



industrial fluid management

A Division Of Gaubert Oil Company



A Maintenance Expert Guide to Oil Analysis

Oil analysis is a powerful tool in the arsenal of any skilled maintenance professional. It offers a window into the health of your equipment, providing valuable insights into potential issues before they become costly failures. This guide will delve deep into this essential practice, exploring the step-by-step process of performing and interpreting oil analysis.



STEP 1: PREPARATION AND EQUIPMENT

Gather Your Tools

Clean sample bottle:

Choose a high-density polyethylene (HDPE) bottle with a capacity of 120-180 ml. Ensure it is new and free of any contaminants. Some labs may provide pre-labeled bottles.

Vacuum pump with hose: Select a pump with a vacuum pressure of at least 20 psi and a flow rate of 1-2 liters per minute. Consider the viscosity of your oil when choosing a hose; a thicker oil may require a wider diameter hose for efficient pumping.

Gloves: Wear nitrile or latex gloves to protect your hands from hot oil and potential chemical hazards.

Rags: Use clean, lint-free rags to wipe up any spills and clean the sampling area.

Disposal container: Prepare a container for the used oil. Dispose of it responsibly according to local regulations. Some labs may offer used oil recycling programs.

Warm Up the Engine

Run the engine for approximately 20 minutes to bring the oil up to normal operating temperature (typically around 175–200°F). This ensures the oil is well circulated and representative of the overall condition of the engine.

Refer to your equipment's manual for specific warm-up instructions, as some manufacturers may recommend slightly different operating temperatures.



Identify the Sampling Point

Consult your equipment's manual for the recommended location for oil sampling. Common sampling points include:

- **Dipstick tube:** Convenient and accessible for engines and many other types of equipment.
- **Drain plug:** May require additional tools and caution to access, but provides a more direct sample of the oil circulating within the engine.
- **Dedicated sampling port:** Some equipment incorporates dedicated ports specifically designed for oil analysis, offering the cleanest and most representative sample.

Ensure the chosen sampling point is free of debris and contaminants that could skew the analysis results. Clean the area around the port if necessary.



Prepare the Sample Bottle

Label the bottle clearly with a permanent marker using the following information:

- Equipment ID (e.g., engine serial number)
- Date of sampling
- Operating time since last oil change
- Any specific concerns or notes (e.g., unusual noises, oil leaks)
- Double-check the information for accuracy and completeness.

If using a pre-labeled bottle provided by the lab, ensure all information is filled out correctly.

STEP 2: SAMPLE COLLECTION

Attach the Hose to the Pump and Bottle

Secure the connections firmly to prevent leaks. Ensure the hose fits snugly into the bottle's opening and the pump's intake port.

Use adapters if necessary to ensure compatibility between the hose and pump or bottle.



Insert the Hose into the Sampling Point

For dipstick tubes, carefully insert the hose until it reaches the bottom of the tube. Then, pull it back slightly to avoid drawing sediment from the bottom.

For drain plugs, allow the initial oil flow to flush out any contaminants before collecting the sample. Hold the container beneath the drain and open the plug slowly.

For dedicated sampling ports, follow the specific instructions provided by the equipment manufacturer or lab.

Pump the Oil and Seal the Bottle

- Start the vacuum pump and draw oil into the bottle until it is approximately three-quarters full. Leave some headspace to allow for expansion during transport and potential lab analysis processes.
- Avoid overfilling the bottle as it can cause leaks and inaccurate results.
- Double-check the label for accuracy and completeness.
- Screw the cap on tightly to ensure a leak-proof seal and prevent contamination.

Store and Transport the Sample

- Store the sample in a cool, dark place until it is ready for shipment. Avoid exposing it to extreme temperatures or direct sunlight.
- Follow the lab's instructions for packaging and shipping the sample. Securely seal the bottle in a padded container to prevent damage during transport.
- Consider using a tracked shipping service to ensure safe delivery and monitor the shipment progress.

Why is lab accreditation important?

Scientific lab accreditation is crucial as it ensures reliability and accuracy in test results, fostering trust among clients, regulatory bodies, and the public. It signifies adherence to international standards, enhancing a lab's reputation and competitiveness. Accreditation also promotes continuous quality and operational efficiency improvement, reducing errors and improving safety. This process ensures consistent, high-quality scientific research and analysis, contributing to advancements in various fields.

STEP 3: SENDING FOR ANALYSIS

Choose a Reputable Laboratory

Accreditation

Choose a lab accredited by a recognized organization like the American Association for Laboratory Accreditation (A2LA) or the International Standardization Organization (ISO).



Experience

Select a lab with experience in your industry and specific equipment type. This ensures they are familiar with the typical wear patterns and oil characteristics of your equipment.



Positive Reputation

Read online reviews and ask colleagues for recommendations to choose a lab known for its reliability, accuracy, and customer service.



Competitive Pricing

Compare prices and services offered by different labs while considering factors like turnaround time, included test packages, and additional fees.

Select the Appropriate Test Package

Standard oil analysis packages typically include tests for:

- **Viscosity:** Measures the oil's resistance to flow, critical for lubrication.
- **Wear metals:** Identifies abnormal wear within the equipment by measuring the concentration of elements like iron, copper, and aluminum.
- **Soot:** Indicates incomplete combustion and potential engine issues.
- **Oxidation:** Identifies the oil breakdown due to aging and high temperatures.
- **Total Base Number (TBN):** Measures the oil's remaining ability to neutralize acids generated during combustion.

Advanced packages may include additional tests such as:

- **Fuel dilution:** Identifies excessive fuel entering the oil, affecting its viscosity and lubrication performance.
- **Additive analysis:** Determines the remaining concentration of additives in the oil and their effectiveness in protecting the equipment.
- **Particle analysis:** Identifies and sizes particles in the oil, providing insights into wear and contamination.



