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MANAGING
OXIDATION

WHAM!

DON'T LET YOUR

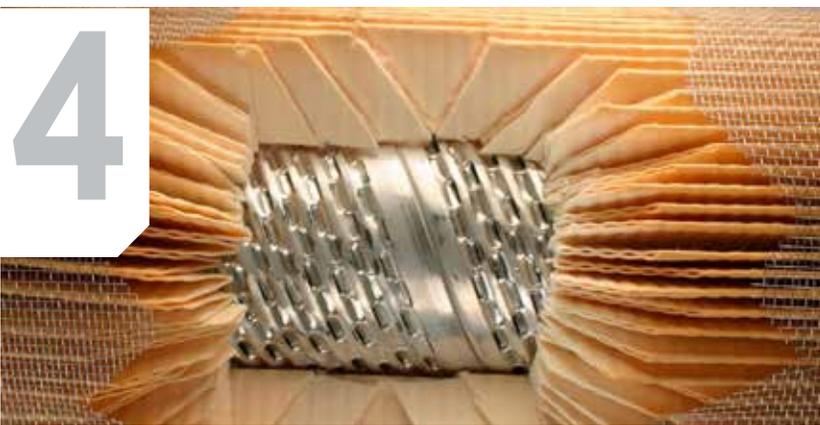
LUBRICANTS GO-GO!

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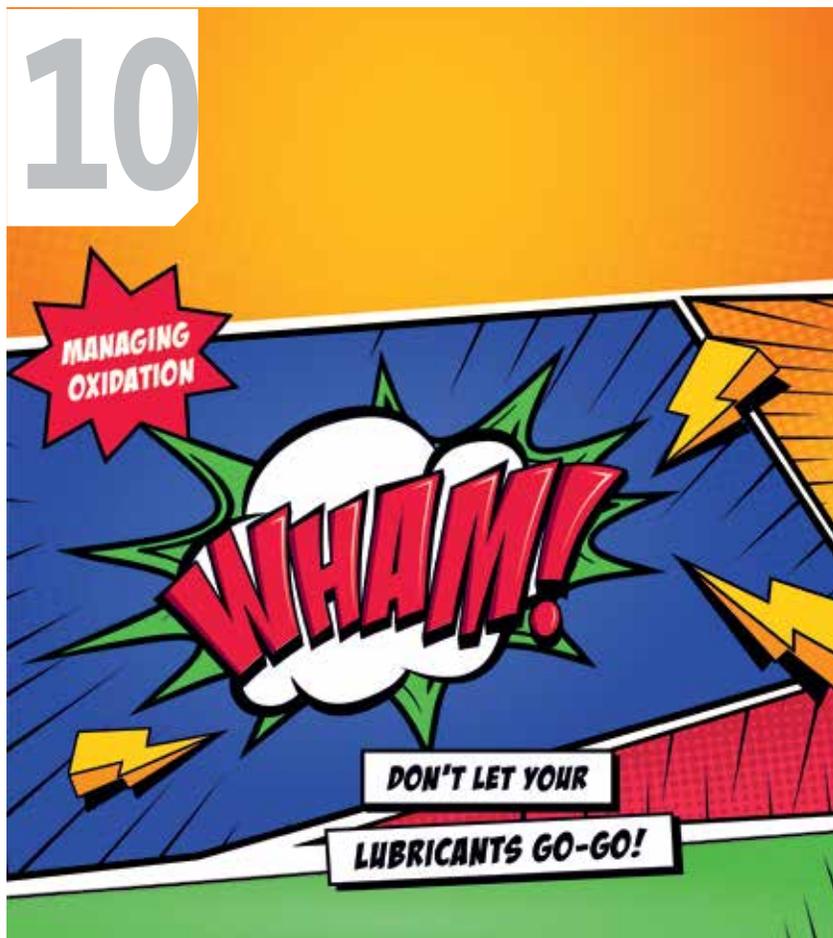
AS I SEE IT

Anatomy of An Oil Filter



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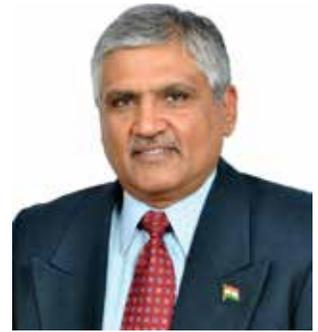
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Publisher's Note



In the world of machinery health and reliability, danger rarely announces itself with a bang. It creeps in quietly—through neglected data, overlooked trends, or a missed inspection. Experienced professionals know: once failure strikes, looking back rarely makes things right. That's why the true mark of excellence isn't just preventing failure—it's seeing the early signals, long before they become symptoms. It's not about paranoia; it's about preparedness.

On **June 12, 2025, Air India Flight AI-171** crashed shortly after takeoff from Ahmedabad, claiming **260 lives**, including 19 on the ground. It was one of the most devastating aviation tragedies in recent memory.

Our thoughts are with the victims and their families. We stand in quiet solidarity with all those affected by this heartbreaking loss.

We won't speculate on the cause—investigations are ongoing and deserve respect. But what this tragedy reinforces is something those of us in reliability and maintenance have always known: **systems don't just fail—they are allowed to fail, often slowly and invisibly, until it's too late.**

This idea—that the **most minor weak point can lead to the most significant consequences**—is at the core of what Machinery Lubrication India exists to explore. We are not in the business of fear.

We are in the business of foresight. And foresight starts with knowing what to look for—and why it matters.

That's why this issue's cover story, "Don't Let Your Lubricants Go-Go: Managing Oxidation with WHAM!," is not just another technical deep dive. It's a timely reminder **that oxidation is happening whether we acknowledge it or not**, and that its drivers—**Water, Heat, Air, and Metals (WHAM)**—are always present, always working, always waiting.

Your oil won't file a complaint when it degrades. But your machines will—with heat, downtime, wear, and in worst cases, disaster. The cost of not listening is too high.

In a world that's moving toward predictive maintenance, AI models, and digital twins, **lubrication is still one of the most hands-on, high-impact, and underutilized levers we have.** It's time we stop treating it as background noise.

In this issue, we bring you:

- Practical strategies to track and manage oxidation
- A deep dive into the anatomy of oil filters—and why design truly matters
- Why contamination still tops the list of preventable mechanical failures
- Best practices from Indian plants where lubrication programs lead the charge
- A forward-looking piece on how lubrication is finding its voice in predictive maintenance conversations

We've also received overwhelming feedback on our new section, **From the Asian Desk**. Thank you. Your perspectives, grounded in regional realities, bring a richness that global theories often miss. Keep the stories coming—every lesson from the plant floor adds to the resilience of this community.

At **Machinery Lubrication India**, we believe in building more than a magazine. We're building a movement—a space where reliability professionals, engineers, and plant heads don't just consume content, but shape it.

So here's our ask: stay engaged. Ask questions. Challenge assumptions. Share what's working—and what isn't. Because when you speak, the entire community learns.

Let's keep machines running.

Let's keep people safer.

Let's keep failure from getting the final word.

There's too much at stake to leave reliability to chance.

And too many lessons are lost when we don't speak up.

Together.

**Warm regards,
Udey Dhir**





ANATOMY OF AN OIL FILTER



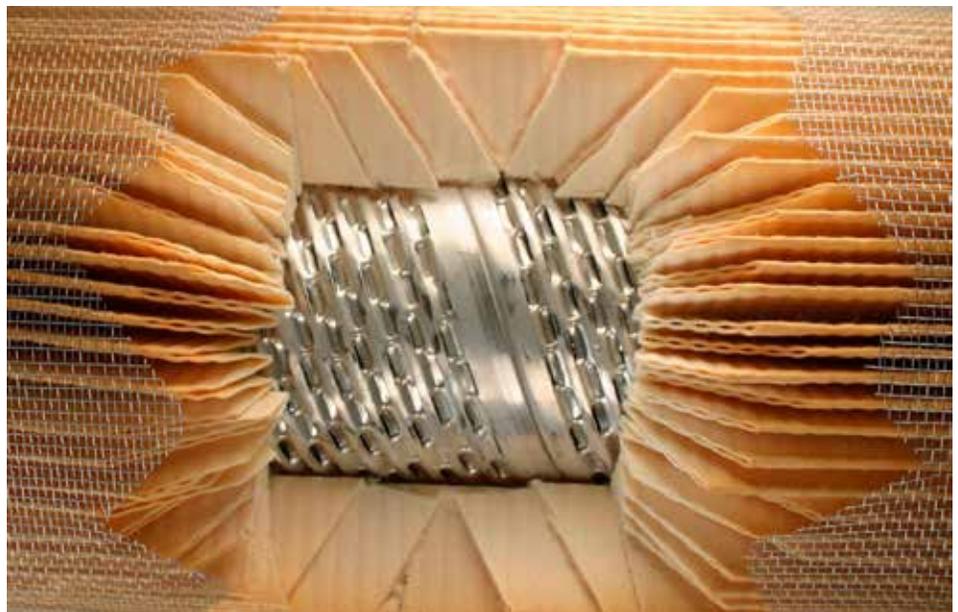
By definition, an oil filter's main role is to cleanse oil from destructive contaminants within a machine such as an engine, transmission, hydraulic system, and other oil-dependent systems. In the case of automotive oil filters, canister-type filters are the most common. This filter configuration was most likely responsible for the advanced performance of oil filtration technology.

In 1922, Ernest Sweetland invented the first oil filter device for automobiles. It was named the "Purolator," which was short for "pure oil later." The spin-on filters common in today's automotive industry were introduced in the 1950s and were virtually a standard by the early 1970s.

Aside from the automotive industry, oil filtration is an integral part of equipment in a wide variety of industries, including aerospace, power generation, oil refining, manufacturing, and mining. Although most current oil filter designs come in canister or cartridge types, several variations in size, filter media, dirt-holding capacities, and flow arrangements are available. For this reason, it is important that filters and filtration systems are selected to meet the needs of the application with cost, performance, ease of use, and environmental conditions in mind.

Oil Filter Types

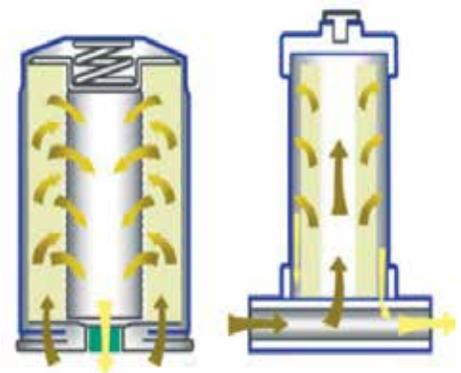
Oil filters can be characterized by the meth-



od in which the contaminants are filtered or the method in which the oil flows through the housing. One technique used to control contamination in filters is through surface-type media. This is the type of filter used in automobiles. In depth-type filters, the filter media are designed to hold much higher levels of contamination and provide a more circuitous path for lubricant contaminants to become trapped.

Other possible contamination control methods include magnetic and centrifugal filtration. Magnetic filtration utilizes rare-earth magnets or electromagnets to attract and collect ferrous particles as the oil passes through a magnetic flux region. Centrifugal filtration works by integrating a rapidly rotating cyl-

inder to produce a centrifugal force for contamination separation from the oil.



Oil filters can also be categorized by the oil flow design. As its name implies, a full-flow filter will draw all of the oil through the filter media. On the other hand, a bypass fi

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ter only requires a fraction of the oil flow for sufficient flow rates within the system. The application's oil flow and contamination control requirements will determine which design is the best option. Another alternative is the duplex filter system, which contains two side-by-side filters in parallel to allow one of the filters to be replaced during uninterrupted operation.

With typical canister-type filters, it is standard for oil to flow from the outside in. This means that the oil travels through the cylindrical filter media from the outward-facing surface into the inner core. However, in some cases the flow direction is reversed, with the oil coming into the filter through the core and pushed outward through a unique pleat design. This is intended to improve flow handling and distribution as well as reduce filter element size.

Filtration Mechanisms and Filter Media

A filter's primary function is to remove and retain contaminants as oil flows through the porous component called the media. The media operate under several types of filtration mechanisms, including:

- **Direct Interception and Depth Entrapment**– Particle blockage on the media due to the particles being larger than the taken passages within the media.
- **Adsorption**– The electrostatic or molecular attraction of particles between the particles and the media.
- **Inertial Impaction**– Particles are impacted on to the filter media by inertia and held there by adsorption as the oil flows around.
- **Brownian Movement**– This causes particles smaller than 1 micron to move irrespectively of the fluid flow and results in the particles being adsorbed by media in close proximity. It is much less prevalent, especially in viscous fluids.
- **Gravitation Effects**– These allow much larger particles to settle away from fluid flow regions when there is low flow.

