is absolutely key to not only a successful lube room, but most other work that a lubrication technician will perform. All tools and applicable handling devices should be stored in cabinets with doors. Each storage area in the lube room should be marked specifically for the tool or piece of equipment that is to be placed in that spot. This helps maintain proper organization and allows for efficient use of the available space.

Lubricant Storage

Grease – While grease is widely used in most industries, it is also the most common lubricant to be stored improperly. Store grease vertically with the plastic cap up. This method of storage decreases the amount of oil bleed that may occur in greases, particularly for long term storage. I'm sure most of us have experienced opening a cabinet to get a new tube of grease only to see the oil pooled on the shelf. This is a result of the oil separating from the thickener—leaving it unusable and wasted.

Grease guns containing grease should be stored differently. Grease guns should be stored horizontally to prevent oil from bleeding out of the bottom of the grease gun. This allows for the next technician to choose the grease gun according to the lubricant label (such as an LIS tag) and not have to worry about pumping mostly thickener into the component. Remember, the oil and additives provide lubrication while the thickener just helps keep it in place.

Oil Drums – Just as grease is often stored improperly, we also see a lot of drum oil waste as well. When storing drums, each facility must utilize the First-In First-Out method, also known as FIFO. This inventory method helps keep oil drums from being left in storage too long and cycled into service before they reach their storage life. Also, good drum storage practices like this can help keep oil drums from being over-ordered, double-ordered or generally wasted through a number of other mistakes resulting in excess drums and poor cost control.

But how, you might ask, is having excess lubricant is a bad thing? Imagine the lube storage area becomes full due to over ordering. Now perhaps the drums must be stored outside. While this can be done properly, most facilities in this situation would not take the time to adequately protect those drums. So there they sit, out behind the shop or some other open space with no cover and exposed to every environmental contaminant nature can throw at them. Soon, you'll have water pooling on top of the drum. Temperatures begin to fluctuate, causing the drums to expand and contract - to "breath". When the drum breathes, it creates

a vacuum and the water on top of the barrel slowly gets sucked in, even if the bung was never opened. Of course, once this water is introduced it begins to prematurely degrade the lubricant.

Best Practice Methods to Storing Oil Drums

Indoor (Preferred)

- Drums should be stacked horizontally and no more than two high
- Drums should be stored on proper drum storage racks utilizing FIFO to maintain a good rotation of stock
- If no rack is available, at least store barrels horizontally with the bungs at the 3 and 9 o'clock positions
- Bungs kept tightly sealed, perhaps with a high-quality desiccant breather attached to prevent contamination.
- Always utilize a filter or transfer cart when transferring oil.

Outdoor (If Necessary)

- Shelter the drums the best you can—tarp, shed honing, etc.
- Lay drums horizontally (3 & 9 o'clock)
- If drums must be stored vertically due to space constraints, utilize some type of covering and/or tilt the barrels to allow water to drain

Bulk Oil Storage and Dispensing System – Of all the lubricant storage options, bulk storage is best practice for oil storage and contaminant prevention. There are many different companies providing a variety of styles for large-scale bulk oil dispensing systems. There are a few key characteristics to consider, rather than a specific brand. To start with, it should have a filtering and circulating system to control contamination and maintain fluid health while in storage. The choice between steel containers and polyethylene containers depends on budget and specific goals of each company. Most dispensing systems on these storage units are similar with a pressurized and filtered dispensing tap, built-in spill containment and they also save space for other equipment.

After considering these lube room and storage requirements, ask yourself, "How would my facility score in this factor?" Your factor score can tell a lot about how your lubrication program is going overall, how it is maintained and usually where a good starting point is for best-practice improvements. Out of the seventeen foundational Factors at the Platform Level on the Ascend Chart, Lubricant Storage and Lube Room (R2P) is one of the most important for overall lubrication program success. ***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.

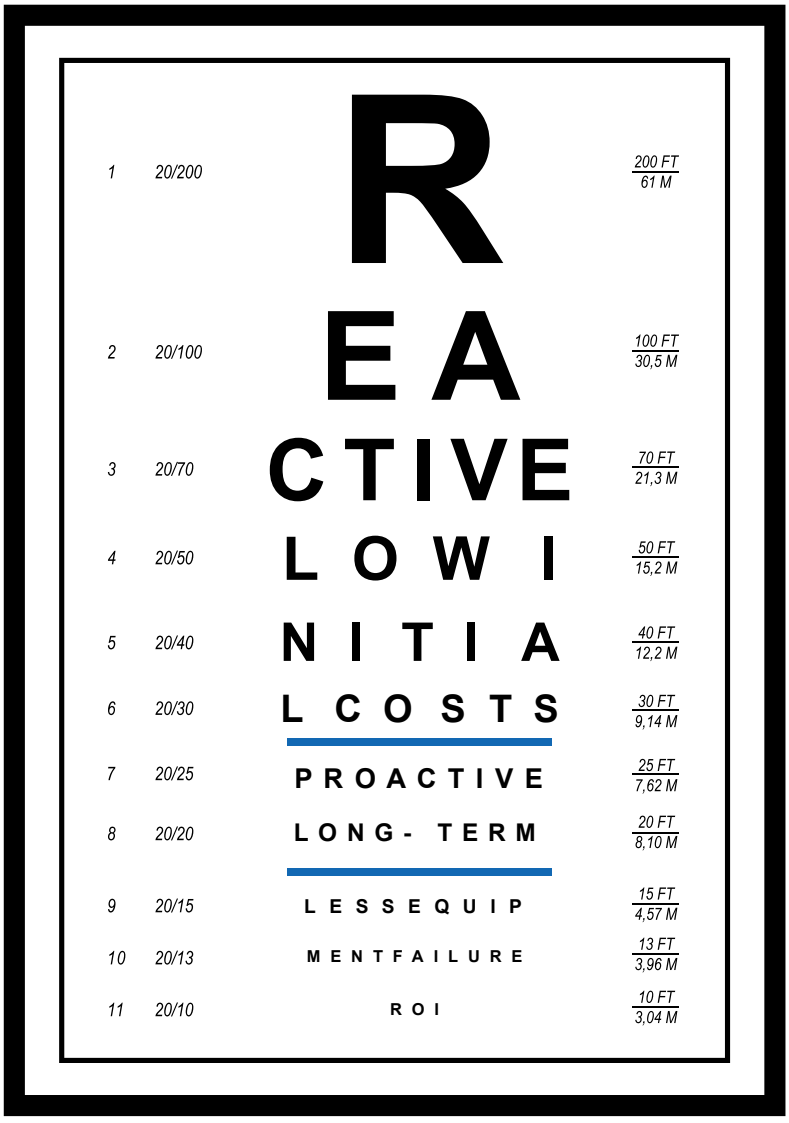
Factor: H2P

Asset Myopia: The Problem with Short-Sighted Machine Configurations

> Many industrial facilities remain stubbornly short-sighted about the acquisition, installation, and operation of their machines. ”

Myopia is a condition in which the eye fails to refract, bend and focus light properly, causing distant objects to be blurry or unclear. The familiar term, short-sightedness, accurately describes a condition that is common in industrial plants across the globe: Misguided Machinery Configuration (H2P). Many industrial facilities remain stubbornly short-sighted about the acquisition, installation, and operation of their machines. So today I want to take a moment to help you look ahead to the future of your machines.

