Machinery Lubrication

INDIA November-December 2018

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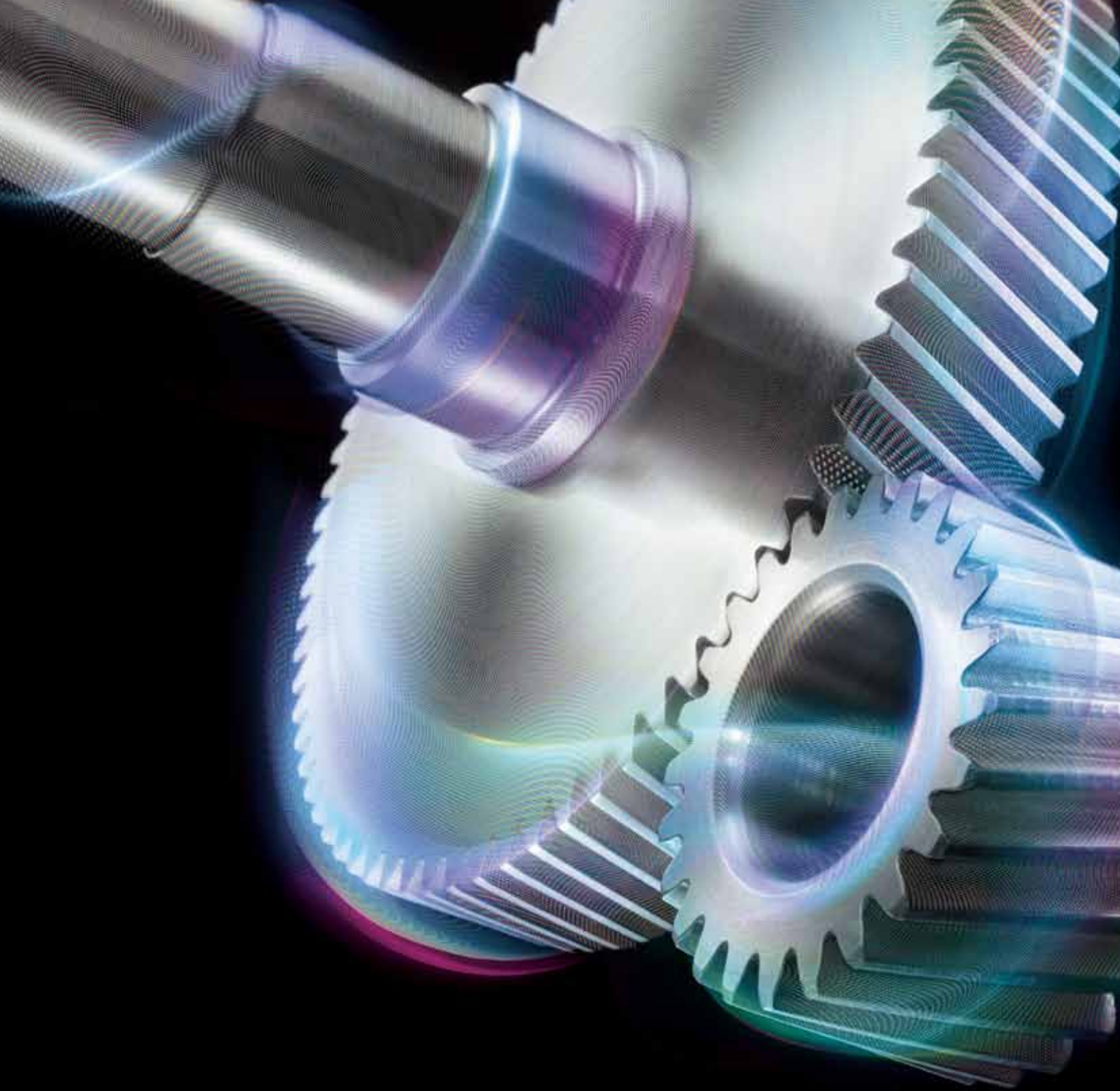
INSIDE

TRACK YOUR LUBRICANT'S JOURNEY TO OPTIMIZE MACHINE HEALTH



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Publisher's Note

When asked to describe a lubricant, people typically refer to its brand or product name. More precisely, a lubricant, whether it is an oil or grease, is a bundle of performance properties such as oxidative life, resistance to thermal or hydrolytic degradation, antiwear or antiscuffing characteristics and air and water separability. When performance properties are compromised, the lubricant's ability to minimize friction, wear and corrosion, control heat and contamination and transmit force and motion in hydraulic systems deteriorates.

To ensure machine reliability, the offending lubricant requires maintenance actions that are properly designed and executed. There are some proactive ways to extend the lubricant's life and proper disposal methods once the oil has been changed.

Contrary to popular belief, oil doesn't last forever. The lubricant in a machine must be changed or at least maintained; otherwise it will no longer possess the required performance properties to carry out the demands of the machine, application and operating environment. In some instances, the oil must be changed because the lubricant's base oil becomes degraded and is no longer fit for service. Oxidative, thermal and hydrolytic degradation will change the base oil's chemical and physical properties, which then alters the lubricant's performance properties. In other cases, the lubricant's additive package becomes depleted. Unfortunately, the lubricant may also become contaminated with foreign material that cannot easily be removed.

One of the most common forms of base oil degradation is oxidation. It occurs when oxygen reacts with the lubricant's base oil, which is typically a hydrocarbon. When the oil becomes oxidized, some hydrocarbon molecules are transformed into acid and sludge, which affect the performance properties of the oil. Unlike oxidation, thermal degradation does not require oxygen to occur. Thermal failure takes place when the oil comes in contact with hot surfaces inside the machine, such as combustion or exhaust areas, or when coming in contact with compressed bubbles, such as in hydraulic systems.

One strategy for extending lubricant life is to select premium lubricants formulated with premium base oils, premium additive systems or a combination of both. The American Petroleum Institute (API) has provided a standard classification for base oils, called groupings, to summarize the quality of the oil.

Regardless of the lubricant selected, the end user has a great deal of influence over the actual life of the lubricant by managing system contamination and refreshing the additive system. Contamination includes all foreign and unwanted forms of matter and energy, including particles, moisture, heat, air, chemicals and radiation. Contamination control is the easiest and most widely applicable method for extending lubricant life.

We would like to thank our readers for the great response to our previous edition's cover story – "How to prevent equipment failures with wear debris analysis" and other articles. Our current issue's cover story is "Track your Lubricant's journey to optimize machine health" which will help our readers to understand the path of lubricants which is the first step towards mitigating risk.

We have introduced a new section called "Face to Face", in which we publish interviews of industry leaders in the field of lubricants and reliability. These will be useful for our readers in having a better understanding of the products and services available to them.

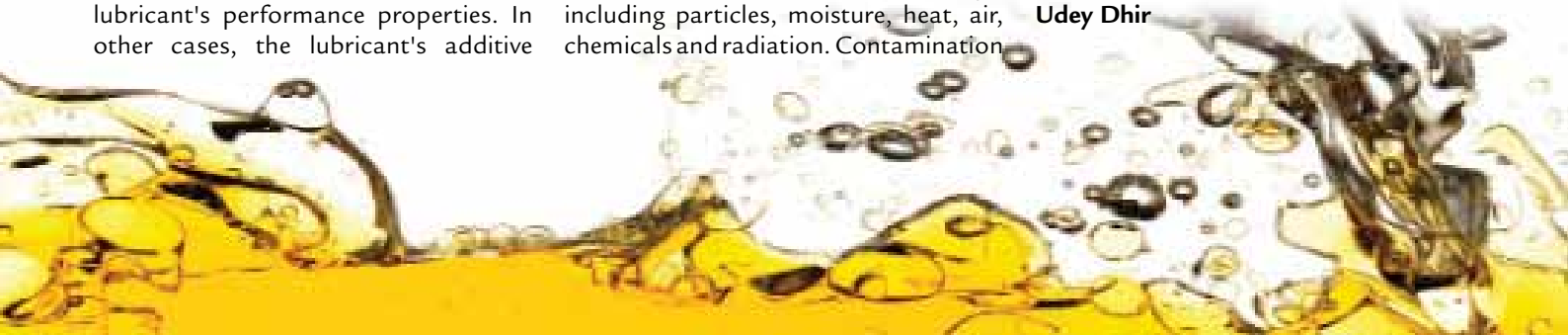
I cannot sign off without giving special thanks to our advertisers, subscribers and authors. You would be happy to know that we now reach out to over 15000 subscribers in products & services sector, academia and research organisations.

We welcome your feedback & suggestions.

My Best wishes for a Merry Christmas and a Happy New Year.

Warm regards,

Udey Dhir



The Importance of **Sustainability for Transformational Change**

Fail-safe Measures to Prevent Relapsing to Business as Usual

"Progress depends on change, yet change is not really change **without a fail-safe plan to sustain it.**"

We've all seen change that was well-intentioned and purposeful. Yet most examples of change are not sustained over time and sadly cycled back to the ways of the past. The cause of this seems to resemble a powerful magnet that's imbedded in every organization. This magnet fights the positive forces of change. As soon as these forces weaken or lose focus, the magnet powers up and takes over. Before long, the business-as-usual beast has made its return.

Does this sound familiar? I've certainly seen it, and you most likely have, too. Remember those New Year's resolutions? We know that all progress depends on change, yet change is not really change without a fail-safe plan to sustain it over multiple business cycles. The need for this is especially true for transformational change due to the scale and magnitude of the effect on an organization. The process is often referred to as change management. Change must be enabled, and so does sustainability.

A Body at Rest Stays at Rest

Sir Isaac Newton's first law of motion states that a body at rest stays at rest unless acted upon by an external force. If we stay at rest, we are dead. We must take action. The world rewards action. This is the change we seek.

To overcome a motionless, unchanging state, we need to overcome the impedance of static friction (see Figure 1). It's like trying to move a large, heavy box by pushing. You push, but the force is resisted by static friction, and the box stays put. If the force is great enough, motion is suddenly achieved, and the box moves forward with a jerk (stick-slip).

In organizations, this physics metaphor might be called "psychological inertia." Those who want change and forward motion must boost the propelling force (drive) or decrease the impedance force (friction). The impedance includes people – and particularly groups of people – who resist change. Of course, some people will be totally sold. Others will be observers who perhaps want to be sold. The challenge comes from those who are there to "play defense."

Why do many aging lubrication practices remain the same after decades of use? Have we not learned anything knew? The most common response is, "It's how we've always done it." This inertia to leave common practice unchanged is both the problem and the opportunity. I'm going to emphasize the opportunity.

Some organizations need an intervention. Half-hearted efforts rarely accomplish anything. From where does the critical driving force that advances the ball emerge? Following are a few examples:

Aspiration

This is the basal desire for excellence and constant improvement. Most overachievers are born with this. Some aspire to change because of youthful innocence, education or even new technology. Organizations, however, need great leaders to champion change driven by aspiration.

Crisis

The greatest change occurs on the edge of chaos. Crisis gives focus, urgency and seriousness to change. It is reactive in nature, like a lifestyle change following a heart attack. In organizations, the crisis might be a serious health or safety event. It might also relate to organizational survivability. Consider that only 60 companies listed in the Fortune 500 in 1955 were still there in 2017.

Opportunity

Change should be purposeful with a solid business foundation. It should also be proactive (why wait for a crisis?). What's behind opportunity-driven change? For individuals, it could be wealth, greed, promotion, ego, etc. Since individuals own companies and manage company decisions, these same factors apply.

Competitive Pressures

The global economy has never been more intense. Organizations in the business of converting raw materials to end products face this every day. It is called commodity hell. However, the global economy doesn't provide a level playing field for some companies due to inequality in tariffs, taxes, laws, environmental protection, raw material sources and the cost of labor. In certain cases, this has resulted in the loss of entire industries to other countries (e.g., the U.S. textile industry).

The frictional forces of change are many. Some are innate forces built into an organization's DNA. Others are human forces that we all face in our personal lives. Figure 1 lists a few of the change-resisting frictional forces that must be overcome. Note, however, that change is more effective if you can reduce some of these forces, not just overcome them.

