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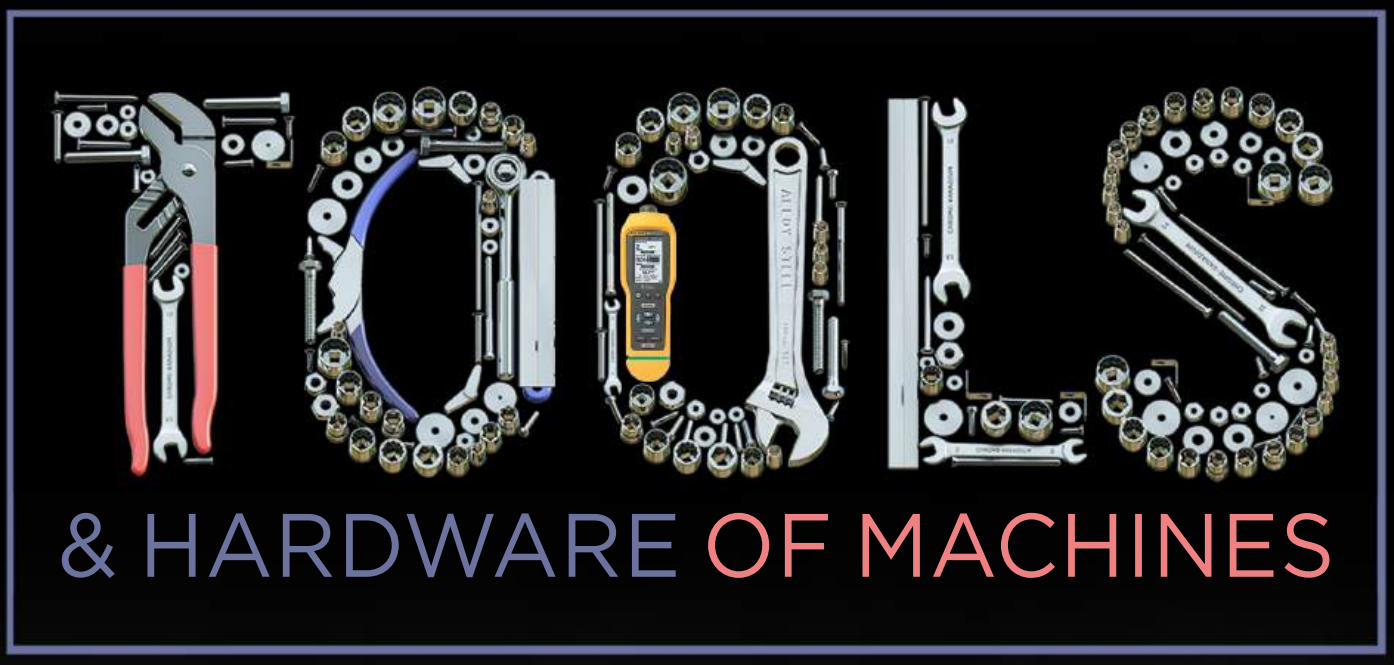
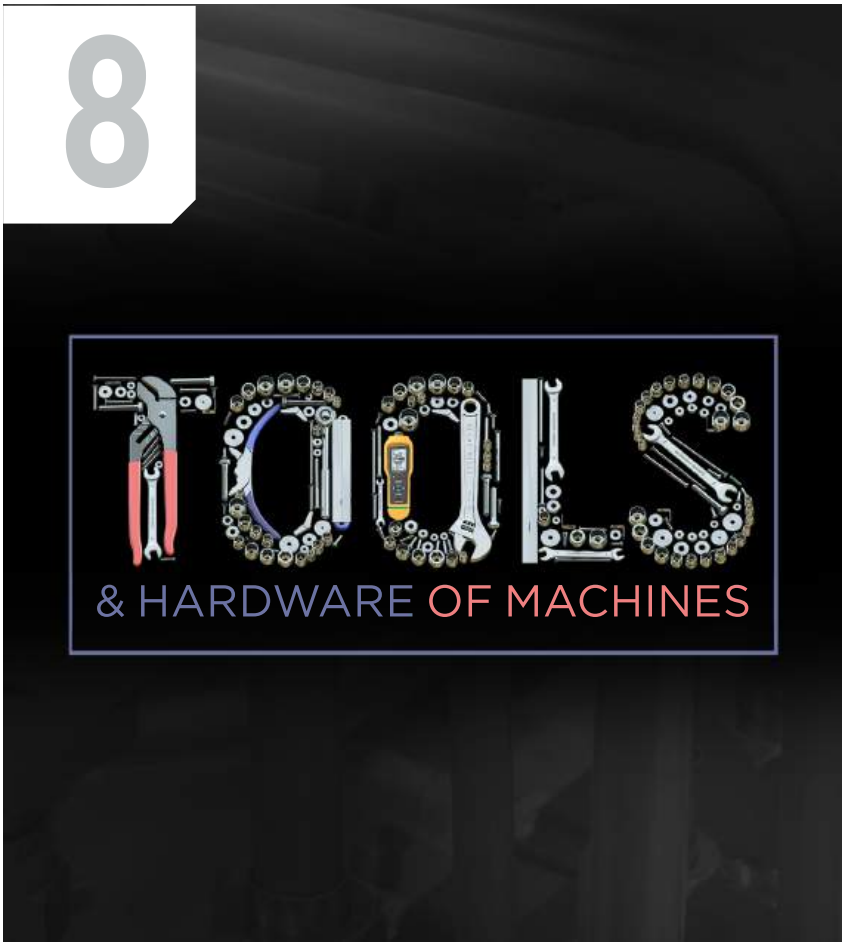


AS I SEE IT

Performing a Failure Scene Investigation

COVER STORY

Tools & Hardware of Machines



From the Asian Desk

EDITORIAL FEATURES

Publisher's Note

This issue is a little exceptional — it marks the 13th anniversary of Machinery Lubrication India. Thirteen years of talking, sharing & learning about lubricants, lubrication, reliability, and machines with all of you who've stayed curious enough. And if there's one thing I've learned in this time, it's this: lubrication is not a supporting act. It's the main storyline in your machine's life cycle — and ignoring it costs a lot.

If machines had WhatsApp, they'd be more talkative than most plant teams I've seen. The compressor would ping: "Boss, things are heating up again." The gearbox would grumble: "It's been nine months. We need to talk." But machines don't send messages. They speak in a language you either understand or you don't.

The truth is, the signs are always there. A hum that wasn't there last week. A vibration just outside baseline. A filter is choking faster than usual. Yet, too often, people notice only when the machine has already failed — and then they call it "sudden." There is nothing sudden about poor lubrication; there is only ignored evidence.

When I started this journey in 2012, I saw the same mistake repeated everywhere — treating lubrication like a checklist item rather than a reliability strategy. Believing OEM specs without context. Assuming "good oil" means "good results." That's wishful thinking. Lubrication doesn't care what you think — it responds only to precision, cleanliness, and consistency.

Over the years, I've walked into plants with lube charts printed in colour and hung on the wall like art — untouched, unreferenced. I've seen grease guns swapped around without labels, filters installed for show, and storage areas that resemble broom closets more than the foundation of a reliability program. That's not maintenance. That's gambling — and the odds are never in your favour.

Reliability doesn't come from chasing the latest sensor or app. It comes from fundamentals executed without fail:

- Every drum labelled
- Every gun is colour-coded and dedicated
- Every PM is carried out when it's due, not when it's convenient
- Every drop of oil was kept as clean and dry as it was when it left the supplier

It's the unglamorous stuff that prevents the expensive stuff. Reliability is never built on shortcuts; it's built on habits — the kind that seem dull in the moment but prove brilliant in the long run. Skip them once, and the cost will remind you. Skip them often, and the machine will retire before you do.

And as this issue's cover story reminds us, it's not just about oils and greases. The tools, storage, and hardware around them matter just as much. A sloppy wrench, a mistreated gun, or a cluttered rack can undo the best lubricant in seconds. Think of them as the unsung cast members in a reliability drama — the ones who never get the spotlight but without whom the show would collapse.

Machines never fail without warning. They always speak first — the hum, the heat, the drift. The real test is whether you're tuned in early enough to respond. In my world, "we didn't notice" is not an explanation. It's an indictment.

After 13 years, I can tell you this with absolute certainty: the plants that treat lubrication as optional will never achieve excellence in reliability. The ones that treat it as the non-negotiable core of asset management rarely need our help — and that's the highest compliment they can pay us.

So here's my advice — not as a suggestion, but as a professional imperative: stop leaving lubrication "on read." Machines are talking. Respond before they go silent. That's not just good practice. That's the only way to win.

We look forward to hearing from you on this issue and discussing how we can better meet your expectations.

Warm regards,
Udey Dhir

PERFORMING A FAILURE SCENE INVESTIGATION

As head of Noria's failure investigation group, I've led many interesting studies in search of failure root causes and remedies. These include missile system failures, highway accidents, helicopter crashes, and turbine-generator wrecks. Most of these nearly 100 investigations were substantially hampered by errors made in collecting and preserving evidence.

We know that when critical failures occur, every effort should be made to prevent repeat performances. Yet, without an intervention to remove the underlying root cause, a recurrence is almost guaranteed.

It stands to reason that maintenance organizations should consider failure investigations as seriously as they do the repair activities needed to return a machine to service. Yet all too often, once production has been restored, the urgency and memory of the failure begins to fade.

We've published extensively on the importance of root cause analysis (RCA) and the steps needed to carry out an RCA. This column will not address these well-documented procedures but instead focuses on the equally important task of preserving and collecting evidence.

After all, it is this evidence that serves as the essential raw material used in the RCA processes. The quality and completeness of this evidence (raw material) is arguably the central factor that determines the precision of the delivered result (the root cause and RCA end product).

Sadly, by the time I get a phone call to participate in an RCA, there is usually only a scintilla of evidence remaining. Perhaps there are a few fragments of a broken bearing or the shelled-out remains of a failed pump. In other cases, there might be photos of the crime scene taken by an alert technician. Of course, there is plenty of anecdotal evidence and personal theories from people who arrived first on the scene. But when it comes to collecting quality data and preserving physical evidence, what's available is usually pretty skimpy.

My advice on preserving evidence is as follows:

What to Do When an Impending Failure is Suspected

Preserving the crime scene should begin at the first indication of a problem. Don't wait until you have a dead body to take action. Most data can be captured only when the machine is still running, so don't squander the opportunity.

Create a log that will serve as a veritable timeline of all information that could be useful in the event the situation worsens. Some suggestions include:

1. Save used oil filters as evidence in a well-marked sealed plastic bag. Note filter condition and abnormal collections (glitter, sludge, debris color, etc.). Record filter service life, especially if it's shorter than usual.
2. Increase the frequency of oil sampling. Pull primary, secondary, and BS&W samples. Some samples can be held in reserve and used only if needed by an RCA investigation.
3. Begin looking for structural and mechanical faults such as misalignment, soft foot, resonance, looseness, bent shaft, etc.
4. Step up vibration analysis by looking for faults and incipient conditions revealed by shaft speed, gear mesh frequency, vane/blade pass frequency, roller/ball pass frequency, cage frequency, etc.
5. Perform frequent walk-down inspections. Check out sight glasses (level, foam, color emulsions, etc.), shaft wobble, oil color and clarity, BS&W bowls, sludge and varnish,- pressure abnormalities, leaks, magnetic plugs, etc.
6. Temperature is a good indicator of impending failure. Use heat guns, infrared cameras, and dedicated temperature probes to look for thermal excursions.
7. Machines emit an assortment of audible signals; some are normal, but others are not. Report unusual whines, rattles, rumbles, pops, etc. Use acoustic instrumentation to isolate structure-bone ultrasonic emissions and other unusual sonic emission sources. Alternatively, a rod, garden hose, or stethoscope could be helpful in localizing problems.

