November-December 2025

Machinery Lubrication

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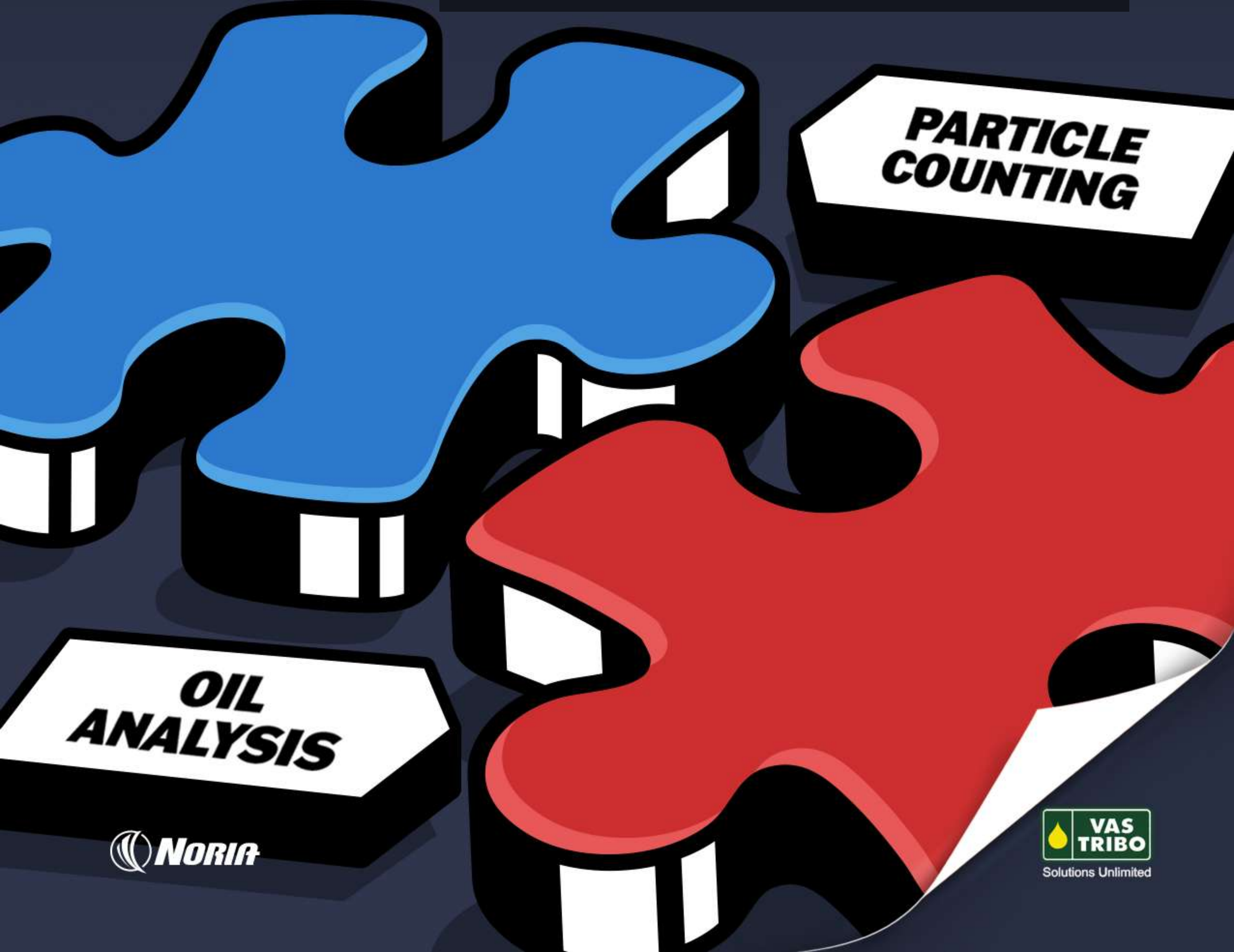
Unlocking the Power of Oil Analysis & Particle Counting



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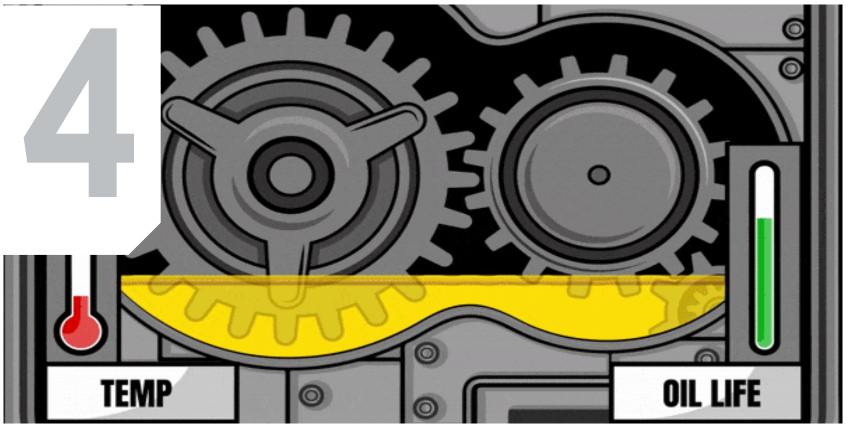
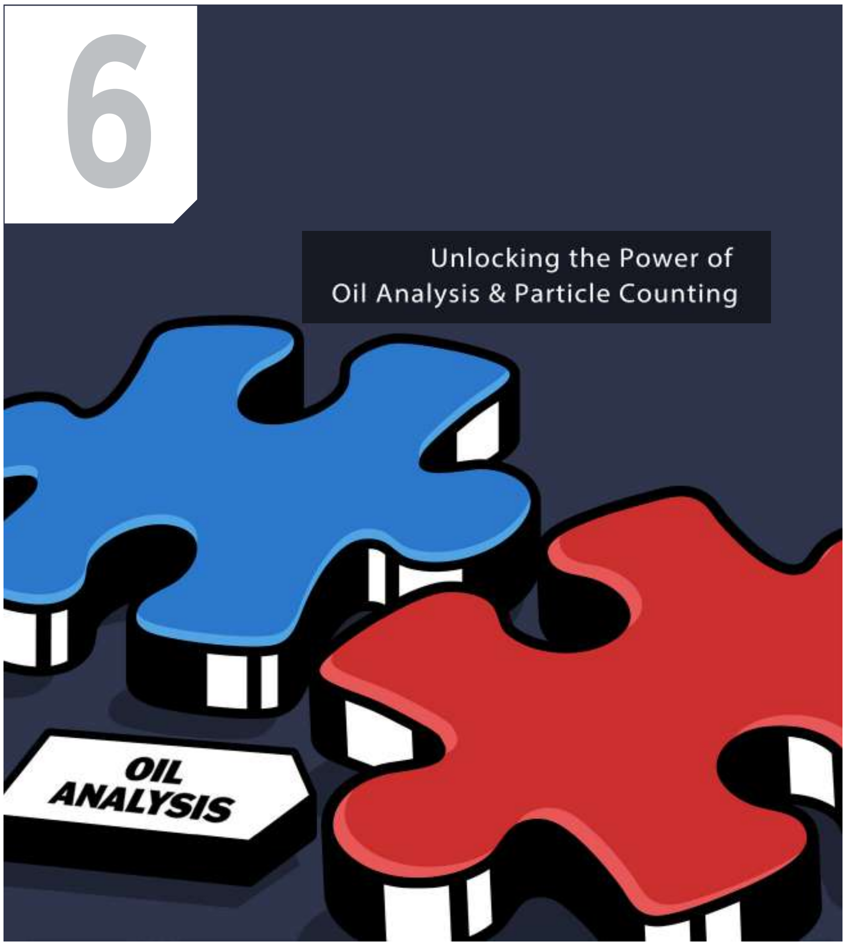


COVER STORY



From the Asian Desk

EDITORIAL FEATURES

FROM THE DESK

Publisher's Note

The nation is still buzzing with the excitement of the Indian Women's Cricket Team's historic maiden World Cup victory. That triumph wasn't born from luck; it was forged through relentless, data-driven preparation, precision execution, and a strict focus on performance measurement. This mentality mirrors our national industrial ambition: with the Index of Industrial Production (IIP) showing robust growth, our manufacturing sector demands the same analytical rigor. We must eliminate outdated practices that threaten this success, chief among them, the costly epidemic of Blind Lubrication.

For too long, maintenance teams have adhered to an outdated relic: the calendar. Like relying on old superstitions instead of coaching analytics, we track the expiry date of the oil, but we tragically ignore the actual condition of the fluid protecting the machine. Relying on time, not data, guarantees that lubricated component failure will remain the largest single root cause of unscheduled downtime. This failure is actively sabotaging the national production goals we are currently chasing. The core reality is that industrial assets rarely fail due to the oil wearing out chemically; they fail because the oil becomes a transport mechanism for contamination. We allow particles—ingressed dust, wear debris, and oxidation byproducts—to circulate freely. These contaminants act as an aggressive, circulating sandpaper, relentlessly accelerating wear. Operating without data is simply gambling with profitability.

The only effective countermeasure to Blind Lubrication is the disciplined adoption of Condition-Based Lubrication (CBL). The foundation of this shift lies in one simple, actionable metric: the Particle Count. Particle counting, standardized through the ISO Cleanliness Code, is the machine's most direct early warning system. It is the quantitative indicator of contamination risk and incipient failure, instantly converting lubrication from a guessing game into a quantifiable science. By trending this data, reliability teams can answer the three vital questions that calendar maintenance never can: Validation (Is my filtration working?); Intervention (When is the system actually at risk?); and Root Cause (Where is the contamination coming from?).

This powerful methodology for mastering fluid analysis to achieve operational excellence is the central theme of our current cover story. The article provides the essential framework—the practical "how-to"—to move beyond the calendar myth and implement a profitable, reliable condition-based program. Oil analysis gives your machine a voice; particle counting provides the vocabulary. It is a professional imperative to stop accepting the cost of operating in the dark. Respond to your machines before they go silent, and secure India's global manufacturing future with reliability, not risk.

We continue to receive invaluable feedback on the content, especially on 'From the Asian Desk', proving the immense value of locally grounded knowledge. Thank you. Your insights, rooted in regional realities, provide a depth that theoretical global models often lack. Keep the stories coming; every lesson that validates the power of data over dates reinforces the resilience of this community. At Machinery Lubrication India, we are cultivating a shared expertise. We invite you to stay actively involved. Pose difficult questions. Challenge the status quo of time-based maintenance. Share your successful ISO Codes and your strategies for reducing particle ingress. Because when you share, the collective knowledge base grows exponentially.

Let's keep assets performing optimally. Let's keep budgets focused on proactive gains. Let's keep wear and tear from defining our schedules.

There's too much efficiency to be gained by embracing data. Too many hard-won lessons are wasted if we don't speak up and share them.

We advance together.

Warm regards,
Udey Dhir

HOW HEAT AFFECTS LUBRICANTS: UNDERSTANDING THE ARRHENIUS RATE RULE

Is it true that a lubricant's life is cut in half for every 10 degrees C (18 degrees F) increase in operating temperature? Yes, this is generally true and is based on a well-established scientific principle known as the Arrhenius Rate Rule.

The Arrhenius Rate Rule Explained

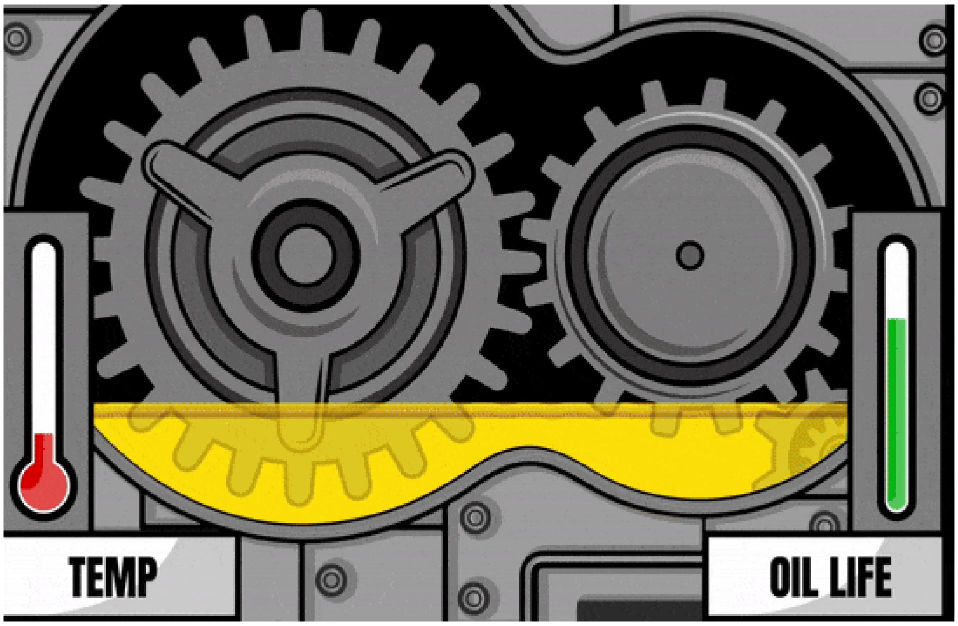
The Arrhenius Rate Rule, named after the 19th-century Swedish chemist Svante Arrhenius, explains the relationship between temperature and the rate at which chemical reactions occur. The rule is pivotal in various fields, including lubrication, which helps predict and manage lubricant degradation.

$$k = A \cdot e^{\frac{-E_a}{RT}}$$

The Arrhenius equation is as follows:

Where:

- **k** is the rate constant of the reaction,
- **A** is the pre-exponential factor,
- **E** is Euler's number
- **Ea** is the activation energy of the reaction,
- **R** is the universal gas constant,



- **T** is the absolute temperature (in Kelvin).