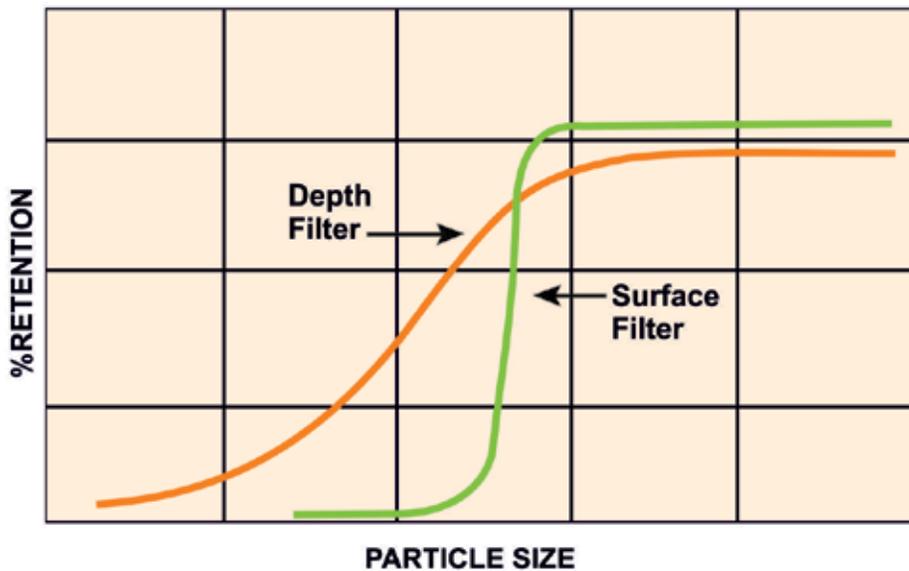
In addition, filter media can be designed to capture particles through two distinct methods:

- **Surface Retention**– Contaminants are held at the surface of the media. This provides an opportunity for the contaminant to become trapped as it comes in contact with the media surface.
- **Depth Retention**– Contaminants are held either at the surface of the media or within the labyrinth of passages within the “depth” of the filter media. This creates several opportunities for contaminants to become trapped.

The following graph shows how depth-type filtration is more efficient in capturing smaller particles when compared to surface-type filters. This can be attributed to the deeper media providing more chances for the particles to be trapped along with the adsorptive and Brownian movement effects being more predominant in depth-type filters. While these characteristics are beneficial, depth-type filters tend to have higher differential pressure across the media as a result of the increased flow restriction from the deeper filter media.

Filter Media Types and Dirt-Holding Capacity

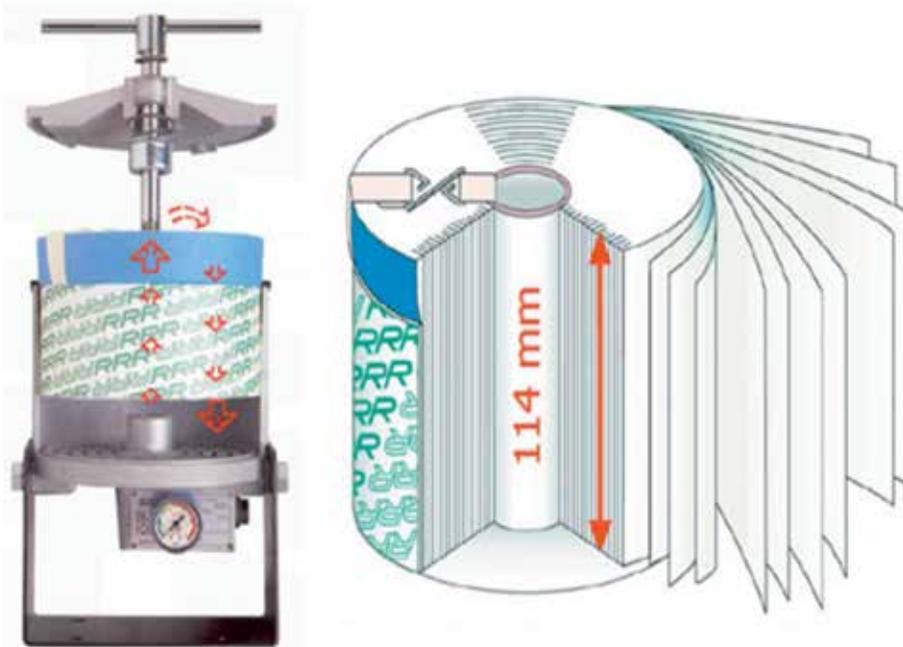
In the September-October 2012 issue of Machinery Lubrication, Wes Cash explained how the porosity of the filter media plays a role in how well the filter can retain captured particles. This is known as the dirt-holding capacity. As pore size goes down, to maintain a low differential pressure across the media, the pore density must go up to account for the oil volume in contact with the surface. The filter depth and size also influence the dirt-holding capacity. Another factor is the filter media material. There are three primary types of filter media:



Particle size retention characteristics of depth-type and surface-type filter media.

1. **Cellulose**- Comprised of wood pulp with large fibers and an inconsistent pore size.
2. **Fiberglass** (Synthetic)- Comprised of smaller, man-made glass fibers with a more consistent pore size.
3. **Composite**- Comprised of a combination of cellulose and fiberglass material.

Cellulose media are advantageous because they can absorb some water contamination. However, these types of media tend to fail more rapidly than synthetic media in acidic and harsh oil conditions. Nevertheless, the primary reason synthetic filter media are preferred is their more consistent porosity and smaller fiber size, which contributes to higher dirt-holding capacity and longevity of the filter.



This example of a depth-type filter has an element that requires oil to pass through 114 millimeters of filter media for maximum particle filtration. (Courtesy Triple R)

Understanding the Beta Rating

Oil filters are rated by a technique called the beta rating. In his Machinery Lubrication article “Understanding Filter Efficiency and Beta Ratios,” Jeremy Wright explained the methodology behind the beta rating in more detail. In short, the beta ratio is calculated by dividing the number of particles larger than a certain size upstream of the filter by the number of particles of the same size downstream of the filter. Every filter will have multiple beta ratios for different particle size limits such as 2, 5 or 10 microns.

Best Practices for Oil Filter Usage

Storage- Filters can fail long before they are to be used for their intended purpose. Therefore, proper filter storage and handling are essential. Ensure filters are kept clean, cool, and dry, and always follow the first-in/first-out rule.

Installation- Even if a filter installation seems simple and routine, refer to the manufacturer’s recommendations for proper procedures. A classic mistake is over-tightening. Most recommendations suggest that a three-quarter turn after seal contact is optimal. Over- or under-tightening can inhibit the seal’s longevity and effectiveness. Confirm that connections, seals and ducts are fitted appropriately and are free of contaminants.

Avoiding Pre-fill- In most cases, you do not want to pre-fill your oil filters before installation. In diesel engines, it is recommended that a pre-lube system be installed instead in order to counteract changes from dry-start conditions.

Choosing Correctly- Many filters and filter housings are designed to be interchangeable, so just because a particular filter fits doesn’t mean it is the correct filter. Make sure each filter is replaced with the right filter. This may not necessarily be the one found on the machine, as an incorrect filter might have been used during the last filter change.

Training- Proper training must be conducted for all personnel involved with changing

filters. Remember, a task that seems straightforward to most people may not be for a new employee.

Filter Failure Modes

Channeling - During high differential pressures, filter media passages can enlarge to a point where unfiltered oil can pass through without an efficient contaminant capture. In addition, any particles that were previously contained within the filter in line with the enlarged passage may now be set free.

Fatigue Cracks- In cyclic flow conditions, cracks can form within the filter media, allowing a breach of oil to pass through unfiltered.

Media Migration- Media fibers can deteriorate and produce new contaminants made up of filter material. This may be caused by improper placement of the filter housing or an inadequate fitting of the filter, which can generate damaging vibrations. Embrittlement from incompatible oils or extremely high differential pressures can also result in media disintegration.

Plugging- During operation, filter media can become fully plugged by exceeding the dirt-holding capacity. Plugging can occur prematurely if excessive moisture, coolant or oxidative products like sludge are present.

61%

of lubrication professionals say filter plugging is the failure mode seen most frequently in oil filters at their plant based on a recent survey

Source: MachineryLubrication.com

Factors for Proper Oil Filter Selection

Structural Integrity- Arguably the most critical factor, structural integrity relates to a filter's ability to prevent the passage of oil through an unfiltered flow path. The International Organization for Standardization (ISO) has established procedures for testing fabrication integrity, material compatibility, end load and flow fatigue. These tests can reveal defects such as improper sealing of seams and end caps or breaks in the media from high-flow conditions, as well as the effects of high temperatures on the filter element.

Contamination (Dirt-Holding) Capacity- This refers to the amount of contaminants that can be loaded on to the filter before the filter's efficiency is limited.

Pressure Loss- This involves the overall differential pressure lost from the filter's placement on the system. The pressure loss will be influenced by the filter media's porosity and surface area.

Particle Capture Efficiency- This is the overall effectiveness of the filtration mechanisms within the filter media to extract and retain contaminants from the oil.

System/Environment- The characteristics of the system and environment in which the filter

will be installed must be considered, including the contamination expectations, flow rates, location, vibration, etc.

Maintaining Installed Filters

The best way to prevent filters from reaching their dirt-holding capacity is to avoid contaminants in the system from the beginning. The fewer external contaminants that ingress, the fewer contaminants that are generated internally (particles produce particles). Use the following guidelines to maintain installed filters:

- Ensure proper breathers are installed to prevent contaminants and moisture from entering the system.
- Keep seals and cylinders clean and dry by using appropriate wipers and boots.
- Select the appropriate oil grade and additive package to counter contaminant ingress and internal friction.

Analyzing the Filter

A filter is not only a trap for the machine's undesirables but also a concentration of clues as to what's occurring within the machine. Particles within the oil may be so highly diluted that practical analysis can become a daunting challenge. However, the particles trapped in the filter may be so plentiful that they can be easily visible to the naked eye.

Metal contaminants are a primary indication of an issue within the machine. Although some amount of metal contaminants can be expected, an unusual amount should be recognized by trending the filter's visual appearance after each oil change. Cutting open the filter and suspending a strong magnet over it can aid in pulling out the metal contaminants to more easily distinguish them.

If the machine is suspected to have an issue, the filter should not be discarded, as this would be similar to throwing away key pieces of evidence. Maintain the filter in the same condition as when it was removed and have it analyzed by the manufacturer or a laboratory.

Filter Disposal

Oil filters are not designed to be dumped into any waste basket. Increasing regulations by the Environmental Protection Agency dictate proper filter disposal. While each type of oil filter may have its own requirements, common practices include oil draining, crushing, or incinerating the filter. Many disposal services or filter distribution centers will accept used oil filters at little or no cost.

Typical Oil Filter Components

A. Condition Indicator- This device typically measures the differential pressure in order to indicate the remaining life or failure of the oil filter.

B. Filter Head- The top enclosure for the filter case contains ports for inlet and outlet flow

as well as bypass and pressure differential indicators.

C. Bypass Valve- Although there are many type and position variations for fluid flow when the differential pressure exceeds a pre-determined pressure.

D. Baseplate- This is the filter media's supporting structure on the interfacing end of the filter head. It helps prevent leaks or ruptures due to increased differential pressures and often contains threads for connecting to the filter head.

E. Filter Housing (Bowl)- The main enclosure for the filter helps direct the oil flow through the filter element.

F. Center Tube (Inner Core)- This is the central duct for outlet flow from the filter media to the filter head. The center tube also acts as a support for the filter media to prevent collapse from increased differential pressure.

G. Filter Media- A pleated filter element is an example of a surface-type filter, which provides a large surface area of porous cellulose or synthetic material for sufficient filtration during normal flow conditions.