What to Do During or Immediately After Failure

At some point, the rapidly approaching end of a machine's service life will be vividly apparent. In other cases, the machine may fail precipitously with little to no warning. These are known as sudden-death failures. Regardless, it is time to begin preserving evidence by securing the crime scene.

Alert operators and maintenance staff that the failure has occurred (or is about to occur) and that evidence protection is critically important. Assuming the above-listed pre-failure data and evidence collection were already in full stride, the following should be performed during machine failure or just after:

1. Document all final readings while the machine is still running: temperatures, vibe, shaft displacement, pressure, speeds, loads, flow rates, etc.
2. Look for signs of intrusion, botched repairs, sabotage, exterior damage, operator abuse, etc.
3. Photograph any conditions that would be relevant, including sight glasses, tank conditions, leaks, etc.

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4. Begin interviewing witnesses. Find out what they observed, heard, smelled, and anything else that would be relevant. Document the interviews.

5. Contact your failure investigator for advice on the next steps.

What to Do During Repair and Teardown

The most important evidence is typically lost, destroyed, altered, or simply mishandled during machine repair. While prompt return of a machine to service is important, don't be foolish when it comes to data collection and evidence preservation. Consider the following:

1. Throw nothing away, especially during repairs, teardown, and final inspections. Keep oil filters, used oil/grease, used coolant, BS&W, damaged parts, sludge, breathers, magnetic plugs, etc. Bag or package all preserved parts as evidence and label them correctly.

2. Don't clean anything. Save this for the failure investigator.

3. Obtain samples of the new oil that was used for top-ups or oil changes. Save a sample of new grease if grease-lubricated.

4. Photograph the tear-down and repair process. Use both video and digital photography. Many parts may need to be photographed with additional lighting and with macro lenses.

Don't force your failure investigator to wildly speculate a root cause because the investigation was crippled by inadequate and poorly preserved evidence.

Conduct Failure Scene Investigation workshops for maintenance staff, engineers, and operators, aided by expert investigators. Establish policies and guidelines that clearly state how to conduct RCAs and preserve evidence.

And remember this: It's hard to determine the exact cause of death when all that remains of the body is a finger.

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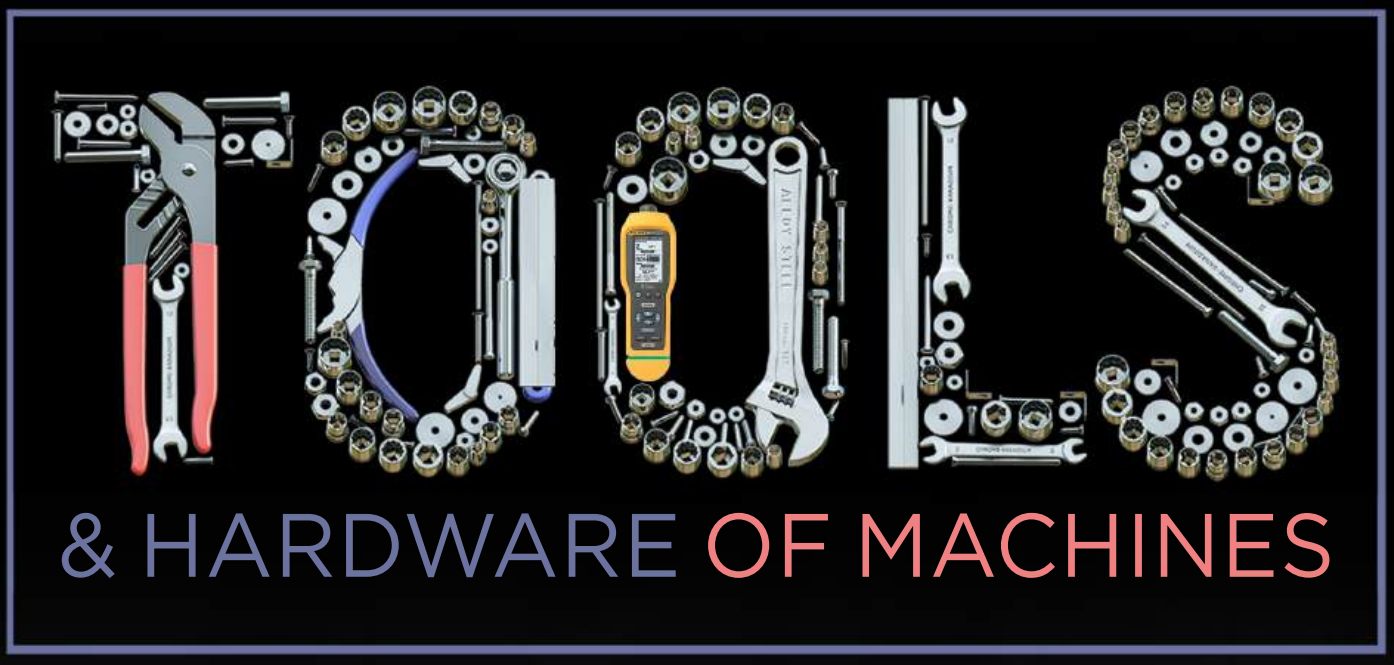
TOOLS
& HARDWARE OF MACHINES

Introduction: 5 Things to Know About the Backbone of Machine Performance

Tools and hardware of all kinds are the unsung heroes of modern machinery. Having the right tools and hardware can make the difference between peak performance and costly downtime in industries focused on maintenance, reliability, and lubrication.

But, because they are crucial, the market can begin to feel oversaturated and frustrating to navigate. By understanding the critical components of various tools and hardware, the right ones can be selected for each specific job.

1. The Importance of Tools in Machine Maintenance

Maintenance professionals understand that machine longevity is determined by proactive care. Essential tools for diagnosis, repair, or preventive maintenance are critical in keeping operations smooth. High-quality tools ensure precision and efficiency, reducing the risk of human error.

Examples of essential tools include:

- **Hand Tools:** Wrenches, pliers, and hammers remain staples in every maintenance tool kit, valued for their versatility and ease of use.
- **Diagnostic Tools:** Vibration analyzers, thermal cameras, and ultrasonic sensors help technicians detect wear and misalignment before they escalate into significant issues.
- **Torque Tools:** Proper torque is crucial for reliability, especially in bolted joints where improper tightening can lead to failure. Advanced torque tools ensure correct specifications are met.

2. Hardware that Boosts Machine Durability

Hardware components like bolts, nuts, seals, and bearings play pivotal roles in machine reliability. They often bear the brunt of wear and tear, so understanding the importance of high-quality materials is critical.

Examples of crucial hardware include:

- **Bolts and Fasteners:** Often overlooked, fasteners must withstand stress and vibrations. Opting for corrosion-resistant materials can extend the life of your machines.
- **Seals and Gaskets:** These components prevent fluid leaks and are essential in machinery lubrication. Different materials (rubber, silicone, or metal) can drastically affect longevity and performance under varying temperatures and pressures.
- **Bearings:** High-performance bearings reduce friction and wear, prolonging machine life. Lubrication plays a significant role here, and integrating systems that ensure constant lubrication will improve operational reliability.

3. The Role of Lubrication Tools

Specialized tools like grease guns, oil filtration systems, and lubrication analyzers are critical for ensuring machine health in lubrication-intensive industries. Lubrication equipment must deliver the lubricant effectively and monitor conditions to prevent over- or under-lubrication.

Examples of popular lubrication tools include:

- **Grease Guns:** Manual and pneumatic grease guns are indispensable for delivering precise amounts of grease to bearings and other moving parts.
- **Automatic Lubrication Systems:** These systems ensure that machines are lubricated without human intervention, improving consistency and reducing maintenance intervals.
- **Oil Analysis Kits:** By regularly analyzing oil samples, technicians can spot contamination and degradation early, preventing more extensive machine failures.

4. Emerging Trends in Tools & Hardware for Reliability

As industries evolve, so do the tools and hardware used in maintenance and lubrication. Examples of emerging technologies that are providing new ways to increase machine reliability and reduce downtime include:

- **IoT and Smart Tools:** The Internet of Things (IoT) has introduced smart tools that offer real-time data collection and monitoring. For example, smart torque wrenches can log applied torque, reducing errors and improving safety records.
- **3D Printing:** This technology is beginning to impact the hardware space by enabling on-demand manufacturing of replacement parts and reducing downtime due to supply chain delays.
- **Condition Monitoring Systems:** Real-time condition monitoring tools integrated with machine hardware allow for predictive maintenance, drastically reducing unexpected breakdowns.

5. The Impact of Proper Tool & Hardware Management on Downtime

Unplanned downtime is one of the most costly aspects of industrial operations, and Poor-quality tools or incorrectly using hardware can lead to failures that halt production lines. On the other hand, well-maintained tools and high-grade hardware reduce the likelihood of failure.

Additional tasks that help prevent unplanned downtime include:

- **Preventive Maintenance:** Regular checks on hardware such as bearings, fasteners, and seals ensure that wear and tear are caught early, minimizing downtime.
- **Tool Calibration:** Regular calibration is necessary for precision tools like torque wrenches and diagnostic instruments to ensure they provide accurate readings and performance.

Conclusion: Optimizing Tools & Hardware for Maximum Reliability

Tools and hardware are at the core of operational efficiency in the maintenance, reliability, and lubrication industries. Understanding the types of tools required, the materials that make hardware durable, and the emerging trends will help companies stay ahead.

Additionally, investing in high-quality tools and reliable hardware while embracing new technologies like IoT and 3D printing can also ensure smoother operations, reduced downtime, and, ultimately, more reliable machines.

Focusing on these critical aspects can help maintenance professionals enhance their machinery's lifespan and performance while improving cost efficiency.

CASE STUDY: WOODGRAIN SOLIDIFIES RELIABILITY THROUGH NEW LUBRICATION PROGRAM

Downtime reduced by 85% in less than three years

Three years ago, Woodgrain set out to slash their downtime and increase machine reliability. This area was creating significant difficulties for the company, and historically, their maintenance program was operating primarily based on tribal knowledge.

Woodgrain wanted to change this and develop a purposeful maintenance and reliability culture that enabled increased trust and communication between management and the small three-person lubrication team. Additionally, the company sought to update and enhance the overall job experience to be more positive and, quite frankly... easier.

An Impressive Implementation

The team's efforts, including the lubrication technicians' impressive hard work and commitment to the project, proved to be a key component of Wood grain's success, and their accomplishments are reflected in the numbers. According to downtime data from 2021 to 2024, they have saved approximately $365,000 by avoiding downtime related to contamination-related failure since making changes. They have also realized another $290,000 in savings by preventing bearings-related failures.

"Since the changes, I really look forward to going to work because I know I'm part of an effective maintenance team that allows my facility to be profitable and to be around for the future," said Woodgrain Lead Lubrication Technician Kevin Ingerson.

Additionally, the company reported 3,500 downtime minutes in its bearing equipment class in 2021. In comparison, only 495 downtime minutes were reported in 2023. Recognizing the success of these initiatives, Woodgrain management is now 100% committed to supporting the company's lubrication team as they complete their remaining reliability initiatives.

