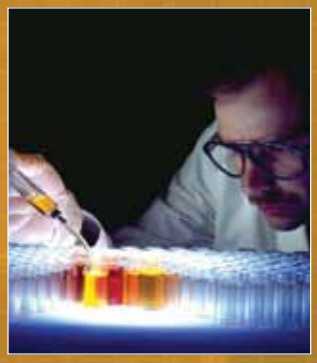
# Used Oil Analysis Program

## Extend Equipment Life by Identifying Minor Problems Before a Major Failure






## Positive Displacement Blowers & Vacuum Pumps

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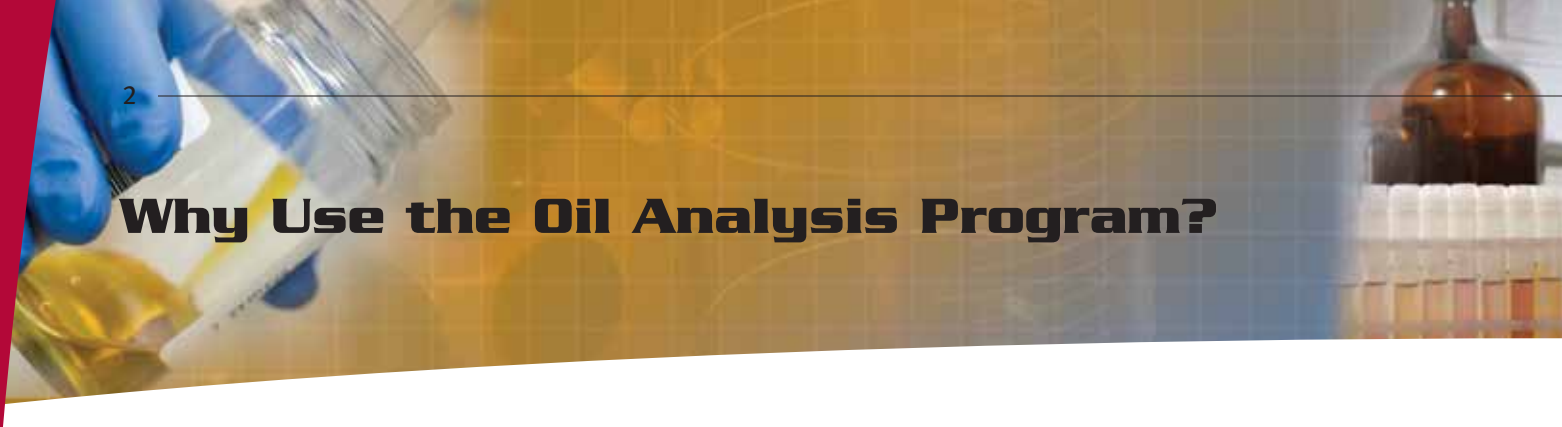

# Why Use the Oil Analysis Program?

It is important to routinely use an oil analysis program for your fluids. Analysis can identify problems in the earliest stages which can keep downtime to a minimum and reduce repair costs.

The program is geared around unique specifications from engineered formulations. Our state of the art testing laboratory is equipped with automated processes, instruments, and advanced technologies that enable us to deliver consistent and accurate test results. Technical expertise is applied to an extensive range of analytical, physical, and mechanical testing capabilities, demonstrating our commitment to help you succeed.

An easy to read report is provided giving detailed information such as: when to sample again, what parameters are abnormal and possible steps you need to amend any abnormality with your fluid system.

## Sampling Methods

Sample bottles are supplied by the analysis lab. It is important to use these bottles as the integrity of the sample is dependant upon the container. The physical and chemical properties of the container are known value to the lab technician. Containers that are open for long periods, stored in contaminated environments or are of different materials can result in corrupted sample data.

- The sampling point is another critical component.
  - » Samples should be collected from the same point at operating temperature with equipment online.
- The sample port and adjacent area should be clean and free of contaminates that could enter the container.
  - » Flush the sample port prior to collection to clear settled contaminates that would corrupt the sample.
- The samples collected less than 8 to 500 hours after you've added oil to the sump **will not** allow fresh lube to blend with existing lube in the system can result in corrupted sample data

## Correct

- Use supplied capped containers
- Complete Sample Label
- Clean and flush sample port
- Sample with equipment online or at operating temperature
- Sample from same point (oil drain plug)
- Sample from 8 to 500 hours after lube change
- Sample from 8 to 500 hours after level add

## Incorrect

- Non Standard container
- Open container
- Contaminated sampling ports and adjacent areas
- Sampling after equipment is offline for an extended period
- Sampling immediately following a level add

## Sample Supplies

- Bottles: Receive AEON PD Oil Sample Kit in your Maintenance Kit
- Labels: The labels are self adhesive and include a shipping label with Analysis Lab Address

The sample label should be completed and attached to the sample bottle. The information supplied will appear on the sample report. Failure to complete the label will result in analysis and trending inconsistencies.

## Turn-Around Time

Our goal is 48–72 hours turn-around time with proper information completed on the sample bottle kit. If you have any questions regarding proper completion of the label please contact us at 1 (800) 682-9868.