In practical terms, this equation tells us that the rate of chemical reactions, including those that lead to lubricant degradation, increases exponentially with an increase in temperature. Specifically, for every 10°C (18°F) increase in temperature, the rate of lubricant oxidation doubles, cutting the lubricant's life in half.

Why Temperature Matters

Lubricants are essential for reducing friction, wear, and heat generation in mechanical systems. However, they are not immune to degradation. High operating temperatures accelerate the degradation process, particularly through oxidation, the chemical reaction that most commonly depletes additives and degrades base oils.

This is why temperature control is crucial in high-temperature applications such as engines or compressors. By monitoring and controlling operating temperatures, you can significantly extend the life of your lubricants and, consequently, your machinery.

Consequences of High Temperature on Lubricants

When lubricants degrade due to high temperatures, several problems can arise:

- **Additive and Base Oil Decomposition:** Heat accelerates the breakdown of the lubricant's additives and base oil, reducing its effectiveness.
- **Increased Oxidation Rate:** High temperatures double the oxidation rate, leading to a quicker buildup of harmful byproducts like carboxylic acids, sludge, and varnish.
- **Filter and Seal Life Reduction:** Hot oil can shorten the lifespan of filters and seals, leading to more frequent maintenance needs.
- **Bleeding of Grease:** Warmer temperatures can exacerbate issues with microbial contaminants and cause grease to separate faster.

Applying the Arrhenius Rate Rule to Maintenance

Understanding the Arrhenius Rate Rule allows maintenance teams to address lubrication issues proactively. For example, by analyzing machinery's current operating temperatures and comparing them to historical data, maintenance schedules can be adjusted to account for accelerated lubricant degradation. This predictive approach can prevent unexpected machinery failures and optimize maintenance intervals.

Practical Example: Industrial Gearboxes

Consider an industrial gearbox operating at 69°C (156°F). If historical data shows that the lubricant needs replacement every two years, an increase in the average operating temperature to 79°C would mean that the lubricant should now be replaced annually. Based on the Arrhenius Rate Rule, this prediction can also justify the need for improved cooling measures to maintain optimal operation and reduce maintenance costs.

Temperature is Just One Factor

While the Arrhenius Rate Rule provides valuable insights into temperature-dependent reactions, it's essential to remember that other factors, such as contaminants, mechanical stress, and the quality of the lubricant, influence lubricant degradation. Each of these factors can complicate the application of the Arrhenius Rate Rule in real-world scenarios.

However, understanding the fundamental principles behind this rule allows you to make more informed decisions regarding lubricant selection, machinery maintenance, and overall operational efficiency.

Conclusion

In the field of lubrication, temperature is a critical factor that can significantly impact lubricant life and machinery reliability. The Arrhenius Rate Rule offers a scientific basis for understanding and predicting lubricant degradation, enabling proactive measures that extend the life of your lubricants and machinery. Keeping your lubricants cool, clean, and dry can enhance equipment reliability and reduce maintenance costs.

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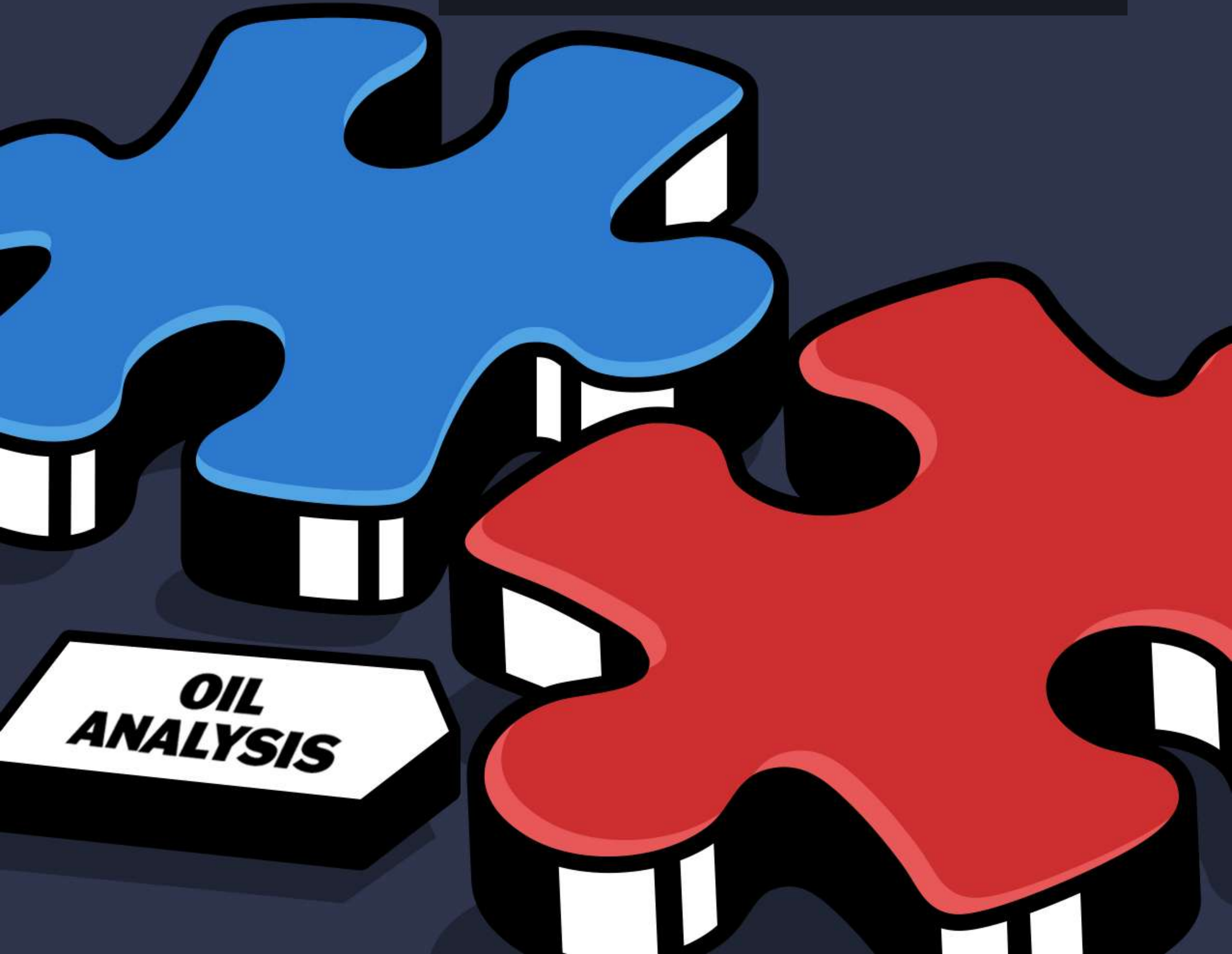
Unlocking the Power of Oil Analysis & Particle Counting



Lubrication practices ensure peak performance and longevity in machinery maintenance. However, relying solely on the correct application of lubricants is not enough to guarantee that machines will run smoothly.

As equipment becomes more sophisticated and demands on productivity increase, industry professionals are turning to oil analysis and particle counting as indispensable tools for predictive maintenance and reliability strategies.

Oil analysis and particle counting are like windows into the health of your machinery, providing crucial insights that help maintenance teams make informed decisions before a problem arises. In this article, we'll explore the importance of these tools, how they work, and how they can be leveraged to maximize machine reliability and reduce downtime in any industrial setting.

The Role of Oil Analysis in Predictive Maintenance

Oil is the lifeblood of your machinery, and analyzing its condition allows you to assess how well it's performing its role in lubrication, cooling, and contaminant control. By regularly performing oil analysis, maintenance teams can monitor the chemical and physical properties of the lubricant, identify potential wear metals, and detect contaminants like water, dirt, or fuel that could compromise machinery performance.

Oil analysis provides key tests, including viscosity measurement, total acid number (TAN), and total base number (TBN). These tests help determine whether the lubricant is still effective or has degraded to the point of needing replacement. Detecting degradation early prevents the costly damage that can result from operating with substandard lubricants.

Particle Counting: A Deeper Look at Contamination

While oil analysis gives a broad picture of lubricant health, particle counting digs deeper, offering a granular view of contamination within the oil. Understanding the number, size, and types of particles present is crucial to diagnosing wear and tear, as well as external contamination sources.

Particle counting uses techniques like laser optical particle counters or pore block particle counters to count and classify debris particles suspended in the oil. The size distribution of particles, particularly wear particles, tells a story of what's happening inside the machine. For example, a sudden increase in large metallic particles could indicate component wear, signaling immediate attention is needed before catastrophic failure occurs.

Oil cleanliness, measured in standards such as ISO 4406 or NAS 1638, directly correlates to machinery longevity. High particle counts can accelerate wear on moving parts, reducing the lifespan of components like bearings, gears, and pumps. Through particle counting, maintenance teams can establish baseline cleanliness levels and set cleanliness targets for each machine,ensuring that lubrication systems remain uncontaminated and fully operational.

The Benefits of Combining Oil Analysis and Particle Counting

While each of these tools is powerful on its own, using oil analysis and particle counting together can dramatically increase the effectiveness of a maintenance strategy. Oil analysis provides context on the overall health of the lubricant, while particle counting pinpoints potential sources of contamination or wear. Together, they form a comprehensive diagnostic approach that empowers maintenance teams to take preemptive actions before failures occur.

For example, a high TAN reading from oil analysis might indicate the formation of acids in the lubricant, signaling potential corrosion issues. Particle counting could then confirm if metallic particles are present, showing that the acid is attacking key components. By catching these early warning signs, operators can change out the oil and flush the system before serious damage takes place.

Moreover, the data gathered from oil analysis and particle counting allows for fine-tuning maintenance schedules. Maintenance can be performed based on actual equipment conditions rather than adhering to a rigid maintenance plan based on calendar dates or machine hours. This extends the machinery's life and minimizes unnecessary maintenance tasks, reducing labor and material costs.

Practical Implementation: Building a Routine

Incorporating oil analysis and particle counting into your maintenance routine doesn't need to be overly complex. Many companies already have these systems in place, and for those that don't, getting started is as simple as identifying the right equipment and training your staff on data interpretation.

Set Baselines: Establish acceptable oil cleanliness and performance levels for each piece of machinery. This provides a reference point for all future measurements.

Sample Regularly: Develop a regular sampling schedule, factoring in the criticality of each machine and the operating environment. More critical machines may require frequent testing, while less essential ones might only need periodic monitoring.

Analyze the Data: Review the oil analysis and particle counting results together to gain a complete picture of lubricant health and machine wear. Use trend analysis to spot gradual changes before they lead to problems.

Take Action: Act promptly when oil analysis or particle counting reveals abnormal results. This could involve flushing the system, replacing the oil, or investigating the source of contamination or wear.

Refine Over Time: As your team gathers more data, you can continually refine your maintenance approach. The more historical data you have, the better you can predict future issues and optimize maintenance schedules.

A Competitive Edge in Reliability

As industries continue to adopt more advanced machinery, the importance of oil analysis and particle counting will only increase. With tight production schedules and stringent quality demands, minimizing equipment downtime and extending machinery life are paramount to staying competitive. Oil analysis and particle counting provide a solid foundation for a robust reliability program, helping businesses maintain operational efficiency while reducing overall maintenance costs.

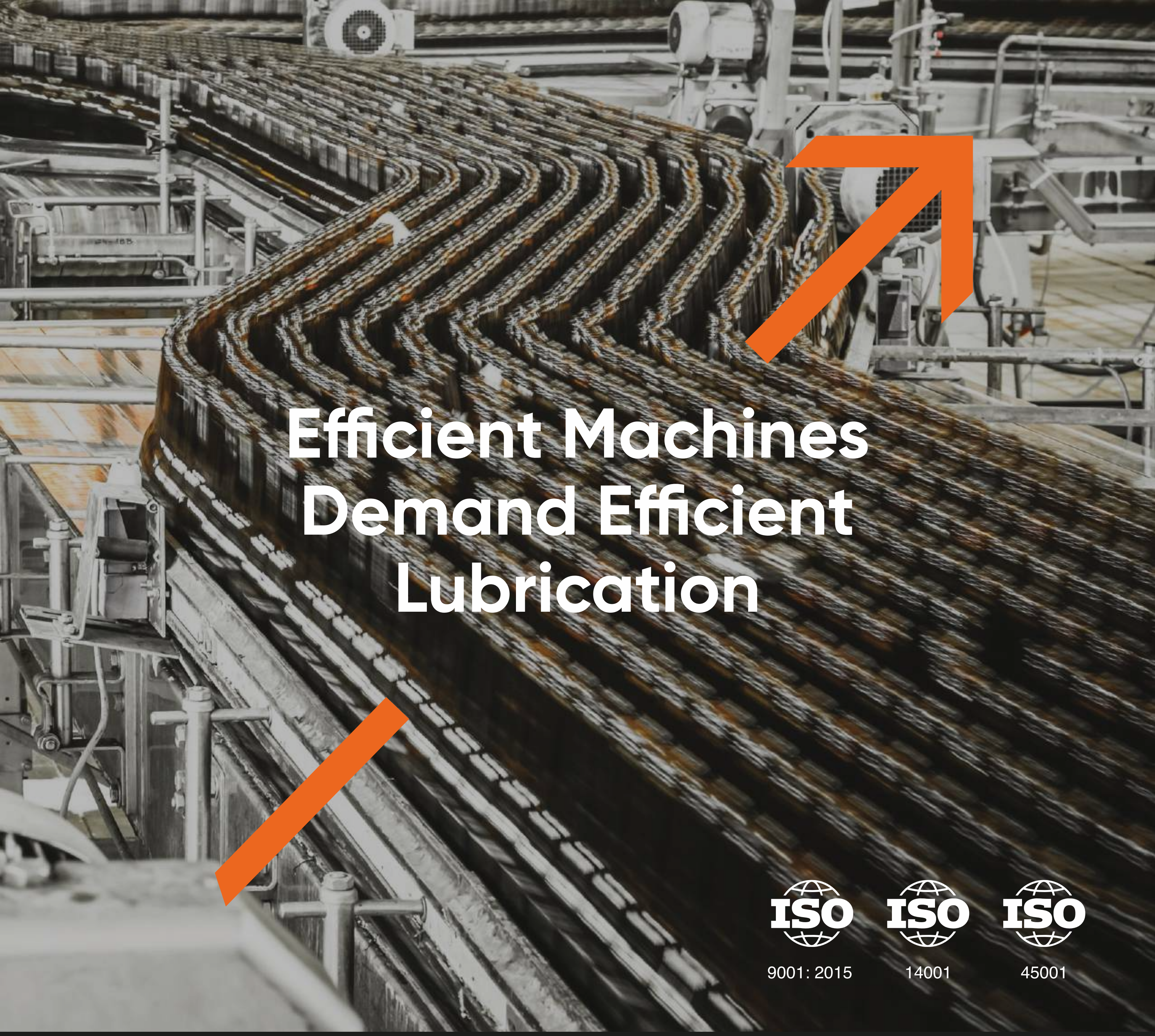
Companies that embrace these technologies are better positioned to catch small issues before they escalate into costly repairs, ensuring maximum uptime and extending the lifespan of critical machinery. By proactively managing machine health, you protect your assets and create a safer, more efficient work environment for your team.