"Training helped improve the understanding of 'why' we need to change our practices and create buy-in," said Jacob Johnston, Maintenance Planner and Scheduler at Woodgrain and Noria Lubrication Champion. "We have procured and installed the proper tools and technology. This includes adding filtration systems, as well as bolstering our head space protection on many of our large hydraulic systems." Additionally, Johnston commented he has seen a notable and positive culture shift among the maintenance staff since improving these processes.

How It All Began

After working with Noria to develop an initial ASCEND™assessment in 2018, Woodgrain identified the gaps in their lubrication program and concluded that for every hour of downtime, the plant was losing $9,000. A few years later in 2021, Woodgrain found themselves at a critical juncture – their seasoned staff was retiring, taking their knowledge right out the door with them.

Recognizing that a lack of documented procedures and a chronic contamination problem weren't sustainable, the team chose to act. They turned their focus to reducing this downtime and improving the return on investment (ROI) of their program.

A New Lube Room

Woodgrain understood that a clean, well-organized, and high-tech lube room had the potential to positively impact both equipment reliability and team culture. With a lube room update at the top of their list, Noria and Jacob Johnston began addressing critical lubrication challenges, including lubricant selection, consolidation, and written procedures. The team also collected inventory data and space specifications.

Their decisions resulted in a custom-built, modular lube room that met the needs of the lubrication program, along with a few perks for the team. The final design boasts a climate-controlled space with OilSafe fireproof cabinets, 55-gallon drum work station, an oil analysis station, and a work station for route management.

"The redesigned lubrication room has made a positive impact on our daily tasks by making everything more organized, cleaner, and efficient," said Ingerson.

Selecting the Lubricants

Reducing the number of on-site lubricants can feel like an overwhelming process when a plant has thousands of lube points, as is the case with Wood grain's facility. The team leaned on their partnership with Noria, which provided consolidation recommendations to optimize their list without negatively impacting facility operations or compromising the equipment's lubrication effectiveness.

The Woodgrain team now labels, tracks, and filters all oils, stores supplies properly in a clean environment, and has new written procedures. These detailed procedures outline all application and re-lubrication activities and are organized by equipment type, environment, and component accessibility.

Johnston indicated that this improved process has become the new norm, stating, "This is just the way we do things now, so the conversations and success have been great."

Safety has also seen considerable progress, a welcome by-product of the new lubrication program implementation. Johnston explains that where the team used to haul 55-gallon barrels across the plant with a hand truck, they now use an OilSafe transfer skid, which has not only increased team member safety, but boosted morale. "They just jump on their cart, hook up to the tank, pump it in there, and they're done," said Johnston. "Plus... It's all filtered in and out."

The reduction in lubrication-related failures has also contributed to safety. According to Johnston, reducing failures also reduced the unplanned activities associated with them, which is where most injuries usually occur.

Focusing on Fixes

Guided by Noria's initial ASCEND™assessment, the Woodgrain team elected to focus improvements and modification efforts on their hydraulic systems first. Hydraulics were prioritized due to their significant downtime, associated costs, and the large volume of oil needed if these systems were contaminated. Lubricant filtration systems with in line particle counters and desiccant breathers were installed on all their hydraulic units in the plant.

Since doing so, the team has seen a significant reduction in failures and downtime with this equipment, subsequently giving the team additional time to improve the mean time between failures on bearings and other equipment classes.

Investing in Oil Analysis

Once the team had identified its largest opportunity for improvement (contamination), they also added a few more tools to combat it. Specifically, they invested in a new on-site oil analysis lab. The team can now make informed lubrication decisions using data analyzed by its lab.

Samples are taken from installed oil sampling ports that are compatible with vacuum sampling devices. This keeps the samples from being exposed to environmental contaminants, reducing the amount of contamination that is introduced during sampling and ensuring that their samples are representative of what's going on inside their machines.

Wood grain's lead lubrication technician is dedicated to their lubricant analysis program, taking monthly samples that the team can regularly monitor for solid contaminants and moisture. Written procedures are also in place for sampling, including how to flush sampling equipment and properly handle samples throughout the process.

Platforms and Technology

To schedule lube tasks and measure key performance indicators (KPIs), the team began using LubePM, Noria's Lubrication Management System. This cloud-based software platform delivers real-time alerts from inspections and tracks the lube technician's time, as well as the amount of grease and oil used.

The team also installed a condition-based monitoring system by deploying sensors throughout the mill. These devices monitor bearings and motors and have already begun paying for themselves. Since installation, these sensors have indicated lubrication issues that the team was then able to resolve before these relatively small issues developed into larger problems. With plans to install

more sensors on maintained assets, the team estimates they have already seen nearly $500,000 in downtime savings.

Training as a Team

The team has also partnered with Noria to begin training and preparing their members for the MLT I certification, and management is committed to providing its staff with training to obtain the necessary certifications. Establishing this common base level of understanding will help ensure that the team's new program is sustained because everyone will have an understanding of why it's important.

What's Next?

Johnston believes other plants in the company should implement a lubrication excellence program like theirs. With management 100% bought in, and nearly two years of trans formative work in the books, Johnston reflected on his team's progress. "We are seeing the culture shift among the maintenance staff. This reliability team functions together. The team may have technology specialization, but communication is clear between members."

"With the full implementation of the lubrication program we've been able to create a more consistent and efficient system," added Ingerson.

Johnston says there are plans to attend industry conferences, like Reliable Plant, which will see professionals in every industry to help further their knowledge and share their own experiences. They also recently implemented ultrasonic greasing and plan to expand their use of vibration analysis, as well as maintain a continuous training schedule for additional team development.

GREASE INCOMPATIBILITY: HOW TO AVOID DISASTER AND PROTECT EQUIPMENT HEALTH

For the last six years, I have traveled the world performing failure investigations and developing lubrication programs for facilities in every industry.

While on the surface, they may all seem as unique as fingerprints, in reality, they all have one major thing in common: their lack of education in best practice lubrication techniques and program management methods is causing catastrophic damage to the assets their businesses depend on.

Whether it's something as simple as not knowing the current lubricant in their mainline equipment or something as challenging as maintaining the crucial demands of a well-developed lubrication program, all shortcomings lead to pain points that prove difficult to overcome.

No matter where in the world they are located, the largest problem I see facilities facing is not being able to manage their lubrication and reliability program as a whole. When facilities aren't able to develop lubrication management standardization, there are dire consequences, with one of the most costly and severe being the mixing of incompatible greases.

The Consequences of Mixing Incompatible Greases

Ultimately, the success of a lubrication management program rests on the team's ability to lubricate bearings with the proper grease at the right time and in the right amount.

Grease is gravely important to understand. If you add a different grease than what was originally used, especially if it is incompatible, this can create massive issues within the machine. Once greases are mixed, they can't be undone, which can mean unplanned downtime and costly repairs or bearing replacements.

But what exactly happens when two incompatible greases are mixed?

To start, mixing incompatible greases can cause severe damage to bearings. Take a thickener and a base oil, for example. The thickener holds the grease in place, and the base oil lubricates the components. However, if you were to mix two incompatible thickeners, the base oil would bleed out excessively, leading to a catastrophic bearing failure due to starvation.

When this happens in electric motors specially, more often than not, the oil will bleed onto the windings, which act as the insula-

tion for the motor. This will cause the motor to fail at dissipating heat which will lead to overall motor failure. This excessive heat generated from mixing greases can create a potentially very dangerous situation with facility fires or collateral damage.

In this situation, it's not just the main machine that you're worried about; it's the whole line of machines that are connected to and being driven by that motor. One failing asset affects another asset, and so on, creating a domino effect with severe consequences that must be stopped before widespread damage occurs.

How Does Grease Mixing Happen?

There are several ways greases can mix – most of which stem from simple, preventable errors.

Throughout my career, the number one issue I see is an overall lack of training. Not only will team members not be aware of the current lubricant, but confusion often occurs over which specific lube point they are supposed to lubricate with that grease. This is where lubricant tagging and labeling become crucial to the lubrication program.

Oversights in program management and standardization like this not only open the facility up to an increased risk of maintenance errors but also waste time that many teams don't have to spare. This includes the time it takes to track down the machine's true current lubricant and then cross-reference this to uncover the recommended and last-used lubricant, dramatically increasing a facility's risk of mixing incompatible greases.

Additionally, a lack of standardization quickly causes problems with managing lubrication frequencies and intervals. For example, many facilities operate on a nine-month to one-year regressing schedule, meaning that if grease is improperly mixed, the issue has a high likelihood of not being caught until the next regreasing cycle.

And even then, many facilities aren't accurately inspecting their equipment. In this case, the problem may not be caught until failure modes start showing, which can take up to three or four years after the initial grease mixing occurs. By that time, most corrective actions are ineffective, and you could be looking at costly repairs and replacements.

This issue is compounded when you take into account the sheer number of machines a facility has. Throughout my career, most of the smaller plants I visited have no less than 450 assets, which equates to about 1,000 motors that need to be managed and 1,000 chances for grease mixing to happen.

If a facility doesn't have a great lubrication management system in place, it's all too easy for team members to become overwhelmed, exponentially raising the likelihood of incorrect lubrication practices and ultimate machine failure.

Painting the Big Picture for LubeTechs

What this all boils down to is a lack of training across the board. But, this isn't inherently a fault or a character flaw – sometimes, it's an "unconscious incompetence". Unconscious incompetence basically means that you don't know what you don't know. This is why training is so important for any facility that wants long-term and sustainable success.

No one is immune from this phenomenon. Looking back on my own educational journey, I didn't know the proper way to grease until I began working at Noria, where they provided me with training. I grew up in the country greasing tractor and trailer bearings, where the mentality was "grease that sucker until the grease comes out." But, if you apply this same advice to industrial bearings, you'll blow the seal and cause serious damage.

It wasn't my fault that I didn't know, but it would have been my fault if I had known and chosen not to do better. As I tell all the facilities I help, 90% of the time, we are murdering our machines, and at the end of the day, our negligence, either through a lack of knowledge or a lack of effort, does the most damage.

Even though it is often overlooked, training is one of the most crucial parts of developing an effective lubrication program. With training, team members become confident in their understanding of best practices and feel empowered to implement changes that keep machines healthy and create a new maintenance culture.

Changing the Culture

It can take years for a facility to realize it needs help with its maintenance management program. Part of the problem is that although team members, like reliability engineers, understand that lubrication is important, they can't implement an entire maintenance management program by themselves. They need buy-in from senior leadership and all other team members to get the program off the ground.

So, while there may be awareness that the current system isn't effective, there isn't anything a single individual or team can really do to permanently correct the issue until everybody is on board and makes changing their practices a priority.

The education and involvement of leadership, such as the plant manager and maintenance supervisors, help create the foundational knowledge that, first and foremost, lubrication is important.

The leadership team will ultimately be the ones responsible for outlining and developing the plan for change. Not only must this plan be developed using best practices, but they must be able paint the big picture for the team. This way, the team knows why these changes are crucial and why they are being asked to change how they have performed lubrication all these years. Without their enthusiastic and educated perspective,

there is a risk that the goals and importance of the change plan won't be communicated effectively.

Additionally, training for team members, such as lubrication technicians, ensures that when these change plans are communicated, they not only understand why the changes are being enacted, but they also have the required skills to make the changes happen and to maintain them.

When a decision is supported by the appropriate actions, that's when changes begin to have a positive effect on uptime and productivity, which secures the health and longevity of the facility's critical assets and equipment. Through training, team members at every level discover how important lubrication is to securing sustainable change while learning how to properly implement and maintain a new program.