Machinery Lubrication India

Publisher
Udey Dhir - udeydhir@tribologysolutions.com

Creative Director
smassociates@gmail.com

Advertisement Sales (India)
ads@machinerylubricationindia.com

Advertisement Sales (US/Canada)
Tim Davidson - tdavidson@noria.com

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

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

Operation office :

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

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

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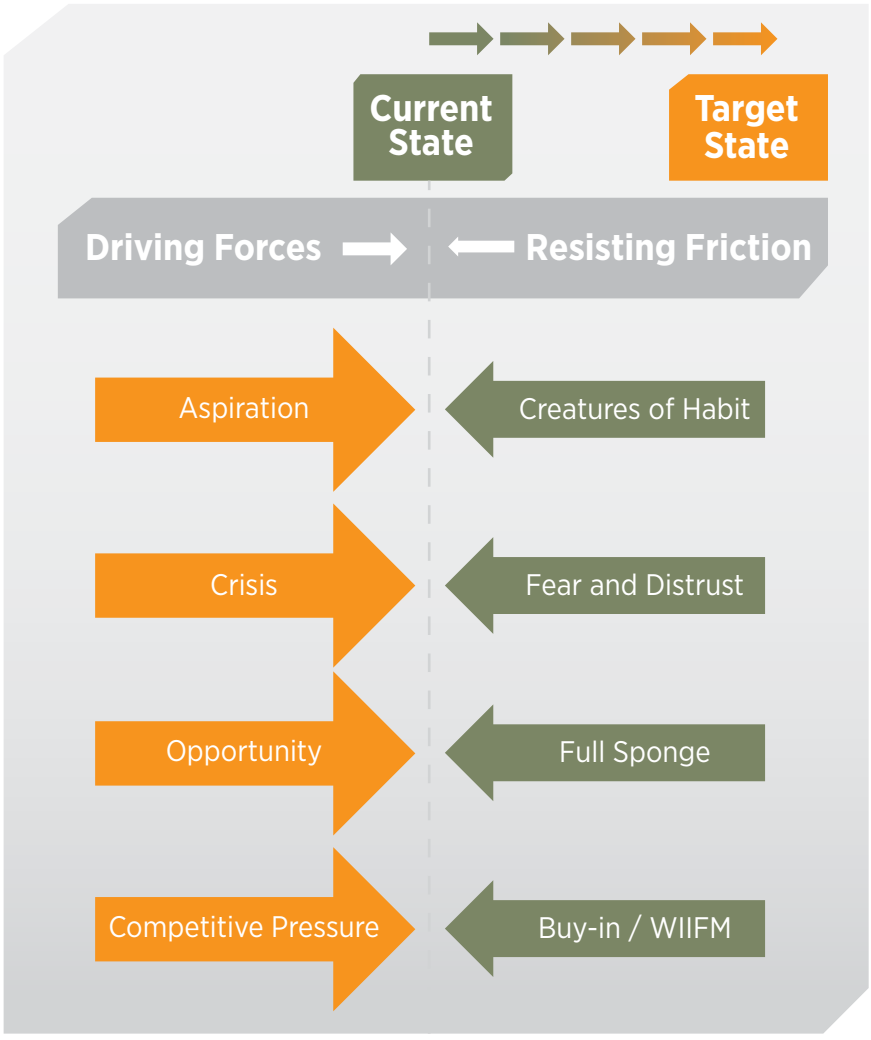


Figure 1. Overcoming static friction to achieve change

Creatures of Habit

People gravitate toward what they know and that which gives them comfort. Change is disruptive and annoying. Old habits are hard to break. Most of us know that we should do what we don't want to do, or like someone once told me, "Do what sucks." For example, you hate working out because it's hard on you. So, you should work out because it's hard on you. Replace the words "working out" with anything else that sucks.

Fear and Distrust

Some associate change with conspiracy, hidden agendas and a threat to their job security. Numerous organizations have faced a succession of cost reductions and downsizings. Some remain lean, while others are cut to the bones. No wonder there is a sense of fear.

Full Sponge

Some of us are over-changed. Too many changes too fast can cause distress while trying to keep up with it all. I feel this way about new software updates that get pushed on me at times. I still haven't figured out the last revision.

Buy-in/WIIFM

It's human nature to ask why, and we should ask questions. Who are the stakeholders? Who benefits and who does not? More specifically, "What's in it for me?" (WIIFM). In the end though, winners change what losers want to leave the same. Don't be a laggard. When the driving forces of change out-push the frictional drag forces against change, the needle will begin to move in the direction of the desired target state. But don't stop there.

A Body in Motion Stays in Motion

The best way to sustain change is through more change, or rather a continuous state of change. This is also known as continuous improvement. To a large extent, the continuous state of change must be the new normal. After all, change is happening everywhere at an increasing velocity.

When the rate of external change exceeds the rate of internal change, disaster is imminent. So, let's look at the forces that influence a sustained state of change. What forces cause or resist backsliding and a return to the past? I'll start with a few frictional forces that try to return us to the old business as usual.

The Ground Is Always Shifting

There are several internal and external factors that disrupt common practices. Technology is huge, but there are also process changes, new tooling, staff turnover, new suppliers, aging assets, policy changes and new assets, to name just a few. You must be adaptive to change and stay well ahead of it.

A Stubborn, Aging Workforce

Baby boomers are retiring in droves, but many remain. I'm a baby boomer. The aging workforce can find it difficult to learn new methods and adapt to change. It's not their fault. They hold dear to tribal knowledge and the conventional practices that they've used for years.

Management Revolving Door

The very best managers are usually those who embrace and champion change. They are also the ones who are quick to get promoted. Their replacement wants to stake

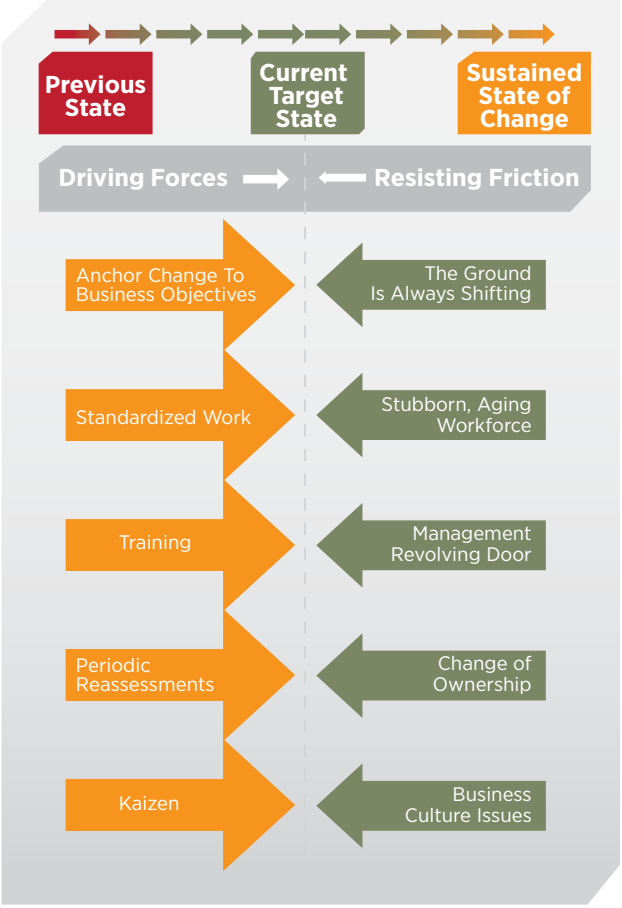


Figure 2. Overcoming dynamic friction to sustain change

a claim too and may undo some of the successes of the previous manager. With each management change comes new risk and the possibility that the pendulum will shift in the opposing direction.

Change of Ownership

These days companies are bought and sold like trading chips. In a few cases, a change in ownership can have a strong, positive impact. Sometimes business culture improves, and there may even be new investment in growth and productivity. In other cases, the merging companies are consolidated, and dismantled business units are sold for parts.

Business Culture Issues

This is its own category, but it also is a subset of each of the previous four categories. Culture starts with a strong, relentless, participative leadership. It has a massive impact on job satisfaction, productivity and the financial success of any business or organization. Conversely, a rotten business culture spreads like an infectious disease and can undermine all improvement efforts.

Now let's discuss some ways to make change an irrepressible, sustainable force. How do you get an organization to a continuous state of change and then put it on cruise control (constant forward motion)? What are the driving forces to achieve this that are real and reachable by most organizations? There are many, but the following are some of the best:

Anchor Change to Business Objectives

Change should never be pursued willy-nilly. It should be tied to a master plan and anchored to overarching business objectives. Change should be understood with support and buy-in at all levels. It should never be command-driven in today's business culture.

Standardized Work

Work should be done to a consistent and optimized state of quality. This seeks to balance the benefits from work performed (or not performed) against the costs and risks. Basically, change should be a modernized engineering specification to achieve the desired optimized state of maintainability, availability, reliability, productivity, safety, operating costs and environmental protection.

Training

Education and awareness training are critical. Competence makes us comfortable. Ignorance does the opposite. Of course, we must teach the specifics of how tasks should be performed, but greater value often comes from understanding why. The mere fact that education is being provided drives home much of the message of why. People have a basic human need to rationalize the purpose of their jobs. You are more likely to accept or embrace what you understand and shrug off what you don't.

Periodic Reassessments

An assessment is the practice of benchmarking an organization against a specific standard of excellence that is precise and definable. Compliance to this standard should be measured or verified. The standard must be aligned to business objectives, standardized work and the change that was achieved. This is done at each iteration of change and periodically reassessed to confirm compliance and continuity (no backsliding).

Kaizen

Change is a slippery slope. Kaizen is how we give it traction. You can't relapse if you're always going forward. Never stop advancing the ball. This is kaizen, also known as continuous improvement.

These five elements (anchoring change to business objectives, standardized work, training, periodic reassessments and kaizen) are the driving forces behind sustained change. They also serve as the centerpiece of a modern asset management system. Many

40%

of lubrication professionals say their organization does not have a change-management strategy, based on a recent poll at MachineryLubrication.com

of you may be familiar with ISO 55000, which is the new international standard on asset management. It standardizes a framework for managing assets in a way that is structurally similar to ISO 9001 for quality. The same is true for ISO 14000 relating to environmental protection. This framework codifies the manner in which assets are managed against costs, risks, performance and organizational objectives.

When it comes to change, some organizations are way beyond low-hanging fruit. They're into the hard work of climbing up higher into the tree to harvest the fruit of their efforts. As someone once said, "Most world-class companies don't realize they are world class. They are too busy and preoccupied with improvement and getting where they are not (up the tree)." I couldn't agree more. ***ML***

Reference

This article was inspired by Drew Troyer and his teachings on change management.

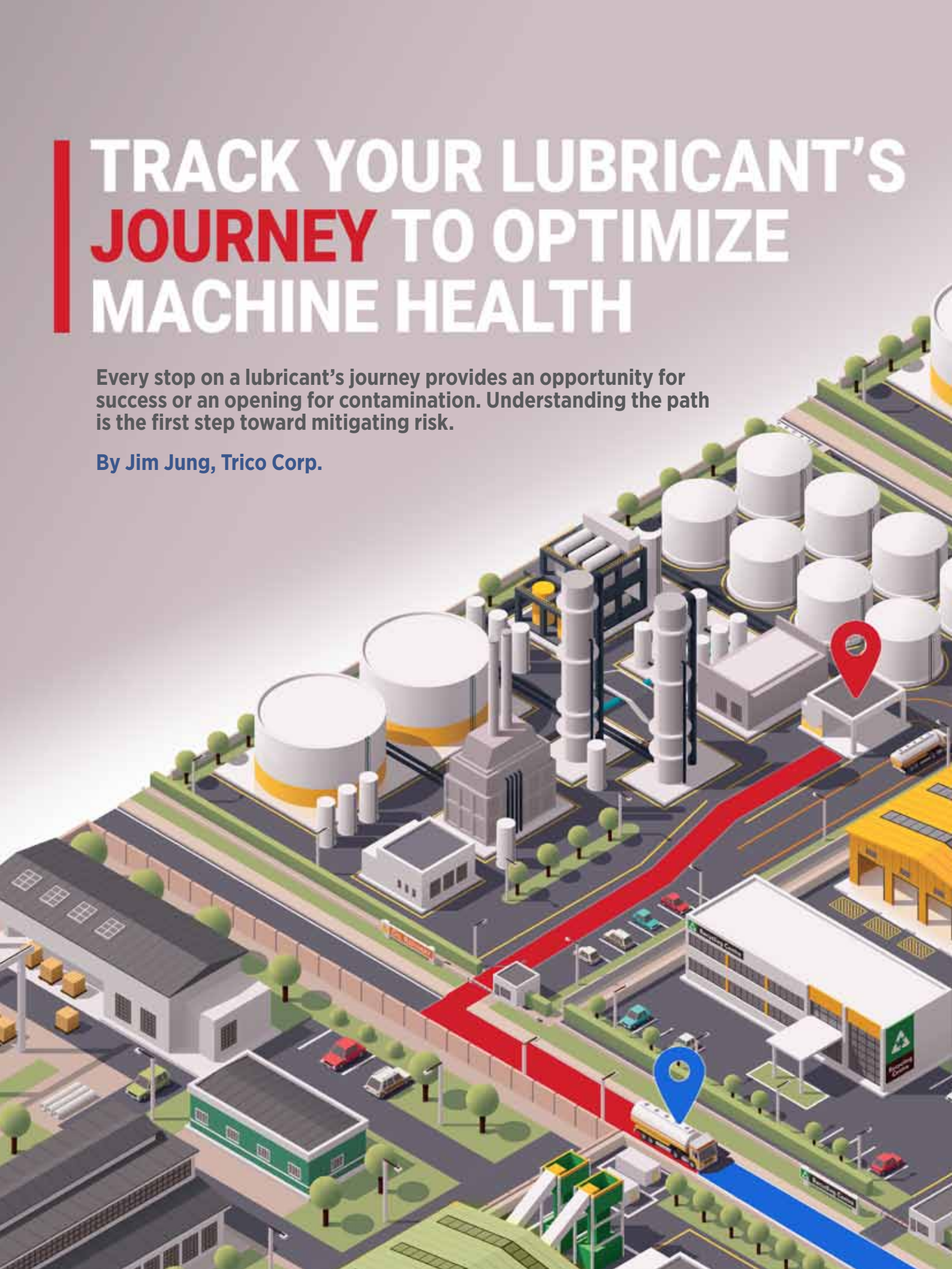
About the Author

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

TRACK YOUR LUBRICANT'S JOURNEY TO OPTIMIZE MACHINE HEALTH

Every stop on a lubricant's journey provides an opportunity for success or an opening for contamination. Understanding the path is the first step toward mitigating risk.