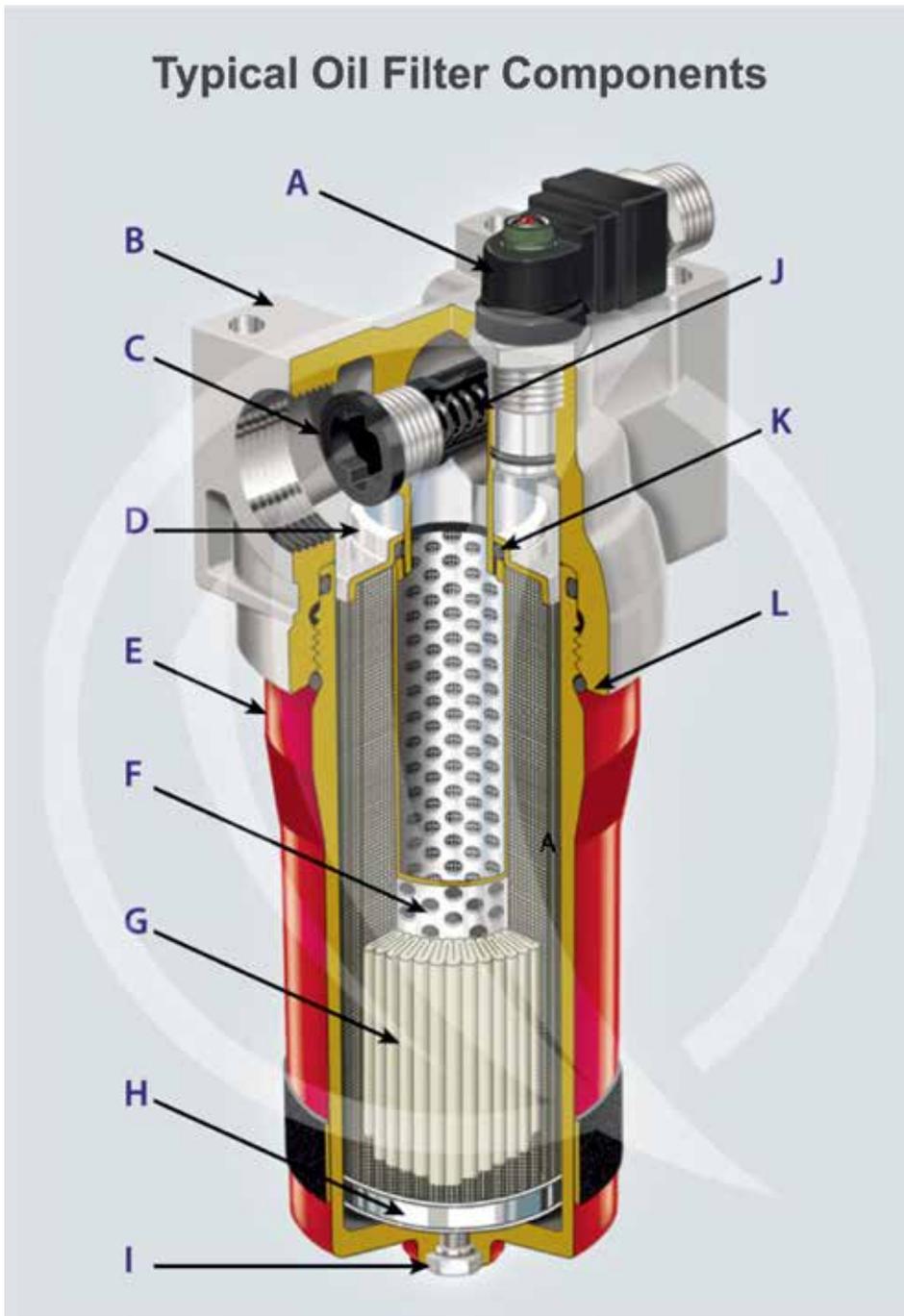
H. End Cap- This is the filter media's supporting structure on the opposite of the filter head. It helps prevent leaks or ruptures due to increased differential pressures.

I. Drain Port- This port provides the option to have the oil drained prior to removal of the oil filter from the filter head. It can also act as a location to take an oil sample or remove excess oil prior to disposal.

J. Coil Spring- This is the predetermined tension for the bypass valve. In other configurations, a leaf spring may be used.

K. Baseplate Gasket- This pre-lubed sealing ring or molding O-ring provides sufficient sealing between the baseplate and filter head during the filter housing installation.

L. Dust Seal- This prevents dust and other contaminants from entering the interior of the filter housing.



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***DON'T LET YOUR LUBRICANTS
GO-GO:MANAGING OXIDATION
WITH WHAM!***

**MANAGING
OXIDATION**

WHAM!

DON'T LET YOUR

LUBRICANTS GO-GO!



The year was 1984, Ronald Reagan was the President, the average price of a gallon of gas was \$1.13 and “Wake Me Up Before You Go-Go” was at the top of the music charts. This catchy song from the group WHAM! was wildly successful and launched George Michael’s career to new heights. Who would have thought that a song from what many consider the worst decade of music could hold a message about lubrication, or more specifically about how lubricants degrade?

Amongst the most common degradation pathways of lubricants is the oxidation of the base oil. This process involves the intake of oxidation and the production of highly reactive molecules that not only damage the surrounding base oil but can also impact the equipment health in a variety of manners. Long has oxidation been the bane of extended oil life, and many industries closely monitor it. However, the approach to proactively managing oxidation has a lot to do with what we allow in contact with the fluid in the first place. This is where WHAM comes into the story.

The leading catalysts for oxidation can be remembered using this simple mnemonic device:

W – Water

H – Heat

A – Air

M – Metals

These four agents working together greatly increase the oxidation rate and shorten the lubricant’s usable life. Our job is to control each of these and reduce their interactions with the lubricant as much as possible. Some are more easily controlled than others though.

While most lubricants will oxidize eventually, we do have help in delaying the process or at least managing the results of oxidation to a point. The vast majority of lubricants will

be formulated with antioxidant additives that function in multiple ways to minimize the impact of oxidation. These additives deplete as they work to slow or delay oxidation. Some of these additives can neutralize or decompose some of the highly reactive free radicals and hydroperoxides associated with oxidation.

Monitoring these additives has become an important aspect of lubricant analysis, especially for equipment utilizing large volumes of lubricants, such as turbines and other machinery with circulating oil systems. The lyrics in the song “Wake Me Up Before You Go-Go” definitely apply to the monitoring aspect of these additives.

In many cases, we want to carefully consider the additive levels to help determine our next course of action. As they deplete to an unsafe level, we may focus on our next full oil change or perhaps even a partial change, known as a bleed-and-feed, to buy us time until a scheduled outage occurs, at which point a more thorough change could occur.

Oxidation causes a dual course of devastation. On one hand, oxidizing promotes the formation of acids, which, if left unchecked, can lead to corrosion. This is especially true in equipment with softer metallurgy, where the acid can pit surfaces, leading to significant damage. The other aspect of oxidation is the production of larger molecules that eventually increase viscosity and, ultimately, the sludge, tars, and varnish that appear inside the equipment.

Varnish has become especially problematic in the industry as it creates surface deposits that reduce dynamic tolerances, reduce heat transfer ability, and produce sticky surfaces that can trap abrasive particles, leading to increased wear. Regardless of the path of destruction, neither is beneficial, and we can delay them from becoming problematic with diligence. To do this, we need to focus on WHAM!

Water

Water can impact the lubricant in many ways but increases the oxidation rate. Water promotes the formation of acids and free radicals, which oxidizes the oil quicker. It also leads to the formation of emulsions, which increases the fluid’s surface area, creating more interactions with oxygen.

Keeping water out of the lubricant requires multiple efforts. Most oils are hygroscopic, meaning that they absorb moisture from the air, so any air in contact with oil needs to be as dry as possible. Dry air purge systems or desiccant breathers can be used to do this.

Sanitation activities such as wash downs can be a source of water ingress, and care should be taken to seal equipment against ingress by properly outfitting the machine with seals, sightglasses, quick connects, breathers, or any other accessories that reduce the need to open the equipment during maintenance.

Water can be removed from the oil, and depending on the quantity and the state of co-existence, this can be straight forward. Free water, water that has separated completely from the oil, can simply be drained out and removed. If the water is emulsified, utilizing water-removing filter elements can be a simple approach. Dissolved water is the hardest to remove and likely requires vacuum dehydration or similar, more aggressive removal strategies.

Heat

Heat is the catalyst that increases the rate of oxidation and other chemical degradation processes within the oil. Often cited is the Arrhenius rate rule, which says that chemical reactions double every 10°C increase in temperature. This applied to oxidation means the rate of oxidation doubles with the same step in temperature, so the oil life is effectively cut in half. We want lubricants to operate as cool as possible.

In most cases, heat is difficult to avoid and is present due to the nature of the operation (friction) or because of the environment (ambient heat, close proximity to ovens, etc.). In either case, we try to guard the equipment against excessive heat. This may include shading for equipment exposed to direct sunlight or heat shields for equipment installed close to hot areas of the process.

Controlling heat is largely a task for heat exchangers and housekeeping. You want to ensure the equipment is kept clean to promote the dissipation of heat from the case of the equipment to the environment. Heat exchangers are used when passive cooling isn't adequate. These devices may utilize fans or cooling fluids to promote faster removal of heat from the systems. For smaller pieces of equipment where these may not be economically feasible, we should ensure we are using the correct viscosity and fluid volume so as not to unnecessarily create more drag and fluid friction that would compound the issue.

Air

Of course, for oxidation to occur, there must be oxygen present. The air that exists within the system is the source of most of this oxygen. Our equipment typically operates at atmospheric pressure, especially splash-lubricated machines and most fluid reservoirs. At these conditions, oil holds air in a dissolved state, up to 10% by volume. As oil experiences turbulence and movement through a system, bubbles can form and start to sus-

pend through the fluid volume. This is entrained air and represents one of the areas of most concern with air contamination.

Suction leaks, turbulent reservoir conditions, and impaired surface tension of the oil are all mechanisms that can lead to entrained air. Once these bubbles are in the system, they hang out in the oil volume and increase the area of the oil in contact with air. This further promotes oxidation and the by products mentioned earlier.

To control this, we need to ensure the oil stays healthy, which in turn ensures the oil's air release properties remain intact. We want the air to rapidly separate from the oil. To further aid in this, we want reservoirs to be as calm as possible, so the addition of baffles, diffusers, and other devices to slow down the movement of the oil can make a huge impact on the amount of entrained air that is allowed to move throughout the system.

Metal Catalysts

Like microscopic spark plugs, the metal particles suspended in the oil greatly impact the rate of oxidation. These particles can react with the air in the system, creating more reactive oxygen species that then attack the oil. They can also react with hydroperoxides in the oil, making more reactive molecules that increase the rate of oxidation and acid formation. Also, the metal surfaces provide a site for oxidation reactions to occur, allowing oxidation to occur more rapidly.

Most of our equipment is comprised of metal, so its presence is not uncommon. However, it is the small wear particles that can cause us great concern. These particles are released from the machine surfaces during operation and then allowed to move throughout the system, coming into contact with more of the lubricant. As their concentration grows, the more surface area is present through the system, which increases the rate of oxidation.

To reduce these impacts, we must ensure that our equipment is mechanically sound and operating well. This includes maintenance activities such as alignment, balancing, and solid mounting to ensure that the equipment isn't unnecessarily producing wear. Correct viscosity and additive packages to minimize wear are crucial from a lubrication aspect. We pair this with proper filtration to remove these fine particles and other wear-producing particles, such as dirt, to minimize the wear-particle population. Keeping the metal particles low helps slow down the oxidative process.

While you may not have the greatest opinion on the band or the song, it doesn't mean that there aren't lessons to learn here. Keep in mind that WHAM is largely controllable, and if we focus on it, we can greatly increase the life of our lubricants. Much like the song says, "I'm not planning ongoing solo." Get your team involved in these improvements, as everyone involved in the lubrication program has a role to play in keeping these contaminants out of the equipment.



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LUBRICANT CONTAMINATION

THE PRIME CAUSE OF MECHANICAL MACHINERY FAILURE



It is a fact that some 80% of machinery failures are related to lubrication. Of these, more than one-third result from the contaminated lubricant. These facts highlight the need to ensure all lubrication systems remain pure and contaminant-free.

This article clarifies misconceptions surrounding the subject, names the prime causes, and recommends suitable prevention methods. It further highlights modern laboratory analysis methodologies, which point directly to the contaminants found, and highlights the need for accurate sampling techniques. Finally, case studies of mechanical failures due to contaminated lubrication systems are presented, along with the paths taken to prevent these.

Misconceptions Regarding Lubricants

It is overlooked that most liquid lubricants arriving at an enterprise receiving bay are already contaminated. This is not due to the lubricant manufacturer but primarily because the drum or canister does not meet ISO codes of internal cleanliness. In some cases, the cleanliness level and particulate



matter's presence exceed this standard five to ten times. A straight forward method of ensuring this lubricant does not cause problems is to provide a filter cart with appropriately selected beta-rated filters depending on the most stringent and critical application.