Measuring Success

Once a change plan is in place and all teams are doing their part, it's important to communicate progress and results effectively. This means tracking Key Performance Indicators (KPIs) and metrics and regularly posting the results somewhere everyone can see them.

By posting the results, every team member is on the same page and clearly understands how their role contributes to successfully reaching the facility's goals. It also brings the added benefit of boosting morale and encouraging best practices, no matter how tedious they can feel, because the team can see the positive results of their hard work.

At the end of the day, it's the small things team members didn't realize mattered that make the biggest impact, and now facilities will have the data to prove it.

Keeping Up with the Times & Technologies

It's one thing to share the data with the team and another thing entirely to collect it. It is management's responsibility to stay up with the times when it comes to the best way of collecting this data. This means that instead of relying on a traditional paper-and-pencil system, facilities should transition to using devices.

Whether it's a cell phone, tablet, or computer, every team member across the entire facility needs to have access to one. This allows everyone to not only track progress in real-time, but also get the information they need right at their fingertips. Technology also cuts down on missing or incorrect information, confusion, and the doubling of efforts, all while reducing the risk of tasks being forgotten or performed incorrectly.

This real-time collection and exchange of information provides several benefits. For instance, it can be used to analyze maintenance management program success. It also guides maintenance and lubrication efforts by alerting team members to when an asset needs lubrication, as well as what kind of lubrication is needed and how much should be applied. This ensures all assets are being properly re lubricated at the right time, cutting down on machine failure and associated costs.

At the end of the day, all facilities rely on their machines to drive critical operations, and there is zero room for error. Technology is a low-cost investment that creates a quick, high return for everyone. A single iPad can cost as little as $400, and this iPad can be equipped with industry-specific applications to help manage maintenance and lubrication operations.

When you consider that a machine or component failure can easily cost $60,000 or more to repair or even replace, not including the loss of revenue from downtime, the $400 investment seems worth while. Everything is all right there in the palm of a team member's hand.

At the end of the day, every small decision we make with conscious, intentional effort, such as training, data collection, and lubrication program development, creates lasting change, allowing facilities to properly care for the critical assets that are a business's lifeblood.

OH, SH#T! A LUBE TECH'S LESSONS LEARNED

The term "OH, SH#T" (or OS! as I'll refer to it from now on) usually means something bad has happened, but this isn't always true. Sometimes, it can come from something great happening, like finding a new, faster, easier, or more efficient way of performing a lubrication task.

As a Lubrication Specialist for the past 6 years, I have had several of these moments, both good and bad. Sometimes, if you're lucky, a healthy combination of both will lead to a new learning experience. If you are not continuously learning and growing (sometimes painfully) from new experiences, you risk becoming stagnant.

Here are a few of my OS! lubrication moments.

First OS! Lesson

Bullseye sight glasses are a wonderful invention that provides a window into the interior of a machine to examine the level of lubricant inside the reservoir. In one case, however, they led to my first OS! moment.

I installed 12mm bullseye sight glasses on about 24 new gearboxes and filled them to the proper gear oil level. Although they're not very big, 12mm sight glasses still give you an appropriate level, or so I thought.

I saw the oil flow into the sight glass for the first time, so I knew I had the level right. The gearbox was inspected weekly, including visually inspecting the oil level in the sight glass. The glass always had oil, even after nearly five months of taking monthly samples. As a new lubrication tech, I assumed that maybe I had over filled the gearbox that first time.

After pulling five monthly samples of 5 ounces (four for the sample and a 1-ounce purge amount), I became curious about how I still had the proper oil level in the gearbox and decided to investigate further.

During the investigation, the sight glass was pulled. The gearbox's oil level was about half what it should have been, but the sight glass still showed that it had the same amount of oil even after it was pulled from the gearbox.

OS! (Not Good)

I discovered that due to capillary action, there was no flow back into the gearbox from the 12mm sight glass. The oil level was immediately taken back up to the proper level. After this, I decided to do away with all the 12mm bullseye and install column sight glasses with head space returns in the piping underneath my desiccant breather. That gearbox is still running to this day, so I would call that a win.

I installed all the 6-inch column sight glasses using a 12mm to ¼-inch adapter and all stainless-steel fittings. It is a little more expensive to do it this way, but using malleable iron or galvanized fittings can and will throw off the numbers in an oil analysis report.

The oil from the gearbox flowed into the column sight glass, and all the other gearboxes were filled to the correct amount. All these gearboxes are sampled monthly, which is good because of my next learning moment.

Second OS! Lesson

All the machines in my facility have a preventive maintenance (PM) schedule to ensure they are inspected once a week. This inspection covers:

- Oil level and condition
- Desiccant breather condition
- Gearbox and drive motor heat, leaks, and abnormal noise.

Although samples are taken monthly, it's good practice to perform your regular inspection while you'r standing there. In my case, the oil was clean, clear, and bright in the column sight glass when I took the oil sample with my vacuum sample pump. But when it came out into the sample bottle, the oil was dark red.

OS! (Not Good)

How could this be? The oil in the column sight glass was in just as perfect condition as the day I filled the gearbox. The reason was because that was the same oil from the day I filled it.

Column sight glasses are excellent at giving an exact level of the oil in the gearbox, but there is no recirculation of the oil in and out of the glass. The only circulation is if makeup oil is added to the reservoir, pushing a small amount into the glass. Otherwise, there is no indicator of the condition of the oil inside the actual machinery. In my case, this oil condition finding was bad but, thankfully, not catastrophic.

Because the reservoir was sampled monthly, at most, I could have had contamination in the oil for 29 days. Had the machine been sampled every other month or, even worse, quarterly, there would have been a longer period of unresolved contamination and more serious consequences for the machine's health.

Third OS! Lesson

The sample was sent to the lab, but I didn't wait for the results; that day, I performed a complete drain, flush, and fill. I also began contemplating how to push the oil from the sight glass back into the reservoir to get an immediate look at the oil's condition. Air pressure is the best option, but it must be "clean and dry" air filtered through the desiccant breather.

Using my own money, I purchased an air pump that pulls air in from a hose on one end of the pump and pushes it out through a hose on the other. I cut my head space return line, attached the inflow side of the closed pump to the breather side, and attached the outflow to the section of the hose on top of the column.

Throughout this process, I had no idea whether this would work. If it didn't, I would take the air pump home and use it on bike tires or inflatable toys for the grand kids so my money wouldn't be wasted.

I pulled out the pump's plunger, filled it with air from my desiccant breather, and pushed it in. All the oil from the glass was pushed back into the gearbox. It worked perfectly!

OS! (Good)

I installed a push-to-connect coupling fi tting on both ends of the cut head space return line to close the loop on my breather. Now, I could perform a visual check on my weekly PM route with an extra 30 seconds and a $7.49 air pump that I got from a local national discount tool store.

Fourth OS! Lesson

In another instance, I received word that a bearing had gone bad. Everyone has had a bearing fail at one point or another in their career; it happens to the best of us. No matter how much time and effort you put into the care and feeding of a bearing, sometimes they go bad, right?

When the maintenance tech told me a particular bearing had gone out, I knew it wasn't a human error on my part because it was a sealed bearing– meaning it was behind a "guard" that made it part of the machine's body and nearly impossible to remove.

You would hope no Original Equipment Manufacturer (OEM) would put a serviceable bearing in a difficult-to-reach place,

right? Unfortunately, that was my exact situation, and once removed, I found the bearing was completely dry.

OS! (Bad, very bad)

I run a tight ship and pride myself on that fact; how could I have overlooked this? Truth is, it is easy to do, and I just assumed that this bearing was sealed because of the location. I never checked.

After explaining what happened to my supervisors and admitting what I had overlooked for several years, I set to work on fixing the problem. I did not want it to happen again because this bearing was the first of eight like it in our facility and was next up to lock up.

My solution was grease line extensions. While not perfect for every situation, in a case like this, they were a great option. During the following scheduled downtime, I locked out the equipment and removed the guard. Then, I installed a push-to-connect fitting on the bearings, ran a pre-filled grease line compatible with our current grease selection out to an easy-to-reach area, and installed a grease fitting. A monthly PM was created for greasing these new (to me) bearings, and so far, none have gone out. In fact, I may have extended the life of the other seven bearings at the expense of one.

Conclusion

These are just a few of the many, many things I have learned throughout my career as a practicing Lubrication Specialist. Although some of these lessons were painful to learn and had me thinking, "OH,SH#T!" they were necessary for my growth – ultimately helping me achieve my positive "ah-ha" moments that made me better at my job.

TASK-BASED TRAINING | TOP-UPS UTILIZING AN S&R CONTAINER

Traditional methods of refilling lubricants using single-use containers contribute to environmental waste and disposal challenges. Adopting sealable and refillable (S&R) containers for oil and lubricant-re filling presents an eco-friendly and sustainable alternative that ensures operational efficiency while potentially minimizing environmental impact and contamination.

What is an S&R container?

An S&R container is a sealable, refillable container that is typically made of plastic and made to house a specific type of lubricant. They are widely used and come in multiple configurations, allowing for easy addition of lubricant while minimizing contamination or potential leakage.

Since oil and grease reservoirs play a critical role in various industrial applications, they require consistent maintenance and periodic top-ups to ensure optimal performance. Utilizing sealable and refillable containers for oil and grease reservoir top-ups presents a sustainable approach that not only maintains operational efficiency but also minimizes environmental impact.

Types of S&R Containers:

When choosing a sealable and refillable container for oil refilling, consider factors like the type of oil being stored, the quantity needed, ease of handling, transportation requirements, and the level of sealing and protection required to prevent leaks or contamination. Additionally, ensure that the containers meet all regulatory standards or safety requirements for storing oils in your region.

S&R containers come in different sizes and shapes, with screw-on caps or lids that provide a sealable closure. Most of these feature pour-style fill ports, with either caps or threaded caps, to seal the opening.

Other S&R containers feature a pump mechanism that allows for easy and controlled dispensing of oil. These containers typically consist of a reservoir for holding the oil and a pump mechanism connected via hose.

Some companies also produce specialized refillable containers designed specifically for oil refilling. These containers may have features like built-in funnels, precise dispensing mechanisms, or spill-proof designs.

Pump-style S&R containers come in various sizes, ranging from small handheld ones suitable for household use to larger containers for industrial or commercial applications. Durable, easy-to-use and clean, some pump-style containers may also have features that ensure accurate measurements, allowing for precise dispensing of oil without wastage.

Challenges and Solutions:

1. **Compatibility and Standardization-** Ensuring that the S&R containers are compatible with various types of oils and lubricants used across different machinery requires careful selection and standardization.
2. **Handling and Maintenance-** Proper handling, storage, and maintenance of these containers are essential to prevent contamination and ensure their integrity for reuse.

Procedure for Topping Up a Reservoir with an S&R Container:

1. Firstly, ensure the LIS Code on the container matches the oil that is being refilled.
2. Clean the area around the fill port.
3. Remove the fill plug, insert S&R container hose into the housing.
4. Begin adding lubricant while looking at the sight glass to confirm you're adding the recommended volume.
5. Stop filling when the lubricant amount has reached the proper level on the sight glass.
6. Record amount of lubricant that has been added and the date.
7. Remove the nozzle from the fill port; clean and replace the fill port plug.
8. Collect and dispose of all consumables used during the procedure.
9. Wipe up any lubricant that may have spilled during the procedure.

