

DREW™ XP LUBE ANALYSIS PROGRAM



DESCRIPTION

The DREW XP LUBE ANALYSIS PROGRAM is a pre-paid analytical program that tests essential parameters to determine the overall quality of lubricating oils in service. Depending on the quality, the oil's Remaining Useful Life (RUL) can be evaluated based on the oil additive's health, provided by parameters like Base Number (BN), which provides an indication of the amount of alkali reserve remaining that combats acids formed by combustion, and contaminant loading such as water, fuel, and wear metals. Lube oils with an insufficient BN may cause premature acid corrosion of internal engine components whereas the presence of contaminants can accelerate the rate of oil additives depletion and shorten oil life. Additional parameters are also tested to provide a complete assessment of the lube oil condition.

By periodically submitting samples to the DREW XP LUBE ANALYSIS PROGRAM, operators can effectively implement a predictive maintenance approach in managing their onboard lube oil in service as well as new oil in storage. As certain lubricating oils can be very expensive, gaining the ability to replace lube oil only when necessary can help in reducing operating costs. By monitoring a component's oil quality and trending it over its service life, the Lube Analysis Program helps in predicting failures by detecting changes in lube oil quality before it begins to adversely affect the performance of the engine or machinery.

Operators participating in the DREW XP LUBE ANALYSIS PROGRAM can combine on-site screening and treatment tools like onboard lube oil test kits and off-line filters to detect and confirm the effectiveness of proactive maintenance management methods. Routinely using onboard test kits to monitor lube quality and positively confirming changes in quality with the Lube Analysis Program allows operators to treat systems before the onset of machinery problems ever begin to materialize. Planned or proactive failure detection and treatment can help to prolong oil life and significantly save on operating and maintenance costs.

APPLICATION AND USE

The DREW XP LUBE ANALYSIS PROGRAM is applicable to used oils in service for diesel engines or other lubricated machinery as well as new oils to confirm product quality and conformance to machinery specification. It is recommended to submit samples from each engine or machinery component routinely (i.e., quarterly, monthly, etc.) depending on the desired frequency of analysis, operating environment, and criticality of the component. Routine samples should be obtained from representative sampling locations that provide a

good specimen of the system oil while the component is in operation. The same sampling location should be used for all future samples taken to provide consistency and trending capability.

The DREW XP LUBE ANALYSIS PROGRAM pre-paid kit contains ten (10) empty sample bottles with caps, sample labels and packaging mailers. One or more samples can be submitted at any time after receipt of the pre-paid kit. Each initial sample submittal requires a component registration form to be filled out for each component plus the grade and type of oil used as well as the email address or fax number of the persons to receive the analysis report. Once the component is registered, a unique component or Unit ID number will be provided on the analysis report. This Unit ID should be used on all subsequent sample submittals to avoid filling out the component registration form again.

It is recommended that new virgin oil samples be submitted as part of the initial set of samples sent to the DREW XP LUBE ANALYSIS PROGRAM for use as reference oil and baseline comparison. Should the supplier, grade or type of oil change for a component another reference oil should be submitted accordingly.

Only the supplied sample bottles and labels from the DREW XP LUBE ANALYSIS PROGRAM pre-paid kit may be used in dispatching samples to the laboratory. Samples submitted using other types or combination of bottles, labels, or mailers should be avoided as it may result in unnecessary delays, additional fees, or worst case: no analysis at all. Only one sample label must be affixed to one sample bottle and only a single sample bottle may be inserted in the mailer provided.

SAMPLING

Routine samples for the DREW XP LUBE ANALYSIS PROGRAM should be taken from "live" zone locations where the oil is in motion and not from where the oil is static or from dead zones. Ideally, samples should be taken downstream of where the machinery's work is done and before any filtration unit. Samples should be taken while the engine or machinery is in operation to ensure good representation of the oil as it is flowing through the system. Where necessary, samples may be taken as soon as the equipment has been shut-down while the oil remains hot.

Turbulent oil flow locations such as elbow joints are excellent sampling points and they can be equipped with sampling valves. Vacuum type samplers are recommended for taking samples from non-pressurized locations. If the sample must be taken from a storage tank, try to obtain a sample from the oil



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suction or return to avoid stagnant oil in the tank. Used sample tubes should not be reused and disposed of properly. Ensure that the sample valves and samplers are cleaned and adequately flush the sample line to prevent standing oil from being sampled. Taking samples from dead pipe legs, hose ends, sumps, drains, and after filters should be avoided as they can be inconsistent, unrepresentative and may contain sludge, debris, and sediment. Once the samples are obtained, it is important to land the samples with the vessel agent at the next suitable port to have them dispatched immediately to prevent delays in getting the DREW XP LUBE ANALYSIS PROGRAM report.