By Jim Jung, Trico Corp.



If your lubrication operation were a hospital blood bank, would patients feel confident that transfusions would sustain life, or would they envision a shorter life expectancy? The often-used analogy of lubricants as the lifeblood of equipment makes sense. People visiting a blood bank expect to witness sound organizational practices for receiving donations, testing the blood, labeling blood bags, proper refrigeration, controlled transfer to the hospital room and the use of sterile equipment for providing a transfusion. In short, the journey of the blood matters. To provide optimum machinery health, consider these five sequential pillars in the journey of a lubricant: arrival, storage, transfer, application and life cycle.

ARRIVAL

When a lubricant arrives at a facility, whether in 5-gallon pails, 55-gallon drums, 275-gallon totes or tankers, the first step is to evaluate the condition of the containers. While the outside of a container does not necessarily represent its inside condition, it could potentially be cause for concern. For sealable and reusable containers and tankers, ask about the distributor's cleaning and refilling procedures. Failure to flow a small portion of the lubricant through the nozzle of a cleaned and air-dried container might lead to contamination from detergent residue.

Upon arrival, test the lubricant before accepting it to ensure it has the appropriate cleanliness and moisture levels. Although testing every container might not be realistic, obtaining a sample from random containers makes sense. Also, do not use a mason jar or other makeshift container to gather samples. Instead, employ disposable sample bottles intended for this purpose as well as disposable silicon tubing.

Use disposable sample bottles and tubing for collecting samples.

Lubricant sampling and testing is essential from a forensic standpoint. Without a reference sample, diagnosing problems later in the life cycle becomes more difficult because there will be more variables to eliminate. Establishing a good relationship with an oil analysis laboratory can pay dividends. The lab may even offer complimentary reference sample testing services if it does not want cost to be an impediment to subsequent problem-solving.

STORAGE

After receiving a lubricant, stamp the date on the container and use first-in, first-out (FIFO) handling practices to ensure constant rotation. While buying in large quantities can drive down the price, some of the lubricant may exceed its shelf life, especially in storage environments where it may be difficult to maintain the lubricant's integrity, such as in extreme temperatures.

A black plastic mailer can protect the sample bottle and help eliminate fluid leakage during shipment to the oil analysis lab.

Although some environments can make it challenging to protect against contaminant ingression, do not invite contamination by transferring pumps from one container to another or by leaving the bungs open. Some companies may want to store containers outside or close to the point of use because they view walking back and forth to a storage location as non-value-added activity. However, unwanted ingression can also include people. This is why the container storage area should have restricted access and not be open to all. There should be a balance between convenience and practices that could sacrifice the integrity of the lubricant. All satellite lubricant locations should

maintain the same principles implemented in the main storage and handling area.

The latest oil storage systems can effectively identify, transfer, store and dispense lubricants. They are an economical way to save space on the plant floor while keeping lubricants organized and contaminant-free. They also can eliminate the potential for mess and mishandling by keeping each fluid clearly identified with color-coded tags and labels. Some add-ons that can further boost a system's value include a spill-containment kit, quick-disconnect kit, dedicated filtration, fire-suppression kits, stainless-steel tank upgrades for corrosion resistance and a fire-safety compliance kit.

TRANSFER

The transfer stage of the lubricant's journey too often tilts toward disaster. A galvanized oil container might be better than a coffee can or soda bottle, but it still invites cross-contamination and misapplication. First, start with sealable, dedicated containers for transferring lubricant. Assigning a color-coding schematic to storage and transfer containers can further mistake-proof the process. Single-use, disposable funnels also eliminate another common source of particulate and cross-contamination.

Vacuum pumps extract an oil sample from a sample port. When used in combination with a sample port adapter and disposable containers and tubing, they can extract contamination-free oil samples from the most representative locations.

Use color-coded transfer containers, color-coded tags and disposable funnels to reduce the chance of misapplication and cross-contamination.

ISO 4406:99 is the reporting standard for fluid cleanliness. It calls out particle size (4, 6 and 14 microns) and a range for the permissible number of particles in 1 milliliter of fluid. Cleanliness studies examining poor practices show that each stage of a lubricant's journey provides an opportunity for contaminant ingression, progressively driving up the code number (higher is worse). For every increase in the ISO code, it potentially doubles the amount of particulate in the oil. The transfer stage is frequently where the highest amount of contamination occurs. However, without baseline testing, there would be no way to rule out the contribution made by poor distributor practices. (If a distributor balks at taking reference samples, it may be time to push back.)

Contamination control is key to maintaining the lubricating properties of an oil. Once water has entered the lubricant, it can exist in the form of dissolved moisture, emulsification or free water. Water damages oil and subsequently the machine surfaces the oil is designed to protect. To remove water and particulate contamination from oil, use a filtration system and/or filter carts. Desiccants and desiccant breathers can also remove moisture and prevent it from entering the oil.

APPLICATION

A bearing is not just a bearing, and a gear is not just a gear. Product designs may differ as much as the speeds and loads, not to mention the operating environment differences between Houston, Phoenix and Alaska. Gaining some "oil intelligence" from a lubricant analysis lab that has experience with thousands of installations can help an in-house reliability engineer and/or maintenance professional to evaluate applications and select the appropriate lubricant. It's not necessarily that a particular lubricant is a poor choice, but rather that a better option often exists.

Of course, selecting the right lubricant for

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the application means nothing if it ends up in the wrong place. Again, it helps to use a color-coding system (or other unique identifier) that connects a lubricant with its application(s).

Once delivered, the lubricant must be protected. Vented constant-level oilers remain the most popular choice, but a closed-system oiler can completely isolate the lubricant from the external environment. That said, pumps and bearing housings are inherently exposed to liquid. As much as possible, control ingression points with labyrinth seals and bearing isolators. Also, consider a desiccant breather to filter and dry the lubricant.

Quick disconnects can enable personnel to connect the oiler to a filter cart and filter the lubricant while the equipment remains online or has been shut down for a maintenance procedure. Filtering the oil will help extend the interval between maintenance activities and/or a full drain-and-flush.

LIFE CYCLE

The most effective maintenance programs incorporate routine lubricant sampling. Having the right sampling ports installed and sampling at the right place inside the machine are key factors for success. When and how samples are collected are two of the most important considerations in the sampling process. Without a representative sample, any further gains by analysis will not be possible.

A variety of sampling ports and pitot tubes are available to assist in obtaining the best sample while the equipment is at normal operating speed and temperature. Combine a pitot tube with a level gauge to help keep a machine running optimally. Installing fixed sampling hardware is always the safest way for maintenance professionals to extract an oil sample from a piece of equipment that is in operation.

To optimize long-term machine performance, work with an oil analysis lab that can pre-emptively spot signs of wear. Although thermography and vibration analysis can provide lagging indicators, oil analysis can offer the earliest warnings about things that potentially could go wrong. Supply the lab with as much information as possible about the application and the machine's environment.

To obtain information automatically, consider constant-level oilers that can wirelessly transmit oil level information. Accompanied by web-based applications, these devices can give real-time input on machine status and maintenance requirements. Other benefits include decreasing inspection times from hours to minutes, reducing the need for personnel to enter difficult or dangerous-to-access areas, preventing downtime with early warnings and having the ability to perform data-driven maintenance.

When maintenance and operations personnel think of a lubricant, they tend to envision a specific application. Even a holistic concept such as total lubrication management can limit their thinking. However, by following the lubricant's journey from arrival through its life cycle, you can see how every step offers an opportunity to implement preferred practices that mitigate risk. Those galvanized cans and funnels might be comfortable old friends, but your machinery deserves better.

TEST YOUR KNOWLEDGE

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

1. A cone penetrometer is used to measure what?

A) Dropping point
B) Remaining useful life
C) Grease consistency
D) Oxidation stability of grease
E) Bleed characteristics

2. Which is not correct related to oxidation?

A) Is the reaction of oxygen with water to form acids
B) Creates acid and sludge
C) Occurs at all oil temperatures but becomes significant above 60 degrees C (150 degrees F)
D) Is the reaction of oil hydrocarbons with oxygen
E) Shortens oil life

3. The information in the center of the API "donut" symbol on motor oil containers represents what?

A) Service classification
B) Viscosity grade
C) Energy-conserving capabilities
D) AW additive
E) Base oil type

ANSWERS

1. C

Grease consistency is the ability of grease to resist deformation by an applied mechanical force (cone penetrometer). The higher the cone penetration, the softer the grease and vice versa.

2. A

Oil oxidation is the reaction of oil hydrocarbons with oxygen. It shortens the life of the oil and results in the formation of acids and sludge. The oxidation rate increases as the temperature increases. For every 18 degrees F (10 degrees C), the oxidation rate is doubled and the life of the oil is cut in half (Arrhenius rate rule). Therefore, "A" is the correct answer.

3. B

This information represents the Society of Automotive Engineers (SAE) viscosity grade.

The increasing demand for high quality and high performance lubricants is encouraging global majors to focus on Indian market. Companies like ExxonMobil™ are adopting innovative ideas and latest technologies to help customers optimize their maintenance programs, improve equipment performance, ensure safety and enhance sustainability. In an interview with ***Jhumpa Mukherjee*** *of Machinery Lubrication India,* ***Glen Sharkowicz, Director of Brand Strategy-Commercial Marketing, South-Asia Pacific, ExxonMobil™,*** *talks about delivering next generation lubrication technologies in India.*

Glen Sharkowicz has developed an in depth expertise in a variety of commercial sectors during his more than 20 year career. In Glen's current capacity, he is the Director of Brand Strategy-Commercial Marketing, South-Asia Pacific and is currently based in Singapore. Glen began his career with the Mobil Oil Company as an Industrial Sales Engineer in Charlotte, North Carolina, responsible for industrial lubricants sales activities in North and South Carolina. Glen holds a B.S. in Engineering Science and Mechanics from Penn State University.

The Indian Lubricants market has been witnessing a positive momentum, what do you have to say about Lube Market in India?

India's lubricant industry has been on a strong growth path in the past few years. India is becoming more technologically advanced. There are so many opportunities here. There is so much energy in India and so the future is looking very bright.

India is a market with strong growth opportunities. Increasing demand for lubricants is also forcing global majors to shift to local manufacturing instead of imports. Keeping in line with this trend how does ExxonMobil look at "Make in India" campaign?

India is very competitive not just in this region but around the world in terms of becoming a manufacturing hub. We are constantly evaluating investments in manufacturing and we do manufacture a number of things only through third party blenders. That is an important area and we look at it in a very holistic basis as to what is the right investment to make and when. 'Make in India' campaign is a great initiative and we want to be part of that for sure.

Some companies are now comparing the overall cost of lubrication vs. cost of lubricants. How does ExxonMobil support the customers in getting their overall cost of lubrication lower?

Noria, Machinery Lubrication® and ExxonMobil have been telling the same story for quite some time that lubricants are not a disposable item, it's a part of your plan to maintain a high efficiency manufacturing environment. So what is important is the right lubricant in the right place at the right time. This is a simple statement but very true. Having products like Mobil SHC elite in the right kinds of applications where one can get maximum benefit of extended life, energy efficiency, backing with our Field Engineers under the Mobil Serv brand and bringing those types of services that really tie the solution together drives lowest cost. Because it's not just about the lubricant itself it's really about what the lubricant does for your business.

Customer's needs are evolving from commodities to customised speciality products and 'value addition' is a buzz word today, so how does ExxonMobil provide a complete solution to the customers than just a product?

Let me take an example and try to answer this question. Manufacturing and machine tools rates as the biggest consumer of lubricants here in India and we are really looking at that holistically about how somebody would manage that environment. Using the right kind of cutting fluid, for example Mobil cut products that we market, using the right kind of lubricant that actually is compatible, interacts well with the metalworking fluids & as a

result the life of that metalworking fluid is extended and using products like Mobil DTE™ 20 for the hydraulic system which meet the most rigorous performance requirements of a wide range of hydraulic system and component manufacturers, allowing use of a single product with excellent performance characteristics. The area where our customers tend to struggle a bit in what is the right product for this application? May be it's a synthetic maybe it's not. So we ensure educating them about how to choose & use lubricants properly and effectively. We also provide an oil analysis service which is to extend and manage the life of oils and in more advanced things like a good inspection for a piece of equipment or bearing inspections etc. So the solution in trying to find the lowest cost is the right product, the application expertise and the services.