Key Takeaways:

- Always ensure the LIS tags match on the container and the lubricant.
- Add oil slowly and record added volume.
- Take steps to prevent contamination. Remember to take care and maintain all safety regulations of the facility.

CHAIN LUBRICATION BEST PRACTICES FOR DRIVES AND CONVEYORS

A chain is a series of traveling journal bearings with a means to engage the teeth of a sprocket and transmit force and motion. Because each chain joint is a bearing, proper lubrication is essential to obtain the maximum service life from a chain drive or conveyor.

Chains for Drives

The three most common types of chains used for drives are: precision roller chain, covered by American National Standard ASME B29.1; silent (inverted-tooth) chain, covered by ASME B29.2; and engineering steel offset sidebar chain, covered by ASME B29.10.

Roller chains are produced in 0.25 through 3.0-inch pitch and are used for a wide variety of drives in the slow to high-speed range. Silent chains are produced in 0.375 through 2.0-inch pitch, run smoother than roller chains, and are used mainly in high-speed drives. Engineering steel chains are made in 2.5 through 7.0-inch pitch and are used mainly in slow-speed drives.

Chains for Conveyors

Both precision roller chains and engineering steel roller chains are commonly used in slat, apron, pusher and crossbar conveyors. Welded steel chains are widely used in scraper and drag chain conveyors. Forged link chains are frequently used in overhead trolley and floor conveyors.

Precision roller chains, engineering steel roller and roller less chains, cast chains, polymeric chains, flat top chains and silent chains are used in plain chain and carrier chain conveyors. Space limitations will permit covering only a few of the most widely used types of conveyor chains here.

How Chains Fail

The three most common ways that a chain may fail are tensile, fatigue and wear. In a tensile failure, the chain is overloaded in tension until it is stretched so badly it will not function properly, or it is literally pulled apart. In a fatigue failure, the chain is loaded repeatedly in tension, at a load below the yield strength (the chain is not stretched), until microscopic cracks develop in the link plates or sidebars.

These cracks continue to grow until the chain breaks. In a wear failure, material is removed by sliding, or sliding combined with abrasion or corrosion, until the chain will not function properly (will not fit the sprockets) or the remaining material is so thin that it lets the chain break. This article covers only the lubrication of commonly used steel bushing and roller chains to reduce the effects of wear.

Chain Wear

Most often, wear between the pin and bushing causes the chain to elongate (grow longer but not stretch) until the chain will not fit the sprockets correctly or will not maintain correct spacing or timing. Sometimes wear between the roller and bushing or wear between the link plates or sidebars and guides causes the chain to malfunction.

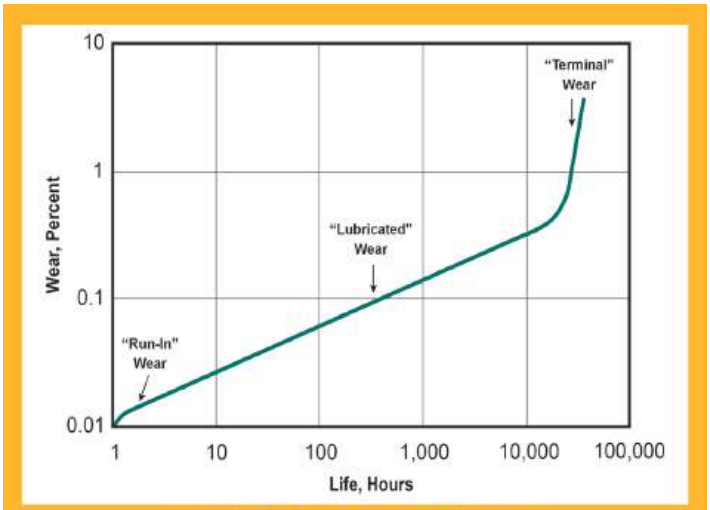

Figure 2. Chain Elongation Progress

Chain wear elongation usually progresses through three stages as shown in Figure 2. First, there is a short period of rapid initial, or run-in wear. In this first stage, high spots are worn off the pins and bushings and minor misalignments are quickly worn away. Second, there is a period of constant slow, or lubricated wear. In this second stage, the pins are seated properly in the bushings and the bearing areas are normally well-lubricated.

And finally, there is another period of rapid, or terminal wear. In this final stage, lubrication may have become ineffective or failed completely, or the hard case on pins and bushings may have worn through, or chain elongation on the sprocket may have caused loads on individual joints to increase dramatically.

Lubrication Effects on Chain Operation

The majority of chain drives and conveyors will perform better and last longer when timely and adequate lubrication is provided. One rule-of-thumb is that proper lubrication can extend chain life by as much as 100 times (Figure 3).

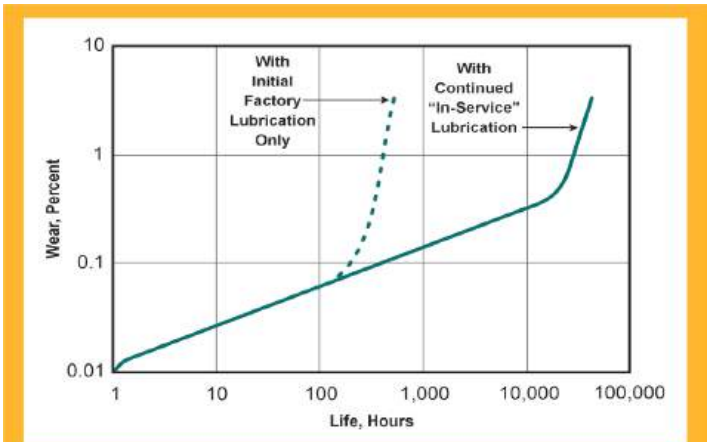

Figure 3. Proper Lubrication Can Extend Chain Life

Even if overall chain life is acceptable, lack of proper lubrication can cause other problems. When a chain is starved for lubrication, wear from one joint to another can vary greatly, causing erratic action. Rapid joint wear can cause early loss of timing in a conveyor. Lack of lubrication can increase friction and power consumption and cause a harmful temperature rise.

Need for Lubrication

Chain lubrication is needed mainly to slow the wear between the pins and bushings in the chain joints, to flush out wear debris and foreign materials, and to smooth the chain's engagement with the sprocket. Additionally, lubrication may be needed to inhibit rust and corrosion, to carry away heat, and to cushion impact forces.

Chain Lubricants

A chain lubricant should have low enough viscosity to penetrate into critical internal surfaces and high enough viscosity, or necessary additives, to maintain an effective film at the prevailing temperature and pressure.

Recommended viscosity for various surrounding temperature ranges are shown in Table 1. The lubricant should have the capability to maintain the desired lubricating qualities under prevailing operating conditions, and be clean and free of corrodents.

Table 1. Recommended Oil Viscosities for Various Temperatures

Recommended Grade	Temperature, °F	Temperature, °C
SAE 10	-20 to +80	-29 to +27
SAE 20	+10 to +110	-12 to +43
SAE 30	+20 to +130	-7 to +54
SAE 40	+30 to +140	-1 to +60
SAE 50	+40 to +150	+4 to +66

Note: When the temperature range permits a choice, heavier grade should be used.

A good grade of non detergent petroleum base oil usually is acceptable. While detergents are not normally needed, anti foaming, anti oxidizing and extreme pressure additives are often helpful. Impure oils should be avoided. Acids or abrasives in the oil can permanently damage the chain.

The chain manufacturer often uses grease or petroleum jelly as an initial lubricant. However, users generally should not apply greases

to chains in service because they are too thick to penetrate into the internal bearing surfaces of the chain. Users should use grease only when fittings for injecting the grease into the chain joints are provided.

Lubrication of Chain Drives

The recommended method of lubrication for chain drives is indicated in the power rating tables published in ASME B29 Series Standards and in various manufacturers' catalogs. The methods normally listed are manual, drip, oil bath, slinger disk and oil stream.

In all methods, the oil should be applied to the upper edges of the link plate or sidebar in the lower span of the chain. This enables gravity and centrifugal force to carry the lubricant into the critical bearing areas.

Manual Lubrication

In manual lubrication, the user applies oil periodically with a brush or spout can. The preferred frequency is once every eight hours, but a longer interval may be used if experience shows it is adequate for that particular drive.

The amount of oil and the frequency of its application must be adequate to prevent the formation of a reddish brown discoloration in the chain joints. That discoloration indicates that red iron oxide (rust, hematite, etc.) is being generated in the chain joints because they are not receiving sufficient lubrication.

Drip Lubrication

In drip lubrication, oil is dripped between the link plate or sidebar edges at a rate from four to 20 drops per minute, depending on speed. Again, the amount of oil and the frequency of its application must be adequate to prevent the formation of a reddish brown discoloration in the chain joints. In drip lubrication of multiple strand chains, a wick-packed distribution pipe may be used to uniformly distribute oil to all rows of link plates or sidebars.

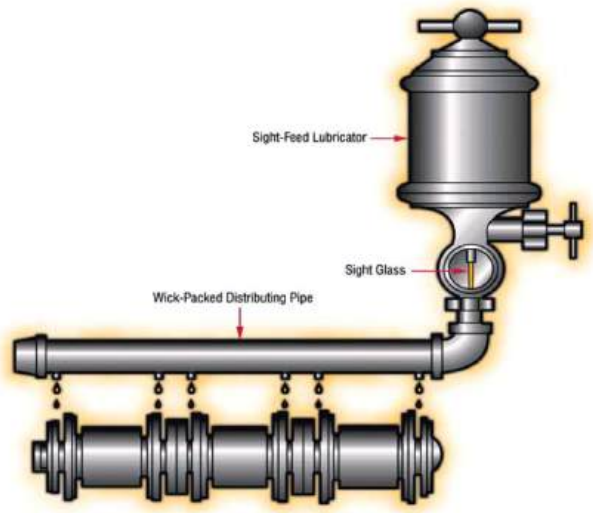

Figure 4. Drip Lubrication

Oil Bath Lubrication

In oil bath lubrication, a short section of the chain runs through the oil in the bottom of the chain casing. The oil level should extend only to the pitch-line of the chain at its lowest operating point. Having long sections of chain run through the oil bath can cause oil foaming and overheating.

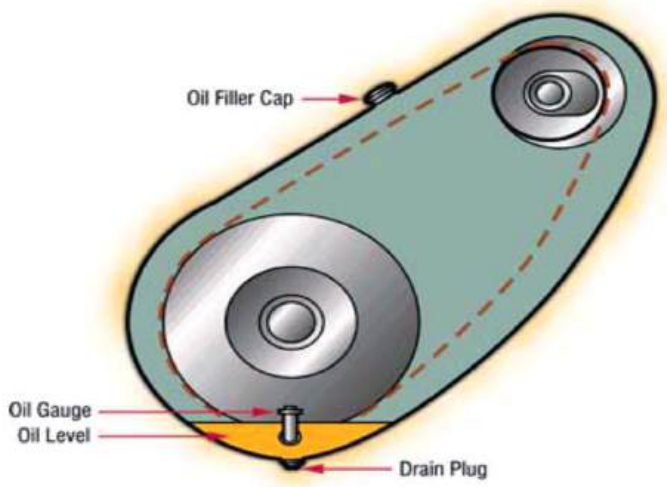

Figure 5. Oil Bath Lubrication

Slinger Disk Lubrication

In slinger disk lubrication, a rotating disk picks up oil in the bottom of the casing and slings it against a collector plate. The oil is then directed into a trough that drops it onto the upper edges of the link plates or sidebars in the lower strand of the chain. The chain should always run above the oil level in the casing.