Machines are designed to play a multitude of roles in different operational contexts. Equipment manufacturers can only customize their machines' configuration options as much as market demand allows. Ultimately, it is the responsibility of equipment owners themselves to re-configure their machines to correlate to the specified operational contexts where



they are used. While this step is commonly overlooked in the acquisition process, proper initial machine configuration prior to operation creates opportunities for simpler preventive maintenance tasks, improved inspections, increased equipment longevity and enhanced site profitability. Understanding asset lifecycle cost and ownership, standardizing and optimizing machine configuration through documentation practices and knowing how to deploy these considerations to assets in an accurate and timely way will provide improved site "vision."

Understanding Asset Lifecycle Costs and Ownership

Cost control measures are a healthy part of physical plant asset acquisition. They help minimize capital spending on projects by ensuring there is a sound business case that maximizes ROI (Return on Investment). Despite this laser-focused efficiency, often a focus on immediate costs supersedes a broader, more strategic view of the situation. The extreme focus on the cost of a project is often based on the initial purchase cost alone - not on the entire lifecycle cost of the asset itself. In turn, this restricted view of asset costs often places plant equipment and productivity in a reactive mindset prior to installation or operation. A reactive approach might seem easier or cheaper in the short term, but it is a more labor-intensive, expensive and failure-prone way to manage the full lifecycle of your assets.

While short-term reduced spending in the form of capital projects looks good in the moment, reliability leaders should be focused not only on investing in themselves and their current situation, but their overall career longevity and the continued success of the plant as well.

Properly understanding the long-term vision of asset ownership prior to acquisition allows for correct enhancement where necessary before operation. Rather than waiting to outfit equipment during associated scheduled downtime, specific machine inspections and Preventive Maintenance (PM) tasks can be carried out ahead of time in a more detailed, less time-intensive manner.

Standardizing and Optimizing Machine Configuration Through Documented Practices

Properly addressing Machinery Configuration (H2P) at your site should begin prior to the acquisition stage. EEM (Early Equipment Maintenance) within the realm of TPM (Total Productive Maintenance), FMEA (Failure Modes and Effects Analysis) strategies and a MOC (Management of Change) process should be implemented to standardize and enhance asset configuration based on reliability, safety and ergonomics. While this level of practice should be the standard, it is rarely the case.

Establishing processes like the ones noted above and creating the correct documentation and standardized practices with the ORS (Optimum Reference State) in a lubrication standards manual can work as a failsafe, improving reliability upon initial operation of the equipment on the plant floor. Some may be unfamiliar with the intricacies of utilizing ORS, but to put it simply: ORS is the prescribed state of Machinery Configuration (H2P), conditions, and maintenance activities required to not only achieve, but also sustain reliability objectives set forth by the site or company. Regarding machine configuration in ORS from a lubrication standpoint, this speaks to the transformation of equipment regarding the specific lubricants, contaminant removal and exclusion options and associated hardware included on the asset to aid in maintaining it while avoiding sub-optimal or excessive states of deviation.

Accurately and Timely Deploying Configuration Consideration to Assets

As already mentioned, due to its level of importance, having a sound comprehension of what is really involved within asset optimization on the front end will pay dividends during production. As such, it is imperative to discuss in some detail the possible, viable options

"Cost control measures are a healthy part of physical plant asset acquisition. They help minimize capital spending on projects by ensuring there is a sound business case that maximizes ROI"

with regards to this pre-implementation transformational process regarding lubrication.

Lubricant selection is a good starting point for lubrication-related Machinery Configuration (H2P) concerns. Ensuring the correct oil or grease is being used can be a first line of defense for preventing friction, heat and wear in the asset. OEM recommendations are generally a great starting point, but consideration must be taken to understand how temperature, contaminant ingression, industry, and your specific application should be addressed as well. Some applications may require an amendment from standard mineral base stocks, additive packages or grease thickeners depending on the nature of the ORS for that specific function. Following this process, a review of the current lubricants on site should take place to see if there is already a functional lubricant available to fulfill the need of the asset that will also aid in lubricant consolidation efforts at the site.

Another machine configuration area to consider is contaminant exclusion and removal options available to help meet the asset's contamination control objectives. Understanding the asset's criticality, associated rebuild labor constraints, replacement part costs and lead time will play a pivotal role. Certain oil-lubricated assets in the plant will require dedicated, machine specific supply, return line, and possibly offline kidney loop filtration systems. Others may need dry instrument air purge systems with high end breathers to ensure proper contamination objectives are being met. Other less essential oil - lubricated assets may suffice with any OEM standards already in place. There should be a similar amount of attention to detail regarding grease-lubricated assets, especially when reviewing bearing structure and other grease-related applications.

One final consideration regarding early machine configuration is the lubrication-associated hardware outfitted on the asset. These deliberations need to consider headspace management tools such as desiccant breathers, particle breathers, expansion chambers, dry instrument air purge and vent plug options. Oil level management apparatuses such as bullseyes, level gauges, dipsticks, level plugs and constant-level oilers need to be evaluated. Bottom-drain management options worth considering include BS&W (Bottom Sediment & Water) bowls, magnetic plugs, ball valves and quick disconnects. Expanded metal guards on sheaves and couplings as well as diffuser or baffle plates that mitigate the concern for air entrainment and foaming should be considered as well. The option for oil-sample management and standardized location selection must be considered in advance, especially knowing the ramifications of poor sampling practices, false positives and variability concerns. Finally, grease supply and delivery management in the form of fittings, nipples, grease line extensions and auto lubricators should be considered as well.

All these important lubrication-specific options play a fundamental role in asset lifecycle management and can be directly related to improved inspections, PM task completion and asset uptime. The amount of time, money and attention that is spent on each one should be directly correlated to the ORS of the asset in consideration.

Wrapping Things Up

By now, it should be abundantly clear that there is often a need for the pre-configuration of plant machinery to correlate to the specified operational contexts. This step is commonly overlooked in the acquisition process, and, if delayed, rarely implemented properly. This can lead to a reactive plant with missing or improper inspections and PM tasks resulting in increased machine repair costs and associated downtime. Understanding asset lifecycle cost and ownership, standardizing and optimizing machine configuration through documentation practices and knowing how to accurately and timely deploy these Machinery Configuration (H2P) considerations to assets will provide great insight and even greater results from this improved site "vision." ***ML***

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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.

