NEW OIL DOESN'T ALWAYS MEAN CLEAN OIL

Lubricants are critical to the operation of machinery across numerous industries, from power generation, to manufacturing, to oil and gas production. However, once lubricants leave the manufacturing plant, they become vulnerable to contamination.

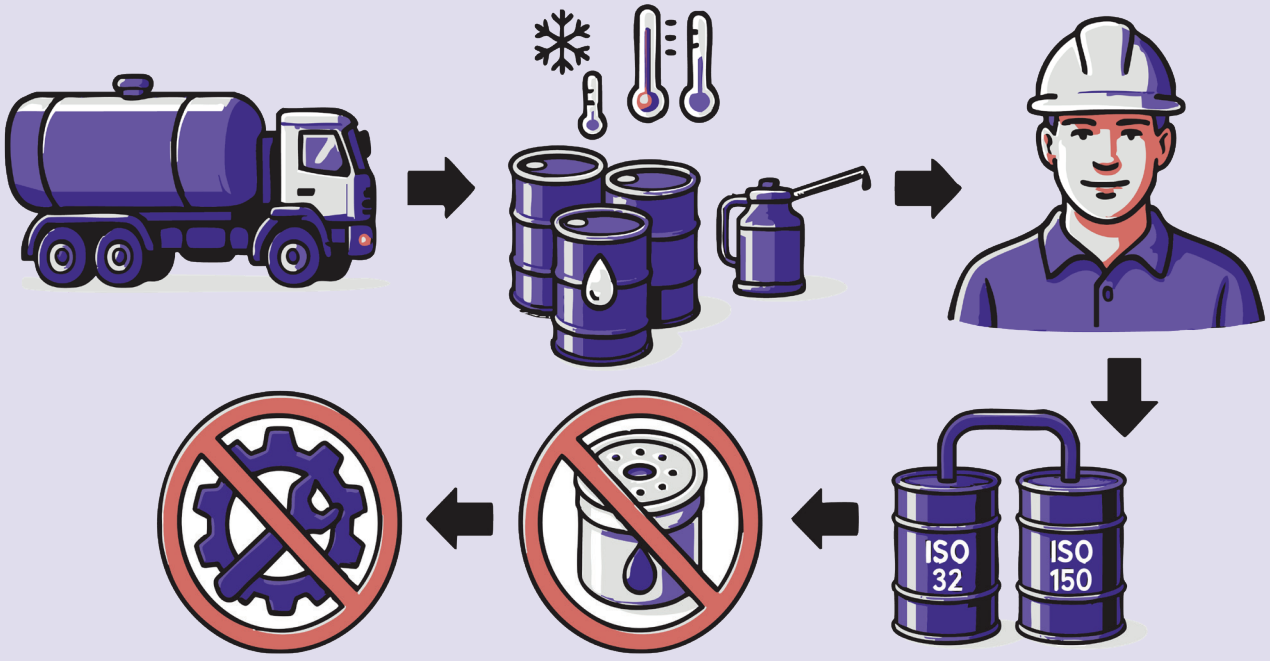
This contamination can compromise lubricant performance, shorten the lifespan of machinery, and increase maintenance costs. This Techni-Tips document explores the various ways lubricants can become contaminated after they leave the manufacturing plant, the impact of such contamination, and strategies to mitigate risks associated with it.

Lubricants are carefully formulated and produced at the manufacturing stage to meet precise specifications required for optimal performance. These products are essential for reducing friction, cooling, and protecting mechanical components in engines, bearings, turbines, gearboxes and other machines. However, even if the lubricants are clean when they leave the manufacturer, lubricants are susceptible to contamination throughout the supply chain and usage cycle.

Understanding how contaminants enter lubricants and the effects of these contaminants is crucial for maintaining machinery efficiency, improving uptime, and extending the life of both the lubricant and the equipment it serves. This is critical to reducing the total cost of machinery ownership.

COMMON SOURCES OF CONTAMINATION AFTER PLANT DEPARTURE

Even if lubricants are clean when they leave the manufacturer, they are susceptible to contamination throughout the supply chain and usage cycle. Contamination sources include transportation, storage and handling, application and use, and end-user practices.



PRIMARY TYPES OF CONTAMINANTS IN LUBRICANTS

Contamination can come from various sources, including environmental, procedural and operational factors. Some common contaminants that affect lubricants include particulate contaminants, water contamination and chemical contaminants.

1. Particulate Contaminants

- **Dirt and Dust:** During transportation and storage, lubricants are exposed to dust and dirt particles that can be introduced into the container. These particles may come from the surrounding environment, from equipment handling, or from poorly sealed storage containers.

2. Water Contamination

- **Moisture from the Environment:** Exposure to high humidity, rain, or condensation during transport or storage can lead to water contamination in the lubricant. Water is especially damaging in high-temperature applications where it can degrade the lubricant's properties.
- **Water from Equipment Failure:** Equipment leaks could stem from heat exchanger failures or condensation build up from heating and cooling of the equipment. Water contamination can cause rust and corrosion in metal components, leading to equipment failure.