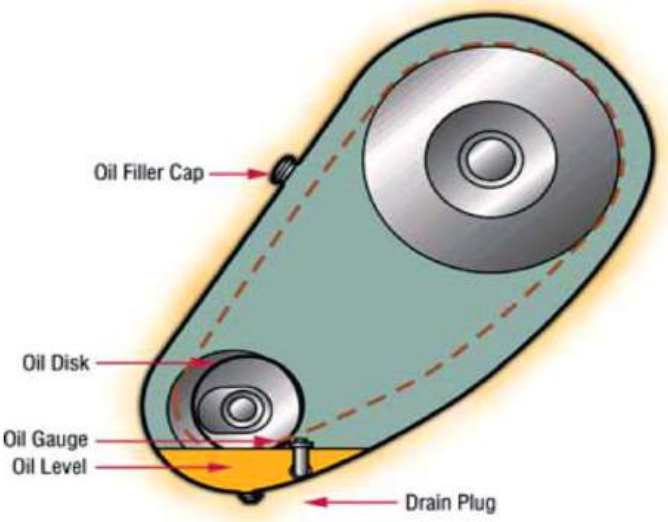

Figure 6. Slinger Disc Lubrication

Oil Stream Lubrication

In oil stream lubrication, the oil is pumped under pressure to nozzles that deliver a stream or spray on to the lower span of the chain from the inside of the loop. The oil spray should be distributed uniformly across the entire width of the chain.

The excess oil is collected in the bottom of the sump and returned to the pump via a reservoir. An oil cooler may be used to keep oil temperature below the maximum limit.

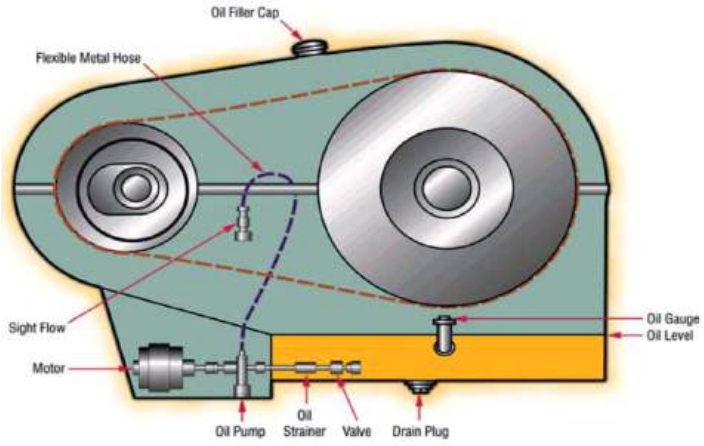

Figure 7. Oil Stream Lubrication

Periodic Maintenance

For manual lubrication, ensure that the designated schedule is followed and the specified grade of oil is used. If the chain is dirty, wipe it clean with kerosene or a nonflammable solvent before re-lubricating.

For drip lubrication, ensure that the flow rate is as specified and that oil is properly directed on to the chain. Check the oil level in the reservoir at least daily and refill as necessary.

For oil bath, slinger disk and oil stream lubrication, check the oil level in the casing or reservoir at least daily and add oil as necessary. At that time check for leaking, foaming or evidence of overheating. Ensure that all orifices and nozzles are clear and that oil is properly directed onto the chain. Change the oil after the first 50 operating hours and then after every 500 operating hours.

Lubrication of Chain Conveyors

The method of lubricating chain conveyors is generally governed by speed, environment and accessibility. Some method of continuously or periodically lubricating the chain conveyor in service should always be considered. Not lubricating a chain conveyor is a reasonable option only if one of the special chains (sealed joint, etc.) is used.

Manual lubrication is normally sufficient for slow-speed conveyors. Manual lubrication may sometimes be adequate for moderate-speed conveyors, but drip or brush lubrication is often needed. Drip lubrication is often required for high-speed conveyors, and continuous oil stream lubrication may sometimes be needed.

Whatever the method, the oil should be applied to the upper edges of the link plate or sidebar in the lower span of the chain. This enables gravity and centrifugal force to carry the lubricant into the critical bearing areas.

In reasonably clean, dry, nonabrasive environments, drip or oil stream lubrication is quite acceptable. However, in dirty, abrasive environments, where the combination of continuous lubrication and abrasive grit can cause rollers and joints to stick, periodic cleaning and manual lubrication may be better.

In extremely high or low temperatures, special synthetic lubricants may be required. In wet environments, special lubricants or coatings may be needed.

When accessibility is limited, special remote-fed drip or intermittent-spray lubrication systems may be necessary. Also, special remote-controlled chain cleaning systems may be needed.

Manual Lubrication

In manual lubrication, oil is applied to the chain with a brush or spout can. The preferred frequency is at least once each day, but the interval may be longer if experience shows it is adequate for that particular application.

The amount of oil and the frequency of its application must be adequate to prevent the formation of a reddish brown discoloration in the chain joints. That discoloration indicates that red iron oxide is generated in the chain joints because they are not receiving sufficient lubrication.

Brush Lubrication

In brush lubrication, oil is continuously brushed on the lower span of the chain from the inside of the loop. The amount of oil and the frequency of its application must be adequate to prevent the formation of a reddish brown discoloration in the chain joints.

Drip Lubrication

In drip lubrication, oil is dripped between the link plate or sidebar edges at a rate from four to 20 drops per minute, depending on speed. Again, the amount of oil and the frequency of its application must be adequate to prevent the formation of a reddish brown discoloration in the chain joints.

Oil Stream or Spray Lubrication

In oil stream lubrication, the oil is pumped to nozzles that deliver a stream or spray onto the lower span of the chain from the inside of the loop. The oil spray should be distributed uniformly across the entire width of the chain.

Periodic Maintenance

The same guidelines given for periodic maintenance of manual and drip lubrication of chain drives apply to chain conveyors. For oil

stream lubrication, check the oil level in the reservoir at least daily and add oil as necessary. Ensure that all orifices and nozzles are clear and that oil is properly directed on to the chain.

Chain Terminology

Pitch
The nominal distance between the centers of consecutive chain joints. That would be the distance between consecutive rollers in roller chain and offset side bar chain, and between consecutive pins in silent chain.

Side Bar
The tension members connecting consecutive joints in an offset sidebar chain.

Link Plates
The tension members connecting consecutive joints in a roller chain.

Joint
The place in a chain where the chain articulates to engage the sprocket.

Guide
A plate or rail on which a chain, usually a conveyor chain, rides.

Pin
The innermost member of a chain joint. The pin articulates inside the bushing in roller and offset side bar chains, and it usually is pressed into the outer link plates or the wide end of the side bars.

Bushing
The intermediate member of a chain joint in roller and offset side bar chains (silent chains may not have bushings). The bushing is fitted between the pin and roller, and it usually is pressed into the inner link plates or the narrow end of the side bars.

Strand
In roller chain, multiple rows of link plates, bushings and rollers are sometimes assembled on to a common pin. Each row of links is called a strand.

References
Much of the information for this article was extracted from two publications by the American Chain Association. For more information on chain lubrication, please refer to the following publications:

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MOLYGRAPH LUBRICANTS

LUBRICATION: THE ENGINEERING BACKBONE OF INDUSTRIAL PERFORMANCE

In advanced industrial systems, the choice and application of specialty lubricants are as critical as the mechanical design itself. These precision-formulated fluids and greases sustain reliability, efficiency, and safety across sectors that operate under extreme load, speed, temperature, and environmental stressors.

1. Lubrication Regimes & Engineering Principles

Understanding how lubricants function begins with the core lubrication regimes:

- **Elastohydrodynamic Lubrication (EHL):** Common in rolling-element bearings and gear contacts, where high pressures create a temporary elastic deformation of surfaces, enabling a robust fluid film. Precise film thickness control is vital to preventing metal-to-metal contact.

- **Hydrodynamic Lubrication:** In journal bearings and other full-film conditions, the motion of surfaces drags lubricant into the contact zone, creating a pressure wedge that supports the load. Oil viscosity, temperature control, and flow stability determine performance.

- **Boundary Lubrication:** When loads are high, speeds are low, or motion is intermittent, the lubricant film breaks down and surface asperities interact. Additives such as anti-wear agents and solid lubricants form protective layers that prevent adhesive wear.

2. Formulation Science – Beyond Base Oils

Modern specialty lubricants are engineered to perform under complex, real-world conditions that general-purpose oils cannot withstand. Key formulation elements include:

- **Synthetic Base Oils:** Polyalphaolefins (PAOs) for thermal stability and oxidation resistance, Polyalkylene Glycols (PAGs) for excellent friction control in sliding contacts, and Perfluoropolyethers (PFPEs) for extreme chemical and temperature resistance.

- **Thickener Technologies in Greases:** Calcium sulfonate for high-tempera-

ture and load-bearing stability, polyurea for oxidation resistance in electric motor bearings, and lithium complex for multi-purpose heavy-duty applications.

- **Additive Systems:** Extreme pressure (EP) additives to prevent scuffing under high loads, corrosion inhibitors for hostile environments, anti-oxidants for long-term stability, and tackifiers for adhesion in slow-moving or open gear applications.

3. Sector-Specific Demands

Specialty lubricants are essential in applications where downtime or component failure carries high operational costs:

- **Cement, Mining, and Aggregates:** Open gears, kiln support bearings, and crusher components face abrasive contamination, shock loading, and high temperatures. Lubricants must provide adhesion, wear resistance, and water resistance under extreme conditions.
- **Steel and Metal Processing:** Continuous casters, rolling mills, and furnace conveyors operate at high temperatures and loads, requiring lubricants with exceptional thermal stability and oxidation control.
- **Automotive NVH (Noise, Vibration & Harshness):** Damping greases and specialty lubricants are used in automotive interiors, seat mechanisms, and moving components to eliminate squeaks, rattles, and vibrations.
- **Forging and Metal Forming:** Die lubricants and high-temperature pastes enable smooth metal flow, reduce die wear, and withstand extreme surface temperatures. In hot forging, lubricants act as release agents, thermal barriers, and friction modifiers, directly influencing surface finish and dimensional accuracy.
- **Metal Working:** Cutting fluids, drawing lubricants, and machining oils are formulated to provide cooling, chip evacuation, and tool life extension. The right balance of lubricity and cooling capacity is essential to maintain tolerances and surface quality.
- **Food and Beverage Processing:** NSF H1-certified lubricants ensure safety for incidental contact while maintaining resistance to water washout, oxidation, and microbial growth in bottling, packaging, and conveyor systems.

The Often Overlooked Performance Driver

Studies have shown that improper lubrication accounts for 43% of all mechanical failures. Selecting the correct lubricant, ensuring the correct volume, and maintaining its condition through monitoring are not just maintenance tasks—they are strategic reliability practices that can directly impact operational profitability.

Molygraph's Role in the Industrial Lubrication Ecosystem

For decades, Molygraph Lubricants has been advancing the science and application of specialty lubricants for demanding industrial environments in over 25+ countries. By combining synthetic base fluids, advanced additive chemistry, and an understanding of industry-specific challenges, Molygraph delivers solutions that optimize equipment performance, extend service intervals, and reduce unplanned downtime. Through engineering-driven lubrication solutions, Molygraph continues to support the backbone of industrial performance worldwide.