Conclusion

Oil analysis and particle counting offer invaluable insights into the health of your lubricant and machinery. By integrating these practices into your regular maintenance routine, you can prevent costly downtime, extend the life of your equipment, and improve overall productivity.

As technology advances and maintenance practices evolve, oil analysis and particle counting will remain indispensable tools for professionals in the machinery lubrication industry.

With the right approach, you can transform your lubrication practices from reactive to predictive, ultimately boosting your operation's reliability and success.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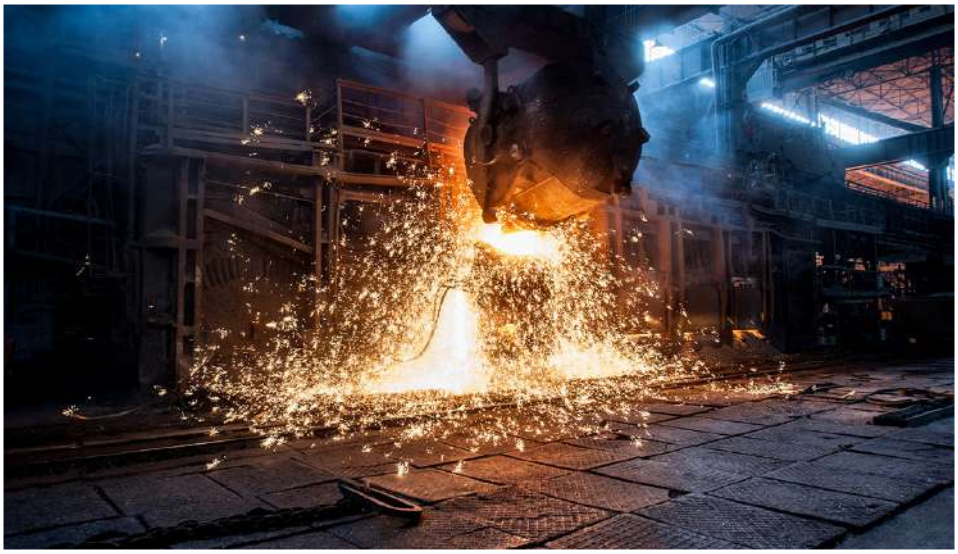
CONTAMINATION REALIZATION: A CASE EXAMPLE AT A STEEL MILL

Condition monitoring, contamination control, lubrication excellence, and machine reliability are keywords that are often overused and misunderstood. These words are far more relevant and encompassing in today's business context, but only a handful of organizations globally are able to implement these concepts simultaneously and successfully while maintaining sustainability.

This process isn't always easy, but organizations can achieve this through intense, thoughtful effort and collective teamwork, and the resulting successes and benefits are widely documented.

For example, let's examine a case study with J.R. Simplot, a private food processing and agricultural company that owns and operates one of the largest high-grade phosphate mines in the Western United States.

A large fleet, including haul trucks, was needed to maintain the demanding mining operation schedule. On average, each engine had to be rebuilt every 15,000 operating hours, costing up to $160,000 per engine rebuild. This consumed nearly 70% of the company's total maintenance budget.



The team recognized that poor lubrication practices and human error were the primary root causes of their engine failures, and they decided to make a change.

By prioritizing proper lubrication management standards and practices, the team increased the average operating hours between engine rebuilds by 37% to over 18,000 hours, leading to an annualized cost reduction of over $15,000. The team is currently working to increase the meantime between rebuilds to nearly 25,000 hours.

However, despite documented success case studies like this one, it has been observed that a new thought pattern is emerging.

Now, it seems that many organizations and leaders are more invested in talking about and promoting extending component life and practicing asset management and proactive maintenance on different platforms than implementing the needed changes.

This mindset of over-confidence in the principles without the action to support it can lead to a modern-day "counting your chickens before they hatch" scenario, meaning that mistakes are more likely to occur, risking the future of a plant transforming into a world-class facility.

The Steel Mill's Shocking State

A few years ago, I had the opportunity to visit an older steel and wire rod mill in India to explore potential business opportunities.

My colleague and I visited the site on a typical day and stayed throughout the workday. Because of the mill's location in India, it's important to note that we were met with an extremely hot, humid, and dusty environment. We walked around the facility, interacted with managers, supervisors, and technicians, and collected a few oil samples using proper sampling hardware accessories and sampling bottles.

What we discovered was a vastly different situation than we were expecting. We found:

1. Improper oil barrel storage
2. Thick layers of dirt on the body of barrels
3. Insufficient quantity, undersized, exhausted desiccant breathers
4. No maintenance tags
5. Oil storage, handling, and dispensing was done in an open atmosphere using hand pump sand small cans
6. Dirt was observed everywhere– floors, hydraulic oil tanks, breathers, parts storage area
7. No housekeeping process in place

Moreover, despite our repeated requests, the mill failed to provide any past data. This reluctance to share data may have been due to:

1. A lack of data
2. A lack of generating consent or accurate data
3. A data collection process simply did not exist

This historical data would be crucial for analyzing and understanding the fluid cleanliness level the machines were operating with and how they got to this state. Additionally, they would be needed to help guide future strategies and action plans for remediation.

Collecting, Testing, and Analyzing the Samples

The oil samples we collected were tested and analyzed that following day at our own lab. The tests we performed included:

1. Microscopic patch with 50X magnification
2. Particle count with standard laser particle counter
3. Wear metal analysis using Inductively Coupled Plasma (ICP) Spectroscopy

The patches were prepared using a manual microscope, and the particle count tests were performed using proper procedures inside the lab. Although not considered crucial in this scenario, the wear metal analysis was performed to understand the metal debris in the oil samples. The test revealed that while there were additive metals, such as zinc, calcium, and phosphorus, we did not find excessive metal content.

A Closer Look at the Lubrication Systems

In addition, when observing the mill's industrial lubrication system, we found that the delivery lines were equipped with 25-micron and 10-micron absolute filters, and there were no return lines. In the hydraulic systems, the delivery line was fitted with a 5-micron absolute filter and the return line with a 10-micron absolute filter.

When looking at the refill tanks and lubrication systems, we discovered the mill still utilized the NAS system standards, which have largely been phased out of every industry in favor of ISO standards. Despite becoming obsolete, the NAS system should have still been able to maintain some level of cleanliness.

However, when we consulted the particle count data, it confirmed our suspicions – the oils were extremely dirty and contaminated.

Several of the hydraulic systems operated with NAS 6 cleanliness (ISO equivalent of 17/15/12), and others operated with NAS 9 (ISO equivalent of 20/18/15) and even NAS 12 (ISO equivalent of 23/21/18).

The mill's industrial lube oils also contained a high moisture content—about 2,000 parts per million (ppm), whereas the industry standard maximum is 200 ppm.

This information allowed us to draw the conclusion that most of their contamination issues were occurring because of human error and improper practices during lubrication storage and handling.

Conversations Come to a Close

With our tests and analysis complete, we sat down with the mill's senior management team to review our data and findings. During this meeting, the management team revealed what their internal cleanliness requirements were:

- Hydraulic system oil cleanliness level should be less than or equal to NAS 3 (ISO equivalent of 14/12/9)
- Moisture content in industrial lubrication oil should be less than or equal to 200 ppm

This was absolutely shocking. When presented with our findings showing the severe discrepancies between facility cleanliness expectations and reality, the mill's management team declined to offer any explanations and refused to discuss the matter further before abruptly ending the meeting.

Needless to say, all of our enthusiasm and initial activities related to discovering a business opportunity and creating a commercial proposal were quickly discarded.

While we may not be well-versed in every industry's processes, one thing remains constant –contamination can affect every facility if proper precautions aren't taken, and an understanding of principles doesn't correlate to proper application. Confidence in knowing what the principles are without appropriate effort and action leads to an increased risk of human error, jeopardizing the plant's ability to transform into a world-class facility.

Reflection

After careful reflection of my experience, these were several reasons why it becomes increasingly difficult to pursue a business relationship with this steel mill:

- Proper cooperation and communication from mill leadership was missing from the beginning.
- An aggressive approach toward proactive maintenance was not observed.
- Neither the mill's team members nor machinery was prepared or equipped to achieve an appropriate cleanliness standard.
- All lubrication activities were performed in an open and dirty environment.
- There was no process in place for properly handling, storing, and dispensing oils.
- A contradictory approach towards standards – they set stringent requirements but implemented extremely poor practices.
- Mill leadership was aware of the need to remove contaminants from the systems, but remained oblivious to the various procedures and techniques required to prevent contaminants from invading the systems.
    - Oil filters were left unprotected.
    - Fluid-carrying hoses and tubes were left open.
    - No processes existed to adequately clean and cover hoses.
- The mill's current filtration system was barely sufficient to bring down the NAS value from NAS 9 to the desired level of NAS 3, even if proper procedures were being followed.
- Incorrect oil filter size selection at multiple locations.
- There was no process for regularly monitoring or collecting data on the cleanliness of all oil samples in the facility.

While these reasons may make further business involvement difficult, this steel mill is unknowingly starving for a change catalyst. It could take just one individual with the right change management approach to trigger a series of positive events. This is about culture, and it starts with leadership.

To change the collective mindset of those currently unmotivated to recognize the opportunity, they need to discover "what's in it for them." We are creatures of habit, and we only change if there is a compelling reason. Until then, the status quo will persist, and the steel mill and the people within will suffer from unscheduled downtime and lost opportunities.

Looking Forward

I remember in the early 2000s, my lab was processing, testing, and analyzing an average of 100 samples per month. Today, this same lab is working through nearly 5,000 samples every month, with team members working in two shifts to complete the workload. This example creates a silver lining amid deplorable conditions, such as with the steel mill I visited.

In the future, training must be at the forefront– not only for team members on the facility floor but also for upper management, which is responsible for designing and driving the implementation of new maintenance and lubrication programs. Because of this, the training not only needs to involve proper lubrication practices but also cultural transformation and change management, which is driven from the top down.

When intense, thoughtful effort is partnered with collective teamwork and intentional action, benefits of a quality program are achieved, and the success stories begin to outweigh the failures.

Taylor Potter - Noria Corporation

HOW THE RIGHT LUBRICATION TOOLS AND HARDWARE INFLUENCE MACHINE RELIABILITY

Having spent a good portion of my career around heavy machinery, both in the military and later in the civilian world, I've come to realize one critical fact: the tools you use matter just as much as the skills you have.

When it comes to maintaining the reliability of machines, especially in environments where downtime is costly, having the right equipment is essential. This is particularly true in lubrication management, which can make or break the longevity of your machinery.

If you want to avoid costly breakdowns and ensure everything runs smoothly, you need to have the proper tools, like color-coded grease guns with meters and color-coded top-up containers. These aren't just fancy add-ons; they are key pieces of equipment that can prevent serious issues like cross-contamination and system failure.

Cross-contamination in lubrication is no joke. You might think, "Grease is grease," but it's not that simple. Different greases and oils have specific properties suited for different machine components. Some are designed for high temperatures, others for high loads, and mixing the wrong kinds can result in anything from excessive wear on parts to outright equipment failure.

Cross-contamination happens when lubricants get mixed due to improper handling, storage, or maintenance procedures. This can lead to chemical reactions that break down the lubricant's ability to do its job, which is to reduce friction and wear and protect the parts.

The consequences? Premature bearing failure, reduced machine life, and ultimately, costly repair sand unscheduled downtime.

The Importance of Color-Coded Systems

In both military and industrial settings, confusion or misapplication can lead to major issues. One simple but effective solution to prevent mistakes in lubrication is a color-coded system for grease guns and top-up containers.