Factor: C3M

Contamination Control Objectives

> Keeping our lubricants cool, clean and dry will help equipment run better, last longer and become more productive with less down time."

The six steps for managing and controlling lubricant contamination are vital for any successful lubrication program. Keeping our lubricants cool, clean and dry will help equipment run better, last longer and become more productive with less downtime. That's the name of the game – less downtime. Prioritizing the following areas will ensure long-lasting lubricants that protect your equipment 365 days a year.

1. Contamination Limits and Standards
2. Receiving New Lubricants
3. Lubricant Storage and Handling
4. Environmental Conditions
5. Oil Analysis
6. Conditioning (Filtration)

Managing these six areas and setting strict contamination limits for each lubricant will give you a baseline for the lubricant going into equipment. As equipment is in use, constant monitoring with oil analysis will allow you to detect the slightest problem with equipment by referring to the baseline or limit you have set. The detection could be wear metals or even moisture indicating you might have a seal or cooler leak. Without establishing the baseline or contamination limit and knowing exactly how clean and dry the lubricant is before going into the machine, you will have nothing to reference when problems inevitably start. Predict and catch problems before they become catastrophic and avoid the associated downtime.

Contamination is the leading cause of lubricant failure. Managing contamination is critical when it comes to machine reliability and overall machine life. Lubricants are the lifeblood of any industrial plant. Without clean, cool and dry lubricants, the plant simply cannot operate at full capacity. In many ways, lubricants are like the blood in our bodies. When our blood becomes contaminated with the flu, we become sick and start to feel bad.

Without medication and vitamins, the issue could become worse and could eventually kill you. In a similar way, when our lubricants are exposed to wear metals, outside contaminants, water and excessive heat, they can start to break down and oxidation, varnish and sludge to begin appearing in the oil. So just like the human body, if we do not correct the contamination issue, lubricants will break down and machines will fail. Staying healthy and clean is how we prevent getting the flu and becoming sick. Managing these six areas is like taking vitamins or antibiotics to prevent lubricant and machine failure.

Contamination control management is important in any industrial plant. It's good to start with setting cleanliness standards for new lubricants being delivered and setting strict standards for lubricants in use. To achieve or meet the lubricant objectives in any facility, strict cleanliness standards and procedures must be set and followed for new lubricants coming into the facility and lubricants in equipment.

Step 1 – Contamination Limits and Standards

The first and most important step is setting cleanliness limits for new lubricants delivered on-site. Yes, new lubricants! Even new lubricants can be contaminated enough to cause serious damage to equipment like turbine bearings and hydraulic systems. This is the starting point for the lubricants on-site. A process or standard should also be set for how new lubricants are received, handled, and dispensed.

Starting with the machine, determine how clean and dry each lubricant needs to be. Each piece of equipment can have various types of metals, different clearances and specifications that determine how clean and dry its lubricant needs to be. Cleanliness also refers to moisture, not just solid particles. Some machines are more susceptible to water damage than others because of the metal parts they are constructed from. Remember, heat air and water create oxidation and rust.

In a perfect world, contamination limits should be set during the commissioning of equipment before ever being put into service. Determining the contamination limits needed for equipment will indicate how clean new lubricants delivered on site need to be.

Step 2 – Receiving New Lubricants

Once you set the cleanliness limits, contact the lubricant supplier and let them know the ISO cleanliness needed for each lubricant they supply. Ask for verification or authentication records showing the cleanliness for each lubricant delivered.

If the lubricant supplier consistently does not meet the contamination limits you have set or will not provide the information you ask for, it's time to look for a supplier that will.

When lubricants are delivered, place everything in a designated quarantine area. Take a sample of each container of lubricant for personal verification and label "DO NOT USE." The delivered lubricant should remain in quarantine until oil analysis test results come back and are verified to be within the contamination limits you have set. If the lubricant is not within the set limits, send it back or filter until you have lowered contamination to acceptable levels. All lubricants should remain in quarantine until contamination limits are verified and approved. Then, it's time to either move the lubricant into bulk storage or place it directly into the machine. If you do store the lubricant, make sure it is properly labeled with the ISO cleanliness reached, the date, brand and viscosity, and that it is ready to use.

Step 3 – Lubricant Storage and Handling

The way lubricants are stored and transferred can have a huge impact on the cleanliness of the lubricants going into your machines. Although lubricant storage is starting to become more important in the 21st century, a lot of industrial plants do not make lubricant storage a priority.

Even today, I often see lubricants stored in the most awful conditions: outside with no protection from the atmosphere or just collecting dust in the dirtiest areas of the plant. When lubricants are stored outside, there is no way to control temperature. Frequent temperature changes will cause condensation and moisture buildup inside the container. Water can pool and eventually seep into uncovered containers, contaminating the lubricant. I work with customers on understanding the importance of controlling atmospheric conditions as well. Storing lubricants in a climate-controlled environment helps keep the lubricant dry and clean like you paid for.

The duration of storage is another important aspect to think about. Lubricants do not last forever, so managing the amount of time lubricants are in storage is important. The shelf life of a lubricant is based largely upon the its additive package. Typically, the heavier the additive package is, the shorter the lubricant's shelf life. For example, an oil containing extreme-pressure additives could start losing performance in as little as six months. Conversely, some lightly-additized turbine oils may have a shelf life of

If lubricants are stored in bulk tanks, utilize

the circulation function to agitate the oil. Remember to always follow the first-in/first-out (FIFO) rotation and clearly label every container with the date and condition so storage time is not accidently extended. Manufacturers' labels will fade or tear over time, so clear, consistent labeling is critical in the storage process.

Managing the amount of lubricant stored is also important. Lubricants should not sit for extended periods of time. Lubricant storage and labeling procedures should be posted and followed to ensure lubricants are still in good operating condition.

When it comes to transferring lubricants from bulk storage into your equipment, you'll need people with both the right equipment and the right training to do the job properly. I repeat: training is important! Over the past five years, I have noticed a big difference in workers who have some lubrication training versus the ones who don't. I think the big difference is that too many people believe "oil is oil and small amounts of dirt won't hurt." Training will show you how wrong that mindset is very quickly. It also gives people a boost of confidence. When they know the "why" behind new procedures, they will have more investment and confidence in their daily work. Don't just tell them *how* to do it the right way, tell them *why*. After everyone involved is trained on the "why," then it's time to outline strict procedures for how lubricants are transferred from the lube room or bulk storage into the machines.

Once your team is equipped with the right knowledge, they need the right lubricant transfer equipment. Using tools like sealable and reusable containers, transfer carts and modifying equipment with quick connects will allow you to add or subtract oil without ever opening equipment to the environment and the possibility of contamination. Keeping the machine parts and transfer equipment clean during the entire prosses will mitigate the chance of contamination while filling containers or transfer carts. Set strict standards for proper storage procedures and for how clean transfer equipment should be.