Choose a test package that meets your specific needs and budget. Consider factors like the equipment's age and operating conditions, any existing concerns, and the desired level of detail in the analysis results.

Complete the Required Paperwork

Most labs require a completed submission form with information about:

- Your contact information
- Equipment details (make, model, serial number)
- Oil information (brand, type, viscosity grade)
- Operating conditions (mileage, hours, operating temperature)
- Any specific concerns or questions you have for the lab
- Carefully review the form for accuracy before submitting it with the oil sample.



Ship the Sample

- Follow the lab's specific instructions for packaging and shipping the sample. This may include using a specific container, packing material, and shipping service.
- Ensure the sample is securely packaged to prevent damage during transport.
- Include a copy of the completed submission form with the sample package.
- Consider using a tracked shipping service to ensure the sample reaches the lab safely and monitor the shipment progress.

STEP 4: INTERPRETING THE RESULTS

Understand the Report Format

Most laboratories will present the results in a report format with:

- A table summarizing key data points with their respective values and reference ranges.
- Color-coded indicators for normal, marginal, and critical levels.
- Trend charts showing changes in key data points over time (if multiple analyses have been performed).
- Interpretation section explaining the results and identifying potential issues.
- Recommendations for corrective action if necessary.
- Familiarize yourself with the report format and key data points to understand the information presented.

Analyze Key Data Points

Each data point in the report provides valuable insights into the health of your equipment. Here's a closer look at some key points:

Viscosity:

- **Too high:** Increased friction, wear, and engine strain. May indicate incorrect oil selection or cold start conditions.
- **Too low:** Inadequate lubrication and potential damage. May be caused by oil degradation, fuel dilution, or high operating temperatures.



Wear metals:

Elevated levels of specific metals indicate wear in corresponding components:

- **Iron:** Engine wear, particularly bearings and piston rings.
- **Copper:** Wear on bushings and bearings.
- **Aluminum:** Wear on pistons and engine block.

Analyze Key Data Points

Soot:

High levels indicate incomplete combustion and potential engine issues like clogged filters, faulty injectors, or incorrect air-fuel ratio.

Oxidation:

Increased levels indicate oil degradation and the potential for sludge formation. Requires oil change and possibly further investigation.

Total Base Number (TBN):

Low TBN indicates a reduced ability to neutralize acids and protect against corrosion. High levels indicate excessive fuel entering the oil, reducing its viscosity and lubrication performance. It may be caused by worn piston rings, faulty injectors, or incorrect engine tuning.

Additive analysis:

Depleted levels of specific additives indicate reduced protection against wear, corrosion, or oxidation. It requires an oil change and consideration of using an oil with a higher additive content.

Particle analysis:

Identifies the presence and size of wear particles in the oil, providing valuable insights into the type and severity of wear occurring within the equipment.

Compare Results to Historical Trends

- Analyze the current results in the context of previous oil analysis reports. This helps identify trends and potential issues that may be developing over time.
- Look for consistent increases or decreases in key data points, which may indicate progressive wear or degradation.
- Comparing results allows for more accurate evaluation and helps anticipate potential problems before they become critical.

Seek Expert Advice

Consult a qualified oil analysis expert or the laboratory for assistance in interpreting complex results and developing a plan of action.

Discuss your concerns and the specific findings of the report.

The expert can provide valuable insights and recommendations based on their knowledge and experience.



Take Corrective Action

Once you have interpreted the results and consulted with an expert, take appropriate action to address any identified issues. This may involve:



Oil change: Replacing the oil with a fresh, high-quality lubricant.

Equipment repair: Addressing specific wear problems identified by the analysis.

Maintenance adjustments: Modifying operating conditions or maintenance practices to prevent further damage.

Additional testing: Performing more in-depth analysis to diagnose specific problems.

CONCLUSION

Oil analysis is an essential tool for proactive maintenance, helping to:



- Extend equipment life
- Reduce downtime
- Minimize repair costs
- Optimize maintenance schedules
- Improve overall operational efficiency

By following the steps outlined in this guide and understanding key data points, you can effectively utilize oil analysis to ensure the health and longevity of your equipment. Remember, consistent analysis, accurate interpretation, and timely action are crucial for maximizing the benefits of this powerful maintenance practice.

Additional Resources

- International Council for Machinery Lubrication (ICML)
<https://www.icmlonline.com/>
- Society of Tribologists and Lubrication Engineers (STLE)
<https://www.stle.org/>
- American Society for Testing and Materials (ASTM)
<https://www.astm.org/>

Disclaimer: This eBook is intended for educational purposes only and should not be substituted for professional advice from a qualified oil analysis expert or maintenance technician. Always refer to your equipment manufacturer's recommendations and consult with a qualified professional when interpreting oil analysis results and making decisions regarding equipment maintenance.

COMPANY INFORMATION

About Industrial Fluid Management



Industrial Fluid Management (IFM), a division of Gaubert Oil Company, specializes in lubrication-related products and services for the industrial, marine, oil & gas, petrochemical, and refining markets. IFM leverages over 95 years in the lubrication industry to offer lubrication solutions with an unmatched level of expertise, safety, and quality.

Our Parent Company



Founded in 1926, Gaubert Oil Company has been providing quality fuel, lubricants, chemicals, equipment, and lubrication-related services to North America's largest industries for decades. Gaubert Oil Company provides safe, accurate, and reliable delivery services throughout the Southeastern United States. At Gaubert Oil Company, we're proud of our reputation for excellence and our continued commitment to being First in Service.