What is the R&D set up that ExxonMobil has?

There are three main business protocols within ExxonMobil- the upstream, chemicals and downstream which I'm a part of and we rely on a network of research and development that supports all of us. There is a corporate strategic research group where people think about things that are really quite far out and could be just about anything. Then we work our way down to the more tactical five year types of deployments which is where the lubricants space ends up being. This group is located in the U.S. (New Jersey) and then we have a little more localized research and development in China (Shanghai) and Germany (Hamburg) as regional offshoots and their role is a little bit more about the adaptation and deployment of our technology platforms into the local markets. For example if we need some sort of a small tweak or a little bit different flavour for someone in India or China etc.

Do you also provide lubricant & coolant management services to your customers? How do you support for oil analysis and interpretation services?

Yes. We do, in some cases through our distributors. Our distributors are an integral part of our offer to the market. They provide their own value and add value to the technology. They're very much involved in day to day activities. So our distributors in many cases provide those services as well.

MSLA (Mobil Serv Oil Lubricant Analysis) is our core program around oil analysis that is the day to day analysis. The samples are sent off to the lab. The registration and information is web based, though registration can also be done via a QR code on the bottle as well as the machine. So you take the human interaction out for data and technology purposes. We do operate our own labs because we really do know our formulations better than anybody else and we feel we could do the best interpretation and beyond. That is one of the key values we bring in. We've been collecting a lot of data and everybody would agree that the data is the new currency today. This is where we are starting to spend a lot more time and effort. This is how we tap into that data and provide the best analysis possible especially when it comes to interpretation. We are looking at not just the viscosity change by 10 percent but the viscosity changed in a particular type of equipment at this point in time, what does that mean? This is where we really want to take our services.

How was the previous year for ExxonMobil and what are the goals for the next year? What are the new initiatives of ExxonMobil?

The last couple of years especially in India have been fantastic. Yes, I'm very bullish on where we are going to go from here and in terms of what can you expect to see. You'll see a lot more of how we bring some innovative products and services to market. Our recent addition to SHC series is Mobil SHC Elite- the best synthetic product we have ever brought to market in terms of oil life, energy efficiency and equipment protection. Do stay tuned in to hear more about our new products that are expected to be launched in the near future.

10 Ways to Check Hydraulic Systems with Thermal Imaging

"By regularly conducting the following tests, a faulty component can be found, **many times before it shuts down the machine.**"

An infrared camera is one of the best tools for performing regular reliability tests on a hydraulic system. It is also invaluable when troubleshooting heat, speed and pressure issues. In any hydraulic system, some lines will be at, above and below the oil temperature in the reservoir. The key is to know which lines should be cool, warm and hot. If checks are made when the system is operating normally, a reference can be established. By regularly conducting the following tests, a faulty component can be found, many times before it shuts down the machine.

A schematic for a typical hydraulic system is shown in Figure 1. The circled letters indicate the points in the system that should be shot and recorded with an infrared camera.

1. Check the Suction and Case Drain Lines

Check the suction and case drain lines of the pump by recording the temperatures at points "A" and "B" in Figure 1. The oil in the "A" line should be very near the oil temperature in the reservoir. The oil that flows out of the case drain line (B), is the oil that bypasses the internal components inside the pump. Most piston pumps bypass 1-3 percent of the maximum pump volume. Vane pumps may bypass as much as 5 percent of the maximum rated volume. For a 30-gallon-per-minute piston pump, the amount of oil in this line should be one-third (1 gallon per minute). Because the oil does no useful work, heat will be generated as the oil bypasses the internal pistons. This line, of course, will be hotter than the oil

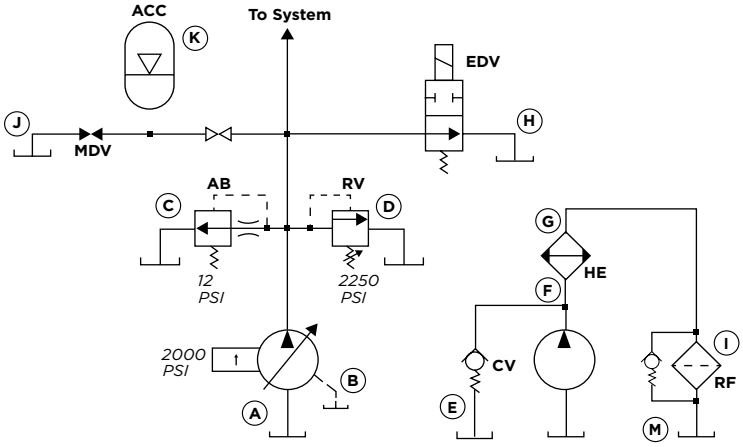


Figure 1. A schematic for a typical hydraulic system

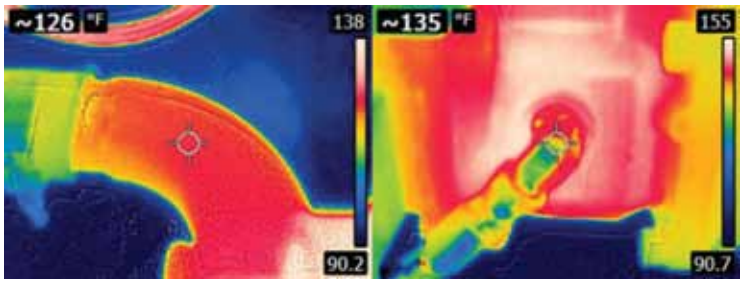


Figure 2. Images showing the suction and case drain temperatures

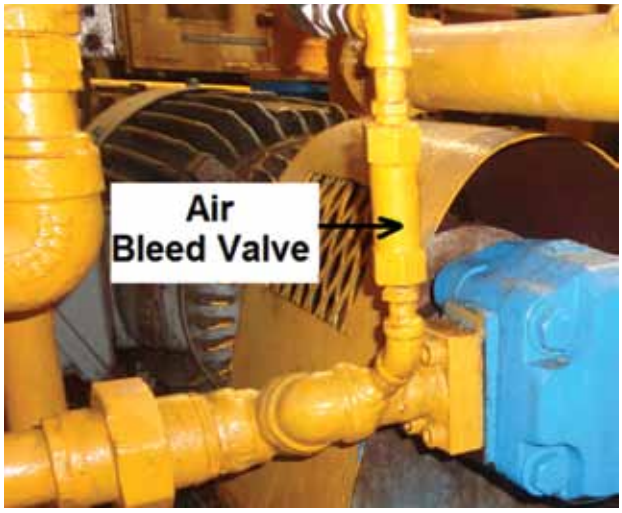


Figure 3. An air bleed valve

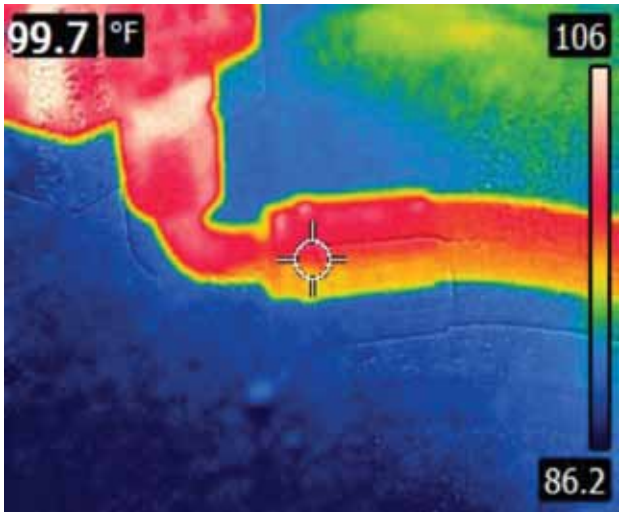


Figure 4. Image showing the tank line temperature of a relief valve

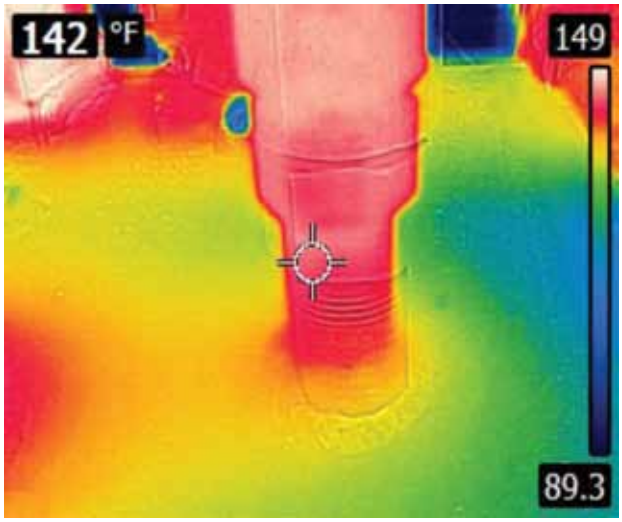


Figure 5. Image showing the tank line temperature of a check valve

entering the pump through the suction line.

The suction and case drain temperatures are shown in Figure 2. The oil entering the pump is 126 degrees F, while the oil in the case drain is 135 degrees F. As the pump wears, the bypassing will increase, causing an increase in temperature of the case drain line. If the pump is checked a month later and the temperature in the case drain is 145 degrees F, then the pump has worn considerably. The flow rate should then be checked by installing a flow meter in the line. If the flow rate reaches or exceeds 10 percent of the maximum pump volume, the pump should be replaced.

In the previous example, a flow rate of 3 gallons per minute (GPM) would indicate a badly worn pump. Since the amount of case drain flow can vary from one pump manufacturer to another, the key is to make initial temperature checks when the pump is relatively new to establish a reference. Permanent installation of a flow meter in the case drain line is also recommended.

2. Check the Tank Line Temperature of the Air Bleed Valve

Check the tank line temperature of the air bleed valve at point "C" in Figure 1. The purpose of the air bleed valve is to automatically bleed air out of the line when the pump is first started. These valves are most commonly found on systems where the pump is mounted above the oil level. Once the air is bled out and the hydraulic pressure builds to the spring setting (approximately 12 pounds per square inch), the valve will shift closed. The valve is relatively small and can only handle a flow rate of 2 GPM. In most systems, the pump volume is higher than 2 GPM. Although the full pump volume usually cannot flow through the valve, heat will be generated if the valve fails open. This can increase the oil temperature as well as cause the actuators to move slower, particularly if a low-volume pump is used.

3. Check the Tank Line Temperature of the Relief Valve

Check the tank line temperature of the relief valve (RV) at point "D" in Figure 1. In a system where a pressure-compensating pump is used, the relief valve spring should be set 250-300 pounds per square inch (PSI) above the compensator setting. The purpose of the relief valve is to provide a flow path in the event the compensator spool fails to shift and reduce the pump volume to a near 0 GPM output. The tank line of the relief valve should be at ambient temperature.

In Figure 4, the tank line is 99.7 degrees F, well below the oil temperature in the reservoir. If this line is hot, then the pump compensator spool has failed to shift, the relief valve is stuck partially open or the plant knob-turner has increased the compensator setting above the relief valve setting.

4. Check the Tank Line Temperature of the Check Valve

A check valve (CV) is commonly used in a filtering and cooling loop, as shown on the schematic in Figure 1. The purpose of the check valve is to protect the heat exchanger from high pressure. The rating of the check valve spring is usually 65-100 PSI. If the cooler is of the air design, the internal

tubes can become plugged with contamination. Also, if the unit is initially started while the oil is cold, higher resistance will be developed in the system. In either case, oil will flow through the check valve when the spring setting is reached. When operating normally, the tank line (E) should be at ambient temperature. In Figure 5, the check valve's tank line is 142 degrees F, indicating that the cooler tubes are most likely contaminated.

5. Check the Heat Exchanger's Inlet and Outlet Oil Temperatures

Check the inlet (F) and outlet (G) oil temperatures of the heat exchanger (HE). There should be a noticeable temperature difference between the two lines. As oil flows through the tubes of an air cooler, the heat in the oil is transferred to the air. Depending on the size of the cooler, a temperature difference of 5-10 degrees can be expected.

In Figure 6, the inlet oil temperature is shown as being 117 degrees F, while the outlet temperature is 109 degrees F, which is acceptable. If the temperature difference decreases, this may mean that the cooler fins and core are dirty or the inner tubes have become contaminated. Use caution when cleaning the fins with an air hose so no bending of the fins occurs. On water-cooled units, the temperature difference usually will be much greater, especially if chilled water is employed. The inlet and outlet water temperatures should also be recorded for future troubleshooting purposes.