SAMPLE DISPATCH

It is the responsibility of the vessel's agent to dispatch the prepared sample package to the consignee pre-printed indicated on the mailer address label. It is recommended to use a traceable delivery courier service that allows packages to be tracked to the DREW XP LUBE ANALYSIS PROGRAM laboratory. To dispatch multiple samples, it is acceptable to combine individual mailers which are designed to protect the sample bottles contained in a single package.

TEST PARAMETERS

Base Number (BN): Measure of oil alkalinity reserve available in neutralizing corrosive acids. Oil BN typically decreases due to reactions with acidic combustion products, thermal degradation of oil, oxidation and contamination from wear metals, water and fuel.

Fuel Dilution: Unburned hydrocarbon resulting from defective injection equipment and exhaust gas blow-by. Fuel contamination can impact cylinder oil film formation, promote oxidation and acidic corrosion, and can cause an engine fire. Fuel dilution will tend to decrease oil viscosity.

Nitration: Combustion by-product resulting from excess oxygen. Nitration can form deposits in combustion areas and accelerate oxidation and acid corrosion.

Oxidation: Permanent degradation of oil by chemical reactions with oxygen. Water contamination can accelerate oxidation by more than 10x resulting in increased viscosity and acid number.

Soot: Combustion by-product resulting from poor combustion and exhaust gas blow-by. Soot can impact additive package effectiveness creating sludge as well as choke filters and narrow oil passages. Soot will tend to increase oil viscosity.

Viscosity: Oil's resistance to flow and shear used typically to classify the grade of oil. Higher than acceptable value indicates increased polymerization or amount of insoluble molecules created by oxidation as sludge, tar, and varnish. Lower viscosity suggests thermal cracking of oil or shear thinning of viscosity improver additives in oil. Contamination by water, soot, fuel, etc. will also change oil viscosity. Changes in oil viscosity can lead to oil film loss, increased friction, heat generation, energy loss and adhesive wear.

Water: Water is the number one contaminant of lubrication oils introduced typically from tank condensation and heat exchanger leaks. Water can be present as dissolved, emulsified, or free water in the oil. Water generally degrades the oil in its entirety though any combination of hydrolysis, oxidation, aeration which impacts both the base oil properties and additive package effectiveness. Water also amplifies any contamination that may be present (i.e., bacteria, rust, soot, sludge, acids, etc.).



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ELEMENTAL ANALYSIS

Aluminium	sign of wear debris from pistons & journal bearings or ingression of dirt
Antimony	sign of wear debris from bearing plating, ball bearings, & solders
Barium	detergent additive
Boron	extreme pressure additive or sign of coolant leaks
Cadmium	sign of wear debris from journal bearings plating
Calcium	detergent additive or sign of seawater contamination
Chromium	sign of wear debris from piston rings & rolling bearings
Copper	sign of wear debris from brass/bronze bushes, gears, thrust washers, oil cooler cores or sign of coolant leaks
Iron	sign of wear debris from gears, rolling bearings, cylinder liners, & shafts
Lead	sign of wear debris from journal bearings or grease additive
Lithium	grease additive
Magnesium	detergent additive or sign of seawater contamination
Manganese	sign of wear debris from steel & aluminium alloys
Molybdenum	extreme pressure additive or sign of wear debris from piston rings
Nickel	sign of wear debris from rolling bearings, camshafts & followers, thrust washers, valve stems, & valve guides
Potassium	sign of seawater contamination
Phosphorus	rust inhibitor, extreme pressure, antioxidant & anti-wear agent additive
Silver	sign of wear debris from solder
Silicon	foam inhibitor & grease additive or ingression of dirt
Sodium	sign of coolant leaks & seawater contamination
Tin	sign of wear debris from bronze bushes, washers, & gears

Titanium	sign of wear debris from turbine blades & bearings or ingression of paint
Vanadium	sign of wear debris from turbine blades & valves or sign of fuel dilution
Zinc	antioxidant & anti-wear agent additive; loss of 25% indicates zero RUL

ANALYSIS REPORT

The completed analysis report containing the above test parameters is typically available via email or fax within 24 hours after the sample has been received by the DREW XP LUBE ANALYSIS PROGRAM laboratory. The analysis report will be sent to the email address or fax number indicated on the initial component registration form submitted with the sample. To request changes to the email address recipient or fax number, simply submit a new component registration form with the new information.

ORDERING INFO

LUBE ANALYSIS PROGRAM: PREPAID, 10 PACK (PCN 1AB2918)



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Drew Marine maintains Safety Data Sheets on all of its products. These documents contain health and safety information for the development of appropriate product handling procedures to protect your employees. Safety Data Sheets should be read and understood by all of your supervisory personnel and employees before using Drew Marine products.



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