The second misconception is that lubricating grease is also pure, but once again, this is a fallacy. There are some methods of purification, the simplest being filtration.

The Causes of Lubrication Contamination

Industrial lubrication systems can encounter various contaminants that degrade their

performance and reliability. Some common contaminants include:

Ingressed Contaminants:

- Dust, dirt, and airborne particulate from external sources
- Moisture and subsequent rust, corrosion, soot, microorganisms, and other contaminations result from water contamination
- Process contaminants

Generated Contaminants:

- Wear debris
- Additive depletion
- Products

These contaminants can lead to various issues such as increased friction, wear and tear of machinery components, reduced efficiency of lubricants, accelerated corrosion, and overall decreased equipment reliability and lifespan. Therefore, effective filtration, regular monitoring, and maintenance practices are essential to mitigate these risks in industrial lubrication systems.

How Does Lubrication Oil & Grease Become Contaminated?

Lubricating oil and grease can become contaminated through various mechanisms and sources. Contamination can occur during manufacturing, storage, transportation, or use within machinery and equipment. Here are some common ways lubricants become contaminated:

- **External ingress:** Dust, dirt, sand, and other particulates can enter lubrication systems through vents, seals, or openings in equipment during operation or maintenance activities.
- **Water ingress:** Water can enter lubrication systems through condensation, leaks, or washing processes. Water contamination can accelerate oxidation, reduce lubricant effectiveness, and lead to corrosion. (Always ensure that the item has a properly selected “breather” that prevents moist air from entering when the system cools down and inhalation occurs.)
- **Chemical contaminants:** Chemical contaminants such as fuel, coolant, solvents, and cleaning agents can mix with lubricants during maintenance procedures or due to equipment malfunction.
- **Wear debris:** Particles generated from the wear of components like gears, bearings, and seals can contaminate lubricants. Depending on the materials and conditions of operation, these particles can vary in size and composition.
- **Additive depletion:** Over time, lubricant additives can deplete due to oxidation, thermal degradation, or chemical reactions, altering the lubricant’s properties and potentially causing increased wear.
- **Microbial growth:** In environments with water contamination and suitable

conditions, micro organisms can grow in lubricants, leading to microbiological contamination that affects lubricant performance and stability.

- **Improper handling:** Poor handling practices during lubricant storage, transfer, or replenishment can introduce contaminants from unclean containers, improper filtration, or inadequate sealing.
- **Cross-contamination:** Lubricants can inadvertently mix with incompatible oils or greases during topping-up or maintenance activities, compromising their performance and potentially damaging equipment.
- **Environmental factors:** Environmental factors such as temperature extremes, humidity, and exposure to airborne pollutants can contribute to lubricant degradation and contamination over time.
- **Operational conditions:** Harsh operating conditions such as high temperatures, heavy loads, or extended service intervals can accelerate lubricant degradation and increase susceptibility to contamination.

What are the Indicators When Lubricators are Contaminated?

Contamination of lubricating oil (and sometimes grease) can lead to various indicators that can be observed through visual inspection, performance monitoring, and analytical testing. These indicators can be a direct indicator of contaminants (e.g., visible inspection or test for particulate) or observed through a consequence of contaminants present in the oil over time (e.g., with resulting oxidation or mechanical wear). Typical of these are:

- **Change in color and clarity:** Clean lubricating oil is typically translucent and clear. Contamination can cause the oil to become cloudy, murky, or change color (e.g., darkening). For example, coolant contamination can cause a milky appearance, while oxidation may darken the oil.
- **Unusual odors:** Contaminated lubricants may emit abnormal odors that indicate the presence of chemicals, fuel,

coolant, or degradation products. These odors can range from sweet (coolant contamination) to acrid or burnt (oxidation).

- **Change in viscosity:** Contaminants such as soot, sludge, or varnish can alter the viscosity of the lubricating oil. Increased viscosity can indicate contamination by solids, while thinning can occur due to fuel dilution or thermal breakdown.
- **Foaming:** Contaminants like water or air can cause lubricating oil to foam excessively. Foam reduces the oil’s ability to lubricate effectively and can lead to air entrainment in the system.
- **Abrasive particles:** The presence of visible particles or sediment in the oil can indicate contamination by wear debris, dirt, or other solid contaminants. This can be best observed on a magnetic plug, such as in a bottom sediment and water (BS&W) bowl. These particles can cause abrasive wear and damage to components.
- **Increased wear metal levels:** Analytical tests such as elemental analysis (Inductively Coupled Plasma Optical Emission Spectroscopy (ICP-OES) or Inductively Coupled Plasma Mass Spectrometry (ICP-MS) can detect elevated levels of wear metals (iron, copper, aluminum, etc.) in the lubricating oil. These metals indicate wear of components and potential contamination by abrasive particles.
- **Acid Number (AN) increase:** An increase in the acid number of the lubricating oil indicates an increase in acid concentrations, often resulting from depleted antioxidants, oxidized base oil and contamination by acidic substances. This can accelerate the degradation and corrosion of metal surfaces.
- **Decreased additive effectiveness:** Contaminants can react with or deplete the additives present in lubricating oil. This can reduce the effectiveness of additives such as anti-wear agents, detergents,

dispersants, and antioxidants.

- **Increased oxidation:** Contamination can accelerate oxidation of the lubricating oil, leading to increased viscosity, formation of sludge or varnish deposits, and degradation of oil properties.
- **Equipment performance issues:** Contaminated lubricants can reduce equipment efficiency, increase friction and wear, overheat, abnormal noise, and overall performance deterioration.
- **Particle counting:** involves measuring particles' number and size distribution in the lubricant. It's often done using laser-based particle counters that can detect particles down to a few micrometers in size. Particle counting can also be done using pore-blockage techniques.
- **Ferrous density and ferrography:** This technique uses a magnetic field to separate and analyze wear debris from the lubricant. Examining the particles' shape, size, and composition helps identify the source of wear (such as gears and bearings).
- **Spectrometric analysis:** This includes techniques like infrared (IR) spectroscopy, elemental analysis), and chromatography (e.g., gas chromatography-mass spectrometry (GC-MS) which can help identify and quantify contaminants, such as fuel, coolant, or oxidation by-products, as well as metals from wear debris.
- **Water content analysis:** Water is a common contaminant in lubrication systems. Techniques like Karl Fischer titration or infrared moisture analyzers can measure the water content in the lubricant.
- **Base Number (BN) decrease:** This measures the alkalinity of the lubricant contributed by over-based detergents in motor oil. A decrease in BN can indicate blow-by contamination.
- **Patch test:** Techniques like patch testing or gravimetric analysis can assess the cleanliness level of the lubricant by measuring the amount of solid contam-

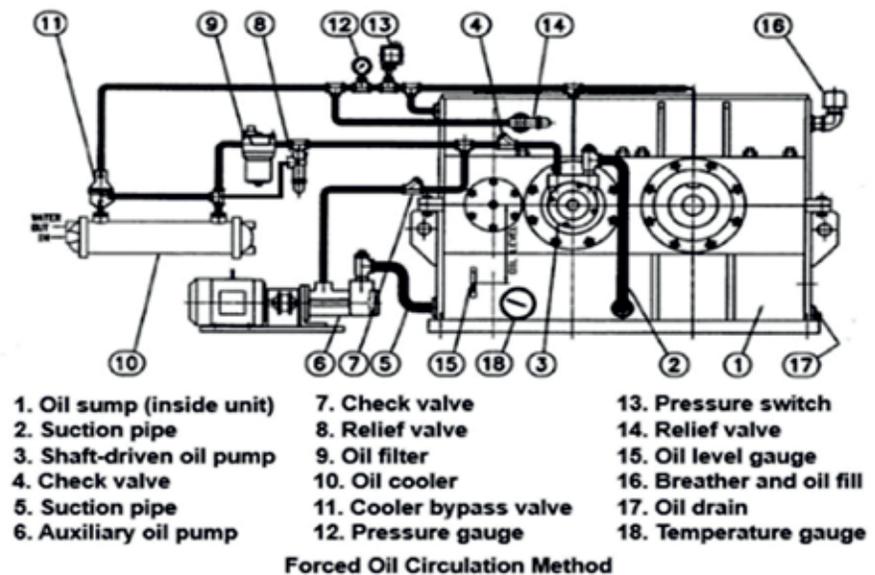
inants present on a filter membrane.

These techniques are often combined to provide a comprehensive analysis of the contaminants present in lubrication systems. This allows maintenance teams to assess the condition of machinery and take appropriate corrective actions to prevent equipment failure.

Contaminant Prevention Case Histories

Case Study #1

During a lecture program presented to a prominent oil refinery on gearboxes, the issue of repeated failures in a series of ultra-large, ultra-heavy-duty units measuring more than 12 feet (3m) in height and critical to the continuity of operations was raised. As installed, these gearboxes had no oil purification method, and the recommendation was to design and install bypass filtration units that not only purified the oil but also cooled it. This potential solution resulted in Mean Time Between Failures (MTBF) that exceeded the shutdown (turnaround) interval and had a major impact on production targets. A simplified but holistic diagram is shown below. This setup can vary depending on the complexity of the application.



Case Study #2

At a sugar milling factory where all the front-end units were hydraulically driven, exceptionally high costs were being incurred as all the equipment was supplied and serviced by a commercial supplier. The management asked to establish a hydraulics department, which resulted in the factory having a specialized workshop with trained staff to install and maintain all such equipment. Multiple changes were made to realize the zero downtime target. The oil brand was changed to what was recommended for the extremely heavy loading. The gear pumps were replaced with Swedish-made piston pumps installed below stainless steel oil reservoirs (flooded suction). The piston rings in these pumps showed minimal wear after five years of operation. They significantly improved in reducing wear compared to the original gear pumps (almost zero friction).

A hose crimping machine was donated, and the factory switched from screw-on fittings to crimped fittings, significantly reducing leaks. All hoses were made in-house, a hose register was created, and working hours/flexing was tracked as a method of planned replacement. Parallel return oil filtration units with 4-micron media were installed, with auto change-over activated by differential pressure control. The overall results of the oil purity tests were impressive, and substantial cost savings were achieved.



MASTERING LUBRICATION PROGRAMS: BEST PRACTICES FOR OPTIMAL MACHINERY PERFORMANCE



In today's fast-paced industrial environment, machinery efficiency and longevity are paramount. One critical factor in achieving this is a well-structured lubrication program. Lubrication programs are not just about applying oil or grease; they are comprehensive strategies to ensure machinery operates smoothly, reduce downtime, and extend equipment life. This article delves into best practices for developing a robust lubrication program, the necessary training, and the steps to implement it effectively.

The Importance of Lubrication Programs

Lubrication is the lifeblood of any mechanical system. Proper lubrication reduces friction, minimizes wear, and prevents corrosion. A well-executed lubrication program can lead to significant cost savings by reducing maintenance costs, minimizing unexpected breakdowns, and prolonging the lifespan of machinery. Moreover, it enhances energy efficiency, leading to lower operational costs.



Developing a Lubrication Program

Creating a successful lubrication program involves several key steps:

Assessment and Planning

- **Machinery Audit:** Begin with a thorough audit of all machinery and equipment. Identify lubrication points, types of lubricants required, and current lubrication practices.
- **Objective Setting:** Define clear objectives for your lubrication program. These include reducing downtime, extending equipment life, or improving energy efficiency.

Lubricant Selection

- **Compatibility:** Choose lubricants compatible with your machinery and operating conditions. Consider factors like temperature, load, speed, and environmental conditions.
- **Supplier Collaboration:** Work closely with lubricant suppliers to ensure you use the best products.

Lubrication Schedule

- **Regular Intervals:** Establish a lubrication schedule based on the manufacturer's recommendations and your machinery's operating conditions. Regular

lubrication prevents wear and tear.

- **Automated Systems:** Consider implementing automated lubrication systems for continuous and precise lubrication, reducing the risk of human error.

Documentation and Record-Keeping

- **Lubrication Logs:** Maintain detailed logs of lubrication activities, including dates, types of lubricants used, and observations about machinery performance.
- **Software Tools:** Utilize lubrication management software to streamline record-keeping and ensure consistency.

Monitoring and Analysis

- **Oil Analysis:** Regularly conduct oil analysis to monitor the condition of lubricants and detect potential issues before they become critical.
- **Trend Analysis:** Analyze trends in lubrication data to identify patterns and make informed decisions about maintenance and lubricant selection.



Training and Education

A successful lubrication program requires skilled personnel. Investing in training and education ensures your team understands the importance of proper lubrication and how to execute the program effectively.