6. Check the Tank Line Temperature of the Accumulator Dump Valve

Check the tank line temperature (H) of the automatic accumulator dump valve (EDV). When the system is operating, the solenoid is energized, which shifts the valve to the closed position. Flow from the main line will be blocked through the valve and back to the tank in this condition. The temperature of the line should be at or near ambient temperature. Notice in Figure 7 that the valve's tank line is 145 degrees F, indicating that the valve is either stuck open or that the solenoid has failed.

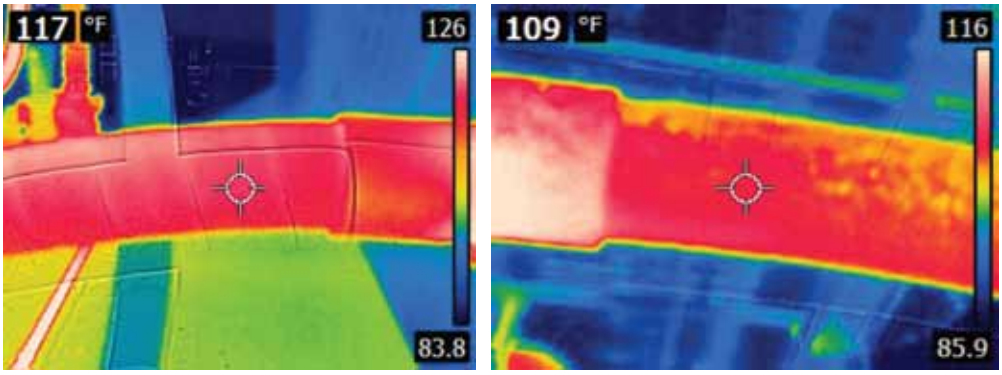


Figure 6. Images showing the inlet (left) and outlet (right) oil temperatures

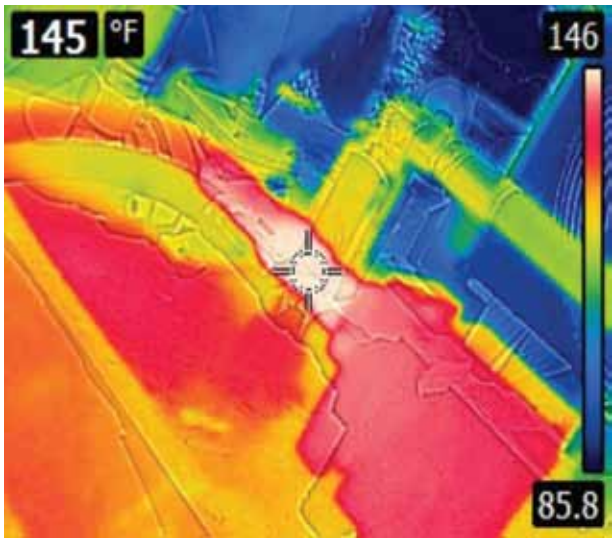


Figure 7. Image showing the tank line temperature of an automatic accumulator dump valve

7. Check the Temperature of the Filter's Base and Element Housing

Often an oil filter (RF) will have an internal bypass check valve, as shown on the schematic in Figure 1. The purpose of this check valve is to provide a flow path for the oil to return to the reservoir in the event the element becomes contaminated. This prevents damage to the filter element. The temperature of the filter base should be compared to the temperature of the element housing. When the element becomes plugged, the housing will be cooler than the base. While many oil filters have visual dirt alarms to indicate the element condition, they should not be relied upon, as they have a tendency to fail over time.

8. Check the Tank Line Temperature of the Manual Valve

Check the tank line temperature

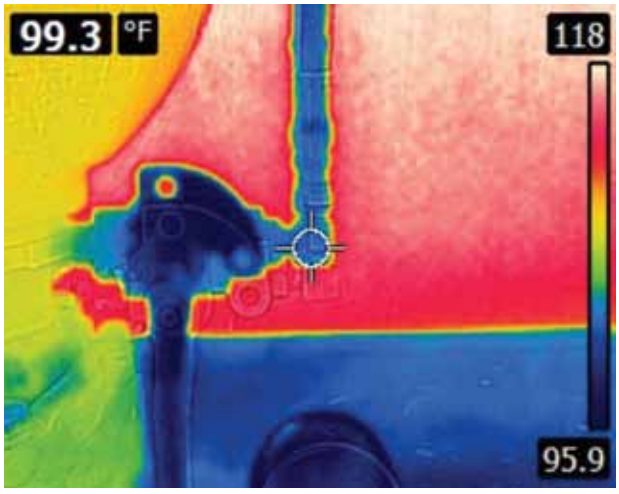


Figure 8. Image showing the tank line temperature of a manual valve

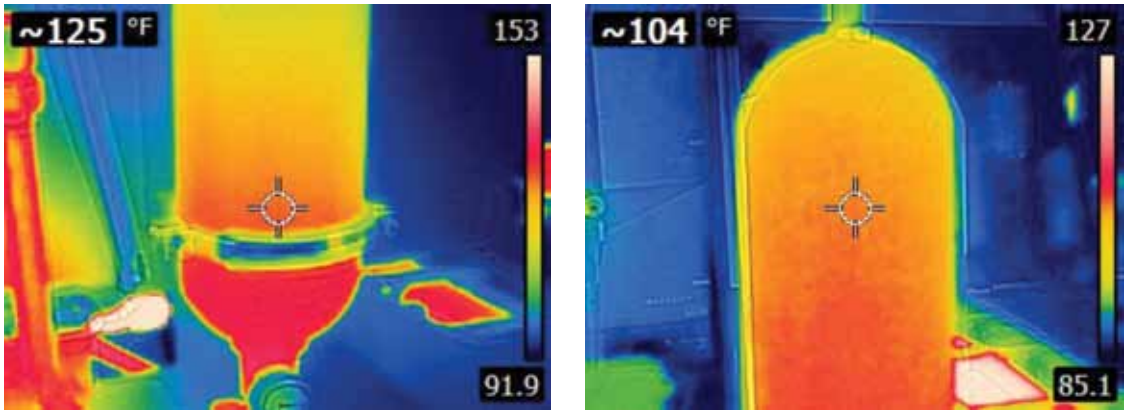


Figure 9. The bottom half of an accumulator (left) should be warmer than the top half (right).

(J) of the manual valve (MDV). This valve is used as a manual accumulator dump valve. It should be opened anytime the system is shut down. This is to ensure that the pressurized fluid in the accumulator (ACC) bleeds down to 0 PSI. This provides a safety backup in the event the EDV valve were to fail closed when the system is turned off. The tank line of this valve should be near ambient temperature while operating. In Figure 8, the tank line temperature of the manual valve is 99.3 degrees F, indicating that the valve is closed.

9. Check the Temperature of the Accumulator Shell

Check the temperature at the top (K) and bottom (L) of the accumulator shell. The bottom half of the accumulator should be warmer than the top half. The heat is generated by the friction of the oil as it flows in and out of the shell. On a bladder type of accumulator, the rubber bladder will be compressed to the top part of the shell. When the pressure drops in the system, the bladder will expand and force oil out of the accumulator. If the temperatures are nearly the same, this indicates the dry nitrogen pre-charge has leaked out, the pre-charge is higher than the pump compensator setting or the bladder has ruptured. Piston accumulators will show a greater difference in heat than bladder types.

10. Check the Oil Temperature in the Reservoir

Finally, check the oil temperature (M) in the reservoir. A temperature gauge usually is included in the sight glass. Over time, the sight glass may become discolored, or the thermometer may fail. To obtain a consistent oil temperature reading, make a mark or draw a target on the side of the reservoir. In this manner, the oil temperature can be checked in the same location each time.

While this article has focused on temperature checks that can be made on the power supply, there often will be other pressure control, directional and manual valves located away from the power supply. Additional accumulators may also be used near the machine.

Performing these tests can help identify an issue before it becomes serious. If a shutdown of the machine does occur, the recorded information will be valuable when troubleshooting the system. ***ML***

About the Author

Al Smiley is the president of GPM Hydraulic Consulting Inc., located in Monroe, Georgia. Since 1994, GPM has provided hydraulic training, consulting and reliability assessments to companies in the United States, Canada, the United Kingdom and South America. Contact Al at gpm@gpmhydraulic.com.

The Effects of Water Contamination **on Oil Filters**

"If water-saturated filters are ignored for long periods of time, the **filtration system will become compromised.**"

Considering the effects that contamination can have on lubrication, it's not difficult to understand why oil filtration is so important to industrial machinery. Without it, contaminants would pile up, and contaminant-induced abrasion would go uncontrolled, resulting in disrupted lubrication and machines more prone to premature failure. Depending on the equipment's needs, there are various types of oil filters, all of which are designed to capture different kinds of contaminants with varying degrees of performance. Solid particles are the primary contaminant targeted by oil filters, but water also has an opportunity to be absorbed by many of these filters, including those made from cellulose fibers and coiled paper. This can even enhance the filter's ability to capture particles to a certain extent. However, if the filter is exposed to too much water, it can cause the filter to function

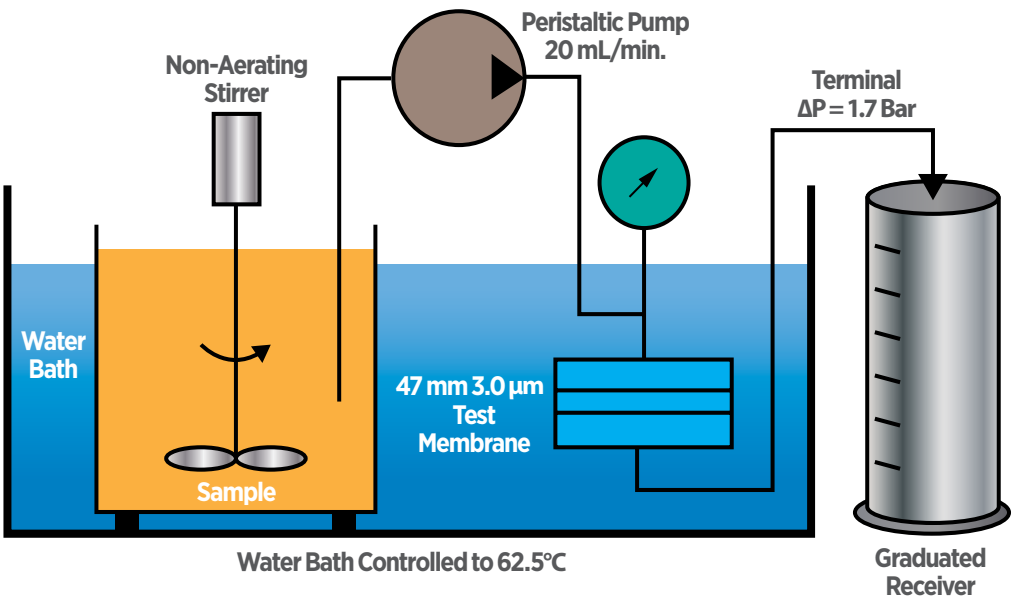
improperly or even clog the oil flow.

A Little History

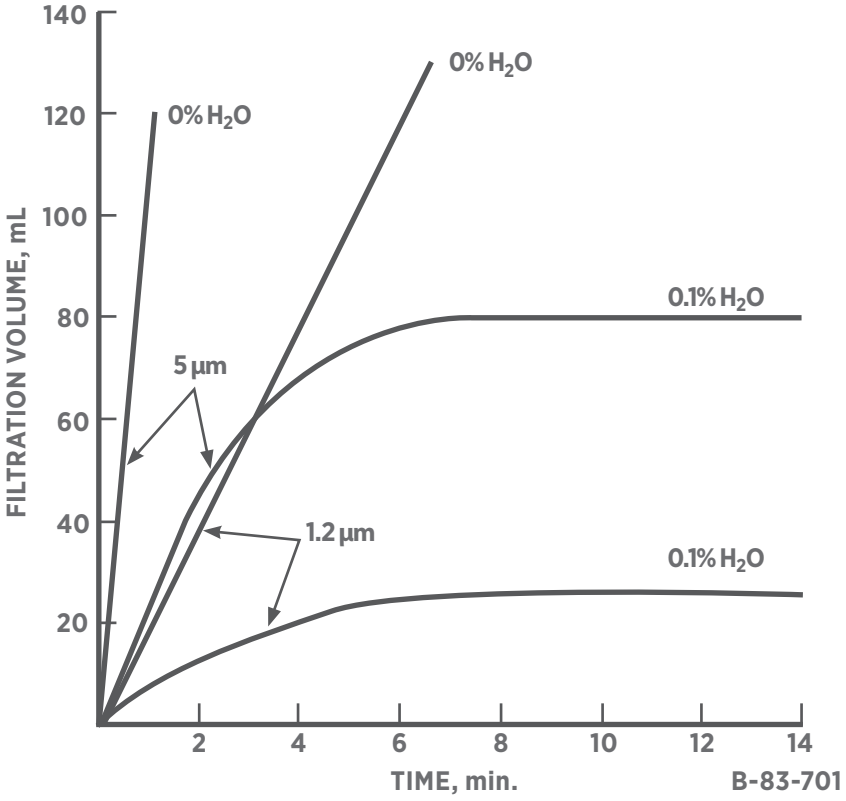
Some of the first known filters were created to remove unwanted contaminants from water. This process was pioneered by the Romans, but it has also been cited as having other origins. The word "filter" actually comes from the Latin word "filtrum" or "feltrum," which is related to felt or compressed wool, providing a means to filter contaminants when water passes through it. The development of filters for oil cleanliness did not occur until the early 1900s through the progression of crude oil refining and the automobile industry.