3. Chemical Contaminants

- **Additive Degradation:** Certain additives in lubricants, such as antioxidants, anti-wear agents and detergents, may degrade over time or due to exposure to extreme conditions, altering the lubricant's chemical balance. Contamination by chemicals, such as incompatible oils or cleaning agents, can also affect performance.
- **Fuel or Solvent Contamination:** Lubricants in automotive and industrial applications are vulnerable to fuel or solvent contamination, which may occur during fueling or when improper materials are used during maintenance.

IMPACT OF CONTAMINATION

The presence of contaminants in lubricants can have significant consequences on machinery and operations, including reduced lubricant performance, increased wear and tear on machinery, corrosion and rust, formation of sludge and deposits, and increased operational costs.

1. Reduced Lubricant Performance

Contaminants can interfere with the lubricant's ability to reduce friction, provide adequate cooling, and prevent wear and corrosion. This can lead to increased heat generation, higher friction levels, and reduced protection for metal components.

2. Increased Wear and Tear on Machinery

Particulate contamination, particularly from metal or dirt particles, can cause abrasive wear on machine components, resulting in pitting, surface erosion, and ultimately, failure of the equipment. These issues increase maintenance costs and decrease machine lifespan.

3. Corrosion and Rust

Water contamination is particularly problematic for components made of steel or other metals. Water can promote oxidation and corrosion, leading to the degradation of machinery parts and increased downtime for repairs.

4. Formation of Sludge and Deposits

Chemical and water ingression in lubricants can lead to the formation of sludge from additive fallout and rapid oxidation which can clog filters, reduce flow, and create unwanted deposits in machinery. This can also interfere with the efficient operation of pumps and other key components.

5. Increased Operational Costs

The consequences of lubricant contamination—reduced efficiency, increased wear and machine downtime—translate into higher operational costs, as well as potential safety risks in certain applications.

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COMMON SOURCES OF CONTAMINATION AFTER PLANT DEPARTURE

Lubricants can be contaminated in several ways after leaving the blending or manufacturing plant, including transportation, storage and handling, application and use, and end-user practices.

1. Transportation

- **Inadequate Cleaning of Transport Equipment:** Tanks or vehicles used to transport lubricants may not be thoroughly cleaned after previous shipments, leading to cross-contamination from residual materials.

2. Storage and Handling

- **Improper Storage Conditions:** If lubricants are stored in environments with high humidity, temperature fluctuations, or exposure to direct sunlight, contaminants can enter or form within the lubricant. The lubricant may also become oxidized, leading to a loss of performance over time.

- **Contaminated Containers:** Storage containers or drums that were not thoroughly cleaned prior to opening may introduce debris or residue that affects lubricant purity.
- **Open Containers:** Exposure to the open air, particularly in dusty or humid environments, increases the risk of particulate or moisture contamination.

3. Application and Use

- **Operator Handling:** Improper handling during application can introduce contaminants. For instance, using unclean tools, open containers, or filling equipment with dirty hoses can introduce dirt or debris into the lubricant.
- **Cross-Contamination:** In multi-lubricant facilities, different types of lubricants may be stored or used interchangeably, leading to potential contamination by incompatible base oils such as synthetics or additives.

4. End-User Practices

- **Inadequate Filtration:** In many industries, lubricants are subjected to long-term use without proper filtration systems. This allows contaminants to accumulate in the lubricant, leading to gradual degradation.

- **Lack of Regular Maintenance:** In some cases, equipment is not maintained properly, which allows dirt, moisture, and debris to enter the system, further contaminating the lubricant.

4 KEYS TO MITIGATING CONTAMINATION RISKS

To reduce the risks associated with lubricant contamination after leaving the plant, a combination of good practices, technologies and monitoring systems should be employed, including these four keys: safe storage and handling, effective filtration systems, regular monitoring and testing, and operator training.

1. Safe Storage and Handling

- Store lubricants in temperature-controlled environments with limited exposure to moisture, dust or sunlight. Use clean, tightly sealed containers to reduce the risk of contamination.
- Implement a rigorous inventory management system to track the age and condition of stored lubricants.

2. Effective Filtration Systems

- Equip machinery with high-quality filtration systems to remove contaminants from lubricants, especially in high-precision operations. However, over-filtering can remove

vital additives from the formulation. Please consult your Royal Purple Industrial advisor on how to properly filter the product.
- Ensure that filtration systems are regularly checked, cleaned and replaced as necessary.

3. Regular Monitoring and Testing

- Implement a regular schedule for lubricant analysis to monitor contamination levels, viscosity changes and degradation of additives.
- Use sensors and sampling devices to check for the presence of water, particulates and other contaminants in real-time.

4. Operator Training

- Train personnel on the correct handling, application and storage practices for lubricants to prevent contamination during use.

SUMMARY

Royal Purple Industrial strives to produce clean products and has several quality checks and processes during production and packaging; however, once it leaves the facility the chain of ownership changes.

Lubricant contamination after leaving the plant is a significant concern that can affect the performance of machinery, increase operational costs, and shorten the lifespan of equipment.

By understanding the sources and types of contamination, as well as implementing best practices for transportation, storage, handling and monitoring, businesses can mitigate the risks associated with lubricant contamination. Proactive measures can ensure that lubricants maintain their optimal performance, reduce downtime, and maximize the life cycle of the machinery they protect.

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