Basic Training

- **Lubrication Fundamentals:** Train staff on the basics of lubrication, including types of lubricants, their properties, and how they interact with different machinery components.
- **Application Techniques:** Educate on proper lubrication techniques, ensuring the right amount of lubricant is applied at the correct intervals.

Advanced Training

- **Oil Analysis:** Provide advanced training on oil analysis techniques, enabling staff to interpret results and take proactive measures.
- **Troubleshooting:** Equip your team with the skills to troubleshoot lubrication-related issues, such as identifying the causes of lubricant degradation or contamination.

Continuous Education

- **Workshops and Classes:** Encourage participation in industry workshops and classes to stay updated on the latest lubrication technologies and best practices.
- **Certifications:** Support staff in obtaining certifications from recognized bodies like the International Council for Machinery Lubrication (ICML).



Best Practices for Lubrication Programs

Implementing best practices ensures your lubrication program is effective and sustainable:

Standardization

- **Lubrication Standards:** Develop and adhere to lubrication standards across your organization. Standardization ensures consistency and reduces the risk of errors.

Cross-Functional Collaboration

- **Team Effort:** Involve cross-functional teams in developing and maintaining the lubrication program. Collaboration between maintenance, operations, and procurement ensures all aspects of lubrication are considered.

Continuous Improvement

- **Feedback Loops:** Establish feedback loops to assess and improve your lubrication program continuously. Regularly review performance data and adjust practices as needed.
- **Innovation:** Stay open to adopting new lubrication technologies and practices to enhance your program's effectiveness.

Safety and Environmental Considerations

- **Safety Protocols:** Implement safety protocols to protect personnel during lubrication activities. This includes proper handling and disposal of lubricants.
- **Environmental Impact:** Consider the environmental impact of your lubrication practices. Opt for eco-friendly lubricants and practices that minimize waste.

Conclusion

A well-developed and executed lubrication program is essential for the optimal performance and longevity of machinery. By following best practices, investing in training, and fostering a culture of continuous improvement, organizations can reap the benefits of reduced downtime, lower maintenance costs, and enhanced operational efficiency. In today's competitive industrial landscape, mastering lubrication is not just an option; it's a necessity for success.



THE EVOLUTION OF LUBRICATION TECHNOLOGIES IN PREDICTIVE MAINTENANCE



Lubrication technologies help to ensure the smooth running of industrial machinery and equipment. Proper lubrication reduces friction and wear, thereby producing less heat so extending the lifespan of the components, and reducing downtime. Engineers and industrial maintenance professionals should stay abreast of the latest advancements in lubrication technology such as advanced synthetic lubricants and condition monitoring systems which can enhance reliability and reduce maintenance costs while increasing overall productivity.

Historical Overview of Lubrication Technology and Advancements

The earliest evidence of lubrication technology dates to ancient Egypt, where animal fat and vegetable oils were used to reduce friction on wheeled carts. By the 8th Century whale oil was being used on ships to lubricate rudders and pulleys, but it wasn't until 1845 that industrial lubricants were first used in cotton spinning mills which most experts agree marks the beginning of the modern lubricant industry. Although the first American oil strike was in 1859, lubricant manufacturers didn't start processing



petroleum-based oils in any volume until the early 20th century to meet the demands of the auto industry.

The use of solvents and related processes to improve lubricant performance began in the 1920s and additives to increase lubrication lifespan were introduced in the 1930s and 1940s. By the 1950s the use of additives was widespread and commercial lubrication oils offered enhanced oxidation and corrosion resistance, significantly increasing their service life. Synthetic lubricants were created in the 1950s, initially to meet specialized demands

from the aviation and aerospace industries.

This technology directly led to the widespread introduction of the modern multi-grade automotive engine oils we see today. This evolution of industrial lubricants continues at a rapid pace with the development of increasingly advanced products to meet the industrial demands of modern machinery, balanced against the need for environmental responsibility. An awareness of the historical development of lubricants and the rate of advancement is useful as a background for engineers to understand the need

to stay current with advancements in lubrication technology.

Understanding the Impact of Proper Lubrication on Equipment Lifespan

This impact of lubrication on the lifespan of machinery can be explained by detailing the importance of correct lubrication and highlighting the detrimental effects of inadequate lubrication.

Importance of Proper Lubrication

Proper lubrication is essential for maximum longevity of industrial equipment. The lifespan of machinery can be significantly enhanced as lubricant reduces friction and therefore wear and tear on moving parts. This reduces the likelihood of breakdowns, costly repairs, and equipment downtime. Industrial maintenance professionals must ensure machinery is adequately lubricated to maintain efficient performance over a long lifespan.

Regular lubrication maintenance has been shown to significantly prolong the lifespan of machinery, however over-lubrication can be detrimental. Excessive lubricant can cause overheating and introduce contaminants which can lead to premature equipment breakdowns. Although maintaining a proper lubrication schedule does require additional time and effort, the reduction in breakdowns and repairs plus higher efficiency over a longer lifespan, more than makes up for the additional time invested. Engineers need to allocate resources to lubrication schedules and perform regular inspections so any issues can be identified and rectified promptly.

Effects of Inadequate Lubrication

Inadequate lubrication causes excessive heat leading to wear and tear on components which leads to premature equipment failures. When machinery lacks the proper lubrication, it does not last as long, requires additional maintenance and repairs, and can even be a safety hazard. Insufficient lubrication can cause catastrophic machine failure, ex-

plosions, and fires.

The Value of Effective Audits and Observing Lubrication Practices in Action

The deceptively simple process of observing industrial practices in real-time to help identify and address issues in a useful way is often referred to as a Gemba walk and was initially popularized by Taiichi Ohno, the founder of the Toyota Production System. In lubrication practices, this observation process comprises audits and monitoring.

Conducting Lubrication Audits

Lubrication audits are systematic evaluations of lubrication practices and schedules to ensure that machinery and equipment are being properly lubricated in an industrial setting. These audits are essential for maintaining the efficiency and longevity of the machinery and involve the examination of all aspects related to lubrication, including types of lubricants, the frequency of lubrication, the methods of application, and the overall condition of the equipment.

Conducting lubrication audits allows engineers and maintenance professionals to identify potential issues and take proactive actions to prevent premature equipment failures and costly repairs. Audits help to optimize lubrication practices by ensuring the right lubricants are used at the right times and in the right quantities. Although audits can be time-consuming and a challenge for busy engineers and maintenance professionals, they save time and money over the long term.

Monitoring Lubrication Practices

This involves observing and evaluating the actual application of lubricants on equipment and machinery in real time. This monitoring allows maintenance professionals to ensure that proper lubrication practices are being used correctly and to address any issues as they arise. Real-time monitoring provides immediate feedback so engineers can quickly identify and rectify any problems before they cause expensive equipment damage. Observ-

ing lubrication practices in real time allows for easy mentoring and continuous improvement encouragement. This monitoring also allows tracking of performance metrics and trends so engineers can implement any necessary changes to enhance efficiency in the process.

The Main Challenges in Lubrication for Predictive Maintenance

- **Contamination:** Contamination is one of the main challenges and refers to foreign particles such as dust, dirt, water, and other debris mixing with the lubricant which reduces the lifespan and effectiveness of the lubricant.
- **Improper Lubricant Selection:** Using the wrong type of lubricant can have a significant negative impact on the effectiveness of a lubrication system.
- **Over-Lubrication or Under-Lubrication:** When it comes to lubricating machinery there is a 'Goldilocks' balance between over-lubrication and under-lubrication for maintaining an efficient lubrication system.
- **Temperature Extremes:** In cold environments, lubricants can thicken which can impair the flow and effectiveness of the lubricant, whereas in hot environments, lubricants may get too thin which reduces protection.

Economic Benefits of Advanced Lubrication in Maintenance Strategies

Correct lubrication strategies can provide several economic benefits including extended equipment lifespan, reduced maintenance costs, improved energy efficiency, enhanced productivity, and better safety. The only downsides to implementing an effective lubrication schedule are some additional man-hours and lubricant costs related to regular maintenance. However, these costs are more than offset by less downtime, less capital expenditure, fewer accidents, and improved efficiency.



RELIABLE PLANT 2025 CONFERENCE DELIVERING INSIGHTS, INNOVATION, AND INSPIRATION ALONG THE “ROUTE TO RELIABILITY”



The Reliable Plant 2025 Conference & Exhibition, held June 2-5 at the Schaumburg Convention Center near Chicago, Illinois, took attendees on an exciting journey along the “Route to Reliability.” Drawing inspiration from the historic Route 66, the conference showcased how industry professionals are navigating the changing landscapes of reliability and maintenance to reach peak performance, operational excellence, and sustainability.

Over four packed days, attendees participated in more than 70 insightful sessions spread across diverse categories, including Lubrication Excellence, Maintenance Optimization, Digital Transformation, Condition Monitoring, and Training, Leadership & Culture. Specialized training programs held alongside the conference provided even more in-depth learning experiences, while carefully curated key note presentations highlighted emerging industry trends, practical strategies, and actionable solutions to enhance asset reliability and drive measurable improvements within attendees’ organizations.

*“It’s like going to church in some ways,” said attendee Alex Bolan from Digital Thinker. “You’re **learning** about something that very passionate people are delivering content on and*



preaching about, so to speak. But you’re also with a group of – even though they’re strangers – they’re all friends because we’re all trying to fight the same fight.”

The event officially kicked off on Tuesday with an energetic opening ceremony led by Noria Vice President of Services Wes Cash and Noria President Bennett Fitch, whose remarks set the stage for the impactful days ahead. Fitch emphasized the importance of collaboration, innovation, and continuous learning in driving the industry forward. During this opening session, attendees also celebrated the announcement of the presti-

gious 2025 Lube Room Challenge winner: Georgia Pacific’s Toledo, Oregon plant. This year also saw the introduction of the Reliability Champion award, won by Vale’s Lisandra Cobu. These awards further one of the central goals of Reliable Plant: recognizing and celebrating excellence and innovation within the reliability and lubrication community.

Throughout the week’s learning sessions, notable industry experts and thought leaders took the stage to share their valuable knowledge. Wes Cash, Noria’s VP of Technical Services, outlined critical steps necessary for transforming lubrication programs and fos-

tering proactive maintenance cultures. Moebius Institute's Michael Dwyer challenged attendees to journey beyond traditional maintenance methods by integrating advanced reliability strategies while Lake Speed Jr. from Speed Diagnostix expertly guided participants through the complexities of lubrication analysis. Lake's presentation was insightful, but also intriguing: he tailored his presentation to an often-unexplored application for oil analysis: daily drivers.

Among the most popular sessions was "Optimizing Lubrication Practices for Improved Asset Condition" presented by Daniel Shorten and Ameer Salah of John Crane Solutions, which provided attendees with practical, actionable tools and techniques to extend asset life and enhance operational reliability. Drew Mackley from Emerson captured attendees' attention with a retrospective analysis of 25 years of wireless vibration technology experience, offering key lessons learned and future considerations in condition monitoring.

"It is massive," said first-time attendee Yuraima Redondo. "There is representation from all

over the world. It's very exciting. Definitely a lot of great sessions about advancements in sensors, lubricants and condition monitoring systems to enhance maintenance and reliability practices as well as amazing vendor exhibitions. I definitely got great insights on how multiple industries have common issues with the equipment."

The always extensive exhibit hall was alive with innovative products and ground breaking technologies, offering attendees first-hand demonstrations of solutions specifically designed to boost reliability and maintenance efficiency. Attendees had numerous opportunities to engage directly with industry-leading vendors, gaining deeper insights and discovering innovative tools to support their reliability initiatives.

Networking events such as the VIP Reception, Meet & Greet, and the lively Casino Reception provided valuable opportunities for industry professionals to connect, exchange stories from their reliability journeys, and collaboratively address the unique challenges facing their respective industries.

Cody Creager from Timber Products was excited to talk with other attendees. "There's a lot of homegrown conversations about what you should do before you start doing all this other stuff. What are the basic things to do? And I think there's a lot of great conversations about that here."

The conference concluded with an exciting closing ceremony featuring the highly anticipated annual prize give away. Multiple lucky winners celebrated by taking home popular personal items such as AirPods, a DJI drone, and more. Attendees left inspired, equipped with practical knowledge, new connections, and renewed motivation to steer their organizations toward even greater success.

Mark your calendars now for Reliable Plant 2026, scheduled for June 15-18 in the scenic and exciting locale of Reno Tahoe, Nevada. Stay informed and connected by visiting conference.reliableplant.com and subscribing to updates to be notified about details about future events as they happen.