Water-induced Filter Failures

A filtration system generally is sized and configured to handle the expected types and amounts of contaminants to which the system will be exposed. It is also important to select components for the filtration system that will allow for infrequent filter maintenance. The differential pressure gauge should change gradually as the filter element becomes saturated. After several cycles of normal filter changes, the maintenance schedule will become predictable. However, when unexpected water is exposed to the system, it can clog the filter and cause a drastic change in the differential pressure, putting sudden strain on the filter element. If this continues for days or weeks, the element can form a bypass gap in the damaged media, enabling oil to flow through unfiltered. So, while these types of filters can absorb a certain amount of undesirable water, if water-saturated filters are ignored for long periods of time, the filtration system will



$$\text{Filterability Factor} = \frac{\text{Volume of filtered fluid (ml)}}{\text{Area of membrane (cm}^2\text{)}}$$



Filterability vs. Percent Water and Membrane Pore Size

become compromised.

Another way water can damage filters is through oxidation. Small amounts of water in oil, typically in the dissolved state, are not unusual and in some cases unavoidable. If the water remains in small quantities, most filters will not have any significant consequences. However, if the water amount rises beyond the saturation point, the negative effects on the lubricant and equipment will increase, impacting the filter's performance.

Water's reactive nature also promotes oxidation reactions with the lubricant's molecular structures. As oxidation occurs, water reacts with hydrocarbons to form free radicals and oxygenated compounds. These new products in the lubricant expose the equipment's lubrication zones to the detrimental effects of organic acids and high-molecular-weight polymeric products. In other words, sludge, tar, varnish, slimes and other resins will form, wreaking havoc anywhere the oil flows. One of the places where the oil will flow is to the filter, where these gummy and sticky substances will quickly saturate the element.

In addition, water encourages the growth of microbial organisms. For example, bacterial growth can cause the formation of sulfuric acid, which can become corrosive in the oil and to machine surfaces. When this type of growth goes unnoticed and uncontrolled, it can result in premature lubricant degradation, corrosive wear and shorter filter life.

Colder operating temperatures can also create challenges with all aspects of lubrication and equipment operation. In regard to filters, not only is the oil more viscous, but water at subfreezing temperatures in a lubrication system can lead to alarming issues. Water droplets will turn into ice crystals, particularly when water is heavily entrained. These crystals will form a new type of solid contaminant that can lodge in the filter media, causing a rapid decline in the filter's performance. With turbulence and changing temperatures, permanent damage to the filter can also occur as the crystals fluctuate in size and position. In some cases, the filter may rupture when flow is obstructed.

SAMPLE NO.	FILTERABILITY FACTOR			FILTERABILITY INDEX		
	0% H2O	1% H2O	2% H2O	0% H2O	1% H2O	2% H2O
Hydraulic Fluids						
A	31.9	21.4	13.9			
B	45.2	66.6	62.1			
C	104.2	104.2	104.2			
D	8.8.	8.9	10.4			
E	47.4	52.1	43.2			
F	2.1	0.0	0.0			
Automatic Transmission Fluids						
G	9.4	5.5	2.6			
H	104.2	51	36.5			
I	5.7	3.6	2.5			
Engine Lube Oils						
J	14.6	21.9	22.9			
K	8.9	3.1	2.6			
Fire-Resistant Fluids						
Water-Oil Emulsion						
A	0.17			0.52		
B	3.7	5.6	6.25	10.2	25.8	28.3
C	0.1			0.26		
D	0.02			0.05		
E	0.0	0.0	0.0	0.0	0.0	0.0
Water Glycol						
F	48.9	57.3	62.5	58.6	49.8	89.3
G	104.2			119.8		
H	104.2			65.1		
I	104.2			90.2		
J	104.2	93.8	91.2	51.6	46.6	48.0
Synthetic Fluid						
K	4.2	14.5	16.3	14.0	18.1	19.6
L	104.2	104.2	104.2	576.9	473.6	385.9
M	21.98	25.8	38.5	19.3	13.6	17.1
N	104.2	104.2	104.2	80.2	51.3	34.97
O	20.8	20.1	19.2	26.0	10.2	11.4
P	21.7	34.4	39.2	19.7	15.6	37.3

Fluid filterability spectrum (Ref. Fluid Contamination Control)

Lubricant Filterability

Just as contaminants and operating conditions can disrupt or damage a filter, certain oil properties can also cause challenges in the oil's ability to be filtered. Filterability is the term used to describe the ease at which oil can be filtered, even in the presence of external contaminants such as water. Many oils are tested for their filterability using the procedure specified by ISO 13357-1:2017.

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Advanced Machinery Lubrication

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19th- 21st Sept

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MUMBAI
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This procedure is based on the premise that lubricating oils may become unfilterable for reasons other than viscosity. Since water is known to impair filtration, the first part of the procedure was designed to establish "a method for assessing the filterability of oils in the presence of contaminating water." The second part of the procedure is intended to "investigate the filterability of an oil which is used in applications where the presence of water in the oil is unlikely." The steps of this procedure can be summarized as follows:

1. The oil sample is deliberately contaminated by a controlled volume of water and mixed.
2. The mixture is placed in an oven for two hours, stirred and then returned to the oven, which is set to approximately 70 degrees C, for 70 hours.
3. The mixture is then kept at room temperature and away from light for 24 hours.
4. Using a filter with a 3-micron pore size and a cellulose and nitrate composite membrane on a special filtration apparatus outfitted with a pressure vessel, the treated water/oil mixture is vigorously mixed following a strict procedure and then poured into a filtration funnel.
5. After reaching 25 pounds per square inch differential (psid), the elapsed time and sample mixture volume are measured in a collection cylinder.
6. The resulting filterability can be analyzed from this data. The filterability factor is reported as a ratio of the volume of oil passing through the membrane filter divided by the area of the membrane filter. Since the test results are dependent on the amount of water added to the sample, the filterability can be reported in reference to this volume.

This procedure is primarily intended for new hydraulic fluids with a viscosity of up to 100 ISO VG. A modification of the procedure can also be performed to establish the filterability of other lubricating oil types. If you are concerned that water contamination is influencing your lubricant's ability to be filtered, consult the lubricant manufacturer's technical support to determine whether this test has been reported for your lubricant type. Additionally, you may wish to contact your oil analysis laboratory to have this test performed if filterability is a concern.

The filterability of some oils may also be influenced by particular additive byproducts or other insoluble contaminants, which are often found as a result of oil oxidation, thermal degradation and varnish. Even some organo-metallic additives can lead to a clogged filter. When certain additives are allowed to react with water in the oil, the formation of precipitates will cause even worse filtration issues.

How to Manage Water

As mentioned previously, water ingression is difficult to prevent entirely, and avoiding it may not even be necessary. In fact, for some types of equipment, a very small percentage of water is better than being completely dry in order to keep specific materials from drying out. Nevertheless, any water ingestion or moisture that is introduced by a process should always be understood, monitored and controlled.

On smaller and simpler wet-sump systems, visual inspection devices should at least be used to recognize the signs of water contamination. These devices would include a bottom sediment and water (BS&W) bowl, 3-D bull's-eye sight glass and/or columnar sight glass. Other in-line

sight glasses or clear-access panels can offer evidence of moisture as well. Water will be revealed by a cloudy or milky appearance, or will drop to the BS&W bowl where it is collected.

Equipment with easy access for inspecting the headspace can help provide a quick indication of any moisture ingression. When temperatures change, the thermal cycles may cause the oil to sweat out the water, which can collect on headspace machine surfaces. Over time, corrosion may occur. Evidence of this or any water present can be detected through visual inspections.

Headspace moisture-control devices such as a dry-instrument air purge or desiccant breathers can drastically help to avoid airborne moisture contamination from entering the oil. A desiccant breather can also indicate the likelihood of water being present in the machine.

Larger, more complex and critical equipment should follow the same recommendations mentioned previously in addition to oil analysis and possibly even online moisture content analysis. Most industrial equipment should maintain a moisture target level between 50-300 parts per million, depending on the component sensitivity, metallurgy, criticality and other factors.

61%

of lubrication professionals say surface or membrane filters are the most common types of oil filters used at their plant, according to a recent survey at MachineryLubrication.com

How to Manage the Filter

Filter management should include a combination of activities, beginning with the selection of filters for the system's needs. If water is a common uncontrollable contaminant, then filters specifically designed to help remove large amounts of water or a separate water-removal device may be necessary. Secondly, being aware of and controlling the ingression points for all types of contaminants will increase not only the filter life but also the life of the oil and machine.

Contamination control is all about exclusion and removal. Removal by means of a filter may be inevitable to some degree, but investing in contaminant exclusion only costs one-tenth of what it will cost after contamination enters the system over the machine's lifetime. Also, solid contaminants aren't the only types of contamination that should be considered. Moisture is the second most destructive contaminant and is often ignored.

As with any filtration, a differential pressure gauge should be installed to identify a change in pressure between the inlet and outlet sides of the filter's housing. This will give an indication of the saturation level of the filter media. If the correct filter has been selected, the differential pressure will gradually increase over several weeks or a month. Of course, a drastic spike can occur at any time as a result of an unexpected surge of particles or saturation of the media by water or other insoluble products. That being the case, never rely solely on historical data to determine how often to change a filter, especially for critical equipment. Just like every inspection device installed on equipment, the differential pressure gauge should be inspected frequently and marked so maintenance and operations personnel can easily recognize an issue and report it immediately.

About the Author

Bennett Fitch is the director of product development and 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 to learn how Noria can help you better control contamination in the critical machines at your plant.

Strategies for Overcoming Gravity's **Impact on Grease**

"Even though grease does a better job of staying in place than oil does, it is still **in a constant battle with gravity as it tries to separate the lubricant's components.**"

While helping a pharmaceutical manufacturer address deficiencies in its lubrication program, I realized one area that needed attention was the variety of grease guns in the hands of the lubrication technicians. Various styles were in use, and there was a wide range of delivery volumes. The first step was to gather this motley collection of tools and choose a new standard grease gun for the company. We settled on a quality gun with a clear tube to allow users to view the type of grease that had been loaded into the gun. We calibrated the gun by measuring the delivery rate per pump.

Thinking we were well on our way to lubrication nirvana, I was surprised to receive a call that there was a problem. The new grease guns were leaking. The techs were finding puddles of red oil in the bottom of their toolboxes, and the new grease guns were the source. Even the clear tubes were stained with oil leaking outside the tube.

We knew the proper procedures for storing grease tubes. Before being opened, when the grease tubes are still in their cases or stored on the shelf, they must be kept with the plastic cap up and the pull-tab down. The plastic cap is not a sealing surface. When oil invariably separates from its thickener, the plastic cap is a pathway for oil to migrate away from the grease. What we failed to realize, especially for greases that easily separate, was that the orientation of the grease gun mattered, too.

Gravity, shearing and vibration are all forces that can separate oil from a grease thickener. It happens in a machine when moving parts shear through the grease to release oil into contact points. It happens in machines subject to high vibration, when the increased rate of separation prompts you to relubricate these locations more often. And it happens when gravity works on a stationary grease to draw oil to a low point. If that low point is not a sealing surface, oil

can leak away from the machine, grease tube or even a grease gun.

Grease is sticky. We apply it to bearings, gears and machine surfaces specifically because we want it to stay in place. We know that oil gets flung around by the movement of the machine. When the movement stops, gravity takes over and the oil finds its way to the bottom. However, just because grease is stickier, you can't ignore the effects that gravity has on it. You need to have a strategy to address the three key ways that gravity can defeat your grease lubrication efforts.

Releasing Oil Before Its Time

Having performed many lubrication audits over the years, I have encountered the dreaded "soaked box" effect many times. The soaked box is the cardboard case that holds a number of grease cartridges. If not properly cared for, it can find its way into your grease supply with a healthy coating of oil absorbed into the cardboard. At first glance, it doesn't look quite right, but perhaps this effect is ignored because we don't understand the mechanism at play or realize how much it can affect the grease's performance.

72%

of lubrication professionals say oil separation and bleeding have been a problem when storing grease at their plant, according to a recent survey at MachineryLubrication.com

Grease is made up of mostly oil. In fact, most greases are 70 percent oil or more. The ratio of oil to thickener is very important in the performance of the grease. Not only must grease stay in place, it must be able to get out of the way of moving parts and slump back into contact with them as they move. This careful balance is ensured by selecting the proper NLGI grade of grease for a given application. If the grease is too firm, it may not flow adequately in the space to which it is pumped.