Make signs and post notes reminding people of what is expected. This includes storage lockers, lube areas and even workstations.

Manage the condition and level of cleanliness of the lubricant by performing weekly or monthly inspections of all lubricant transfer equipment. Periodically replace any transfer equipment that becomes damaged or worn out so the level of lubricant cleanliness can be maintained on its way through the plant.

Lubricant cross-contamination, or mixing two lubricants that are not compatible with each other, can be catastrophic to machines. Managing lubricant cross-contamination can be difficult when you have a large amount of people performing lubrication tasks. This is another reason that everyone involved needs the proper training on lubricant identification and proper uses. Labeling machines and transfer equipment to match each other is one way to help people identify which lubricant is used where. Modifying machines and transfer equipment to only accept one type of fitting is another way. Controlling traffic by limiting who has access to lubricants is always recommended as well.

Locking cabinets and lube storage areas will prevent cross-contamination because only trained professionals can access lubricants.

Step 4 – Environmental Conditions

Environmental conditions are the conditions surrounding a machine. This could be excessive heat due to nearby steam, dripping water from cooling water lines or excessive product buildup.

Heat and water are catalysts for lubricant failure. Add in some outside contaminants, and you have a recipe for lubricant failure or oxidation that could damage most equipment. This is where being creative and doing research comes into play. Figure out ways to eliminate or mitigate the amount of contaminants entering machine parts. Managing this can be a never-ending battle for some industries like paper & pulp or mining, where everything is wet or covered in dust. Determining how to exclude contamination takes time, resources and requires diligence from all those involved in the process. Machine or structure modifications might be necessary to truly protect your assets.

For example, I had a customer who was experiencing repeated bearing failures on a conveyor. The bearing was only lasting about six weeks before failing. I verified lubrication procedures on the bearing, and everything looked good. When I looked at the bearing itself, it was off the shaft and what grease remained looked cooked. The next morning, I went out to the newly installed bearing and noticed steam shooting out of the bearing itself. That explained the cooked grease. Somehow, steam was traveling down the shaft and directly into the bearing, cooking any grease inside. I did some research and

found a double-wall, greaseable seal that could be installed between the conveyor and the bearing, blocking any steam from coming in contact and cooking the grease. This is a great example of how unexpected contaminants could be killing your lubricants before they even get started working.

Another example: I was dealing with a customer who had water continuously contaminating a 100-gallon turbine reservoir. The customer explained they were constantly running a filter cart trying to remove water – so much water that the reservoir overflowed at times. When I went to look at the turbine, I noticed it was skid-mounted with a catch basin built in to redirect cooling water or prevent oil from going on the ground. The catch basin was full of water, or what looked like swamp water mixed with oil.

I asked the guy showing me around, "How long has the catch basin been full of water?" "It's always like that," he replied. "I think the drain is plugged or something." I reached down and pulled a heap of garbage from the drain, and the basin started draining. I explained I think this is the cause of the issue. Water was seeping into the reservoir somewhere because the water was not allowed to flow out of the drain. Over time, water will always find a way in if allowed to sit stagnant. I also explained that the seal water lines could be fixed so less water is spraying on top of the reservoir. A week later, the oil had been sufficiently filtered and the problem was solved.

Fixes like these are easy changes that can save you time and money without much effort.

Another way of managing environmental conditions is to install rain or drip covers on equipment prone to heavy water contact. Redirect water flow if possible so it doesn't pile up on equipment. Heavy product buildup can cause heat, and we all know what heat can do to lubricants and to the machine itself.

Performing constant machine inspections and operation walk-downs will help catch these problems.

Step 5 – Oil Analysis

Oil analysis can be a key indicator for lubricant contamination, if managed correctly. Having the proper training on how to collect samples, what sample location on equipment will give you the most representative sample, and how to install quick sample valves is important. Oil analysis can be very expensive depending on what test you would like performed and the volume of samples sent out for testing. Not to mention the cost it takes for someone to collect, label and send off all the samples. Making sure samples are collected in the most clean and consistent way every time is the only way to detect a true change with the oil inside equipment. When oil samples are not collected correctly, not only are you wasting money on the lab, but you might overreact and change the oil out immediately, wasting good oil. Always try to have the same person collect oil samples for consistency and cleanliness. This person should be a trained professional in oil analysis.

Oil analysis result interpretation can be complicated and confusing. Without training on what to look for on oil analysis reports, a problem could slip by. If the oil sample was collected correctly, you should have a good reference point to refer to when determining how clean the oil was going into the equipment and where it is now as well as how many hours... and how many hours it has been in operation. Start building a trend and monitor it to make sure it doesn't go above the limits set initially. The results will determine if another sample should be pulled and sent off. If lab results come back and something is abnormal, always pull another sample to verify that a problem exists and it's not just a mistake. Make sure you monitor equipment conditions closely until verification results come back.

Set strict standards and procedures for the way oil samples are collected, managed and interpreted for each piece of equipment.

When I refer to oil analysis, not only am I referring to lab testing, but also to quick, in-house oil analysis testing. Installing easy-to-view sight glasses and BS&W bowls on equipment to utilize quick visual inspections is good way to catch possible lubricant contamination. This also allows you to take corrective action immediately. There are many different in-house oil analysis testing instruments on the market. Tools like patch test kits, acid and water testing kits, viscosity testing tools and small particle counters are readily available and relatively inexpensive. While the testing

may not be as in-depth as you would receive with commercial lab testing, having this equipment will give you a quick in-house indication that a problem is occurring, and corrective action can be taken right away.

Step 6 – Conditioning (Filtration)

Use filtration to keep lubricants in operating condition. Filter management is another aspect where, without training, you might be wasting time and money. As I mentioned before, machines have different clearances, and those clearances can give you a good indication of what size particle to target for each type of equipment you have. When you ask yourself, "Should I use a 4-micron filter or a 20-micron filter? What efficiency should the filter be?" These kinds of questions all require training and research to answer properly. Otherwise, you will be shooting in the dark, just hoping to reach the cleanliness targets you set.

Using oil analysis results to determine how dirty and dry the oil is and comparing it to cleanliness target levels set will determine the type and duration of filtration needed. Filtering oil allows you to keep the oil in equipment clean and dry within the contamination limits set. Modifying equipment with quick connects allows you to attach a portable or even dedicated filter whenever needed, giving you the upper hand for managing or removing contamination.