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Leadership Lessons in Lubrication

GEAR TALK : Episode 8



GEAR TALK
WITH WES CASH

In this episode of Gear Talk, Wes sits down with Jeff Walk up, Fluid Life's vice president of sales and marketing, to discuss leadership lessons in lubrication. As an industry veteran, Jeff is passionate about the impact of leadership on maintenance and reliability teams and how it drives innovation and excellence in facilities. Whether you're on the facility floor or in the C-suite, this episode is packed with insights, experiences, and tips to elevate your leadership skills.



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From the Asian Desk

Our region. Our voices. Our solutions

This new section dives into the challenges, innovations, and success stories shaping lubrication and reliability across Asia — from expert articles and event coverage to wellness, training, and insights from the field.





Chai for Us, Care for Them – Monsoon Maintenance: Human-Machine Edition



As the skies open up and we settle in with a hot cup of ginger chai and a side of pakoras, life seems cozy. But spare a thought for the real workhorses — your machines. While we enjoy the drizzle from behind glass windows, they're out there getting soaked, slipping on moisture, and quietly plotting their next shutdown if ignored.

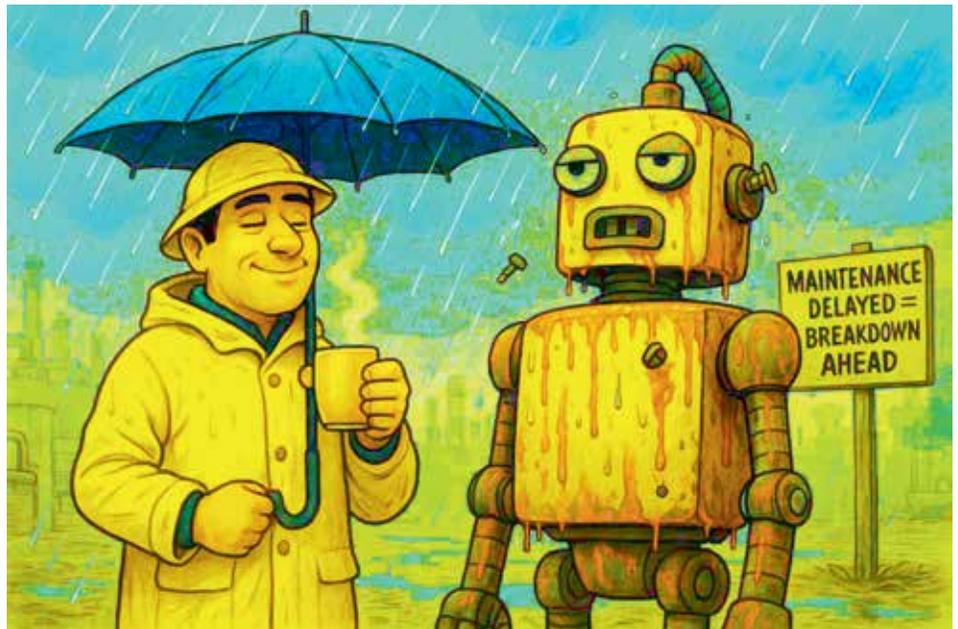
Machines don't complain. They fail silently, often at the very moment you need them the most.

So before the weather takes the wheel, here's your monsoon survival guide — for your equipment, not your umbrella.

1. Moisture Is the Sneaky Villain – Lock the Doors!

Humidity doesn't knock — it just lets itself in and makes itself comfortable. Your lubricants don't appreciate the intrusion.

- Swap open breathers for desiccant ones (because even machines hate musty air).
- Tighten those bolts, seals, and inspection covers like you'd seal a leaky window.
- For idle equipment, rainproof covers are more effective than wishful thinking.



You've got your chai and raincoat near, but your machine needs care this time of year!

Pro tip: If you're covering your scooter with plastic, your gearbox deserves the same courtesy.

2. Water in Oil? That's a Recipe for Slippery Trouble

Lubricants and water go together like pizza and pineapple — some people try it, but it's not recommended.

- Check for emulsification — if your oil looks like a milkshake, it's not breakfast.
- Use oils with good water separation

properties.

- Apply water-resistant grease where splashes are likely to occur.

Smells funny? Looks cloudy? Don't ignore it — your lubricant's trying to tell you it's drowning.

3. Rust Is That One Guest Who Overstays His Welcome

One rain shower, and suddenly all your bright metal parts are turning into vintage decor.

- Spray rust preventives generously — think of it as sunscreen for steel.
- Wrap exposed tools or spares in VCI film — not your old newspapers.
- Don't let parts sit directly on damp floors — they're not meant to be floor-mats.

Bonus: Machines love spa treatments. A rust preventive rub-down is their monsoon massage.

4. Water + Wires = Sparks and Regrets

You wouldn't stand barefoot on a wet floor holding a toaster. Then don't let your MCC panel do it either.

- Inspect enclosures for cracks, loose gaskets, or mystery moisture.
- Add silica gel or anti-condensation heaters inside panels (they like it warm too).
- Insulation resistance testing isn't optional — it's survival.

Moisture in control panels is like coffee in your keyboard — it never ends well.

5. Slower Days, Slippery Floors – Stay Sharp

Rains slow things down — maintenance shouldn't be one of them.

- Adjust PM schedules to prevent tasks from being missed due to downpours.
- Add anti-slip mats near machines — not just outside your main door.
- Keep a monsoon maintenance log — because memory gets soggy too.

If it's raining excuses, it's time to check your checklist.

6. Belts, Hoses & Bearings – The Silent Sufferers

While everyone's busy wiping down panels and checking oil, belts, and hoses, quietly take a hit. Moisture seeps in, reducing flexibility and increasing the risk of cracks or slippage. Bearings, meanwhile, suffer from ingress and corrosion if left unchecked. Give these parts a quick monsoon inspection —

check tension, look for signs of wear, and don't forget a dab of fresh grease if needed. Remember, just because it spins quietly doesn't mean it's happy.

7. Cleanliness Is Next to Reliability

Muddy boots shouldn't lead to muddy bays. Monsoon grime can clog filters, jam actuators, and generally lower morale (human and machine). A quick end-of-day wipe-down, both for high-touch areas and floor zones around critical machines, can go a long way. It's not about making it sparkle — it's about giving your equipment a fighting chance to operate without gunk throwing a tantrum mid-shift.

8. Filters Don't Take Rainchecks

With all that extra moisture and dust in the air, filters are working overtime —and often silently begging for attention. Air filters, hydraulic filters, and even breathers can get clogged faster than usual in this weather. A quick inspection or scheduled change can save you from a nasty surprise later. Think of it like changing your car's wipers before the downpour — nobody remembers until it's too late.

9. Storage Areas Need TLC Too

Just because it's not running doesn't mean it's safe. Spares, tools, and backup equipment sitting in storage often bear the brunt of poor monsoon prep. Rising damp, leaking roofs, and lazy stacking can quietly ruin what you'll need in an emergency. Elevate shelves, check for leaks, and throw in a few silica sachets — your future self will thank you when you're not fishing out a rusted coupling midshift.

Closing Thought:

We prepare for the rains with umbrellas, waterproof shoes, and backup snacks. Your machines need the same kind of prep (well, maybe not the snacks). A little humor and a lot of vigilance can go a long way.

This monsoon, give your equipment the care

it deserves — before it returns the favor with an unscheduled breakdown.

About the Author:



Sangeeta Iyer, Publications Manager at Machinery Lubrication India, brings over 18 years of experience in technical writing and editing. She leads the magazine's editorial vision, with a special knack for simplifying complex lubrication and reliability technologies into clear, engaging, and relatable narratives. Her passion lies in making technical knowledge not just accessible, but genuinely helpful for real-world industry challenges.

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SMART EATING ON THE MOVE!

What to eat during work and what to avoid?



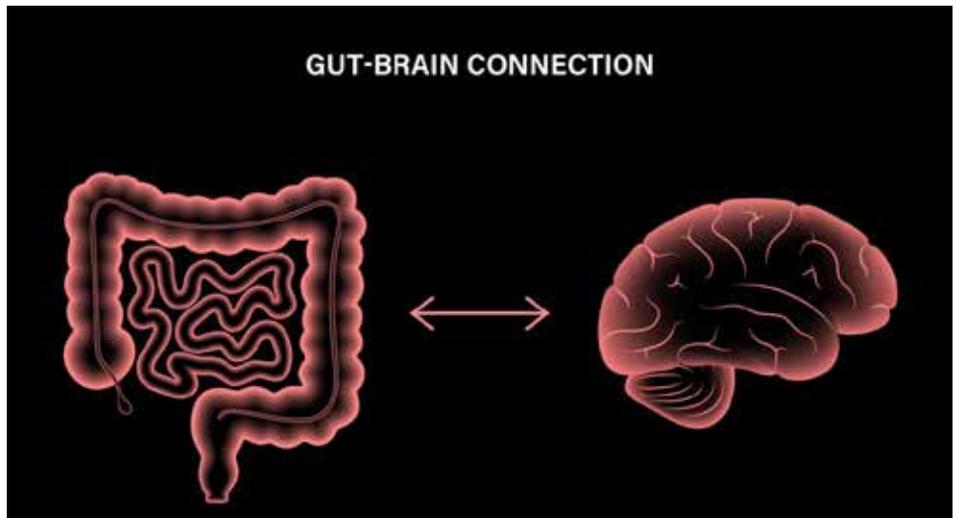
When you're racing between machines, managing teams, or tackling site breakdowns, and constantly on the move, what you eat can make or break your energy levels, concentration, and long-term health.

Think of your body like the machines you maintain—run them on low-grade fuel/lubricants, and sooner or later, performance suffers.

Let's understand how to smartly fuel your body while navigating a packed work schedule.

1. Eat for Energy, Not Just to Fill Your Stomach

Many people tend to opt for heavy lunches or quick-fix snacks like chips and sugary biscuits, but these choices often lead to drowsiness and sluggishness soon after. Instead, it's wiser to focus on high-energy, low-crash foods that sustain you through the day. A light, easy-to-digest lunch, such as one chapati paired with double the portion of vegetables and a generous helping of salad—can do wonders for your energy levels. For snacks, choose nutrient-dense options like nuts, seeds, and roasted chana, which are packed with protein and healthy fats. Fresh fruits like bananas, apples, or oranges offer instant, clean energy without the crash. And



for a delicious yet nutritious treat, energy laddoos made from dates, oats, and seeds are a perfect homemade, portable solution.

2. Smart Snack Swaps

It's easy to grab a packet of namkeen or a soft drink. But every unhealthy snack adds up. Try this instead -

Craving	Typical Snack	Smarter Alternative
Crunchy	Chips	Roasted fox nuts (makhana)
Sweet	Chocolate bar	Dates + peanut butter
Beverage	Soda	Coconut water/lemon water

3. Hydration Is Not Optional

Dehydration is a silent productivity killer. It affects mood, focus, and digestion. Especially if you're working outdoors or in heated areas, make sure to -

- Drink 2–3 liters of water daily
- Use a steel bottle that stays with you
- Add ORS or lemon + salt on extra hot days.

4. Gut Health = Mental Health

The gut-brain connection is real. An irritated gut can lead to fatigue and even poor decision-making.

- Start your day with liquid (Coconut water, green juice or ABC juice)
Note: Avoid fruit juices in empty stomach
- Avoid heavy meals—it stresses your gut
- Limit oily, spicy, and overly processed foods during work hours
- To improve gut health, try intermittent fasting—16 hours of fasting between dinner and the next day's breakfast.

5. What Snack to Keep in Your Bag?

Here's what to carry so you never have to compromise your health on the go -

- Dry Fruits & Nuts Mix: Almonds, wal-

nuts, raisins – instant energy without sugar crash

- Homemade Energy Bars or Laddoos: Made with dates, seeds – filling and nutritious
- Two- to three-ingredient mixture or roasted fox nuts: if you don't have a sweet tooth
- Fruit (Banana or Apple): Durable and doesn't spoil quickly
- Fennel Seeds (Saunf): Aids digestion and freshens breath

These will help you avoid junk food traps.

By upgrading your daily choices, you'll not only boost your work output but also protect your long-term health. Because when your body runs well, so does your day.

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.

Want to bring a health session to your workplace?

Let's connect!





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DOUBLE THE LIFE OF YOUR GEARBOX: WHY CLEAN OIL IS NO LONGER OPTIONAL

The Industry's Dirty Secret

"We analyze our oil regularly—our machines should be fine."