SIMPLE HABITS TO KEEP YOUR CARDIOVASCULAR SYSTEM HEALTHY

Every beat of your heart is a reminder that life is moving forward. With World Heart Day around the corner, I felt it was the perfect time to talk about the small yet powerful choices we can make to protect our most vital organ. Heart disease continues to be the leading cause of death globally, responsible for nearly one-third of all deaths worldwide, according to the WHO. These numbers are alarming, and they remind us that heart health is not something to take for granted.

The good news? You don't need dramatic lifestyle overhauls to protect your cardiovascular system. Consistency in simple habits can go a long way in keeping your heart strong and resilient.

1. Move More, Sit Less

Long hours at a desk can slow circulation and strain the cardiovascular system. Try adopting the "60-2 rule": for every 60 minutes of sitting, stand or walk for at least 2 minutes. Even small movements, such as stretching at your desk, taking stairs, or pacing during calls, improve blood flow and reduce cardiac strain.

2. Fuel Your Heart with the Right Foods

A diet rich in fiber, omega-3 fatty acids, and antioxidants strengthens the cardiovascular system. Simple swaps like nuts instead of chips, fruit instead of sugary snacks, and whole grains instead of refined carbs make a big difference. Stay mindful of salt and processed food intake, as both are linked to high blood pressure and heart disease.

3. Practice Mindful Breathing

Stress is one of the most underestimated threats to heart health. Mindful breathing for just a few minutes a day helps lower blood pressure and calm your nervous system. Try the 4-4-4 method: inhale for 4 seconds, hold for 4, exhale for 4. It's simple enough to do between meetings or while waiting for your computer to restart.

4. Hydrate with Purpose

Dehydration makes your heart work harder to pump blood. Keep a water bottle at your desk and aim to sip steadily throughout the day.

5. Sleep: Your Heart's Silent Protector
Quality sleep (7–8 hours) allows your cardiovascular system to rest and repair. Poor sleep has been directly linked to hypertension and increased risk of heart disease. Establishing a consistent sleep routine and limiting screen time before bed can significantly support heart health.

6. Routine Health Check-ups
Don't wait for warning signs. Regular monitoring of blood pressure, cholesterol, and sugar levels helps in early detection and prevention of cardiovascular risks.

You don't need hours in a gym to protect your heart. A few intentional movements sprinkled across your workday can go a long way in keeping your cardiovascular system strong.

1. Desk Marches – Pump the Circulation

- Sit upright, lift one knee at a time as if marching at your desk.
- Do 20–30 lifts per leg, 2–3 times a day.
- Boosts circulation, prevents stiffness, and keeps blood moving.

2. Seated Torso Twists – Open the Chest

- Sit tall and twist gently, hold for 10–15 seconds.

- Repeat on the other side.
- This opens up your chest, aids posture, and relieves pressure on your heart and lungs.

3. Calf Raises – Strengthen the Heart's Pump

- Stand, rise onto your toes, hold for 3 seconds, and come down.
- Repeat 15–20 times.
- Simple but effective for improving circulation and keeping your leg muscles (the "second heart") active.

4. Desk Push-Ups – A Quick Heart Booster

- Place both hands on the edge of your desk, step back, and do incline push-ups.
- 10–12 reps.
- Strengthens the upper body and engages large muscle groups.

Your cardiovascular health is not built in a single workout or a single day; it is built every day, with consistent small actions. Whether it's marching at your desk, hydrating between tasks, or taking mindful breaths before a meeting, these little choices keep your heart strong and resilient.

The best part? Protecting your heart doesn't demand hours in the gym or complicated routines. It only asks for awareness and commitment in the moments you already live, at your desk, in between calls, or while walking to your next meeting.

Think of these habits as "tiny deposits" in your heart's savings account. They may feel small, but over time, they add up to long-term strength, focus, and well-being.

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!

THE HAZY SAMPLE: A LAB ERROR THAT SHOOK A LUBE OIL BLENDING PLANT

Narrative of the Incident

One small dash in an additive code was all it took to derail a carefully planned test. In the laboratory of a Lube Oil Blending Plant (LOBP)—renowned for its disciplined processes and methodical testing protocols—a new formulation for an advanced engine oil blend had just arrived from international collaborators. Before pilot production, the formulation needed to be validated through a lab-scale blend, checking appearance, viscosity, and stability.

The recipe clearly called for a proprietary dispersant inhibitor package labeled "F 2183." An experienced chemist was assigned the task and, following routine procedure, prepared the trial blend. But within an hour, the sample began to show an unusual haze. The formulation had already been vetted and approved abroad, so the instability was unexpected.

An audit of batch records and lab logbooks uncovered the problem: instead of "F 2183," the chemist had mistakenly used "F 218-3"—an anti-wear additive intended for a completely different set of formulations. The nearly identical labels, stored side by side in inventory, had led to a critical misread.

Figure: Similarity in additive labels ('F 2183' vs. 'F 218-3') leading to misidentification during lube blending.

Error Analysis:

This case, while seemingly minor due to the lack of downstream production, served as a critical reminder of how subtle lapses can cascade into larger issues. The following factors contributed to the incident:

1. **Similar Naming Convention:**
   - Both additives bore almost identical nomenclature: "F 2183" and "F 218-3."
   - The visual similarity led to cognitive oversight, especially in a fast-paced lab environment.
2. **Labelling & Inventory Arrangement:**
   - Additives were arranged alphabetically, and both were stored on adjacent shelves.
   - Labels were not color-coded or categorized based on function (e.g., DI package, anti-wear).
3. **No Secondary Verification:**
   - The blending process did not mandate a peer review or checklist-based confirmation.
   - A single chemist handled the entire procedure, leading to unchecked assumptions.
4. **Ambiguity in Communication:**

- The formulation received via email only mentioned additive codes, without commercial or descriptive names.
- There was no appended Material Safety Data Sheet (MSDS) or product description for F 2183.

5. Training Gaps:

- Although experienced, the chemist had not undergone refresher training in inventory control or additive identification.
- There was over-reliance on human memory and judgment.

Figure: Error-proofing measures introduced: color-coded labels, barcode integration, and dual verification protocols

Corrective and Preventive Actions (CAPA):

1. Inventory Management System Overhaul:

- Additives were reclassified and relabeled with both code and function.
- A color-coding system was introduced to distinguish between additive types (e.g., dispersants, anti-wear, detergents).

2. Digital Inventory Integration:

- A barcode-based tracking system was implemented.
- Lab chemists are now required to scan each additive into a digital log before dispensing.

3. Two-Person Verification Rule:

- All lab blends now require dual sign-off before proceeding.
- This includes one chemist to prepare and another to cross-verify additives against the formulation.

4. Training & Awareness:

- A refresher module focusing on additive classification, formulation review, and common error scenarios was introduced.
- Monthly toolbox talks are now held to revisit past incidents and derive learning.

5. Improved Communication Protocols:

- All new formulations from collaborators must include the additive's descriptive name, CAS number, and technical data sheet.
- Standardized templates were adopted for formulation communication.

Lessons Learned:

- **Precision in Labelling Is Paramount:** In technical environments, even a minor variation in names (a dash, a space, a decimal) can lead to critical errors.
- **Assumptions Must Be Checked:** Experience does not exempt one from the discipline of cross-verification.
- **System Design Should Prevent Errors:** The environment should be structured in a way that makes the wrong choice difficult, not easy.
- **Communication Matters:** Technical accuracy should be complemented by clarity and completeness in all external and internal communications.
- **Training Is a Continuous Need:** No matter how experienced the personnel, periodic training is essential to keep knowledge fresh and biases in check.

Conclusion:

This lab incident, although controlled in scope, highlights the fragility of technical processes when human factors and system weaknesses intersect. It illustrates the importance of robust systems, clear communication, and an organizational culture that encourages vigilance. Ultimately, the hazy sample served not just as a failed test but as a clear lens into how operations can—and must—evolve to prevent similar occurrences in the future.

About the Author

Manoj Srivastava is a Chemical Technologist with over 32 years of experience in the lubricants industry. His expertise spans plant operations, process optimization, and cost control across lubricant and grease manufacturing facilities in India and Tanzania. A CSSC-accredited Lean Six Sigma Black Belt, he specializes in lube surveys, system re-engineering, and operator training. Manoj is passionate about improving productivity, efficiency, and reliability through strategic consulting and hands-on implementation.

OIL MANAGEMENT FOR BUSINESS PROFITABILITY

Profit is the only motive of any commercial organization, whether it be a Public Limited Company, a Partnership Company, or a Proprietorship Company. Profit is the result of producing an item or offering any service at the lowest cost and realizing the best sales price, as the market decides the usual price and is not in the hands of the company. Profit is the function of demand and supply. If a company has to exist, then it has to follow the market and only focus on reducing costs.

Only the following three resources are available to the company to reduce the cost.

1. Capital
2. Workforce
3. Plant and Machinery

Thus, the company is left with only three options to control the cost.

1. Reduce the cost of capital – Typically, it refers to the interest on borrowed money or the loss of interest by using personal funds.
2. Reduce the cost by compromising on the quality.
3. Utilize resources at the optimal level for the highest level of efficiency.

Figure 1: From oil flow to cash flow — efficiency that pays

We will ignore the first two options, i.e., Capital and Compromising the Quality. Both these options will never last long and sometimes will lead to the closure of the company, sooner or later. We will ignore these two aspects since it is not the focus of this article.

The only third option, i.e., the company must focus on the optimization of Investment in Manpower and Plant & Machinery. We will discuss in detail how to reduce the cost of investments in Manpower and Plant and Machinery. We will discuss the involvement of Management at a macro level.

Investment in Manpower – Engaging the person means sharing the responsibility and, therefore, sharing the authority to make decisions. **Thus, in Business, engaging any person to share the responsibility and authority to make a decision is a Risk.** The higher the responsibility, the higher the risk. Therefore, it is The Most critical to select and engage the most capable person for High-

er Responsibility. As such, it applies to all workforce engagement since at all levels the responsibility and decision-making authority is shared to some extent.

Management needs to constantly monitor and evaluate the outcome of threats and opportunities arising from the decisions taken by these engaged persons. Thus, the authority of decision-making of an engaged person depends upon the confidence level of Management in the involved person. This is why engaging a skilled and experienced person is the most crucial step in Management.

In most of the Technical matters, Management has no choice but to depend upon the decision taken by the Engaged person involved in technical issues. Since the Skilled and Experienced Manpower in technical matters is always in short supply. The company has to compromise with the best available Manpower. Once a person is engaged, it is up to the Management's discretion to what level his suggestions, recommendations, and advice are to be accepted and implemented. Here, the confidence level of the Management plays an important role.

This limitation is always there. Furthermore, it is also true that not all technical personnel are experts in all the latest technologies. They can manage the show, but beyond a certain level, they cannot make the best decision. This may result in missing an opportunity to reduce manufacturing costs despite investing in the latest technologies. Here, the Management can come forward and help him get trained on the technology adopted by the company. Indian Management is lagging in this field. They miss the bus in reducing costs by spending marginally on training their Technical Personnel.

Assuming that the company has engaged the best available skilled and experienced technical workforce, there is still scope to improve their output by Providing Training to them. Providing Training to recruits or refreshing Training for old wood will always help. Training can be provided by seniors in the organization, or by inviting experts from outside, or sponsoring them in attending such professional training programs conducted by experts. The keyword is TRAINING and EXPOSURES.

Very few companies are alert to this & are investing in training their Manpower. Most of the time, the company neglects this crucial area due to a lack of budget, a Lack of Time, Pressure on Production Schedules, and a lack of willingness to invite & pay outside expert agencies. They do not realize that the advantage of spending marginally on Manpower Training will increase the productivity of both Manpower and machines.