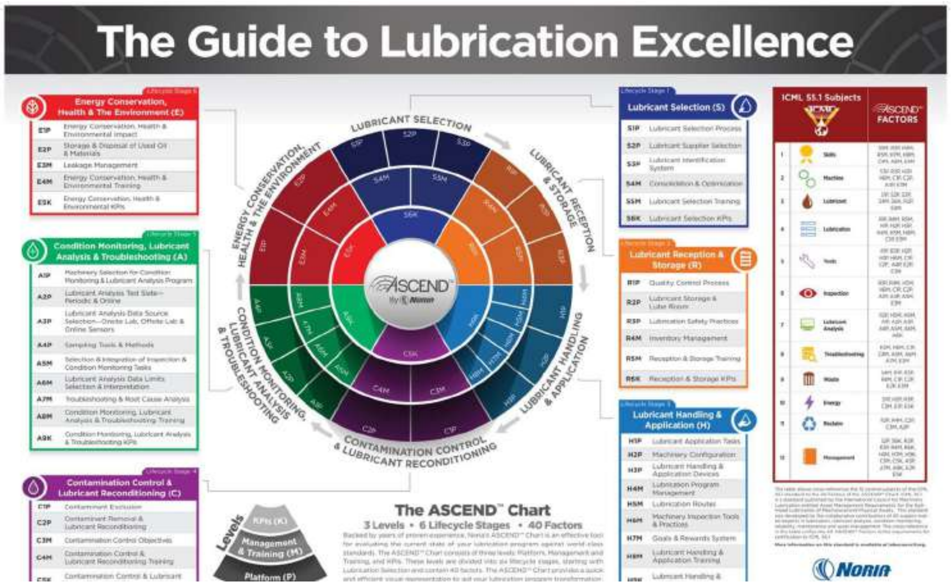
Different types of grease are formulated for specific applications, and mixing them up can cause serious damage. This system simplifies the job for the lube tech by ensuring there is no confusion between lubricants meant for different applications.

For example, if you have three different types of grease in your shop—say, one for high-temp bearings, one for low-speed, high-load components, and another for general-purpose lubrication—you can assign each one a specific color. By using color-coded grease guns, lube techs can quickly identify which tool is meant for which grease type, eliminating the risk of applying the wrong lubricant to the wrong part.
The same logic applies to top-up containers.

Color-coded containers not only make it easy to identify which lubricant goes where but also help maintain cleanliness. These containers are often sealed to prevent dust, dirt, and moisture from contaminating the lubricant, which is critical in environments where heavy machinery operates.

Contaminated lubricant can lead to accelerated wear, reduced performance, and eventual failure of machine components. The Noria Ascend Chart emphasizes the importance of controlling contamination in lubrication management, and color-coded systems are a practical way to meet this standard.

Preventing cross-contamination is not just good practice, it's a cost-saving measure that aligns perfectly with the Ascend Chart's focus on reducing overall operational costs through efficient maintenance.



Grease Guns with Meters: Precision Matters

In my experience, precision is everything. Whether you're tuning a motorcycle or maintaining a massive industrial machine, guessing doesn't cut it. One of the most effective tools for lubrication is a grease gun with a built-in meter.

Over-lubrication is more common than people realize, and it's just as bad as under-lubrication. Over-greasing can blow out seals or create pockets where contaminants can collect, leading to breakdowns. On the flip side, under-greasing causes parts to wear out more quickly. A grease gun with a meter removes the guesswork by delivering the exact amount of lubricant required. It's like using a torque wrench—precision is key to preventing damage. To take it a step further, the Machinery Lubrication Bearing Grease Calculator is an excellent online tool that helps you calculate the precise amount of grease needed for your bearings based on their size and operating speed. This tool is especially useful in making sure you don't under- or over-grease, ensuring optimal bearing performance.

By combining a grease gun with a meter and tools like the bearing grease calculator, technicians can follow maintenance procedures and guidelines down to the last detail. This precision ensures the right balance, reducing wear and optimizing machine performance. This aligns with the Noria Ascend Chart's focus on precision, which ultimately extends the life of critical machine components and prevents expensive downtime.

The Real Costs of Cross-Contamination

Mixing lubricants doesn't just lead to mechanical failures; it also introduces safety risks. Machines running on compromised lubrication are more prone to overheating, which can cause fires and catastrophic equipment failure. In industries where heavy machinery operates 24/7, safety is paramount, and the cost of getting it wrong is more than just financial.

The upfront investment in quality tools and systems is minimal compared to the potential costs of machine failure, unplanned downtime, and safety incidents. In the long run, preventing cross-contamination not only saves money but also enhances operational safety.

Cost Benefits of Reliable Lubrication Practices

When it comes to maintenance, cutting corners never pays off. Reliable lubrication practices—using color-coded grease guns, meters, and top-up containers—lead to measurable cost benefits. Proper lubrication management reduces the frequency of repairs, extends machine life, and minimizes downtime. The savings from preventing unplanned breakdowns far outweigh the cost of investing in a disciplined system.

Following this strategy, businesses can expect fewer breakdowns, extended equipment lifespans, and better overall performance. Ultimately, prioritizing the right tools and following best practices leads to fewer emergency repairs and more predictable, reliable machine operation.

Conclusion

The role of proper tools in machine reliability cannot be overstated. Simple solutions like color-coded grease guns with meters and organized top-up containers prevent cross-contamination, ensure proper lubrication, and contribute to machine longevity.

The Noria Ascend Chart serves as an essential guide for companies looking to improve machine performance and reduce maintenance costs. In the end, investing in the right tools isn't just about avoiding mistakes—it's about safeguarding equipment, ensuring safety, and optimizing long-term operational efficiency.

PREDICT OIL USEFUL LIFE WITH REAL-TIME DATA

When I was working in a forging plant, we had some very large hydraulic systems. When the system went down for any reason, we lost a minimum of $10,000 per hour in production. When a large hydraulic system's oil goes bad, it can easily take eight hours to change out or flush. Ask yourself, can your company afford to lose $ 80,000 in production for a single incident?

Oil is the life of any hydraulic or lubrication system. When it is fresh and healthy, the system operates as intended. As it ages and begins losing its properties, issues within the system occur to the point where your system can fail.

A common practice for a hydraulic system is to take an oil sample monthly or even quarterly. This sample is then sent off to be analyzed. The analysis takes a few days to a week to get back, and it requires a highly skilled person to read the analysis and determine if there is an issue. Trending an issue might take months; all the while, the system is losing performance.

In this paper, we will discuss what type of data should be collected, why that data is important,how the data should be collected,

what should be done with the collected data, how to analyze this data, and how to apply the analysis to your system.

What Should Be Collected

There are numerous factors to consider when trying to determine what is affecting a system's fluid, including:

- The ambient temperature
- The atmosphere the system is operating in
- How often the system turns over in the tank
- The pressure the system is operating at

All these outside influences affect the fluid. For instance, systems operating in a humid environment can ingest moisture from the air. This moisture will cause water ingress into the fluid, often leading to oxidation, an increase in the fluid's total acid number, and damage to the system's components. Any of these conditions will cause additional problems within the system and affect the components and overall system performance.

Now, the real question is, what data should be considered critical to know?
Understanding a fluid's breakdown mechanism will help direct you to the factors that should be monitored:

- Wear debris (ferrous and non-ferrous)
- Contamination
- Moisture content (percent saturation)
- Electrochemical changes (TAN, conductivity, viscosity)
- Temperature

Every system will become contaminated. Components will wear, seals will decay, the system will ingest contamination from the outside atmosphere, and the operation of a system will create its own contamination. All this contamination is carried through the system by the fluid. Using monitor that provides real-time data will help trend daily events and anomalies. Knowing how healthy a system is will allow you to understand better what is going on in that system.

We should also know and be able to trend the fluid's temperature. Since temperature directly affects viscosity and contributes to oxidation while influencing other additive properties in oil, it is important to know a fluid's temperature during operation.

Another factor to consider is the water content. Along with being incompressible and non-lubricating, water increases oxidation and is a catalyst for acid formation. Water in a fluid will result in accelerated wear of bearing surfaces, breakdowns in seals and pumps, and an overall decrease in system performance.

Finally, trending changes in the electro-chemistry of oil should be considered. With the changes in the refining of oils over the past years, an oil's conductivity – or ability to carry an electrostatic charge – has become a matter of grave concern. This static charge can cause damage to the system and is dangerous for operators and maintenance personnel. Correlations can be made from trending fluid conductivity and comparisons of the results to known degradation curves. Analytics can transfer all the data collected into a readable report for you to use.

Why This Particular Data

Each of the above parameters helps tell the story of degradation. By trending the data, correlations can be made between these parameters and the system's health, allowing a very personal understanding of what is happening inside the equipment.

So why is this specific data important? Let's look at the contamination monitor data first. Data from the contamination monitor will indicate the size and type of contamination in a system. Combined with the metallic counter, it's possible to correlate the amount of non-metallic and metallic particles in a system.

Knowing the amount and type of particles can help determine what is occurring within a system. Most non-metallic particles come from seal wear, additive breakdown, or the ingestion of particles from outside the system. Metallic particles result from system component degradation.

Considering that the average free clearance in a common cylindrical roller bearing is .010" to.012", knowing the size and quantity of particles within that range will reveal bearings are being damaged. Understand that when the particle size exceeds the film thickness, the result is microscopic damage to the components. This damage usually results in an increase in metallic particles.

Additionally, finer particles work in a system like a lapping compound, which can have a polishing effect that breaks down hard surfaces and increases component degradation rates.

The effects of temperature and water content have a coupled – or related – influence in a system. Water can enter a system through condensation and ingression. The amount of condensation can be related to the system's temperature fluctuation. All systems must breathe.

If a system is operated in a cool environment for one shift, the oil temperature will rise significantly during operation and cool down during the non-operating time. Since the system is breathing relatively cool air, which would be heavier in moisture content, this moisture will be in the system's head space. As the hot fluid and the cool air in the head space interact, the moisture in the air will condense, enter the fluid, and begin to oxidize. When the fluid heats up again, the oxidation rate will increase due to the fluid's moisture and temperature.

The dielectric constant measures the oil's ability to carry electrical potential energy. As the oil becomes contaminated or undergoes a chemical change due to degradation, the dielectric constant will change. Monitoring this value can determine the oil's rate of change. Additionally, since we have the dielectric constant value of the base oil and the base oils do not have the same constant, we will get an indication of whether the correct oil has been added to the system.

Deploying Sensors for Real-Time Data

The current method of collecting commonly used in industry is to obtain an oil sample from a system and send it to a lab. The lab processes the sample to obtain data, which is then available for analysis. The lab places the results on a graph for trending and offers a good or bad estimation.

This method is flawed due to the extended time frame required to obtain trending data. Since most samples are generally collected monthly, the data will be at least three to four months old before any type of trend analysis is available. By that time, significant damage could have occurred to the system. This also leads to reactive maintenance, which is not an efficient way to maintain production. This is where applying sensor technology can help collect real-time data on systems.

This can include online contamination monitors, metallic contamination sensors, and similar devices that measure temperature, moisture, and conductivity. As technology continues improving, the necessity of collecting precise, real-time data will only increase. By predicting system's health, a facility can plan for downtime and more efficiently utilize maintenance resources and capital.

What To Do with the Data

Now that we know what to collect, what do we do with this data? First, we must understand that the data we are collecting using sensors in real-time is more consistent. Since the data was collected using instrumentation, we eliminated the human factor.

When we use oil analysis, a person must take the oil sample and repeat the same process each time. The sample is taken from the exact same place, in the exact same manner, in a tiny sample bottle, all the while trying to maintain the same oil flow, temperature, and ambient temperature. The possibility of an error or variation occurring is very significant. This sample is then tested by a person in the lab, affording another opportunity for human error.

By removing the human factor, a sustainable and very reliable method for collecting data is possible. Measuring flow, ambient temperature, and time allows one to determine any outside factors that may have caused an issue with the sample data.

As mentioned above, most systems' current data collection method is a reactive, long-term type of trending analysis. Using the sensors above, the data can be collected while the unit operates. Since the data is trended as the unit is operating, we can more closely monitor the data trends. This allows us to track the degradation of the oil by monitoring many of the critical factors we mentioned above in real-time.

If the data is stored as it's collected, a graphic of the results can be created. The results can then be compared against a representative sample previously analyzed in a lab. There are now many possibilities for analyzing the data.

We can use the trends, interpolate, and determine when the oil will reach its useful life. By determining an approximate end of oil life based on our data, we can proactively plan the oil change out to limit downtime and possible machine failure.

Trigger points can also be installed to set alarms for immediate reaction. Since the triggers will have a time stamp, the issue at the trigger point can be compared with what occurred in the machine operation. This allows problems to be pinpointed and to determine ways of preventing those issues in the future.