There is also an effect called

"channeling" or "tunneling." This occurs when a grease loses its "slumpability" and no longer flows back into contact with the moving parts. A contributor to channeling is a change in the ratio of oil to thickener. If even a small amount of oil is allowed to bleed away from the grease, this changes the consistency and can increase the likelihood of channeling, starving the machine of the oil and additives it needs.

When oil stains appear on the packaging of grease cartridges or puddles near the area where they have been stored, there is a chance this grease will not behave as required, and the life of the machine may suffer. Therefore, you must recognize this as an unacceptable condition and remove such compromised cartridges from your grease supply. More importantly, you must find the source of this separation and oil loss, and change the conditions that led to it. Often, this is a training and awareness issue, as the grease has passed through many hands before it finally ends up in the machine. Some grease cartridge packaging includes labels and arrows to indicate "this end up," which can help, but reviewing the storage practices at the distributor, shipper, receiving dock and central lubricant storage area may be necessary to eliminate practices that can lead to drying out the grease supply.

Have the Bullets Fallen out of Your Gun?

When deer hunting with my family, my father always preached gun safety. This meant unloading the chamber when encountering obstacles, including climbing into a tree stand, to make sure the gun couldn't misfire. This also meant you had to remember to load a bullet back in after safely being in position. Unfortunately, for one member of my family, the click of the trigger pull was not enough to get that first deer. It might as well have been a flag coming out the end of the barrel that read "Pow."

Is it possible to load a grease gun but then not have the needed ammunition to complete the task? If the gun is not stored correctly, the same separation issues that can happen to a cartridge can take place after the grease is in the gun. Grease guns frequently end up at the bottom of a toolbox, lying on their sides. Not only is there a risk of damage to a device that can generate more than 10,000 pounds per square inch of pressure, but the conditions for leakage are created with the cartridge in this position. Although there is a lip seal against the inside of the cartridge, most guns are stored with spring pressure against the grease to feed it into the pumping mechanism. Separation occurs due to gravity and the spring pressure. The oil is then able to flow through the lip seal and to the end of the gun, where the rod exits the gun through a fairly large hole. Invariably, guns stored this way show evidence of this separation with puddles of oil in the toolbox drawer. Releasing the spring pressure reduces the separation but doesn't completely eliminate this effect.

Some companies have improved the storage of their grease guns by installing racks from which to hang them. However, these installations often get one key consideration wrong. If the head of the grease gun, where the pump is located, is facing up, then the hole in the housing is facing down, allowing separated oil to escape. It takes a bit of modification, but if the grease guns can be stored with the head facing down, this path of leakage is nearly eliminated.

How Long Will Oil and Additives Stay in Place within the Machine?

If you have protected the grease in storage with good practices for both the cartridges and the grease guns, and have managed to get the grease into the machine in good condition, your considerations for gravity are not quite over. Greasing frequency is a function of multiple factors, including aging and oxidation stressors, the rate of contaminants fighting to reach the bearing through the grease, and the vibration the grease experiences, which places additional shearing stress on the lubricant to separate the oil from the thickener. Gravity is another contributor to limiting the life of the grease, as it is a constant downward pull on the grease or the separated oil. If the grease is in a sizable housing with a solid floor, such as in a horizontal shaft arrangement, the grease and oil will be pulled to the bottom of the housing and be retained. If the shaft is not horizontal, this force piles up grease against a sealing surface and increases the opportunity and rate that the grease can exit under operating conditions. When calculating the "K" factors for grease relubrication frequency, shaft orientation is considered for this very reason. If gravity increases the rate of loss, the rate of replenishment must be stepped up to ensure there is always a supply of grease in the proper oil-to-thickener ratio to feed into the lubricated contacts.

Grease is often the answer to the effects of gravity. When you have machines that need their lubricant kept close, grease is the choice. Frequently starting and stopping machines are normally designed for grease to counter the effects that gravity can have on an oil lubricant, pulling it down into the housing or reservoir and away from the lubricated parts. Even though grease does a better job of staying in place, it is still in a constant battle with gravity as it tries to separate the lubricant's components. Your job is to give the grease a fighting chance. This will help to ensure a constant grease supply and extend the life of your grease-lubricated machines. ***ML***

"How long should you run a diesel generator before pulling an oil sample?"

As with any oil sampling procedures, it is recommended that the machine be currently running or recently shut down (less than 10-15 minutes), depending on how the sample is to be taken. Diesel generators are no different.

One of the most important times to take a sample on a diesel generator (or any machine) is during the first few hours of operation. The probability of failure is much higher at the onset of a machine's life due to the potential of infant mortality, which is a result of break-in wear and other possible but improbable faults during fabrication.

That said, soon after a diesel generator is initially run, a sample should be taken. At this time, and assuming fresh oil was just added, it is recommended that a sample be taken after the generator has been in operation for approximately one hour. This running time not only is early enough to provide the oil analyst an opportunity to catch any significant concerns before an issue worsens, but also long enough to anticipate potential break-in wear or other concerns present in the oil sample.

If the oil analysis is reported normal and without concern, then sampling intervals can increasingly be extended until a standardized sampling frequency is reached. This will be dependent on the operating conditions and manufacturer's recommendations. This frequency could be anywhere from a few weeks for continuously run, highly critical applications to up to a year for low critical applications with sporadic use. Environmental conditions will play a role in this decision as well.

For a used oil sample, the advice is nearly the same. Just be sure the sample has been taken when the generator is operating under normal conditions or immediately after it has been shut off while still at typical operating temperatures. In either case, the generator should have been running for at least an hour.

If the sample is taken from a sampling port, such as on the inlet of the filter housing, then sampling during running conditions is not a concern. If a sampling tube must be inserted near the machine's moving components, then you must sample soon after the generator has been shut off.

Try to have all the sampling equipment ready before shutting off the machine so you are able to pull the sample within 10 minutes of the machine being shut down. Remember, it is critical to obtain the sample in such a manner that it will be representative of the oil in the generator.

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

Oil Ring Tip

When using oil rings for lubrication in wet sump pumps and other equipment, you may notice that the rings are smooth on the internal diameter (ID). If you machine a groove 0.002 inches deep and 0.05 inches wide around the ID circumference, you may find that the ring will pick up more oil for delivery.

Did You Know?

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

Have Some Tips?

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

Why Timing Is Critical When Filling **Automatic Grease Systems**

Fill the grease reservoir in an automatic grease system only if it is 75 percent empty. Obviously, you never want the reservoir to run out of grease, because this can cavitate the pump and let air into the system. However, if you fill the reservoir too frequently, the grease in the top half never leaves the reservoir.

Grease reservoirs fill from the bottom because a follower plate above the grease pushes the lubricant into the pump cavity. Filling the reservoir too frequently keeps fresh grease in the bottom half of the reservoir while the older grease remains in the top half. The older grease travels up and down with the follower plate but never leaves the reservoir. Because grease is designed to release oil from the thickener when it is under pressure, the continual pressure from the spring above the follower plate can allow the stagnant grease to slowly bleed its oil over long periods. The stagnant grease then becomes stiffer as the oil-to-grease ratio is reduced.

Eventually, the stagnant grease becomes too stiff to pump through the system if the reservoir is allowed to become empty enough for this stiffer grease to enter the pump. Coloration differences in the grease reservoir are signs of this condition.

Annual cleaning of the grease reservoir will show you if this is happening and ensure that grease consistency is homogenous throughout the reservoir.

Advice for **Cleaning Sumps**

While cleaning out a sump that contains extreme-pressure gear oils, do not use any form of degreasers or detergents. These items will most likely cause foaming problems and reduce the overall characteristics of the gear oil properties.

For the best results, try using an alkaline cleaner that will effectively remove oily residues along with grit and dirt from the interior of the tank. This type of cleaner is recommended for general maintenance applications as well as coolant system cleanouts. ***ML***

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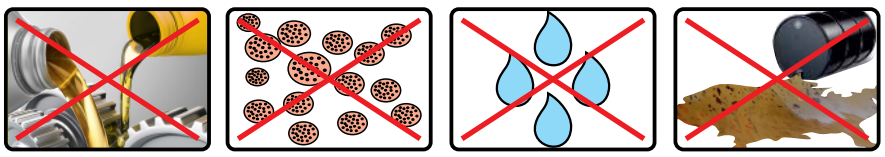

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OIL IN MACHINE IS LIKE BLOOD IN HUMAN BODY

Alejandro Meza | Noria Corporation

Causes of **Low Oil Pressure in Engines**

"When the pressure gauge detects low oil pressure, be aware that **it may be real or just an inaccurate reading.**"

Oil pressure is one of the most important parameters in an engine. When your vehicle's oil pressure light comes on or the pressure gauge reports a lower than normal reading, it could signal a major problem. Unfortunately, you won't know whether the issue is serious, so the best course of action is to simply turn off your engine. To help provide a better understanding of engine oil pressure, this article will explore the possible causes of low oil pressure and the most effective ways to remedy it.

Why Oil Pressure Is Important

An engine's lubrication system is essentially formed by the pump, oil filter, lubrication lines and hardware. The pressure in the system is generated by the resistance that the oil must overcome in the lines to reach the lubricated components. A pump is used to force lubricant through the system. When an engine is in the design stage, the pump is engineered to generate the required pressure and flow to allow the lubricant to circulate to the most remote component.

When the oil pressure is low, it indicates something is not working properly. It also means there likely is not enough lubricant moving through the system. Keep in mind that lubricant starvation will lead to metal-to-metal contact and machine failure. Depending on the severity of the situation, an engine can fail in a couple of hours or even a few minutes. The repair could also be costly, with most of the engine needing to be replaced.

Viscosity's Impact

Viscosity affects oil pressure. If you were to pour oil on an inclined surface, it would flow downhill due to the force of gravity. The higher the viscosity, the slower the lubricant will flow. Viscosity can be defined as resistance to flow. Lubricant viscosity varies with temperature, decreasing when the temperature rises and increasing when the temperature drops. Therefore, engine oil viscosity

will be dependent on the engine's ambient temperature during startup as well as its normal operating temperature.

There are two common ways to measure viscosity. The first involves allowing oil to flow through a capillary tube and recording the amount of time it takes to flow from one point to another. Viscosity can also be

measured by putting the lubricant in a calibrated cup and stirring it. The higher the viscosity, the more difficult it will be to stir. This resistance is calculated by a lab torquemeter. Tests are performed at precise temperatures for consistent results.

Most vehicle owners are familiar with the viscosity grades developed by SAE International, such as SAE 30, SAE 40, etc. These standards, which are based on the measurement systems described above, simplify the process of selecting the right lubricant for your engine. An SAE grade, such as SAE 40, has no single viscosity value. Instead, it denotes a viscosity range with a minimum and maximum limit. Lubricant manufacturers have the freedom to formulate their lubricants within the accepted viscosity range for a specific grade. SAE grades that contain a "W" refer to lubricant viscosity and pumpability at low starting temperatures. Lubricants without the "W" designation may be too thick during winter temperatures.

Reasons for Low Oil Pressure

The oil pressure in an engine can be low for a number of reasons. When the pressure gauge detects low oil pressure, be aware that it may be real or just an inaccurate reading. In any case, it helps to understand some of the most common causes.

Not Enough Oil in the Engine

Even if the correct amount of lubricant has been added during an oil change, the oil may be unduly consumed due to evaporation, burning caused by worn piston rings, and leaks through the seals or oil plug. Oil consumption increases as the engine ages, so checking the oil level and topping up may be a simple solution. However, if leaks are evident outside the engine or there are oil drops on the floor, the leaking component should be fixed as soon as possible.

When an engine is old, it will burn more oil. When the engine consumes a quart of oil every 1,000-2,000 miles, an overhaul is needed. If the oil change interval is over-extended, the oil level could be quite low, even if the engine is not very old. Therefore, follow proper oil change intervals and check the oil level periodically.

Too High or Low Viscosity

When oil viscosity is too low or high, it may be detected as a loss of pressure in the oil supply to the engine. Low viscosity generates less resistance to flow through the system, which is translated as lower pressure by the pressure gauge or sensor. Viscosity that is too high may produce greater resistance from the oil being pumped, leading to a lack of lubrication in the system and consequently lower pressure.

In an engine, oil viscosity is influenced by the original lubricant viscosity selected, the operating temperatures, the breakdown of viscosity index improver additives and the presence of contaminants such as glycol and soot. The engine or car manual should specify the recommended viscosity grades according to the equipment's design and the ambient temperatures where the vehicle will be operating.

A higher viscosity selection may be a concern, particularly for engine startups in cold weather. In extreme low temperatures, not only must you choose the right lubricant viscosity, but you may also need to use an oil heating system. Low viscosity can be the result of a variety of factors, such as fuel dilution, incorrect lubricant viscosity selection, or excessive temperatures due to overloading or a cooling system failure.