Managing lubricant contamination can be accomplished with training and having dedicated teams involved. Focusing on these six areas will help you achieve the contamination and reliability goals set for your facility. Controlling contamination is a slow process, especially in some industries. Sometimes it can even seem impossible. But start with the low-hanging fruit like clearing drains and fixing seal water leaks, adding protective covers, protecting equipment from contamination and making sure all ports and hatches are sealed tight. Start with these simpler fixes and you'll be on your way to effectively managing lubricant contamination. ***ML***

About the Author

David Dise is an to Associate Technical Consultant for Noria Corporation. He works closely with plant managers and reliability engineers to develop lubrication and reliability programs. His goal is to help plants become world class. David has been certified as a Level II Machine Lubricant Analyst and a Level I Machine Lubrication Technician by the International Council for Machinery Lubrication. Before joining Noria, he worked as a flowback operator at 1st Rate Energy Services, traveling to several different locations around the United States.

LUBE-TIPS

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

New Grease **Gun Caution**

Before installing grease into a new grease gun, consider disassembling the gun and cleaning it thoroughly. Metal shavings have been found in new grease guns. These metal shavings appear to be from the manufacturing process of the grease gun.

Avoiding Contamination **in Dirty Environments**

Machines operating in an extremely dirty environment, such as in a forge or foundry, require extra care to prevent contamination. Try to keep the equipment sealed and avoid unnecessary opening of the reservoirs. Install quick disconnects in tanks and on fill vessels for filling or topping up hydraulic tanks. Add mainstream sampling taps on all equipment. This will result in a true indication of the oil's condition, avoiding any bottom sampling.

Preventive Measures **Make Sense**

Catastrophic pump failure on circulating and hydraulic systems can damage more than just the pump. Consider using oil strainers or filters upstream of all equipment components to prevent pump failure debris from damaging these machines. This is also important for kidney-loop systems with expensive heaters and oil/water separators. ***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@machinerylubrication-india.com

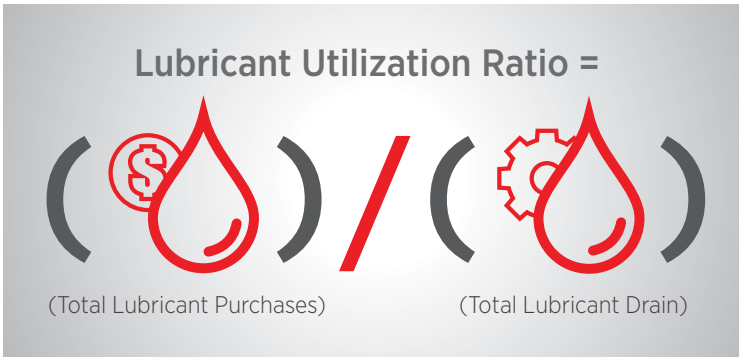
Factor: E5K

Reveal Hidden Problems with This Top Lubrication Metric

> "There is one metric in lubrication that has proven extremely important and effective at revealing hidden lubricant-and equipment-related issues. This metric is known as Lubricant Utilization."

Lubrication is full of metrics. Whether it's oil analysis, equipment uptime, filtration or route compliance, all have a role to play. There is one metric in lubrication that has proven extremely important and effective at revealing hidden lubricant-and equipment-related issues. This metric is known as Lubricant Utilization.

In short, this is a Key Performance Indicator (KPI) based on the volume of lubricant applied to machines, relative to the amount of lubricants that have been disposed of over a period of time. But more importantly, the data collected on Lubricant Utilization is directly associated with other important metrics and KPIs across all stages of the lubricant and can define some KPIs for the lubrication program. Some of these indicators may focus on controlling overall lubricant expenditures while others focus more on minimizing risk and reliability issues. Regardless of the indicator, it must begin with establishing the metrics and tracking good data.



Tracking the Application of the Lubricant

Lubricants, like many other consumables, are likely monitored by some sort of inventory tracking system, usually starting in a warehouse. Here, the warehouse management tracks the reception of each lubricant, by container or in batches as they arrive and are put into a storage location. Lubricants can be delivered in many different containers, such as pails and boxes of tubes for grease or in drums, totes or quart/gallon-size bottles for oil. But regardless of how it is contained, an amount of total lubricant delivered should always be known and recorded. Knowing this total delivered amount and associated costs are metrics by themselves, as well as monitoring when each lubricant reaches inventory minimums and maximums. But there's more.

Warehouse metrics are more than just the inventory of your lubricants in storage. It can be an important piece of data that stretches across your entire plant's overall equipment reliability and helps monitor plant performance. As these lubricants become needed for equipment, inventory management can monitor their exits from the warehouse with date, time, by user, which

machine(s) it will be used in, how much, how often, and so on. As this data is collected, it populates the first important piece of useful information for Lubricant Utilization.

Tracking the Removal of the Lubricant

For a variety of reasons, lubricants become removed from the machines they are used in. The most obvious and preferable reason is because they are intentionally drained by maintenance during oil change procedures. This happens either because of a scheduled oil change as a PM task or because compromised conditions of the lubricant have triggered a condition-based oil change. When this happens, the volume of oil is collected in an appropriate waste container which is subsequently disposed of in a larger waste oil storage tank. During this process, the volume of disposed oil should be noted as part of the maintenance activity. This can be estimated by using volume markings on the sides of the disposal container, or any other suitable means. Oil disposal is going to be easier to track, but it is important to note that grease can sometimes be tracked as well.

Is the lubricant applied to the machine always the same as the lubricant disposed of? Not always. There are many reasons for this expected discrepancy. Exploring these reasons and tracking lubricant consumption can be important. In one way or another, the constituents that make up the lubricant end up somewhere. When the lubricant is removed from the machine for unknown reasons, it also removes its ability to provide key lubrication functions and risks lubricant starvation on the equipment. Aside from scheduled oil drains, here are some examples of possible lubricant removal mechanisms that may occur:

- Dripped out by gravity from leak points
- Pushed out in pressurized systems from seals
- Sucked out into product suction lines through seals
- Evaporated out by volatilization of oil molecules
- Burned out by other hot machine surfaces or microdieseling
- Absorbed out by rubber and other elastomeric materials (seals)
- Adsorbed out by contaminants and other materials as polar additives and other polar oil molecules hitch a ride when they are trapped and removed by filtration
- Foamed out by stable foam generation and escape from a breather port
- Splashed out in highly agitated and open top sumps
- Extracted out for lubricant sampling
- Flung out by high centrifugal force on open-air components (open gears, chains, etc.)
- Purged out by maintenance on bottom sediment and waterbowls
- Trapped out in closed off pipes and hoses
- Spilled out by overfilled systems by maintenance or when contaminants significantly contribute to volume control issues
- Siphoned out through pipes, hoses and other absorbent materials
- Drained out due to other maintenance activities or abnormal events, such as
- Sudden component failures
- Component replacement
- Machines going out of service

Some of these lubricant removal mechanisms may be ordinary or seem negligible in volume, but it could still become a root cause for equipment issues. Some of these mechanisms may be highly aberrant and even difficult to quantify in terms of volume for some of the more unique removal mechanisms. Nevertheless, awareness of these possible events is important and should considered during investigation.