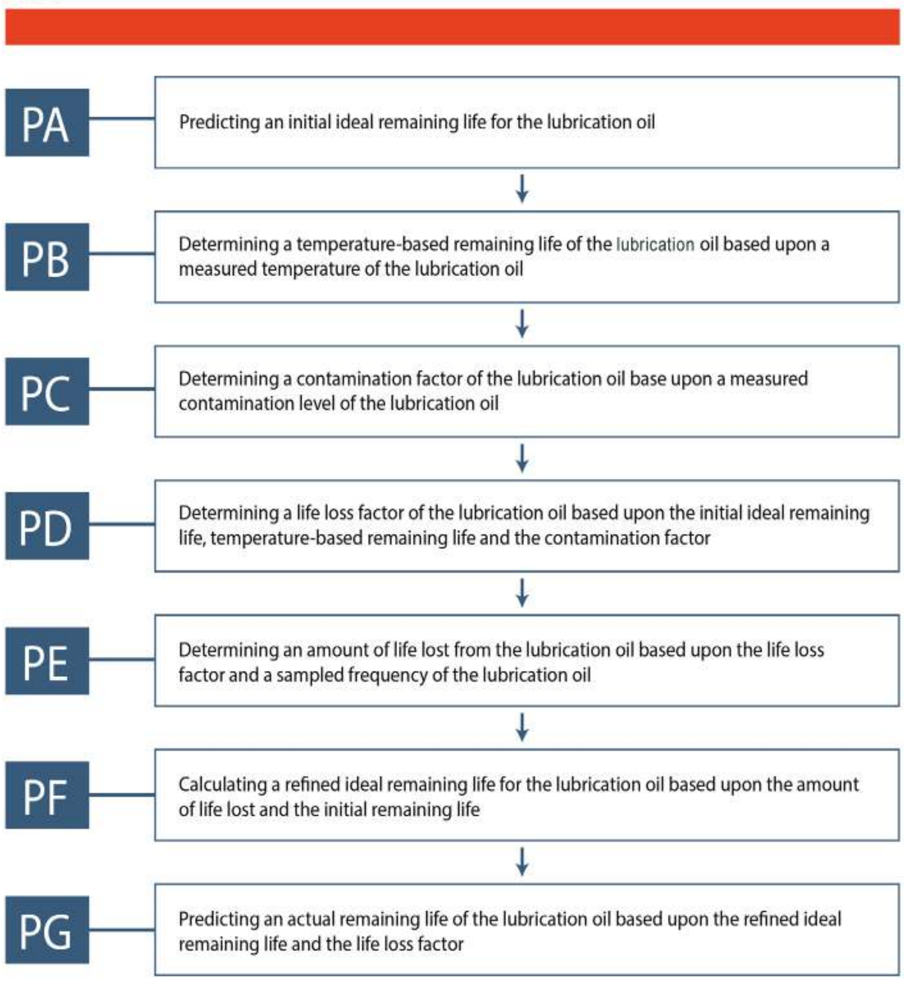
Finally, analyzing the data can help determine other system factors. This includes selecting the proper fluid and additive package and understanding if the fluid is lasting as anticipated.

Using this trending analysis and reviewing the whole system, we can develop more reliable designs that will last longer and improve uptime.

How Does Analysis Predict Oil Life?

The sensor technology mentioned above can be used to develop a series of equations that predict an oil's remaining useful life. Several equations, such as the Arrhenius Reaction Rate, provide a foundation for this equation-based analysis.

FIG 1



By using the collected data to determine various factors, as indicated in Figure 1, the fluid's actual life loss at the time of data collection can be determined. The data can then be used to systematically calculate the oil's lifespan.

Each data point, such as temperature, water, contamination, and electro conductivity, influences the fluid's life. Using this data to create equation factors can help determine when an oil will reach the end of its useful life. The data can also be used to create graphs and determine trends. When compared to the analysis results, it can determine when the oil will begin causing problems within a system.

Moving Forward from Here

Predicting maintenance intervals and reducing downtime should always be a priority, and it takes diligence and patience to achieve this goal. Collecting reliable data to develop trends that will serve as a baseline takes time. Once the baseline is completed, system data can be compared with production output, seasonal changes, and/or any other factors required to determine the trends.

Coupling this data with quarterly or yearly oil analysis from an outside lab will allow for a reliable prediction of required maintenance to improve equipment uptime and drastically reduce reactive maintenance and downtime. The comparison of the lab data is equally important to validate the trended data.

Today's technology lacks the capability to provide online elemental spectroscopy, which would analyze fluid health more concisely. Based on technology and economics, this is the path forward. Like the evolution of cell phones, this will also be possible in time.

The choice now becomes yours. You need to evaluate the cost of your system, the cost of changing out oil, the cost of downtime, and the labor costs to maintain and repair equipment. The technology is available and ready for use. All you need to do is make it happen.

EFFECTIVE USE OF THE PATCH TEST FOR SIMPLE ON-SITE ANALYSIS

The very best oil analysis programs incorporate some degree of on-site analysis. For most plants, mills, and mines, particle monitoring is the most productive on-site oil analysis activity available.

Studies show that particle contamination is responsible for up to 80% of lubrication-related machinery failures. Hard particles can enter the system through seals, breathers, new oil changes, and top-offs. They can also be generated within the system from component wear. These particles can abrade, fatigue, and erode component surfaces - robbing them of precious life.

Because particles cause so many problems, they should be monitored regularly and controlled by filtering the oil or changing it as required. Particles are generated when a machine fails, and monitoring for increased generation of wear debris alerts the technician of an impending failure.

The simple patch test enables the technician to quickly identify abnormal levels of contamination and wear debris so that corrective actions can be scheduled accordingly. While several excellent automatic particle-monitoring devices (particle counters and wear debris meters) are available, low-cost patch microscopy allows on-site particle monitoring without spending a great deal of money.

The patch test can help maintenance personnel determine if on-site particle monitoring suits their needs. It can also provide them with experience and information that will help them determine if a more sophisticated particle-monitoring device is needed and, if so, which device best suits their needs.

The procedure for performing low-cost patch microscopy is explained below.

Analyzing Debris on the Patch

After the patch has been prepared, a number of things can be determined by visually examining the debris collected on the patch.

First, by using the 100 X magnification microscope, a comparison may be made with a catalog of standard patches, which can be obtained from numerous sources. The appropriate ISO Cleanliness Code can then be estimated.

A laboratory correlation exercise showed that the ISO code obtained by this comparator method and an ISO code obtained using a standard portable particle counter were within one ISO code number.

Likewise, a visual examination of a particle's morphology - its shape, size, color, and other details -can also be used, like conventional ferrography, to help elucidate the source of any particles observed.

Often times, the patch test can add a piece of the puzzle missed by other on-site instruments or laboratory analysis. The following examples highlight some cases where patch microscopy was used to help determine a serious mechanical problem that might otherwise have gone unnoticed.

Case Studies Provide Proof of Patch Test's Usefulness

Example #1

In a high-pressure hydraulic system, the operator suspected that the axial flow piston pump had suffered damage and was operating with reduced efficiency. The laboratory analysis suggested that the system was satisfactory, with no evidence of iron, copper, zinc, or tin, and its 16/13 ISO code was within the target cleanliness level for that system.

A routine patch test (1 µm) showed the presence of numerous brass/bronze cutting wear particles (Figure 1). A subsequent examination of the piston pump revealed severe wear on the slipper pad/swash plate surfaces.

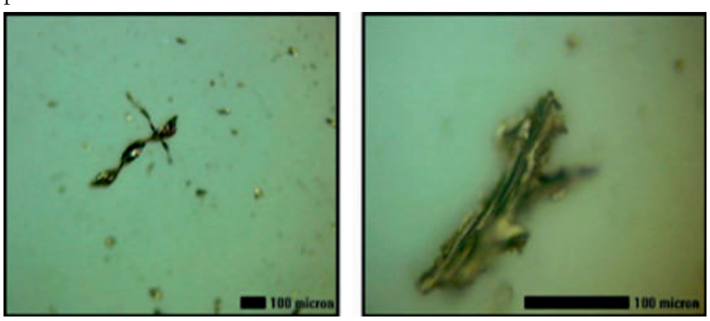


Figure 1. Example #1 Patch Test Result

Example #2

A sample of hydraulic oil from a pre-feeder is detailed in Figure 2.

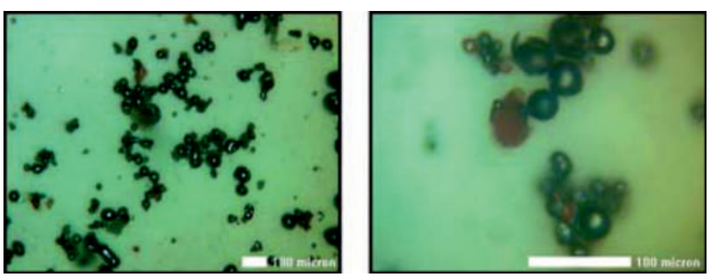


Figure 2. Example #2 Patch Test Result

The spectrograph analysis failed to detect any abnormal wear or contamination. However, in this case, the PQ index and particle counts showed an abnormal contamination level. Spectrometry failed to detect iron due to the analysis limitation of particle size (less than 5 µm).

The patch test, however, showed a high concentration of spherical particles ranging in size from 20 µm to 75 µm - typical of welding debris (Figure 3).

Unit No.: SCAT 07: 23C2 Prefeeder Lubricant: Mobil DTE 25		Component: Hydraulic
Date Received by Laboratory	29/05/03	
Sample Date	21/05/03	
Elements ppm	Iron	1
	Chromium	1
	Aluminum	1
	Copper	2
	Lead	1
	Nickel	1
	Tin	0
	Manganese	0
	Titanium	0
	Silver	0
	Molybdenum	0
	Zinc	241
	Phosphorus	247
	Calcium	42
	Barium	0
	Magnesium	1
	Silicon	0
	Sodium	0
	Boron	0
	Vanadium	1
Physical Tests	Water	95 ppm
	BN	-
	AN	0.52
	PQ	895**
Particle Counts	ISO Code	22/21
Viscosity	cSt@40°C	44
	cSt@100°C	-
Result (Internal Ref. No.)		R99
*Reportable **Unacceptable ***Urgent		

Figure 3. Example #2 Laboratory Analysis Results

Maintenance was carried out in the vicinity of this unit with no protection. Welding and grinding debris from the environment had entered the unit's hydraulic system through an inadequate reservoir breather.

Unit No.: SCAT 13: 618 Prefeeder Lubricant: Mobil DTE 25	Component: Hydraulic	
Date Received by Laboratory	05/29/03	
Sample Date	05/21/03	
Elements ppm	Iron	8
	Chromium	0
	Aluminum	0
	Copper	1
	Lead	0
	Nickel	0
	Tin	0
	Manganese	0
	Titanium	0
	Silver	0
	Molybdenum	0
	Zinc	704
	Phosphorus	467
	Calcium	70
	Barium	1
	Magnesium	1
	Silicon	2
	Sodium	2
	Boron	0
	Vanadium	0
Physical Tests	Water	101 ppm
	BN	-
	AN	1.15
	PQ	19
Particle Counts	ISO Code	17/12
Viscosity	cSt@40°C	33
	cSt@100°C	-
Result (Internal Ref. No.)		Y17

Figure 4. Example #3 Laboratory Analysis Results

Example #3

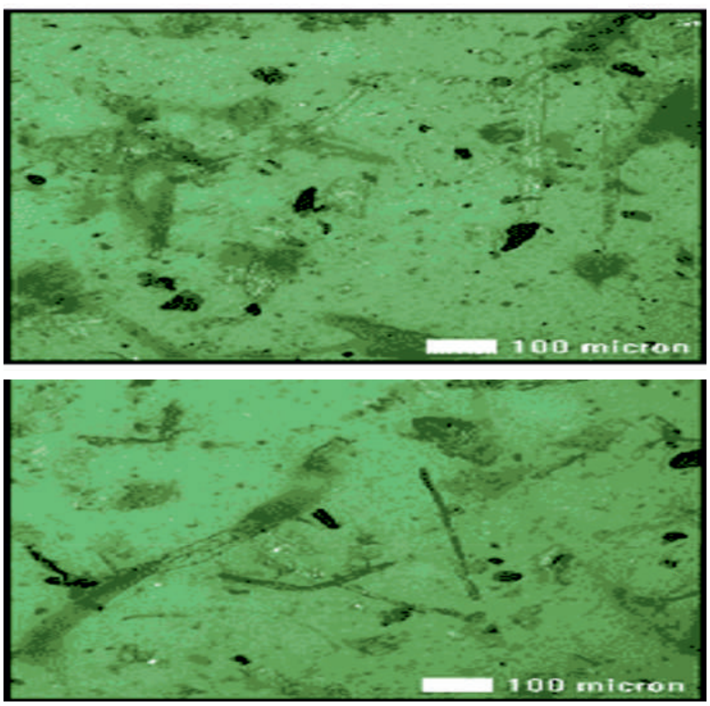


Figure 5. Example #3 Patch Test Result

The analysis in Figure 4 was of a sample of hydraulic oil from a preferred similar to the unit detailed in Example #2. The spectrograph analysis, particle counting, and PQ index failed to detect any abnormal wear or contamination.

Although the viscosity of the hydraulic fluid was lower than the specification, there was no obvious problem. The patch test, however, revealed possible filter element deterioration (Figure 5).

Fibers were prevalent over the whole patch surface. A faulty element that had collapsed was subsequently changed.

Example #4

The sample in this example was taken from a production water booster pump at an on-shore oil pumping facility. This example shows the limitations of the spectrograph analysis and also, in this case, the limitation of the PQ analyzer (Figure 6).

Manufacturer: Prod Water Booster Pump Lubricant: BP Energol HLP-HM46							
Date Received by Laboratory	12/03/01	02/22/02	07/01/02	10/30/02	04/24/03	10/31/03	
Sample Date	11/24/01	02/16/02	06/21/02	10/27/02	04/12/03	10/29/03	
Elements ppm	Iron	34	26	33*	67*	83*	45
	Chromium	0	0	0	1	1	0
	Aluminum	0	0	1	1	1	2
	Copper	14	30*	14	19	43*	3
	Lead	4	1	0	3	2	1
	Tin	0	0	0	0	1	0
	Nickel	0	0	0	1	0	0
	Manganese	0	0	0	1	0	0
	Titanium	0	0	0	0	0	0
	Silver	0	0	0	0	0	0
	Molybdenum	0	0	0	0	0	0
	Zinc	524	372	446	525	517	314
	Phosphorus	306	276	295	266	289	245
	Calcium	33	29	31	31	34	41
	Barium	1	0	1	1	1	0
	Magnesium	0	0	0	1	1	0
	Silicon	4	3	2	5	4	2
	Sodium	2	2	2	4	7	6
	Boron	0	0	0	1	0	0
	Vanadium	0	0	0	0	0	0
Physical Tests	Water	0.1%	Neg	Neg	Neg	Emul*	Neg
	Fuel	-	-	-	-	-	-
	Dispersancy	-	-	-	-	-	-
	BN	-	-	-	-	-	-
	AN	0.41	0.43	0.38	0.39	0.43	0.53
	PQ Index	153	22	69	474*	61	72
Particle Counts	ISO Code	17/12					
Viscosity	cSt@40°C	46	47	47	46	46	48
Result (Internal Ref. No.)		Y4	G1	G1	Y19	R99	R99
*Reportable **Unacceptable ***Urgent							

Figure 6. Example No. 4 Laboratory Analysis Results

The large bronze-type particles greater than 100 µm (Figure 7) were not detected by the emission spectrometer or the PQ instrument, which measures the ferromagnetic debris in the sample. It is important to note that the bronze forces a negative PQ measurement in relation to the positive ferrous reading.