Apparent Low Pressure

In diesel engines, the pressure gauge typically reports real-time pressure in pounds per square inch or bars. Some lubricant manufacturers produce lubricants with a lower viscosity that is still within the range of the SAE grade. A lower viscosity offers better fluidity through lubrication systems but may result in lower pressure in the pressure gauge. If the pressure is within the normal range, there is no cause for concern. You may find that some lubricants produce higher pressures than others.

Engine Wear

If the oil level on the dipstick is between "add" and "full," a possible cause of low pressure would be worn engine bearings, especially if the engine has very high mileage. Excessive wear reduces the original flow restriction, which consequently drops the pressure. If this is the case, the engine likely will need to be rebuilt or replaced.

Defective Oil Pressure Gauge

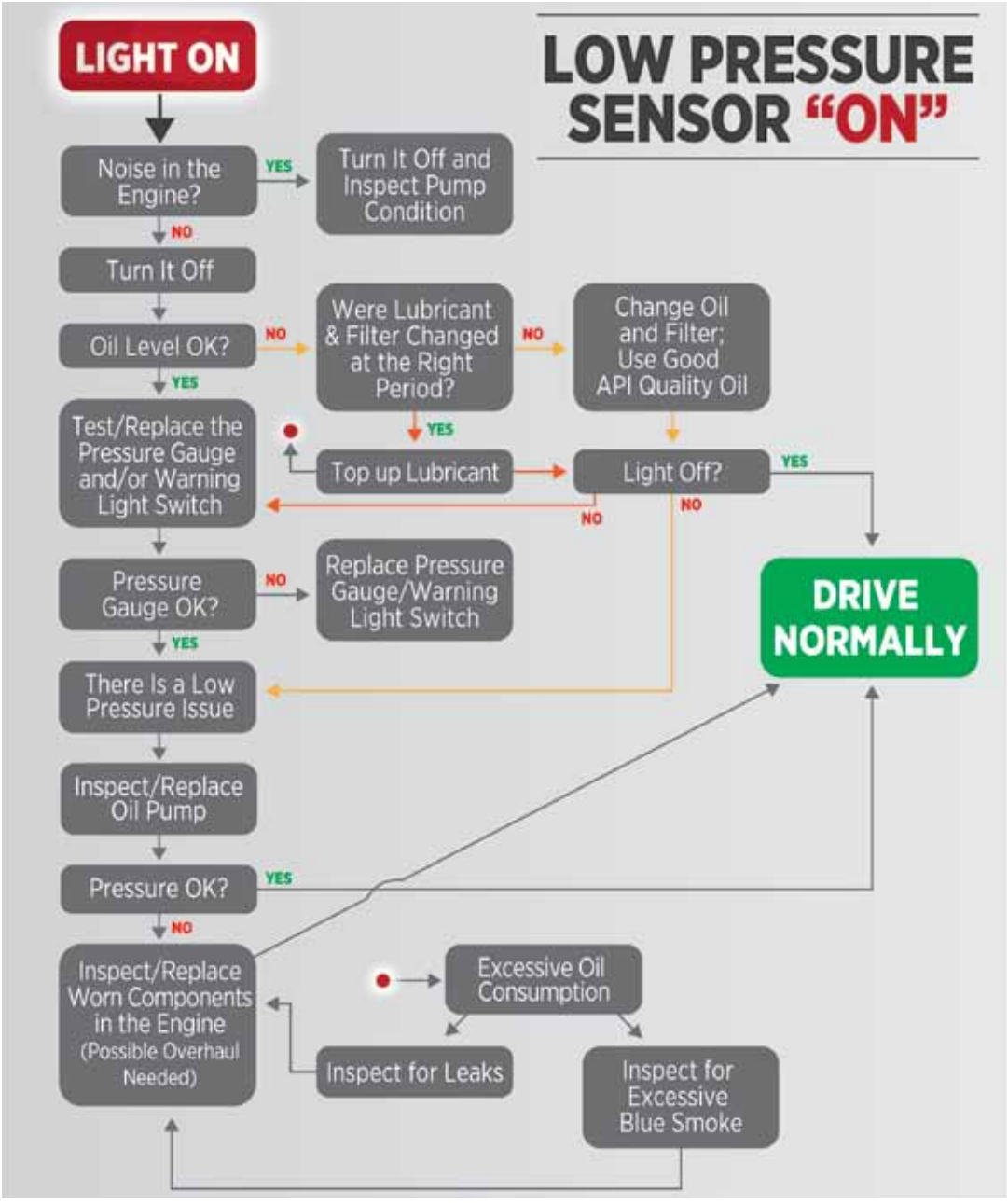
If the oil pressure warning light has come on but you have confirmed that the oil level is correct and the engine is running normally with no unusual noises or high temperatures, the problem may be a defective sensing unit. You may wish to have the oil pressure tested with a gauge. If the pressure is normal, simply replace the oil pressure sensor. However, if the warning light or low gauge reading continues after replacing the sensor, the problem is likely a bad oil pump.

Pump Wear

If the oil level on the dipstick is between "add" and "full" but the engine is running noisily, the oil pump may be worn. A worn pump is unable to generate the necessary pressure due to internal leaks. Stop the engine until the issue can be fixed. A pump replacement will be needed.

Plugged Filter

In a lubrication system, the pressure gauge is installed after the filter. If the filter becomes clogged with contaminants and the bypass valve does not operate correctly, it may lead to lubricant starvation. A clogged filter is often the result of an overextended oil. It may also be caused by water and/or soot contamination. Water typically comes from a cooling system leak,



50%

of lubrication professionals say low oil pressure has caused problems in their engines, based on a recent survey at MachineryLubrication.com

while excessive soot may be the result of poor combustion. If the bypass valve is not working properly, a defective filter may be to blame.

Above is a flow chart detailing the inspections and corresponding actions for low oil pressure in an engine.

Reducing the Risk of Low Oil Pressure

To reduce the risk of low oil pressure in your engine, change the oil and filter at the correct intervals. Also, use high-quality lubricants, including the right viscosity grade and appropriate quality standard specified by the American Petroleum Institute (API) in the engine/car manual. Be sure to check the oil level periodically and inspect your engine (and garage floor) for leaks. In addition, watch for blue smoke emitting from the exhaust, particularly with high-mileage engines. Do not drive your car if the pressure sensor is on and you don't know what the problem is. For fleets, employing oil analysis to determine the condition of the oil and machinery will be the best predictive/proactive strategy. ***ML***

About the Author

Alejandro Meza is a senior technical consultant with Noria Corporation. He has more than 20 years of experience in the lubricant industry, technical services, quality assurance, training, consulting and development in the United States, Brazil, Mexico and the Americas region. Contact Alejandro at ameza@noria.com.

Honda Motorcycle & Scooter India and Bharat Petroleum Corp Ltd. launched 'MAK Honda Power' Engine Oil

Honda Motorcycle & Scooter India Pvt. Ltd. recently announced the launch of exclusive co-branded 'MAK Honda Power' Engine Oil in association with MAK Lubricants (Bharat Petroleum Corporation Ltd.). Branded as 'MAK Honda Power', tested & recommended by Honda Motor Co. Ltd. Japan, the engine oil is specially formulated for Honda 2Wheelers vehicles. The oil is launched in two grades: 'MAK Honda Power 10W30 MA' for Honda motorcycles and 'MAK Honda Power 10W30 MB' for Honda scooters. The co-branded oil will be available in the open-market from November 2018.

Pradeep Kumar Pandey, Senior Vice President – Customer Service, HMSI said, *"With the aim of providing quality products & services to our customers, we have joined hands with MAK Lubricants (BPCL) to launch a new product 'MAK Honda Power' engine oil specially developed & recommended by Honda Motor Co. Ltd Japan for Honda 2Wheelers engines."* According to company, the engine oil ensures quick start, rapid acceleration, fuel efficiency benefit and is protects engine. It also keeps the engine components clean and free from deposits, and comes with lower maintenance cost.

V Anand, Executive Director – Lubes, Bharat Petroleum said, *"New co-branded product offering will be made available across country through BPCL extensive distribution network of Retail outlets and Bazaar channel partners".*

MAK Lubricants from Bharat Petroleum Corporation Ltd. is one of leading channels in terms of Engine Oil Brand, Distribution & Marketing. Working with Honda R&D, the product is a result of a long trusted association. Noteworthy, the growth of lubricants is driven by the growth of two-wheeler demand in the market.

BECHEM clinches the top slot at All India Lubrication Seminar

Mr. Kanchan Ramachandra Chatterjee, Business Manager, Heavy Engineering, Bechem India was adjudged the best presenter at the All India tech seminar on lubricants. His presentation on 'anti friction coatings and its application for steel industry' highlighted the key benefits of coatings and the propositions for the rapid rate of adoption of AFC in the automotive industry. Elaborating on global AFC trends with examples of trials being conducted at steel plants at the sections of Caster and Hot Strip Mill, the presentation made a strong case for early adoption of the technology in the Indian scenario. The second and third spot was shared by **Mr. Ronald Knecht, Quaker Lubricants** and **Mr. Nithin M, Hydac India** for their paper presentations on 'Fire resisting lubricants' and 'Condition monitoring of lubricants' respectively.

BASE OIL REPORT

India ll imports in October rose 14.1 percent from a year earlier to 4.7 million barrels per day (bpd) with shipments from Africa more than doubling to 874,000 bpd. The reason behind this rise is due to higher fuel demand in the festival season and as industrial activity picks up after four months of monsoon rains. Resumption of operations at some refinery units after maintenance turnaround also pushed up India's oil imports in October. A narrowing price differential between Brent and Dubai linked grades and uncertainties over Iranian supplies were another reason that spurred the purchase of African grades. The narrowing of the price spread between the two benchmarks opens the arbitrage for Atlantic Basin crude grades to Asia, while making Dubai-linked grades more expensive for Asian buyers.

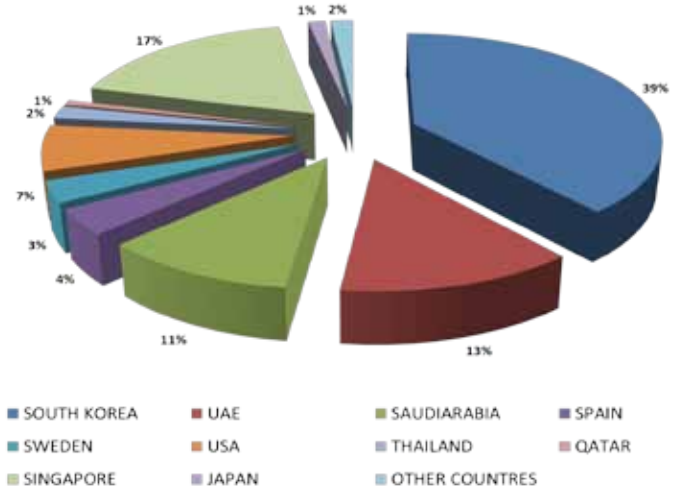
India import has gone up by 9% in September 2018, as compared to same period last year i.e. September 2017. The Indian base oil market remains steady with inventories at optimum levels with surplus of imported grades. During the month of September 2018, approximately 224963 MT have been procured at Indian Ports of all the grades. Compared to last month i.e. August 2018, import of the country has decreased by 16% in the month of September 2018. Major imports are from Korea, Singapore, USA, UAE, Iran, Taiwan, France, UK, Netherlands, Japan, Italy, Belgium, etc. Indian State Oil PSU's IOC/HPCL/BPCL has changed their base oil numbers as reflected in the price chart effective November 01, 2018.

In the month of September 2018, India imported 66436 MT of Base Oil, India imported the huge quantum in small shipments on different ports like 109548 MT (49%) into Mumbai, 31067 MT (14%) into Chennai, 23012 MT (10%) into JNPT, 17195 MT (8%) into Kolkata, 14869 MT (7%) into Hazira, 13008 MT (6%) into Pipavav, 11950 MT (2%) into Kandla, 3457 MT (2%) into Mundra and 857 MT into Other Ports.

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

Month wise input of Base Oil in India

Origin wise Base Oil input to India, Country and %- September 2018



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

Month	Group I - SN 500 Iran Origin Base Oil CFR India Prices	Group II -N-250 Korea Origin Base Oil CFR India Prices	N- 70 South Korea Origin Base Oil CFR India Prices	Rubber Process Oil Drums Iran Origin CFR India Prices (Aromatic Extract)
September 2018	USD 835 – 845 PMT	USD 810 – 820 PMT	USD 770 - 780 PMT	USD 420 – 430 PMT
October 2018	USD 830 – 840 PMT	USD 805 – 815 PMT	USD 765 - 775 PMT	USD 420 - 430 PMT
November 2018	USD 810 – 820 PMT	USD 785 - 795 PMT	USD 745 - 755 PMT	USD 415 - 425 PMT
	Since September 2018, prices have gone down by USD 25 PMT (3%) in November 2018.	Since September 2018, prices have gone down by USD 35 PMT (5%) in November 2018.	Since September 2018, prices have gone down by USD 25 PMT (3%) in November 2018.	Since September 2018, prices have decrease by USD 5 PMT (1%) in November 2018.

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