In some machines (particularly smaller sumps), every drop is a critical contribution to effective lubrication and when it is lost, it can put the equipment at risk. Tracking the known quantities of lubricant drained becomes an excellent indicator of the unknown and unexpected quantities of lubricant loss.

Calculating Lubricant Utilization Metrics

From a plantwide perspective (as a macro metric), quantifying the total volume purchase or segmented by totals for each lubricant type should be easy. This data can then be compared against either the known volume of lubricant disposed of (to calculate the Lubricant Utilization Ratio) or the total machine charge in the plant (to calculate the Lubricant Consumption Ratio), all over a fixed time interval, such as yearly. Here is a further explanation of these two ratios.

- Lubricant Utilization Ratio is a calculated ratio between the lubricant purchased volume versus the lubricant disposed volume across the plant. If done correctly, this should be a number greater than one. The higher the number, the more oil is going unused or unaccounted for by one or more

Lubricant Utilization Ratio (Plant)=
(Total Lubricant Purchases)/(Total Lubricant Drain)

Lubricant Utilization Ratio (Machine) =
(Total Lubricant Fill+Top Ups)/(Total Lubricant Drain)

removal mechanism, including any untracked volumes of oil drained that may have never made it into a machine. A number close to one suggests that most oil applied to machines eventually finds its way to an appropriate disposal container. And while a number less than one is not common, it might be justified, such as when a large number of machines are going into repairs or out of service. Applying data from a greater period of time can minimized the influence from these unique events for this metric. A good goal for the Lubricant Utilization Ratio is about 1.5 or 2.0, but this will vary based on industry and equipment type.

- Oil Consumption Ratio is a calculated ratio between the lubricant purchased volume versus the total lubricant machine charge (not considering lubricant removal mechanisms). This ratio provides a different consideration on lubricant utilization by observing how effective the lubricant and the lubrication system is over a period of time. In the example data below, the consumption ratio started out as a 2.4. Working towards a lower number would mean that the oil has a longer life in the machine. Some reasons the life of the oil in the machines are increased could be because:
- The oil was better selected for the applications, thus reducing the lubricant degradation rates.
- Oil changes are more condition-based, rather than scheduled where oil may be prematurely drained.
- The machines are operating more efficiently, not needing more shutdowns (and oil drains)
- Less leaks or other unknown lubricant removal mechanism

Note: An increase in lubricant life assumes there is also condition monitoring in place. Otherwise, simply leaving the oil in the machine longer will put the machine at risk of failure. For this reason, the Oil Consumption Ratio must be monitored alongside condition monitoring and failure rates KPIs.

A common Oil Consumption Ratio goal would be a reduction of 50% each year until a Consumption Ratio approaches 0.2, which will also vary by industry and equipment type. By year three in the example, the ratio was reduced to 0.29 which was a total reduction of oil consumption of more than 85% across the plant.

From a machine-specific perspective (as a micro metric), quantifying the total volume applied to each machine or group of similar machines over an oil change interval is usually achievable. Rather than a lubricant purchase volume, this includes the initial volume of oil put into the machine(s) and any subsequent top-ups until the schedule oil change. Similar to the macro version of this metric, this data can then be compared against the known volume of lubricant from the machine(s) that was disposed of to calculate the Lubricant Utilization Ratio or compared against the lubricant charge per machine to calculate the Lubricant Consumption Ratio. Since these metrics are calculated for specific machines, the reasons for a higher or lower ratio value can be more exclusively observed.

These are examples of metrics that can be developed as important performance indicators of the lubrication program. If abnormal data trends are discovered, this can help uncover a lubricant removal mechanism taking place and reveal hidden problems within the machine.

Creating Key Performance Indicators by monitoring Lubricant Utilization

From the initial delivery of the lubricant to the eventual lubricant disposal and removal from the plant, there are many metrics and key performance indicators that are directly connected to Lubricant Utilization. Here are a few examples, as well as where they are connected to each of the six lifecycle stages in the Ascend™ Methodology:

1. Lubricants must meet standards before they are applied to machines, thus there are key performance indicators connected to lubricant quality control (Ascend™ Factor R1P) and the Supplier Selection (S2P). If the oil analysis results for new oil testing are often finding issues regarding lubricant meeting specification and cleanliness requirements, then this needs to be addressed. Otherwise, this will impact the lubricant's ability to maintain equipment reliability.
2. There are many metrics related to lubricant storage practices in the warehouse and in the lube room (R2P) and inventory management (R4M). This includes tracking data such as shelf life and inventory volume changes with minimums and maximums. When this data is compared to specific times each amount of lubricant is brought out to the machines, key performance indicators can be defined. What could cause any discrepancies or unusual trends in the lubricant volumes and inventory control? Maybe lubricants are not being properly tracked upon exit. Maybe lubricants are being stored too long or compromised and never used in machines. Looking for trends and abnormalities in this data is not unlike other types of condition monitoring.
3. When lubricants are transported and applied to machines, using appropriate top-up containers (H3P), filter carts, grease guns or other replenishment methods, the volumes can be tracked for suspicious use and activity. Both excessive use and or lack of use are important considerations. These can be linked to a number of possible machine issues or possibly even personnel-related issues.
4. Tracking lubricants in use can be compared to how lubricants are becoming filtered or reconditioned (C2P). Machines with larger sumps that

may require more complex contamination control strategies could impact the volume control of the lubricant. Some contamination removal strategies even remove a volume of lubricant temporarily or permanently, and this could present some risks to the machines. On the other hand, some lubricants have their life extended as they are reconditioned and reapplied, a good performance indicator of lubricant use.

5. When oil analysis is chosen for certain machines (A1P), the decision factors stem from the opportunity to increase machine reliability through careful monitoring of lubricant properties, contaminants and wear debris. Effective oil analysis data interpretation (A6M) is necessary to build confidence. We should expect the occasional justification of preventative actions to remediate oil at risk of degradation and schedule more precise oil changes. When this happens, Lubricant Utilization is improved.
6. Leakage management (E3M) always comes to mind when monitoring lubricant volumes and improving overall Lubricant Utilization. There are many possible metrics on leaks, such as tracking leak rates, total volumes lost, time until remediated, lubricant type, machine type, environmental and health exposures, the cost associated to the lubricant lost, the cost associated to any machine related failures or downtime and so on. Every plant faces different challenges with leakage control, but the goal should always be to minimize this when possible, particularly when the risks are high.

Conclusion;

Analyzing Lubricant Utilization within the plant is an important metric for revealing many hidden problems at all stages of the lubricant lifecycle. First, steps must be taken to collect good data, which might be easy in some areas but more challenging in others. Certain data will never be fully collected, such as with some of the lubricant removal mechanisms mentioned. But there is good news. While putting the practices in place to collect and track volume use, where possible, you will uncover opportunities for improved lubrication along the way and start to see how the benefits of corrective actions can already be achieved. In fact, implementation may be an ongoing effort. Regardless, Lubricant Utilization is more than just a metric. It has a lifetime of benefits and has proven to be a powerful performance indicator for the entire lubrication program.***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.