Investment in Latest Plant and Machinery – Production cost is directly related to the Plant and Machinery Engaged. There is constant improvement in machine performance worldwide. Speed and improvement in the quality of the output are the aims of any company to reduce costs. Depending on the capital available, all companies try to adopt the latest technologies. However, any new machine or technology needs expertise, skilled, and experienced Manpower to use it at an optimum level. After initial Training to technical persons by the supplier of the Machine, day-to-day operation and Maintenance is the responsibility of the Technical persons engaged by the company. Here is the most significant risk. The Machine has to work at an optimum level – neither under-use nor over-use or misuse. Cost of Production is directly related to the performance of the Machine. Over time, Machine operators and engineers responsible for the Machine learn how to improve its performance. However, this will be achieved through a trial-and-error method if there is no Proper Training. But this is again at a cost. This is quite avoidable if Management spends on Training.

Due to budget constraints, Management often avoids the suggestions, recommendations, and advice of the Responsible Technical person for marginal expenses for improvement in the performance of the Machine or even to maintain & service it properly. By not spending the Money on their suggestions for improving the machine performance, the company is indirectly losing a lot more on opportunities to save Money. It is therefore necessary for Management to consider his advice seriously.

To maximize profit by reducing costs, Management must ensure that it avoids the risk of under-use, over-use, or misuse of the Machine.

Let us examine the key factors that help minimize this risk & reduce the Costs.

Factors Affecting the Performance of the Machine

Figure 2: The Cost of Neglect vs. the Payoff of Proper Oil Management.

Includes

1. Limited knowledge of the Machine Operation and Maintenance.
2. Limited budgets in the Maintenance & operation of the Machine.

Let us go into more detail about each of these two factors.

Limited knowledge of Machine Operation and Maintenance: Actual hands-on experience & knowledge of operating the Machine, as well as a theoretical understanding of machine operation, are two distinct aspects.

There is a chance that the senior Technical person, like a Technical Director or Technical General Manager, has any practical hands-on experience of operating the Machine. It is equally valid that there is no need for them, even though not all shop floor engineers have any hands-on experience in operating the Machine.

Similarly, a semi-skilled machine operator will not have theoretical knowledge of the machine operation. He is also not expected to know it.

The Machine will perform at its optimum level only when a combination of these two technical persons works together, complementing each other's skills & knowledge. The machine operator needs to follow the instructions of the Engineer, and the Engineer must listen to and understand the comments and suggestions made by the Machine operator.

Here, interpersonal relations play a vital role. Management needs to play an essential role in maintaining these relations healthy and cordial.

Establishment of a healthy relationship will be possible only when both of them have a common understanding of the machine operation and Maintenance. For this, both of them need professional Training. When the parallax between their knowledge of the machine performance and Maintenance is reduced, there will be better coordination and higher chances of producing Quality material at the lowest cost. This is only possible through common Training programs and knowledge sharing.

Limited budgets in the Maintenance & operation of the Machine. The performance of any machine depends upon Maintenance and repairs. Not only the performance of the Machine but also the performance of the machine operator, Production, and Servicing / Maintenance Engineers rely on the performance of the Machine. When the Machine is not maintained correctly, frequent breakdowns will reduce Production and create stress on machine operators, production, and maintenance engineers. Their efficiencies will be reduced.

Thus, the overall cost of Production is inversely proportional to the Price of the Maintenance budget. Unless Management allocates sufficient Maintenance Budgets, the direct or indirect expenses incurred in maintaining the production level will exceed the savings from the reduced maintenance budget. Therefore, it is necessary for the Management to carefully decide the Maintenance Budgets and allow the responsible Technical person to spend Money for Maintenance. Cutting corners will be more expensive.

What is a Maintenance Budget? For the operation of the Machine, three things are required. Money is spent on these three factors:

A. Manpower - Machine operator, including supervisors, service and maintenance engineers.
B. Power to operate Machine – Electrical / Mechanical / Fluid Power.
C. Consumables for Maintenance of Machine – Lubricants, Spare parts, and enough time for shutdown of the Machine for proper Maintenance.

How to get the best out of all three of these factors?

A. Machine Operator, including Supervisors, Service and Maintenance Engineers –

The solution is in ***Training and incentives***

I. Incentives in the form of recognition by Public Appreciation, Awards, Monetary benefits, and Gifts for good performance or improvement in performance. Allow family members to visit the factory once a year as a common celebration/ festival. This will establish the sense of ownership of the Machine by them.

II. There is no alternative to Training. Ownership of the Machine is developed when a person is trained to operate. Introduce and expose them to new ideas and techniques for improving the Machine's performance and reducing operational costs. Listen, and if feasible, accept their suggestions and encourage them to think. If not expensive, allow them to experiment with their ideas using the Machine for improvement. Most important is not to compromise with the cost of machine Maintenance & repairs.

B. Power – Electrical / Mechanical / Fluid Power –

I. **Electrical Power:** Unless it is a captive power plant, a company cannot do anything about the cost of Electrical Power. Assuming we are discussing small and medium-sized organizations that obtain Power from a power-generating company, we overlook the cost of Power in our analysis, except for addressing power wastage.

II. **Mechanical Power:** There is not much to discuss regarding savings in mechanical power transmission, such as gearboxes, Pulleys, Belts, and Couplings, except for regular maintenance costs.

III. **Fluid Power:** This is an interesting area of cost saving. In fluid Power Transmission, Power is transmitted through fluids like Air & Oil. Since Power Transmission is through Fluid, it is highly flexible and therefore very much preferred by Machine Designers. However, both are expensive and can be problematic if not handled carefully. Here are the maximum chances of wastage as well as savings…. There is a significant scope for reducing costs and achieving savings.

IV. **80 to 85% of the operational & Maintenance costs can be saved from**

proper Management of Fluid Power Transmission. Air / Oil Management is the key word for it.

OIL MANAGEMENT & BUSINESS PROFITABILITY

Any Management aims to reduce the cost. There is a tremendous scope for savings in Fluid Power Transmission, mainly by controlling and reducing the consumption of fluids such as Air, Lubricants, and Hydraulic Oil.

Fluid Power Transmission is a very specialised method of power Transmission and, if used correctly, will save a substantial amount of Money. But not all operators or engineers need to be experts on it. It is therefore most essential to impart proper Training on OIL MANAGEMENT to operators, Supervisors, and Service and Maintenance Engineers by inviting Experts from outside.

A lot more savings are possible from properly handling Fluid Power Transmission. Oil or Compressed Air are the primary Fluid Power Sources, and due to ignorance, they are wasted the most. Managing the Hydraulic Oil and Hydraulic System needs special Training. There is no choice but to invite an outside expert on this subject. Savings will far exceed the cost of Training.

Focusing on a few of the following Areas will help Management save Money. Some fundamentals are:

1. Leaking Air is the main reason for power loss. Please stop it.
2. Hydraulic & Lub Oil Management

Hydraulic Oil Wastage and mismanagement are the sources of most wasted and costliest items, i.e., hydraulic Oil. It is due to a lack of knowledge and Training. There are many areas in Oil Management where significant scope for savings can be achieved with just a little more knowledge and Training.

Hydraulic Oil is wasted due to:

1. Lack of Knowledge of Oil itself. Consumption of Lub and Hydraulic Oil is a significant expense in machine maintenance and Repairs. Understanding the Oil will help in reducing this consumption.
2. Lack of Knowledge or minimal knowledge of the functioning of the Hydraulic System.
3. Lack of Monitoring and controlling the factors affecting the Oil and Hydraulic System, and costly components like Pumps and Valves.

A few critical factors affecting Hydraulic Oil & System are Micron Size Particles, Oil & water mixing, System overheating and leakages, Mishandling, and faulty method of storage of Oil & many more. Oil gets highly contaminated just by mishandling it, and still the handlers are not aware of it. Just knowing how to handle Oil itself will save the Oil. These factors not only damage the Oil itself but also damage the expensive components like Pumps and Valves, directly affecting the performance of the Machine.

Once Operators and Engineers are trained to monitor and control these factors, it will not only reduce the frequency of machine breakdowns but also improve the performance of the machines and save the Oil & components from getting damaged by contamination. It will have a tremendous impact on cost reduction.

Most important is the savings in the premature replacement of expensive Oil. It is observed that most of the time, instead of removing the contamination from Oil and cleaning it, healthy Oil is discarded just due to a lack of knowledge as to how to clean the Oil. But it costs heavily to the organization. Better to engage the expert external agency to do it professionally. It will be at a fraction of the cost of doing it in-house.

Trying to do it in-house is expensive, as it requires a specialized filtration unit, an expertly trained workforce to operate and maintain it, and additional costs for consumables such as filters, as well as maintenance & repair expenses. Additionally, it is not the primary focus of the Production unit. Therefore, it is advisable to take the help of professional external experts at a fraction of the cost of all these expenses.

Almost 80 to 85% of the cost spent on Hydraulic systems & New Oil Purchase can be easily saved with little expense on Training and taking the help of professional Experts. Therefore, Training by Experts and professionals is the only solution.

Here, MANAGEMENT needs to understand the OIL Management and increase the profitability.

A lot more can be written and discussed on the subject, but it is not within the scope of the article.

About the Author

Mr. V.S. Dave, a Mechanical Engineer, has over 40 years of experience in selling and marketing industrial products, as well as nearly 20 years of professional technical service provision in hydraulics, lubrication, and oil. He is the proprietor of Hymat Services (ISO 9001:2008), based in Mumbai, India. He is actively engaged in trading a wide range of hydraulic products such as filters, pumps, and valves. He also provides professional technical training in oil management.

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GULF OIL LUBRICANTS PLANS 70% CAPACITY EXPANSION TO 250 MILLION LITRES

Gulf Oil Lubricants India plans to increase its production capacity by 70% to 250 million litres within the next 18 months. Currently, the company operates at 95% utilization across its two plants, producing 152 million litres annually. Expansion will begin at the Chennai plant, while land acquisition has been completed at the Silvassa facility.

CEO Ravi Chawla highlighted the company's strong Q1 performance, reporting volume and revenue growth nearly three times higher than the industry average. This growth spans all core segments, including B2C, B2B, Industrial, OEM, and Agri-rural.

Gulf Oil is strategically targeting categories where it currently holds a market share of less than 5%, aiming to capitalize on growth opportunities in these underrepresented segments.

The company's market capitalization stands at ₹6,078 crore, while its shares are currently trading at ₹1,233.50, representing a 11% decline over the past year.

Alongside capacity expansion, Gulf Oil is strengthening its market position through strategic partnerships, including a new 3-year alliance with Nayara Energy, granting access to over 6,500 retail outlets, and renewing its tie-up with Piaggio until 2032 to deepen OEM integration. The company has also launched a revamped two-wheeler engine oil, Gulf Pride, with upgraded formulation and branding, which has been well received in the market.

The company continues to invest in electric vehicle infrastructure through its subsidiary Tirex, supplying EV chargers and targeting substantial revenue growth in this emerging sector.

Overall, Gulf Oil's expansion and growth strategy position it strongly to capture rising demand across traditional and emerging lubricant segments, despite a recent share price decline.

Analysts indicate that sustained capacity expansion, coupled with diversified partnerships, could help Gulf Oil outperform industry growth over the medium term. The company's focus on both conventional lubricants and future-ready technologies reflects a balanced approach to long-term competitiveness.

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