This belief has been widely accepted for decades, but 2025's reliability-focused operations are exposing its flaws. Oil analysis is diagnostic, not preventive. By the time ferrous wear shows up in your reports, damage has already begun.

Modern best practice is no longer about waiting for results. It's about setting cleanliness targets, preventing contamination, and tracking trends—not just symptoms.

The real game-changer? Contamination control, not just condition monitoring.

Building the Case for Oil Cleanliness

1. What's Killing Your Gearboxes?

Gearboxes are rugged, yes—but they're not immune. Hidden enemies like dust, metal particles, and moisture wear them down long before failure is visible.

Field data shows that reducing oil contamination from ISO 26/23/21 to 14/11/9 can extend gearbox life by up to 7x.

Fact: Even a 3-point ISO drop = ~50%



Figure 1 : One gearbox, two outcomes—clean oil protects, dirty oil destroys.
The difference is reliability.

more life.

2. Understanding ISO 4406 and What "Clean" Means

The industry standard, ISO 4406, assigns oil a cleanliness code based on the number of solid particles in 1 ml of oil, broken down into: $\geq 4 \mu\text{m}$, $\geq 6 \mu\text{m}$, $\geq 14 \mu\text{m}$

System	Recommended ISO Code
Gearboxes	<18/16/13
Turbines	<17/15/12
Hydraulics	<15/13/10
Fresh oil	Cleaner than the system's requirement

Table 1: Recommended ISO Cleanliness Targets by System Type

3. Myths That Are Holding Us Back

Myth	Why It's Wrong
“Gearboxes are rugged and don't need clean oil.”	They're still susceptible to particle-induced wear.
“Oil analysis alone ensures reliability.”	It only detects damage that's already begun.
“OEM specs are enough.”	OEMs offer minimum standards, not optimized targets.
“Ferrous density tests are sufficient.”	They measure wear, not contamination, and not early enough.

Table 2: Common Misconceptions About Oil Cleanliness

4. Ferrous Density vs. Particle Trending: Know the Difference

Method	Tells You	When It's Useful
PQ/WPC (Ferrous Density)	Presence of wear metals	After wear has started
Particle Counters/Trending Tools	Level of contamination	Before wear begins

Table 3: Comparison of Oil Analysis Methods

Particle trending (e.g., mesh obscuration or microscopy) is now considered essential for predictive maintenance, especially for gearboxes, which labs often skip due to thick oils and coarse debris.

5. Cleanliness Must Be Contextual

Your industry and environment directly impact oil contamination risk:

- Mining, Cement, Steel - high dust and particulate exposure
- Marine, coastal - higher moisture risk
- Precision systems - ultra-sensitive to fine particles

This makes one-size-fits-all ISO targets ineffective. Custom targets are essential.

6. Don't Ignore Moisture

Water contamination—even as low as 0.03% (300 ppm)—can:

- Accelerate oil degradation
- Reduce film strength
- Lead to wear and corrosion

Best test method: Coulometric Karl Fischer + Co-distillation

It's more accurate, especially in oils with additives that interfere with volumetric tests.

7. Cost-Benefit Thinking: Make It Justifiable

Clean oil is an investment—but one that pays off. Before upgrading filters or tools, reliability teams today ask:

- What's our average cost of repair?
- What's our downtime worth per hour?
- How much longer can our gearboxes run if contamination drops 6 ISO points?

Then they run a 5-year ROI model. The answer almost always favors action.

What Does 18/16/13 Mean? A Simple Guide to Understanding ISO 4406 Cleanliness Codes

The ISO 4406 standard tells you how clean (or dirty) your oil is by counting how many particles of different sizes are floating in every milliliter of it.

ISO Code Number	Particle Size	Approx. Particles/ml
18	≥ 4 μm	1,300 – 2,500
16	≥ 6 μm	320 – 640
13	≥ 14 μm	40 – 80

The lower the number, the cleaner the oil. Even a one-point improvement means up to 50% fewer particles and longer machine life.

From Reaction to Prevention

The days of relying solely on lab reports and OEM suggestions are over.

Clean oil is no longer just about compliance—it's about performance.

If you're serious about:

- Increasing uptime
- Reducing unplanned breakdowns
- Extending the life of high-cost gearboxes

...then your strategy must evolve from “test and react” to “target, clean, and trend.”

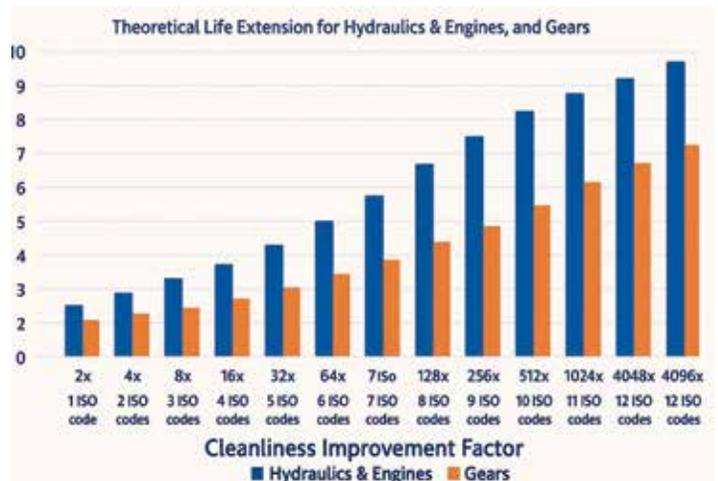


Figure 2: Impact of oil cleanliness on gear surface condition

Action Checklist:

- Set ISO cleanliness targets for all systems
- Monitor particle counts—not just ferrous debris
- Customize targets based on environment & equipment
- Validate ROI with long-term cost modeling
- Don't just test your oil—protect it

About the Author



Chander Mohan Sharma (C M Sharma) brings over three decades of hands-on experience in industrial lubrication. A former Senior Manager at Tata Steel, he superannuated after a distinguished career overseeing lubrication across project planning and plant operations. His expertise spans critical equipment in the Steel, Power, Mining, and Cement industries.



WHEN ONE MISSED STEP COULD COST A SHUTDOWN

Forklift Incident as a Lesson in Operational Discipline and Maintenance Culture



On a routine afternoon inside a busy industrial facility, a simple oversight nearly turned into a serious accident. A forklift left unattended on a mild incline began rolling backward, unnoticed, only stopping after hitting a road kerb just short of a distracted employee. While no one was injured, the close call served as a much-needed reminder: the most minor operational errors can trigger a cascade of failures, not just in safety but also in equipment reliability.

The Incident

The forklift was temporarily parked on an inclined section of the plant's internal road. The operator stepped away without engaging the parking brake—an apparent deviation from the SOP. The slope, though mild, was enough for gravity to do its work. Down the bend, an employee stood with his back to the vehicle, speaking on the phone. Fortunately, the car was stopped by the kerb before contact. But the outcome could've been very different.

Maintenance Is More Than Lubrication – It's Discipline

Though the forklift's braking system was lat-



Figure 1: Near-miss caused by parking lapse and inattention

er confirmed to be fully functional, the near-miss exposed a gap in operational maintenance discipline. In a well-oiled machinery ecosystem, preventive measures go beyond greasing fittings or topping up fluids—they also involve ensuring human behaviors align with equipment safety protocols.

This isn't just an EHS concern. Consider what could happen if the brake system had failed due to neglected maintenance—per-

haps water contamination in hydraulic fluid, worn seals, or degraded lubricant. Any of these would make the incident not just an operator error but a full-blown system failure.

Sequence of Events (Summarized)

1. Forklift parked on an incline; parking brake not engaged.
2. The operator stepped away, assuming it was secure.

3. The forklift began to roll.
4. Employee in the path, unaware of the danger.
5. Vehicle halted by the kerb.
6. Brakes found operational; root cause: human error.

Deeper Analysis: Reliability vs. Routine

Using the “5 Whys” technique, the root cause was traced to complacency, worsened by inconsistent training and weak supervisory follow-up. But from a maintenance and reliability standpoint, such incidents raise a red flag about how well operational procedures are internalized and enforced.

In maintenance culture, failure often begins with minor, ignored deviations: skipped checklists, assumed conditions, or a lack of follow-through. These are as risky as ignoring a vibration reading or oil analysis report.

Corrective and Preventive Measures

1. Checklist-Driven SOPs

Forklift SOPs were updated to include a mandatory walkaway checklist. This serves the same purpose as a pre-lube inspection—simple, quick, and vital.

2. Training, Now with Testing

Biannual refresher training is now mandatory, supported by quizzes to ensure retention. Similar to a post-training certification process.

3. Behavioral Safety Integration

Toolbox talks now include genuine incident reviews. This helps translate “lessons learned” into actionable frontline practices, much like reliability-centered maintenance teams do with failure histories.

4. Physical Zoning and Signage

Vehicle-pedestrian boundaries were re-marked and reinforced with barriers. Signage is important, but physical deterrents are far more effective in maintaining safety zones around machinery.

5. Enhanced Monitoring

CCTV and shift supervisors now track MHE parking practices. Surveillance is not about punishment—it’s about accountability and data, just like condition monitoring is for rotating equipment.

6. Poka-Yoke for Parking

Wheel chocks were made mandatory for parked equipment—classic mistake-proofing, just like keyed fittings or color-coded oil ports prevent lube mix-ups.

Lessons for Maintenance Leaders

- **People are part of the system.** Human reliability is just as important as machine reliability.
- **Checklists are underrated.** They prevent both near-misses and long-term damage.
- **Training needs structure.** Ad-hoc awareness isn’t enough—for-

mal refreshers and testing help.

- **Minor violations have major consequences.** Today it’s a missed brake; tomorrow it could be a burned motor or seized bearing.
- **Maintenance culture includes safety.** The goal isn’t just to prevent breakdowns—it’s to ensure the whole operating environ-



Figure 2: Wheel chocks now mandatory for all parked MHEs

ment stays under control.

Conclusion

This incident, while not resulting in physical injury or equipment damage, serves as a sharp reminder that in any plant, discipline is as important as diagnostics. Maintenance isn’t limited to tools and fluids—it includes behaviors, habits, and the ability to anticipate failure before it strikes.

In a well-run facility, even something as basic as setting a parking brake is treated with the same seriousness as changing critical lubrication. Because ultimately, both affect machine uptime, operator safety, and plant efficiency.

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.



THE MACHINERY DOCTOR:

Diagnosing Silent Failures Before They Kill Your Equipment

When Machines Go Quiet—That's When You Should Worry

A silent machine doesn't mean a healthy machine—it means it's hiding its symptoms.

Imagine treating a patient who can't speak or explain where it hurts. You rely entirely on observation, vital signs, and test results. Now replace the patient with a high-value machine, and the clinic with your plant.

This is the reality of modern industrial maintenance. Machines don't communicate in words, but they constantly send signals. The challenge today isn't just noticing those signals—it's knowing how to read them early enough to avoid failure.

With rising downtime costs, aging assets, and increasing pressure on reliability metrics, the role of the reliability professional has evolved. Today, you're not just a technician—you're the diagnostic frontline of plant performance.

Observation 2.0: Seeing the Right Signals at the Right Time

Modern observation goes beyond watching for leaks or listening for noise.

Today's best practices include:

- Daily walkdowns with digital checklists
- Visual inspections linked to mobile apps or CMMS
- Capturing trends via thermal cameras, vibration sensors, or AI-enabled cameras



Figure 1: Clean oil protects. Dirty oil damages

Visual cues—like a dusty motor or a bypassed breather—are no longer anecdotal. They're data points. And they matter more than ever in Condition-Based Maintenance (CBM).

The Role of Observation 2.0 in Industry 4.0 Frameworks

Industry 4.0 involves integrating cyber-physical systems, IoT devices, and data-driven decision-making into manufacturing and maintenance. Within this framework, Observation 2.0 refers to the use of sensors,

thermal imaging, ultrasonic tools, and mobile inspections to capture machine health data.

These tools enable real-time monitoring, reduce reliance on subjective checks, and feed structured data into CMMS and predictive analytics systems.

As the sensory layer of Industry 4.0, Observation 2.0 supports early fault detection, automated diagnostics, and the shift from reactive to predictive maintenance.

The Reliability Check-Up: Non-Invasive but Deep

In medicine, imaging changed diagnosis forever. In maintenance, it's tools like:

- Wireless vibration sensors
- Thermal imaging via drones or fixed cameras
- Ultrasonic leak detection and bearing lubrication monitoring

These aren't add-ons anymore—they're baseline requirements in any predictive maintenance (PdM) program.