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As a part of the post training engagement, projects were assigned to one team at each plant location and the progress and project completion monitored on a regular basis. Two quizzes are also being conducted to ensure knowledge retention.

Sanjay Aher
Chief Manager Mech, Gwalior

Programme is very good. Good information about oil management. This will help in improving the health of our equipment.

Bilal Ansari
Lead-Mechanical Maintenance:

The training is really significant and useful for maintenance engineers to perform correct and standard lubrication practices for reliability of equipments in manufacturing industries.

Sudhir Kumar Devpura
Kankroli-Sr.Manager (Mechanical)

Overall program content and pace was very good. It covered most of the related topics. Virtual learning-faculty was very good and regular pause & check for our questions and prompt answer.

Mayank Nagori
Dy. Manager, Kankroli

Course is a good eye opener for us to manage lubricants in our plant effectively resulting in cost saving for the company.

Rohit Gupta
Laksar

This training is very helpful for us. Now we understand our mistakes and know how to correct them, like- Oil sampling location, selection of air breathers and filter equipment

Rüdiger Krethe | OilDoc GmbH, Germany

Mixable or not mixable– that is the question here

If there are timeless questions asked by lubricant users that never seem to become "obsolete," then the question of the miscibility of different lubricating oils or hydraulic fluids is definitely one of them. This is also understandable from the point of view of lubricant application, as this question merely reflects everyday operational practice when dealing with lubricants. Very contradictory statements can be found on the market.

The two extremes: One side tends to mix almost anything called oil without hesitation. The other side is overly cautious and demands 100% assurance through elaborate laboratory tests, even for uncritical constellations.

A well-known saying puts it in a nutshell: "Prevention is better than falling on your back!" The purpose of this article is to show a well-founded, but practicable way to deal with the issue of miscibility. Because the following also applies to this topic: Observing a few, simple rules helps to recognize and avoid potential problems.

Miscibility or compatibility

As a rule, it is more a question of compatibility. In general terms, it is often a question of whether oil A, when mixed with oil B, works just as well in system XY as it did before it was mixed. Laymen do not always use the appropriate technical terms. A professional lubricant consultant helps his customer by questioning the specific situation and thus helping him to recognize the real question and its significance:

- Is it "only" about miscibility or "after all" about compatibility?

In the following, a brief consideration of the two terms is first given. What is the difference and what is the relationship between miscibility and compatibility.

Miscibility

Two (or more) liquids are miscible if, when mixed, they form a single, homogeneous phase. In simple words, this homogeneous mixture cannot be seen from the outside that it is actually two or more liquids that have been mixed. Conversely, if they do not mix, there will be more or less turbidity or even separation into different phases/layers. (Fig. 2)

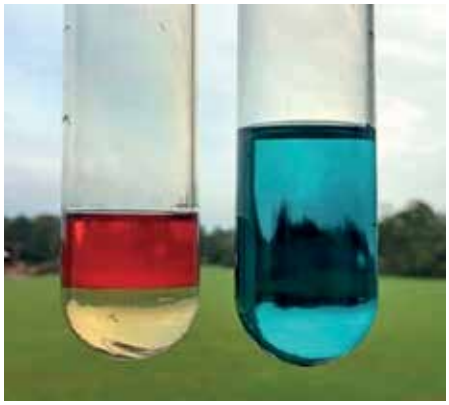

Figure 2: Water/oil = immiscible, ethylene glycol/water = miscible

Miscibility - A question of polarity

Water and mineral oil are immiscible. Laymen attribute this immiscibility to the difference in density. On the other hand, gasoline and mineral oil do mix, although their density difference is greater!

When atoms become molecules, they form bonds with each other. Depending on the electronegativity of the atoms involved, these are very different. In water molecules, oxygen has a much higher electronegativity than hydrogen, resulting in a high dipole moment. As a result, the water molecules have a high polarity. Mineral oils consist of various hydrocarbon molecules in which, on the other hand, nonpolar bonds dominate (Fig. 3).

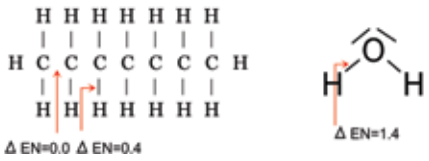

Figure 3: Polarity of oil (left, kerosene, non-polar) and water (right, polar)

Water and mineral oil are immiscible because they have very different polarities. That is why certain compounds are water-soluble, while others are oil-soluble. (Incidentally, the polarity of a compound determines not only its miscibility but also its solubility and material compatibility).

Compatibility

A definition of the term "compatibility, is somewhat more complicated in contrast to miscibility. At this point, a practical explanation related to lubricating oils and hydraulic fluids will suffice:

Lubricating oils are compatible if their mixture

- meets the requirements of the application in terms of function, performance and service life, and
- the user's expectations beyond these requirements are met.

The question posed at the beginning by a user about miscibility should serve as an example. The user assumes that mixing will cause the system to "work the same as before".

In addition to the two liquids, the machine and its importance in operation must also be included in the consideration. The following examples are intended to demonstrate this:

A system is to be changed over from oil type A to B, if possible without a flushing process. While in one case even an oil change interval that is shortened only once as a result is intolerable in view of the high downtime costs, this may not be critical in another application.

In one system, for example a gear unit with a low oil charge that does not have to be available virtually non-stop in "24x7" operation, even multiple flushing may be easy to manage, but not in a main gear unit of an offshore wind turbine that holds many hundreds of liters of oil.

While a mineral HLP hydraulic oil and a bio-hydraulic fluid of the HEES (synthetic ester) type are miscible with each other, mixing them may change parameters such as material compatibility, foaming behavior or filterability.

In addition, in supposedly "identical" applications, the oil is exposed to different pressures, temperatures and ambient conditions, and mixtures of two oils in these applications can consequently also behave differently. Ultimately, the term "compatibility" is clearly influenced by the application itself.

Miscibility and compatibility

The miscibility of two liquids is the basic prerequisite for their compatibility. This is the basis for the first practical rule:

1. What is not miscible is incompatible!
The miscibility of two liquids is a basic prerequisite for their compatibility.

However, the miscibility of two liquids alone does not mean that they are also compatible. Compatibility is a "subset" of miscibility. This results in rule 2:

2. What is miscible is not automatically compatible!
Two examples:

- Mineral oil-based hydraulic fluids of type HLP 46 are miscible with each other. If the two fluids contain different additive systems (e.g. zinc-containing or zinc-free), incompatibilities may occur in the form of an increased tendency to foam, deposit formation or restricted filterability.