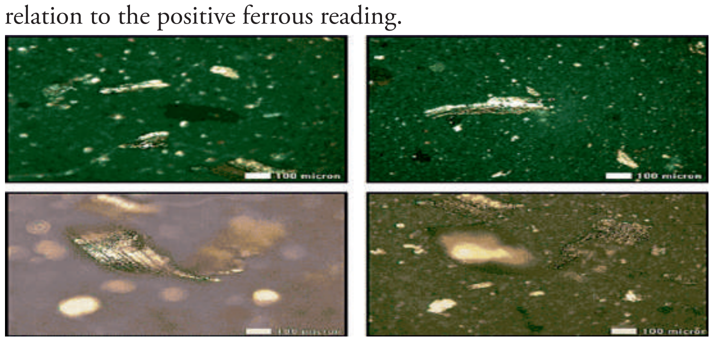


Figure 7. Example #4 Patch Test Result

Example #5

The patch shows debris deposited onto a 3 µm patch (Figure 8). The sample was a 320 cSt gear oil from a reduction gearbox. The bronze particles shown are typical of this type of application. The particle size, shape, morphology and number are indicative of the severity of wear.

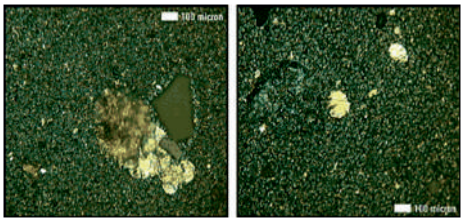


Figure 8. Example #5 Patch Test Result

Preparing a Filter Patch for Particle Contamination Detection

Supplies Required for the Test:

- Patch-making funnel
- Oil sampling vacuum pump
- 25 mm filter disc
- Tweezers
- Filtered mineral spirits or reagent-grade kerosene (other solvents may be suitable too)
- 100 X or better microscope

Patch Preparation Procedure

1. Insert the patch-making funnel into the top of the vacuum pump. Tighten the seal by tightening the knurled fitting.

2. Remove the funnel from the white base by turning it counterclockwise.

3. Using tweezers, carefully place a 25 mm filter disc onto the screened surface of the funnel's interior. Return the funnel to the white base.

4. After aggressively agitating the sample, pour the oil into the funnel precisely to the 25 ml mark.

5. Fill the funnel to the 50 ml mark with mineral spirits dispensed through a filter installed on the bottle.*

6. Draw the diluted sample through the filter by activating the vacuum pump until the funnel is empty.

7. Fill the funnel to the 25 ml mark with mineral spirits dispensed through a filter installed on the bottle.*

8. Draw the mineral spirits through the filter by activating the vacuum pump until the funnel is empty.

9. Using the tweezers, remove the patch and place it on a clean surface to dry for 10 minutes.

* Note: Unless you are certain that the mineral spirits and the bottle are free of contaminants, it is highly recommended that the mineral spirits be dispensed through a filter installed on the bottle (not pictured here).

Conclusion

The ability to detect and analyze large particles of different materials, both metallic and nonmetallic, is vital to the success of any oil analysis program. Whether performed in a lab, as most of these examples were, or in the field, on-site patch microscopy can offer some distinct advantages over off-site conventional oil analysis instruments and tests and is an excellent addition to any oil analysis program.

John Q. Todd | Total Resource Management, Inc. (TRM)

BREAKING DOWN THE BASICS:
A LESSON IN ASSET RELIABILITY

Before you go marching down to your reliability engineers and ask questions like, "What are the top 10 worst performing assets in our production line?", it's important to know the actual difference between an asset and reliability. These two terms are used often in our field, and many times we aren't even sure what we're talking about. You may feel like you know what these terms mean on their own, but do you truly know what they mean when pressed together?

This article is going to walk you through how these two very important elements of our daily lives as maintenance & reliability professionals come together to either benefit or damage your business. Further, we will discuss how to view these terms and form a strategy for success.

WHAT IS AN ASSET?

First things first: what do we mean when we say something is an "asset?" Take a look around you and identify things that are:

- Costly to acquire and to make operational
- Critical to the operation of the business. If it is not functioning, the business suffers significantly.
- A focus of maintenance activities, whether corrective, preventive, or even predictive.

A key element to help define what an asset is to your business is identifying those pieces of equipment that are valuable and worth caring about. The initial acquisition cost of the item may be an obvious parameter but not always. Rather, inexpensive equipment can be critical to the operation yet perhaps costly to maintain.

As part of your overall asset management strategy, you need to define what is an asset to your business:

- Are the costs to maintain (corrective, preventive, calibration, inspections, etc.) significant percentages of the budget? Are these costs fixed, or are they variables that need to be managed?
- Is there a difference between how accounting, maintenance and operations look at what is an asset?
- Is the equipment public-facing? Is there risk that while the equipment is functioning just fine, the public can develop a "problem," with it?

- Does the equipment add risk to the business, and how is the increased risk managed/mitigated?

There is no hard and fast rule that defines an asset. On a basic level it is those pieces of equipment that cost money to acquire, maintain and dispose of. Your goal is to get as much return on investment as possible during the life-cycle of the asset.

An asset could be a room in a building. An asset could be a chain saw that gets issued out of inventory, returned for servicing and put back on the shelf awaiting the next fire mission. An asset could be a field service truck that requires preventive maintenance such as oil changes, which you farm out to the local garage via contract.

The bottom line to what an asset is just that: assets are the physical things that either enhance or detract from the bottom line of the company. By keeping them operational or by disposing of or replacing them at the right moment, the business benefits. These are considered your assets.

THE DIFFERENCE BETWEEN ASSETS AND RELIABILITY

The term reliability is a well-defined and understood term. An easy definition is the percentage of "trouble-free" time you have with a piece of equipment. If a piece of equipment has been operating for 10,000 hours and has only been down for 1000 of those, then we can state that it is 90% reliable.

It's the definition of that "down" time that is important. Being "down" for preventive maintenance would not go into those 1000 hours. Being down due to defined failures would.

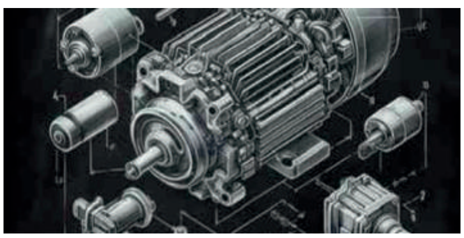
Another way to look at reliability is the probability that the equipment will survive long enough to perform its function(s). At any point in time, what is the chance that the device will be in-service?

No matter how you mathematically arrive at the reliability of a piece of equipment, there are two important considerations:

- Is the percentage of reliability acceptable?
- Is doing anything to increase it cost-prohibitive?

If a pump is deemed to be 95% reliable, does it matter? What does that mean to the business? Does that 5% loss of service translate into millions of dollars in lost production or fines? Don't panic if the calculated reliability of a device is less than perfect — they all will be.

Kind of a side topic is that of redundancy. If you have two pumps, both with 95% reliability, but the system only needs to use one at a time, then your system has very high reliability due to redundancy. In this case 95% reliability per pump is very good.



Let's stop a moment and go back to the mathematical aspect of this. To do math, you need data for your formulas. If you want to even come close to establishing a reliability number that has any degree of confidence, then you will need to be collecting data that supports your calculations. How are you collecting downtime, in your context?

Given there will always be variation in data captured in the field, how are you accounting for this? There is nothing worse than coming up with a 95% reliability result for a pump when you only have two downtime events recorded, when you know there were more.

It's all about the data, folks. And there are many software tools to help not only capture good data but to also visualize and gain insights from raw data in the field.

It has been stated that incremental changes — fractions of a percentage point of reliability increases — are very expensive to achieve. This remains true. Making it a goal to increase equipment reliability sounds good on paper, but it will cost you.

One of the best ways to increase equipment reliability is to acquire new equipment. That can be an expensive endeavor, but it might be less costly in the long-term than trying to eke out another percentage point of reliability from the 30-year-old pump.

WHAT ASSETS ARE

"An asset could be a room in a building. An asset could be a chain saw that gets issued out of inventory, returned for servicing and put back on the shelf awaiting the next fire mission. An asset could be a field service truck that requires preventive maintenance such as oil changes of which you farm out to the local garage via contract. The bottom line to what an asset is just that: assets are the physical things that either enhance or detract from the bottom line of the company."

BACK TO "ASSET RELIABILITY"

Let's put these two terms back together and see what that phrase means to us now. Assets, those things we care about, cost money to own, may not be perfect and will likely fail at some rate that we may or may not have control over. Gee, that's a fun thought.

We all have that "old reliable" thing that we go to when the chips are down. Ever wondered what makes that rusty old thing such a big help to us in bad times? Well, a few aspects come to mind:

- Simplicity
- Understanding of its use and limits
- How it was put away the last time it was used

There was a time when starting an engine was just a series of manual turns and twists of the controls. Now, all it takes is a push of a single button and letting the computers do all the work.

Is the equipment itself simpler? Perhaps not, but what it takes to operate is, and that lends itself to sustained high reliability.

One caution when it comes to evaluating the reliability of a piece of equipment is attributing its failures to itself or the supporting equipment around it. Is a failed fuel pump charged against the generator or the fuel system? One can argue either way.

How about the environment the equipment is in? How is a particularly harsh environment considered when analyzing reliability? Maybe there is something you can do about the environment that could have a big impact?

The overall reliability of an asset, as you can see, is a function of many things. Certainly, reliability is built into a device, but the environment it is operating in, how it is being operated and how it is being looked after have dramatic impact on the result.

Maybe for some equipment, you don't care about reliability. You use it up and replace it with new or refurbished. This is a perfectly valid approach if the context is right and the business benefits. Maybe the equipment is so critical to the production of your product that there is nothing you won't do or spend to keep it operational. Maybe you are operating the equipment outside of its intended envelope and you need to figure out a better solution to keep things going.

THINKING STRATEGICALLY

A strategy puts you in a position for success. Plans are formed to support the strategy. You want to be in a position where you can put your finger on what specifically you are doing and what you are doing it to, for defined reasons or goals. A documented approach — typically called a Strategic Asset Management Plan (SAMP), goes a long way in making sure everyone is aware of what is going on and their respective roles.

This approach should contain the measures you will use to determine if an asset is performing as you need it to. Different classes of equipment will have different measures, but the point is that they are in writing.

You can take advantage of the ISO 55001 standard to develop your SAMP. While you might not ever need or want to achieve ISO registration, this standard is a solid framework to use for your approach to asset management, and ultimately, better reliability.

In your SAMP, you outline what is an asset in your context, the approaches you are taking to manage them and the metrics you expect to use to make decisions with. This very clear picture of where you are and where you are going will certainly have an impact on asset reliability over time.

WRAP-UP

So, a simple two-word phrase gives us lots to think about, eh? It is always good to stop a moment and ponder the words and phrases we toss around without much thought. These words really do have meaning, and with a better understanding of what that is to each industry professional, we can refocus our efforts in the right direction.

Mohammad Aatif | Baker Hughes

BEYOND THE LABEL: UNDERSTANDING LUBRICANT TECHNICAL AND SAFETY DATA SHEETS

Over the years in lubrication, I have noticed that many professionals either overlook or misinterpret lubricant datasheets, especially Product Datasheets (PDS), which are key to selecting the proper lubricant. While Safety Datasheets (SDS) are widely known due to compliance requirements, the PDS holds the technical insights needed for informed decision-making. Yet, it is often misunderstood or ignored.

Lubricants generally have two main documents:

1. Product Datasheet (PDS) – Also called a Technical Datasheet (TDS), focused on performance and application.
2. Safety Datasheet (SDS) – Also known as Material Safety Data Sheet (MSDS), focused on health, safety, and handling.

Although they may appear similar at first glance, these documents serve distinctly different purposes. In this article, I will explain how to read and understand lubricant datasheets effectively, highlight common mistakes, and demonstrate how to utilize them to make smarter, more informed decisions.

Figure 1. The Complete Picture: Every Lubricant's Dual Story

The Anatomy of a Lubricant's Product Data Sheets:

While the exact layout might vary between manufacturers, most lubricant datasheets follow a standard structure. Here are the key sections and the vital information they contain:

A. Product Description

This section provides a concise overview of the lubricant, including its basic formulation and intended performance characteristics. Think of it as the product's resume: polished, impressive, and packed with all the good stuff. You will often find phrases like *"exceptional load-carrying capacity"* or *"advanced proprietary technology"* even for the most basic lubricants on the market. That's because this part is typically crafted to highlight strengths and create an appealing image.

Pro tip: Don't get too carried away here. While it's useful for a quick first impression, this section is more about positioning than precision. Save your time for the technical specs and performance data that follow.