Paired with smart data logging, these tools enable remote monitoring, helping plants move from reactive firefighting to proactive decision-making.

Oil Analysis: Still the Most Underrated Diagnostic Tool

Despite advances in sensors and AI, lubricant analysis remains one of the most cost-effective condition monitoring tools, mainly when used consistently and interpreted correctly.

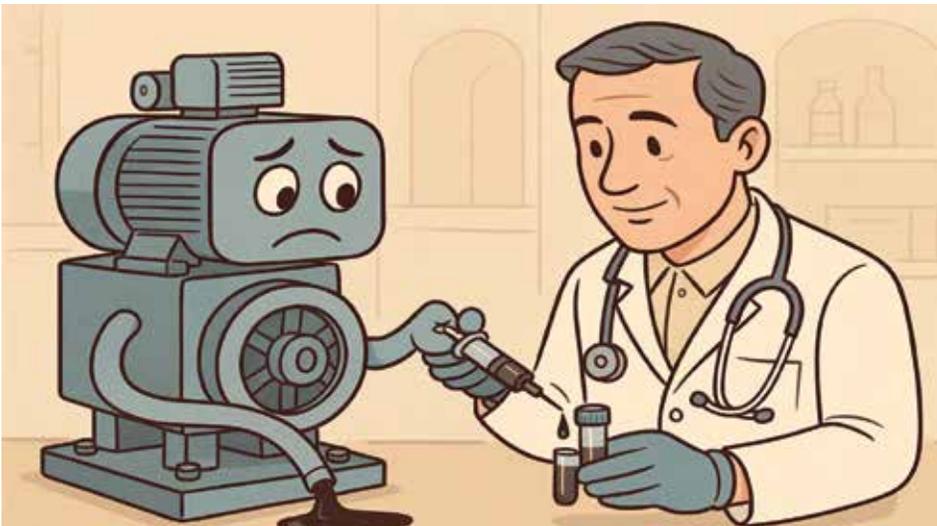


Figure 2: Cleaner oil means longer machine life.

Trends we now look for:

- Wear metal trending instead of single-event spikes
- Particle count vs PQ index to detect root cause vs symptom
- Additive profiling to detect incorrect oil top-ups or thermal stress
- Moisture intrusion analysis in the context of seasonal/environmental data

Many plants are now integrating oil analysis directly into their maintenance dashboards, triggering alerts and work orders based on lab results.

Note: While additive replenishment is technically possible, it is not common practice except in large-scale or tightly controlled systems like turbines. For most systems, oil replacement is the recommended approach.

Prescriptive Maintenance: Your Machine's Treatment Plan

Once the diagnosis is in, the goal is targeted intervention, not just blanket maintenance.

This can include:

- Inline filtration systems or kidney loop flushing
- Microfiltration to extend oil life instead of frequent changeouts
- Load balancing and alignment for stress reduction
- Lubrication automation with feedback-based greasing

The trend is toward data-driven prescriptions, where maintenance is customized based on operating conditions, not OEM checklists alone.

Prevention, Now Powered by Predictive Intelligence

The saying still holds: prevention is better than a cure. But today, prevention is no longer based on gut feeling—it's powered by:

- AI-based failure pattern recognition
- Digital twins for critical systems
- MTBF-linked risk modeling
- Training frontline staff to recognize failure modes in real time

Good lubrication, clean oil, and aligned equipment are still non-negotiables. But so is your organization's ability to act on insights quickly and make the preventive mindset part of daily operations.

From Maintenance Tech to Reliability Diagnostician

Your machine is talking. Maybe not loudly—but clearly.

Modern reliability isn't about responding to failure. It's about reading the signs, confirming them with data, and intervening just in time. That's not just maintenance—it's diagnosis. And the people who master this are no longer seen as back-end support. They're strategic contributors to uptime, sustainability, and profit.

Like doctors, we can't wait for the emergency room moment. We have to act early, interpret quietly raised red flags, and keep our machines alive—efficiently, responsibly, and reliably.

About the Author



Kunal is a Chemical Engineer and Lubrication Specialist with an MBA.



4TH ROSEFIELD CONFERENCE ON CIRCULAR ECONOMY IN USED OIL DISCUSSES CHALLENGES IN EPR 'FROM POLICY TO PRACTICE'

May 26, 2025 | Taj Palace, New Delhi



Valvoline Presents 4th Rosefield Conference on Circular Economy in Used Oil, organized by Rosefield Energy Tech in association with, PRAI, co-organised by HPCL and BPCL with Guiding Partner RECEIC, brought together over 250 key stakeholders from the lubricants, re-refining, and waste oil sectors for a powerful dialogue on the next phase of India's Extended Producer Responsibility (EPR) implementation. Held at the Taj Palace, New Delhi, the conference embraced the theme "From Policy to Practice," spotlighting actionable strategies for transitioning EPR mandates into operational systems.

With India's EPR targets for used oil scaling from 5% in 2024 to 50% by 2031, the event served as a much-needed convergence point for industry and regulators. Opening the conference, Mr. Srinivas CH (Executive Director - Lubes, HPCL ; Chair, Used Oil Working Group, RECEIC) acknowledged the formidable gap between the current 0.1 MMT of EPR certificates and the required 1 MMT by FY2031. Calling the challenge "herculean," he proposed the formation of a National Used Oil Management Association and announced a dedicated training program for collection agents, jointly developed by RECEIC and Rosefield Energy Tech.

Inaugural addresses by senior leaders, including Dr. S.S.V. Ramakumar (AM Green), Mr.

and Philip Mathew. The session highlighted the necessity for traceable collection systems,



Akhilshwar Jha (Valvoline Cummins), and Mr. Madanlal Khandelwal (PRAI), laid the foundation for deep discussions on logistics, traceability, and the need to mainstream Re-Refined Base Oil (RRBO) within OEM specifications and consumer perception. Shailendra Gokhale, Founder and Director of Rosefield Energy Tech, reflected on the progress made since 2022 when the 1st Conference was held, emphasizing the shift from awareness to accountability and the role of policy, people, and practice.

The session 1, the technical session moderated by Dr. Kalpendra Rajurkar featured industry voices such as Kavita Rai, P. Ramesh,

quality control mechanisms for feedstock, and scalable OEM-driven circularity initiatives. Digitalization and data transparency emerged as vital to building trust in RRBO.

Session 2 by Dr. Y.P. Rao (Former CTO, Gulf Oil International) emphasized the performance benchmarks in India's new BIS standard IS 18722, encouraging the evolution of Group I-based RRBO toward Group II and III categories to match virgin base oil quality. He flagged India's ~2.5% RRBO re-refining rate, significantly below the 12% global average, and stressed on capacity building and public education on used oil segregation.

In Session 3, industry experts focused on the technological and investment roadmap to scale RRBO production. Infineum India's Lalit Madan presented data from global field trials proving RRBO's capability to meet high-performance specs like API SP and CK-4. Darshan Jindal (Balaji Consultants) laid out capital investment estimates ranging from ₹ 20–48 crore for re-refining infrastructure upgrades. Discussions revolved around solvent extraction, hydro-treatment, and the policy ecosystem required to attract investment.

A key feature of the conference was the direct interaction with regulator. In session 4, moderated by Shailendra Gokhale, Ms. Deepti Kapil (Additional Director, CPCB) addressed ongoing implementation of the EPR framework, emphasizing recycler registration, EPR certificate generation, and upcoming tools like the Environmental Compensation (EC) Guidelines and EPR Adjustment Module. The transparency and responsiveness of the CPCB dialogue were widely appreciated.

Session 5, moderated by Himakar Sarraju, explored cost dynamics and value chain challenges. Syed Ashfaq Ahmed (KarRecycle) shared insights from India's first formal used oil collection center and advocated for capped RRBO pricing and better integration of service stations into the EPR regime. Bhaskaran Nagarajan (Rosefield Energy

Tech) showcased Used Oil Collection agent such as RecykLube, while Bhavesh Bhamhani (IIT Roorkee) presented an innovative reuse model for RRBO residue in road construction, potentially reducing bitumen costs by 5–12% and improving environmental sustainability.

The session 6, a high-powered Deep Dive Dialogue led by Dr. S.S.V. Ramakumar, united industry leaders like Bankim Patra (Indian Oil), Sudhir Kumar (RECEIC & FICCI), Sarvesh Tomar (BPCL), Nandan Agrawaal (Nandan Petrochem), and Akhileshwar Jha (Valvoline Cummins). They addressed operationalizing EPR through regulatory clarity, digital traceability, cost rationalization, and incentive structures. A recurring theme was the urgency of establishing a national institutional framework to ensure uniform compliance, address the diversion of used oil, and reduce foreign exchange outflows by boosting indigenous RRBO production.

Each speaker underscored the environmental, economic, and strategic imperatives of transitioning to a circular lubricant economy. The consensus: India's used oil ecosystem can only be transformed through collaboration, innovation, and strong market enforcement. The introduction of city-level pilot projects and greater OEM commitment were seen as crucial next steps.

The conference concluded with widespread appreciation for Rosefield Energy Tech,

which has steadily built a credible and collaborative platform for aligning producers, refiners, OEMs, and regulators. As the sector moves into the most challenging phase—implementation—the conference reinforced the importance of institutional synergy, stakeholder training, and data-backed transparency.

Rosefield Energy Tech plans to deepen industry engagement through targeted training programs, pilot initiatives, and international partnerships. The momentum generated at the 4th Rosefield Conference on Circular Economy in Used Oil marks a pivotal moment in India's journey from policy design to circular execution—solidifying the event's reputation as the definitive convening space for the future of used oil management.

Looking ahead, Industry is now gearing up for Valvoline Presents 3rd Rosefield Conference for Lubricants and Fuels, scheduled for November 12–13, 2025, at NESCO, Mumbai. This event will bring together over 600 delegates and more than 45 exhibitors to explore the latest innovations, market

trends, and sustainability practices in the lubricants and fuels industry. Expect high level presentations, insightful panel discussions, a vibrant exhibition, the Rosefield Awards ceremony honoring industry innovators, and ample networking opportunities, all designed to foster collaboration and drive the future of fuels and lubricants.





LUBRIZOL AND INDIANOIL SIGN MOU FOR ENHANCED STRATEGIC PARTNERSHIP



June 2025 : The Lubrizol Corporation is proud to announce the signing of a pivotal Memorandum of Understanding (MoU) with Indian Oil Corp Limited (IOCL), India's leading lubricant marketer. This agreement signifies a major advancement in their strategic collaboration, aimed at fostering innovation, sustainability, and long-term growth within the lubricant and energy sectors.

The MoU was formally signed at Lubrizol's Turbhe facility in Navi Mumbai. Representing their respective organizations were Mr. Nitin Mengi, Chairman & Managing Director, Lubrizol India Pvt. Ltd. and Mr. Bankim Patra, Executive Director – Lubes, IndianOil Corp Limited.



This strategic partnership underpins a shared vision between the two industry giants. It articulates a joint commitment to developing future-ready solutions, enhancing sustainable practices, and pursuing avenues for mutual growth in the evolving energy landscape. The collaboration is expected to leverage the strengths of both companies – Lubrizol's

advanced additive technologies and IOCL's extensive market reach and operational expertise.

This significant step reinforces the ongoing commitment of both Lubrizol and IndianOil towards driving progress and innovation in India's robust and dynamic lubricant market.



SHELL STRENGTHENS INDIA PRESENCE WITH ACQUISITION OF RAJ PETRO



In a significant move to deepen its presence in the Indian lubricants market, Shell has acquired 100% equity in Raj Petro Specialities Pvt Ltd, a Mumbai-based specialty oil and lubricant manufacturer, from Germany's Brenntag Group. India, being the third-largest lubricants market globally, is a key focus area for Shell's growth strategy.

With this acquisition, Shell expands its portfolio into high-growth sectors such as pharmaceuticals, personal care, power transmission, and white oils—segments where Raj Petro has built strong capabilities over the years. The company operates manufacturing facilities in Chennai and Silvassa, with a combined capacity of 350,000 tonnes per annum, along with robust R&D infrastructure and a presence in over 100 countries.

Shell already runs a lubricant blending plant in Taloja, Maharashtra, and a 200+ distributor network serving nearly 50,000 outlets across India. According to Shell India Chairperson Mansi Madan Tripathy, this acquisition not only complements Shell's existing operations but



Shell acquires Raj Petro to boost India reach

also brings operational synergies, enhanced customer reach, and new opportunities for innovation and scale.

The integration is expected to drive value across the lubricants value chain, helping Shell accelerate its market footprint and deliver tailored solutions to a wider customer base in India.

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