- Engine oil was used to flush or clean a contaminated gear unit because the detergent additives it contains have a better cleaning performance than the gear unit oil. After a short "cleaning run," the oil was drained and the transmission filled with new transmission oil. The new oil fill foamed a lot and had to be replaced again. Both oils, engine oil and the transmission oil, are mineral oils and miscible. The very different additivation of the two oils is the cause of their incompatibility and the associated malfunction.

Miscibility test

A test for miscibility is relatively easy to perform. In the case of lubricants, the technical data sheet is usually sufficient for the expert, provided it contains information on the base oil type.

In the vast majority of cases, non-miscibility can be easily recognized visually (Fig. 5), often even when a single-digit percentage of liquid A is added to liquid B. The number of classic base oil types is relatively small.

The number of classic base oil types is manageable. Their miscibility is documented in a large number of available miscibility tables, such as Table 1.

Please note that Table 1 does not deal with ready-formulated lubricants which contain additives in addition to the base oils. The table cannot therefore be used to adequately test compatibility! Non-miscibility, on the other hand, can be easily determined on the basis of the table.

Fig. 4: Turbidity of a mineral oil-based gear oil due to the introduction of a polyglycol

+ compatible - not compatible o conditional (test!)	Silicone oil	PAO	Ester	Polyglykol	Silicone oil (Methyl)	Silicone oil (Phenyl)	Polyphenylether	PFPE-Fluid
Silicone oil		+	+	-	-	+	+	-
PAO	+		+	-	-	+	+	-
Ester	+	+		-	-	+	+	-
Polygykol	-	-	-		-	-	-	-
Silicone oil (Methyl-)	-	-	-	-		+	-	-
Silicone oil (Phenyl-)	+	+	+	-	+		+	-
Polyphenylether	+	+	+	-	-	+		-
PFPE-Fluid	-	-	-	-	-	-	-	

Table 1: Miscibility of base oils

Compatibility testing

Not in every case is an actual compatibility test useful or necessary. The more similar the two products to be mixed are and the less critical the application, the more likely it is that they will not be used. In this case, the expert estimates the risk on the basis of the chemical composition. First, the base oil types are used, then the additive systems of both fluids. If this results in only a very small residual risk, an expensive compatibility test is not justified or is uneconomical.

Two examples:

- In a mobile hydraulic system, a mineral hydraulic oil is used that is additivated like motor oil, i.e. it is highly detergent and contains zinc dithiophosphates as an anti-wear additive. It is to be replaced by an "equivalent" oil (equal in terms of meeting neutral specifications) from another manufacturer. If this is on a comparable basis in terms of base oil and additives, their compatibility can be easily assessed.

- If, when comparing two lubricating oils on the basis of Table 1, it is found that the base oils are not miscible with each other, this alone indicates that the two oils are incompatible. A further compatibility test can be dispensed with. With reference to Rule 1, it therefore makes sense to perform the simple miscibility test before the complex compatibility test.

Which test methods are used in which mixing ratios is determined by the oil types A and B and the application. It is not always easy to determine which results lead to the verdict "compatible" or "incompatible. As a minimum requirement, the specifications of the corresponding requirement standard should apply. If the machine manufacturer or user specifies special regulations or requirements, for example beyond those of DIN 51524, these must be included in the test.

In principle, this procedure can be applied to lubricating oils. Depending on the application, other tests are then useful, for example, in the case of a steam turbine, the water separation efficiency WAV in conjunction with a foam test and the LAV.

If the conversion of a specific plant is concerned, the used oil from the plant and a fresh oil sample of the "new" oil can be used for the test. The concentrations can then be selected according to the degree of mixing to be expected.

About Rüdiger Krethe

Rüdiger Krethe is a qualified mechanical engineer and tribotechnician. For more than 25 years, he has been intensively involved in the lubrication of machines, starting with product selection, in-house organization and monitoring of lubricating oils and hydraulic fluids during use.

He is a "Certified Lubrication Specialist" (CLS) and "Oil Monitoring Analyst" (OMA I) of the STLE as well as a "Machine Lubrication Engineer" (MLE) and "Machine Lubricant Analyst II" (MLA II) of the ICML.

Valvoline launches All-Terrain heavy duty diesel engine oil

Valvoline Inc. announced the launch of ValvolineTM All-Terrain, a new engine oil specially formulated for off-highway, heavy-duty diesel engines operating in severe conditions and extreme duty cycles.

"Not all heavy-duty engines are created equal. Valvoline All-Terrain was developed specifically with a focus on wear protection in equipment operating in harsh environments such as those experienced in mining, construction and agriculture," said Edward Murphy, PhD, Valvoline Senior Group Leader, Heavy-Duty Formulations. "This innovative product is designed for the heavy-duty diesel engine that needs superior wear protection in extreme applications and high idle time."

"This engine oil was developed for heavy-duty vehicle operators with off- and on-highway engines who are looking for an oil to help protect critical engine parts against the challenges of severe duty cycles," said David Young, Valvoline Heavy Duty Vice President of Sales. "Valvoline All-Terrain has demonstrated real-world engine performance, providing outstanding wear protection for critical engine parts and enhanced viscosity and oxidation stability in rigorous fleet testing."

All-Terrain was tested in 25,000 hours of field trials among real fleets operating in mining and agriculture with extreme duty cycles. Even engines that were pushed to over two-times the OEM recommended oil drain interval, demonstrated excellent sludge, deposit and wear control.

SK Lubricants to use recycled containers

As a part of its practical ESG management efforts to fulfill the financial story, SK Lubricants announced that the company decided to expand the use of "eco-friendly" recycled plastic containers for its lubricant products, leading the activation of the circular plastic economy.

After launching the ZIC ZERO line that has been using recycled containers for a year, SK Lubricants found out that the market and its customers have great demand for eco-friendly products. This motivates the company to expand to more lines, and this will greatly raise the company's total use of eco-friendly containers. Last year, SK Lubricants reused 21 tons of waste plastic to make containers of ZIC ZERO. With the decision to use recycled plastic for more of its main products, it is expected that the company will recycle about 100 tons of waste plastic every year. It is equivalent to 5 million bottles of 500ml water bottles that weighs 20g each.

SK Lubricants' expanded use of recycled containers is in line with the "Green Transformation" strategy of the SK Innovation. Also, it is part of the measures to achieve its Net Zero goal through this green project.

Meanwhile, SK Lubricants, leading the global lubricant market with an eco-friendly trend, is sharing its own technology and know-how of making eco-friendly containers with the industry to contribute to expanding the waste plastic circular ecosystem with a broader point of view.

"SK Lubricants, already leading the future market of lubricant with ultra-low viscosity lubricants, which greatly reduces carbon emission and lubricants for EV. Now, the company's effort to use more eco-friendly recycled containers will make SK Lubricants a major eco-friendly company that leads the ESG era of the lubricant industry," , Chief of Lubricants Business Supply Business Unit of SK Lubricants.

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