B. Product Features and Benefits

This section bridges the gap between technical specifications and practical performance. It highlights how specific properties of the lubricant translate into operational advantages. Typical features and benefits include:

- **High Viscosity Index:** Ensures consistent performance across temperature ranges.
- **Excellent Oxidation Stability:** Extends oil life and minimizes degradation.
- **Superior Wear Protection:** Enhances equipment life.
- **Water Resistance:** Critical for marine or humid environments.
- **Low Volatility:** Reduces oil consumption and emissions.

This section helps align the lubricant's strengths with your operational priorities.

Note: Do not use this section as the sole basis for comparing lubricants. Different manufacturers may emphasize different benefits, which may not fully reflect the performance profile relevant to your application.

C. Suitable Applications

This section outlines the industries, equipment types, and operating conditions where the lubricant performs best.

Examples:

Intended Use Cases:

- Hydraulic systems
- Gearboxes
- Chains and conveyors

Operating Conditions

- Temperature ranges (e.g., "suitable for use from -30°C to +120°C")
- Load conditions (e.g., "for high-load, shock-load applications")
- Exposure (e.g., "resistant to water washout")

D. Technical Specifications

This is the heart of the datasheet, providing quantifiable, test-based data that defines the lubricant's physical and chemical properties. This section offers measurable properties and test results.

Common parameters:

Example- General Purpose Grease		**Example- VG 320 Gear Oil**	
Property	**Value**	**Property**	**Value**
NLGI Grade	2	ISO Viscosity Grade	320
Thickener Type	Lithium Complex	Viscosity, Kinematic cSt at 40°C (ASTM D 445)	321
Dropping Point, °C (ASTM D2265)	280	Viscosity Index (ASTM D2270)	98
Viscosity @ 40 C, Base Oil, mm2/s (ASTM D445)	220	Flash Point, °C (ASTM D92)	275
Viscosity Index (ASTM D2270)	98	Density at 15°C, kg/L (ASTM D4052)	0.89
Four-Ball Wear Test, Scar Diameter, mm (ASTM D2266)	0.5	Copper Corrosion 3 h @ 100°C (ASTM D130)	1B
Timken OK Load, lb (ASTM D2509)	40	FZG Pass Stage (ASTM D5182)	12

Use the technical specifications in a lubricant's TDS to benchmark products across brands and identify the best fit for your application. These values also serve as critical baselines for predictive maintenance through oil analysis (such as fresh oil TAN value) and condition monitoring.

Common Mistakes to Avoid:

- **Assuming "typical values" are guaranteed:** These are average values, not minimum or maximum limits.
- **Overlooking test methods:** Always check the ASTM, ISO, or DIN test method used; different methods can yield different results.
- **Ignoring application context:** A lubricant with excellent specs may still fail if not suited to the specific operating environment.
- **Overlooking modified test standards:** Always check the test methods listed in the datasheet to see if they follow standard procedures or have been modified. Manufacturers often mark changes with terms like "mod" and explain the alterations, which can impact reported values. Commonly modified tests include FZG, Four Ball EP, and RPVOT.

E. Approvals

This section outlines certifications, endorsements, and compliance with industry or OEM standards, which is essential for verifying equipment compatibility. It also plays a key role in ensuring regulatory compliance in specialized sectors.

- **Food Grade Lubricants:** Includes certifications like NSF H1, Halal, and Kosher, confirming suitability for incidental food contact.
- **Engine Oils:** Standards such as API SN, API CK-4 for four-stroke engines, and NMMA TC-W3 for two-stroke marine en-

gines.

- **OEM Specific Approvals:** Specific endorsements from equipment manufacturers exist for products such as turbine oils, hydraulic fluids, and gear oils. For example, turbine oil specifications from OEMs like Siemens TLV 9013 04 and GE Power HTGD 90117 are commonly referenced.
- **General Industry Standards:** Compliance with norms like ISO 6743, DIN 51524 (for hydraulic oils), and AGMA (for gear oils).
- **Biodegradability & Environmental Approvals:** Certifications such as EAL VGP (Vessel General Permit) and EU Ecolabel, indicating environmental friendliness.
- **Country-Specific Requirements:** Standards such as BS VI (India's emission norms) and Euro VI oils.

Common Mistakes while Interpreting This Section:
1. Confusing "Meets" vs. "Approved"

- "Meets" means the manufacturer claims the product meets the spec.
- "Approved" means it has been officially tested and certified by the OEM or standards body.
- Always prefer approved products when OEM warranty or critical performance is involved.

2. Assuming Newer Is Always Better

- Newer specs are not always backward compatible.
- Some older engines require legacy formulations (e.g., API SJ or CF) for seal compatibility or additive balance.

F. Health and Safety References

This section provides a brief overview of where to find detailed information related to health, safety, and the environment.

The Anatomy of a Safety Data Sheet (SDS):

An SDS typically includes 16 standardized sections defined by the UN's Globally Harmonized System (GHS), which ensures consistent global communication of chemical hazards. Below is a brief overview of each section.

Section	Title	Key Information
1	Product and Company Identification	Product name, supplier's location, and emergency contact number.
2	Hazard Identification	Physical, chemical, health, and environmental hazards. Includes U.S. and European classifications and pictograms (if applicable).
3	Composition/Ingredients	Identifiers, nature, and concentration of hazardous substances.
4	First-Aid Measures	Crucial instructions for emergencies, categorized by routes of exposure: Inhalation, Skin Contact, Eye Contact, and Ingestion.
5	Fire-Fighting Measures	Extinguishing Media (suitable/unsuitable), Hazardous Combustion Products (e.g., CO, SOx), Flammable Properties (flash point), and Advice for Firefighters (PPE like SCBA).
6	Accidental Release Measures	Spill response, including Notification Procedures, Protective Measures (PPE), Spill Management Guidance (cleanup), and Environmental Precautions.
7	Handling and Storage	Safe handling practices, storage conditions, container material, and guidance on avoiding electrostatic charge.
8	Exposure Controls/Personal Protection	Occupational Exposure Limits, Engineering Controls (ventilation), and required Personal Protective Equipment (PPE), such as eye/face, skin, and respiratory protection.
9	Physical and Chemical Properties	Key characteristics like Physical State, Boiling/Freezing Point, Density, Viscosity, Flash Point, and Evaporation Rate.
10	Stability and Reactivity	Information on the chemical's stability and potential to react under certain conditions. Lists Conditions to Avoid (e.g., heat), Materials to Avoid (e.g., oxidizers), and Hazardous Decomposition Products.
11	Toxicological Information	Health effects and symptoms from exposure, including data on reproductive toxicity and carcinogenicity.
12	Ecological Information	Potential environmental impact, including Aquatic Toxicity, Persistence and Degradability, Bio-accumulative Potential, and Mobility in Soil.

Section	Title	Key Information
13	Disposal Considerations	Guidance on safe and compliant disposal of the chemical and its container, including waste treatment methods and EWC codes.
14	Transport Information	Details for safe transportation, including the UN number, hazard class, and packaging requirements under regulations like IMO/IMDG.
15	Regulatory Information	Safety, health, and environmental regulations applicable across different countries (e.g., EU REACH, OSHA).
16	Other Information	Revision date, references, abbreviations, and any applicable disclaimers.

Quick Summary: Product Datasheet (PDS) vs. Safety Data Sheet (SDS)

Aspect	Product Datasheet (PDS)	Safety Data Sheet (SDS)
Primary Purpose	Describes product features, performance specs, and applications	Provides health, safety, environmental, and handling information
Format Standard	Manufacturer-defined format	Follows globally harmonized system (GHS) standards

Final words: Read, Understand, and Make Better Decisions

Understanding lubricant data sheets helps you make wise choices for machinery. These sheets (TDS and SDS) provide key details about safety and performance. By learning how to read them, you avoid guesswork and improve equipment life. Some manufacturers may leave out certain information to protect proprietary formulations. If the information on TDS is unclear, please contact the supplier for further details. Stay curious, stay precise, and empower your machines. Thank you for reading!

About the Author

Mohammad Aatif is a Lubrication Leader with Baker Hughes for the Middle East, India, and Africa (MEIA). He holds FPL, VIM, VPR, MLT II, MLA III (ISO 18436-4, III), and MLE certifications from the International Council for Machinery Lubrication (ICML). With over a decade of hands-on experience in both industrial and marine lubrication, Aatif is a dedicated expert in the field. Contact him at mohammad.aatif@bakerhughes.com.

Mrigank Bothra | ClipOn

SMART FILTRATION IN HEAVY INDUSTRIES:
PROTECTING WORKERS IN CEMENT AND STEEL MANUFACTURING

In heavy industries such as cement and steel manufacturing, the invisible risks are often the most damaging and hazardous. Environments in these sectors are constantly circulating hazards such as dust particles, microscopic contaminants, and air laden with respirable debris. For many years, plant operators have accepted this as part of the trade and an unavoidable by-product of large-scale production in manufacturing units. But advances in smart filtration are beginning to challenge that assumption. Today, it is now possible not only to protect machines from damage but also to safeguard the operators, who are the primary users of these plants.

Figure 1: Aerial view of a large cement manufacturing plant

The importance of clean air in cement and steel plants extends far beyond merely implementing regulations. It involves the reliability of the equipment, increases the lifespan of the critical parts, and most importantly, secures the staff's well-being. Although filtration may seem to be a less significant component in the overwhelming machinery of industrial production, it actually represents the difference between long-term success and the sustainability of operations.

The Human Side of Filtration

Inside a cement grinding unit or a steel rolling mill, in an environment where both humans and machines face a hostile situation. Besides equipment, airborne cement dust, iron oxide particles, and oil mists can affect the lungs of the workers. People working close to the kilns, the crushers, or the blast furnaces sometimes inhale invisible particulate matter.

This is the moment when smart filters integrated with technologies like HEPA filtration become the game changers. While often thought of only in the context of food and pharmaceutical facilities, HEPA filters have also found their place and demonstrated efficiency in the heavy industry sector. Their high-efficiency particle capture capabilities mean that they not only create a cleaner environment for the process but also drastically reduce the risks of respiratory illnesses among workers. Hygiene and safety, which were once considered secondary in heavy manufacturing, are now part of core operational planning.

For many companies, the realization is straightforward: the healthier the workers, the fewer absences, the higher the satisfaction, and the more consistent the productivity. Protecting staff is not only a necessity but also a key factor in determining the plant's performance and overall production.

What Makes Filtration "Smart"?

In the past, filtration was treated as a static safeguard, where it was installed and replaced periodically, with the hope that it would hold. However, operating this way is no longer sufficient in today's highly competitive industries. What makes filtration "smart" is its integration with monitoring and predictive maintenance.

Figure 2: Example of filter cartridges used in industrial air pollution control systems

The essential features of modern smart filtration include:

- Highly advanced filter media engineered to endure high temperatures and chemically aggressive environments typical for cement kilns and steel furnaces.
- Digital monitoring utilizing pressure sensors to recognize clogging before it influences production.
- Custom designs that take into account particle size, dust type, and air flow rates, which are unique to each facility.

This flexibility enables filters to function not in isolation but as part of the plant's reliability strategy, which is directly connected to lubrication performance and machinery uptime.

Reliability Through Clean Systems

On the machinery side, where the filtration plays a critical role. Every particle that enters a hydraulic system, compressor, or lubrication line poses a potential danger. Dust particles can erode valves, scratch cylinder walls, and degrade lubrication quality. Over time, this silent assault leads to unplanned downtime, higher maintenance costs, and equipment that doesn't work as long.

The smart filtration systems address these issues beforehand. By maintaining appropriate levels of contaminants and according to the flow rates or filter loads, they ensure machinery takes in only clean lubricants and air. The result is an easier time for the valve, less wear on bearings, and better thermal control in the engines and compressors. The net benefit is remarkable, as machines live longer, less energy is used, and the entire plant operates more efficiently and dynamically.

Learning from Field Experience

Across the industry, examples are emerging where smart filtration has transformed plant outcomes. A steel manufacturer in southern India, for instance, introduced smart filtration across its lubrication systems. Within a year, they recorded a 40% drop in bearing failures and noticed a significant reduction in oil replacement cycles. Not only did this save on procurement costs, but it also reduced waste oil disposal, and is an often-ignored sustainability benefit.

Similarly, a cement plant experimenting with HEPA-grade dust control systems found that worker absence due to respiratory issues dropped during peak grinding operations. This improvement not only boosted productivity but also reshaped the company's reputation as a safe employer in a traditionally high-risk sector in the heavy industries. These case studies reinforce an essential truth that smart filtration is not a theoretical upgrade, but it delivers measurable results.

The Bigger Picture with the Operations and Culture

Manufacturers typically focus on efficiency, output, and profitability. However, the current manufacturing scenario requires a more holistic approach and increased productivity. Reliability, sustainability, and the worker's health are no longer optional; they are the keys to long-term success.

While the benefits are clear, adopting smart filtration is not without its initial hurdles. The transition requires a significant upfront investment in sensor technology, digital monitoring infrastructure, and integrating these systems with legacy machinery. Plant managers must plan for specialized maintenance training to handle these advanced filters and their monitoring software, ensuring the technology's full potential is realized.

Smart filtration takes this transformation to the next step. It is a perfect example of how a technical intervention, such as better filters, more intelligent monitoring, and cleaner lubrication, can lead to a cultural shift. Workers are feeling more secure, the maintenance teams are getting more effective, and the plant operators can trust their machines. The site, previously perceived as a harsh environment where risk was a constant lure, becomes an ecosystem where human beings and machinery coexist sustainably.