# Types of Testing

## Water by Karl Fischer

The Karl Fischer method is used for many substances as a reference method. It is a chemical analysis procedure which is based on the oxidation of sulfur dioxide by iodine in a methanolic hydroxide solution. In principle, the following chemical reaction takes place:

$H2O + I2 + SO2 + CH3OH + 3RN \rightarrow [RNH] SO4CH3 + 2[RNH] I$

The titration can be performed volumetrically or coulometrically. In the volumetric method a Karl Fischer solution containing iodine is added until the first trace of excess iodine is present. The amount of iodine converted is determined from the burette volume of the iodine-containing Karl Fischer solution. In the coulometric procedure, the iodine participating in the reaction is generated directly in the titration cell by electrochemical oxidation of iodide until again a trace of unreacted iodine is detected. Faraday's law can be used to calculate the amount of iodine generated from the quantity of electricity required.

The Karl Fischer test is important because it informs the user how much dissolved water is in their system. High water can cause coalescing filter and bearing damage. It also causes corrosion in the compressor. Results are reported in ppm.

## Inductively Coupled Plasma (ICP)

Inductively Coupled Plasma (ICP) is an analytical technique used for the detection of trace metals in samples. The primary goal of ICP is to get elements to emit characteristic wavelength specific light which can then be measured.

Metals analysis is performed to determine the parts per million (ppm) of metals that are either present or not present. Al, Ag, Ba, Ca, Cr, Cu, Fe, Mg, Mo, Na, Ni, P, Pb, Si, Sn, Ti, V, and Zn are the significant metals being tested.

## Particle Count

The particle count instrument uses a laser diode as the illumination source and a photodiode as the detector. The particles pass through a sensor. When particles are present within the sensor's micro cell, the particles block the laser beam from the photodiode detector. The loss of laser light generates an electronic pulse for each particle. These pulses are proportional in amplitude to the light intensity or light extinction, which is a measure of the particle size. The particle counter identifies the quantity and the height of the pulses by sorting the pulses into bins with predefined pulse amplitude ranges. The data is transferred to digital numbers and printed. The test breaks the size ranges down from 4–70 microns. The results formulate the ISO (International Standards Organization) code fraction. The ISO code (i.e. 3/2/1) represents the ratio between particles present at levels greater than 4 (the denominator [1]) versus the particles present at levels greater than 6 micron (the middle number [2]) versus the particles present at levels greater than 14 micron (the numerator [3]).

The importance of particle count analysis includes: identification of solid material, identifying abnormal wear conditions, monitoring the effects of filtration, and measuring overall system cleanliness.

## Total Acid Number

The total acid number (TAN) is the number expressed in milligrams (mg) of potassium hydroxide needed to neutralize the acid in one gram of oil. The test is used to indicate the amount of oxidation that the fluid has undergone. The acid number increases as the fluid begins to oxidize.

The TAN test is used to condemn nearly all fluid types, thus a precise and accurate analysis is crucial. The TAN signifies the basic condition of the fluid by giving a value that signifies the amount of oxidation that the fluid has undergone. The TAN can also indicate if a compressor is running too hot, or if the compressor is ingesting a foreign chemical that is harmful to the lubricant and or the compressor.

## Kinematic Viscosity

The term viscosity is defined as the internal resistance of a liquid to flow over a certain amount of time with larger numbers relating to thicker fluids. Kinematic Viscosity is the measure of the resistive flow of a fluid under the influence of gravity. The S.I. unit for the measurement of viscosity is the centistoke (cSt). A fixed volume of liquid flows under gravity through a calibrated viscometer capillary, by a reproducible driving head and at a closely controlled and known temperature, 40º C. If the oil increases in viscosity, it means that the oil is becoming thicker. The most common cause of increased viscosity is oxidation. Oxidation is a normal process of a lubricant and is the reason for most oil changes.

The viscosity test is considered the most imperative property of lubricating oils, and an active indicator of the oils' functionality. The viscosity can be used to indicate high operating temperatures, contamination of another fluid, overloading, and water/coolant contamination conditions. An increase or decrease in viscosity can lead to overheating, increased friction, and ultimately catastrophic failure.

## High Performance Liquid Chromatography (HPLC)

HPLC is a method of separating mixtures into their individual components for the purpose of isolation, identification, or quantification. A sample, dissolved in a liquid, is carried by a flowing liquid (the mobile phase) through a tube (the column) tightly packed with a finely divided solid material (stationary phase). During the passage through the column, the components move at different rates by virtue of differences in chemical or physical interaction with the stationary phase and thus exit the column separately. The high separating power is achieved by the column, which uses very small particles of large surface area, which are densely packed in the column. A pump is used to allocate the proper liquid flow rate through the column. A design of the optic assembly is attached.

The HPLC analysis is important because it measures the approximate amount of antioxidant present in used and new oil (QC) samples. Depending on the hours on the fluid the antioxidant is deemed normal or below normal. It also gives the percentage of antioxidant for Quality Control purposes.

## Contact Us

If you have any questions or concerns please feel free to contact one of our lab technicians who would be glad to assist you.

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