The transition in culture is imperative. Heavy industries face mounting expectations from regulators, communities, and investors. Plants that neglect to address worker safety or environmental concerns not only risk monetary fines but also risk losing their social license to operate. However, those that embrace sustainable techniques, such as smart filtration, show themselves to be responsible and forward-thinking, which prepares them for the future.

Looking Ahead

The use of automation and digital technologies accompanies the journey to smart filtration. The new technologies embedded in filters can monitor and record air pollution levels, the particle count, as well as the filter's lifespan. The information they can collect can be used by predictive maintenance systems, which will enable directors to identify potential errors and rectify them before they occur.

For the cement and steel manufacturing industries, where operational margins are so thin and pressure is high, foresight remains precious. It helps to back the smoothly running machinery, minimizing wasted resources, and, in turn, ensures a worker's well-being at the workplace. The workers are now able to breathe cleaner air, and as a result, they are making better strides in their health.

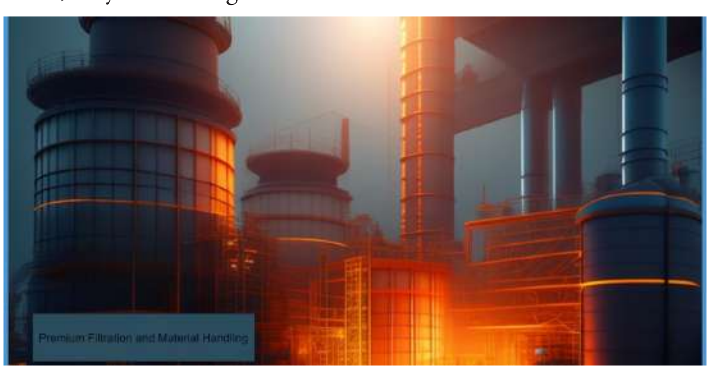


Figure 3: An illustration of modern heavy industry facilities embracing smart technologies for cleaner operation

Smart filtration is no longer a niche consideration reserved for clean room or laboratory systems. In the heavily polluted and high-temperature chambers of cement and steel plants, it has become one of the primary operational standards and a means to safeguard the lives of the workers. The effects were evident through the dramatic change in machinery, as their lifespan and time to heal (lubricate) were extended with cleaner air and dust-free oil.

For manufacturers tasked with balancing efficiency, safety, and sustainability, the answer is clear: where filtration is not only about preventing dust, but also about transforming the plants into cleaner, safer, and more reliable workplaces in the future.

About the Author:

Mrigank Bothra is the Director of ClipOn.io. Specializing in advanced industrial filtration and processing solutions that drive sustainability and efficiency across various industries. He oversees strategic initiatives, business management, and product development in this sector. His dedication to upholding the highest standards in filtration has earned recognition from leading organizations, including NAFA and ASHRAE.

Jhumpa Mukherjee

CAFFEINE VS. CALM: FINDING THE RIGHT ENERGY BALANCE DURING WORK HOURS

For many of us, the workday doesn't officially begin until the first sip of coffee. In industrial and corporate settings alike, caffeine is often seen as a silent co-worker, fueling early mornings, long shifts, and back-to-back meetings.

But what if that daily cup (or three) is silently draining your energy instead of sustaining it?

Caffeine, in moderation, can be a powerful ally. It sharpens alertness, enhances reaction time, and even boosts mood. Yet, when overused or poorly timed, it can lead to crashes, anxiety, and disrupted sleep, ironically making you feel more fatigued over time. The goal isn't to give up caffeine entirely, but to find a sustainable energy rhythm, one that keeps you alert without burning out your body's natural balance.

The Perks of Caffeine

When used mindfully, caffeine can truly be performance-enhancing.

- **Improves Focus:** Caffeine blocks adenoine, a neurotransmitter that causes drowsiness, leading to improved concentration and alertness.
- **Boosts Physical Energy:** A small dose before meetings can elevate endurance and motivation.
- **Elevates Mood:** Moderate caffeine intake stimulates dopamine, often lifting your spirits during demanding workdays.

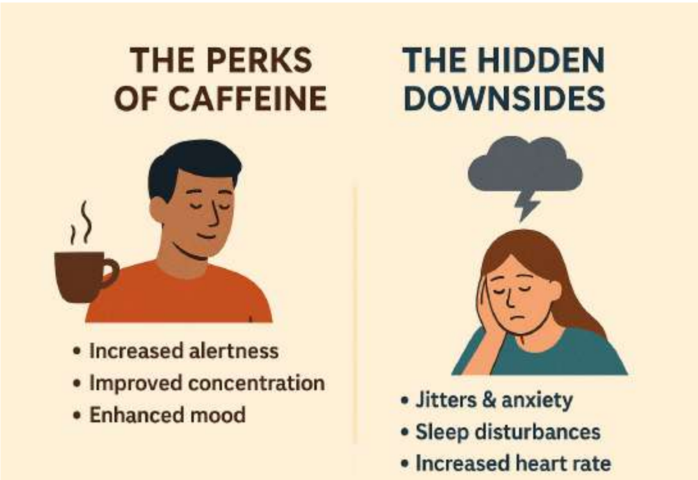
A moderate intake of 200–300 mg per day (about 2–3 cups of black coffee) is generally safe for most adults, according to health experts.

The Hidden Downsides

While caffeine feels like a friend, too much of it can quietly tip the balance.

- **Energy Crashes:** The post-caffeine dip leaves you more tired than before.
- **Anxiety & Restlessness:** Caffeine stimulates the nervous system; excess consumption can make you jittery or irritable.
- **Sleep Disruption:** Even an afternoon cup can interfere with deep sleep cycles, reducing your body's recovery time.
- **Dehydration & Nutrient Loss:** Caffeine is mildly diuretic, which can lead

to reduced hydration—especially in high-heat or high-activity environments.



Sustainable Energy Boosters for Your Workday

If caffeine gives you an instant jolt, these natural methods help you maintain calm, consistent energy throughout the day:

1. Hydrate Smartly

Water is the simplest, most overlooked energy booster. Even mild dehydration (as little as 1–2%) can lead to fatigue and slower cognition. Add lemon or mint for a refreshing twist.

2. Snack with Purpose

Combine protein, complex carbs, and healthy fats, like nuts with fruit, or yogurt with seeds, to stabilize blood sugar and prevent energy dips.

3. Power Breaths

Just 2 minutes of deep breathing increases oxygen flow, clears mental fog, and improves alertness without overstimulating your nervous system.

4. Midday Movement

Stand up every hour, stretch your shoulders, or take a brisk walk. Physical movement reactivates circulation and resets mental focus far more effectively than a third coffee.

5. Matcha, Herbal Tea, or Lemon Water

Green tea or match a contains L-theanine, an amino acid that provides steady energy without the caffeine crash. Herbal teas like peppermint or chamomile can help calm the mind during stressful hours.

Finding The Right Balance

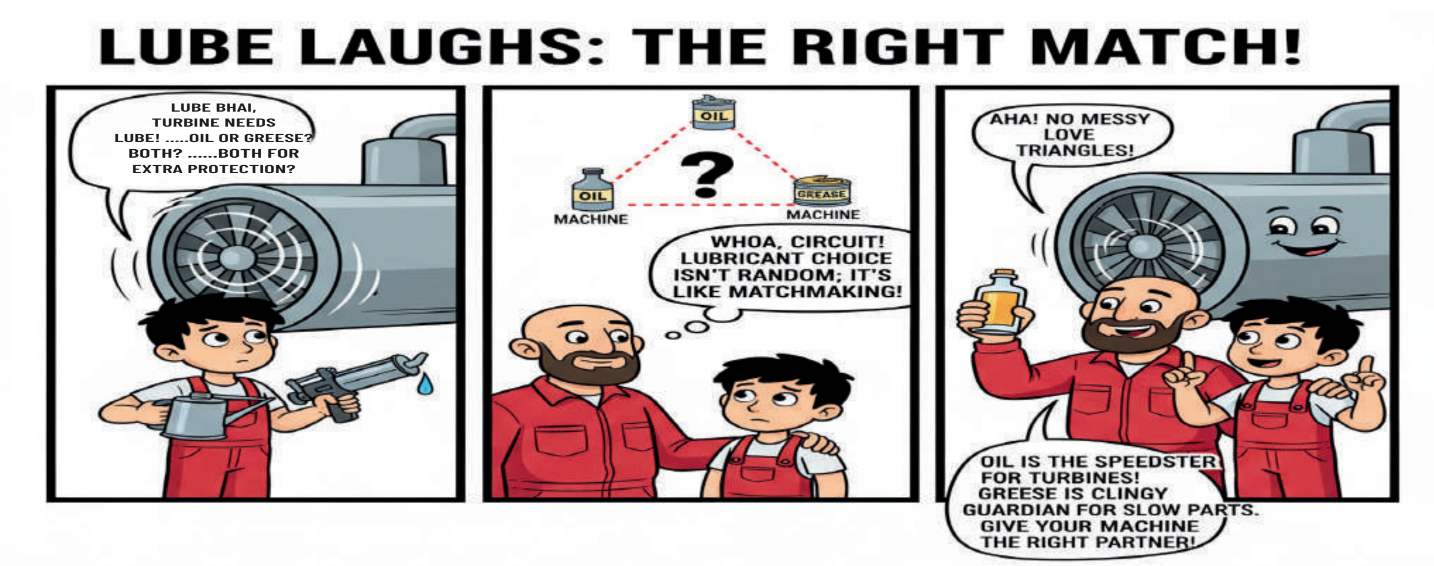
Caffeine itself isn't the enemy; it's how, when, and why we use it. The real goal is balance: using caffeine as a tool, not a crutch. Addressing the root cause creates sustainable vitality, without the roller coaster ride of peaks and crashes. A cup of coffee can start your day, but your calm, your hydration, and your breathing will carry you through it.

About the Author

Jhumpa Mukherjee is a health educator and wellness speaker who believes that well-being and productivity go hand-in-hand. She conducts engaging health awareness sessions for corporates and professionals across industries, making fitness and mental wellness simple, science-backed, and achievable.

Would you like to bring a health session to your workplace?

Let's connect!



MOLYGRAPH
LUBRICANTS

MOLYGRAPH LUBRICANTS SUCCESSFULLY CONCLUDES 'AUTOMOTIVE TECH DAY 2025' IN PUNE

Molygraph Lubricants, a leader in high-performance and specialty lubrication solutions, successfully hosted the Automotive Tech Day 2025 on 9th October 2025 in Pune, bringing together key professionals, engineers, and decision-makers from India's leading automotive OEMs and Tier-1 suppliers.

The event served as a collaborative platform for discussing emerging trends and innovations in automotive lubrication, with a strong focus on Noise, Vibration, and Harshness (NVH) control, damping solutions, and advancements in R&D.

The evening kicked off with a deep dive into lubrication science by the Automotive Team, followed by application selection know-how in real world components. Molygraph's R&D team unraveled how Chemistry plays a vital role in damping greases - revolutionizing in-cabin comfort and tactile precision, especially in the fast-evolving landscape of electric mobility.

Speaking on the occasion, Mr. Paramjeet Singh Karir, Head of OEM & Strategic Business at Molygraph Lubricants, said, "Our goal with Automotive Tech Day was to create a platform for real dialogue between technology leaders and lubricant experts. The automotive industry is evolving rapidly, and lubrication plays a crucial role in improving comfort, performance, and sustainability. Through continuous innovation, we aim to be the trusted partner driving this transformation forward."

The event also featured a "Voice of Customer", an interactive session, highlighting collaborative success between Molygraph and leading Automotive Component manufacturers, followed by a lively Q&A segment.

The evening concluded with networking over cocktails and dinner, providing an opportunity for industry leaders to connect and explore future collaborations.

Media Partners

IOCL & INFINEUM FORGE STRATEGIC LUBRICANT PARTNERSHIP

Infineum India and Indian Oil Corporation Limited (IOCL) have signed a strategic Memorandum of Understanding (MoU) aimed at deepening their collaboration to unlock long-term business value and drive innovation in India's mobility sector. The agreement was formalized at IOCL's Mumbai office, with Bakim Patra, Executive Director (Lubes) at IOCL, and Harshad Jambaulikar, General Manager of Infineum India, as the principal signatories.

Figure 1. Bakim Patra (IOCL) and Harshad Jambaulikar (Infineum India) exchanged the MoU, strengthening their strategic partnership

MoU Signing Details

The MoU marks a significant milestone in the relationship between the two organizations, reinforcing a shared commitment to the future of Indian mobility. The collaboration is designed to expedite the delivery of innovative lubricant solutions that address the evolving needs of consumers and the transport sector in India.

Business Impact and Opportunities

The agreement opens new avenues for business growth by integrating Infineum's expertise in specialty chemical additives for lubricants with IOCL's extensive industry reach and manufacturing capabilities. Both companies aim to co-develop advanced products tailored for Indian operating conditions, supporting smarter, cleaner mobility and catering to increasingly stringent environmental and technical requirements.

Strategic Goals and Indian Market Relevance

Infineum's partnership and investments—including its expanded blending facility in India, set to be fully operational in 2025—highlight the company's strategic focus on localization and innovation to meet the demands of the rapidly growing Indian automotive and transportation market. This aligns with IOCL's goal to shape sustainable and value-oriented solutions for India's transport infrastructure.

Vision for Mobility and Sustainability

Both IOCL and Infineum are committed to supporting India's broader smart mobility and sustainability agendas, envisioning contributions that advance efficiency, reduce emissions, and optimize reliability for future transport systems. Their joint efforts strengthen India's position as a hub for technological innovation and sustainable transportation solutions.

In summary, the MoU formalizes a partnership with ambitions to transform Indian mobility, accelerate the delivery of innovative lubricant technologies, and support the country's transition to more creative and sustainable transport.