

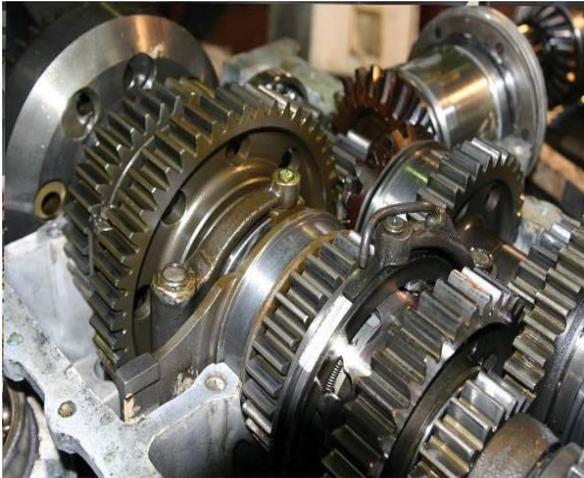
LEOAP[®]

LUBXPERT OIL ANALYSIS PROGRAM



Aimil Ltd.

Instrumentation & Technologies



Lubricant Analysis, Lube Consolidation, Lubrication Program
Development & Oil Analysis Trainings.

www.aimil.com/lubxpert

AIMIL-LUBXPERT

Aimil Ltd as a multi-faceted, multi-technology instrumentation products company. Since its inception in 1932 as a British company selling civil instrumentation products, Aimil Ltd has built its reputation as one of leaders in the Instrumentation & Condition Monitoring domains in India. Apart from our own manufacturing setup for manufacturing Civil Engineering testing products for which, we have over the years partnered with world leaders in various fields of technology for promoting their products in India. Aimil Ltd today is in the field of Civil Engineering Instrumentation, Analytical & Industrial Instrumentation, Telecom, Material Testing, Particle Characterization, Metallurgy, Pharma instrumentation, NVH & Machinery Condition Monitoring, etc.

AIMIL – Pruftechnik is a well known joint venture that provides highly technical condition monitoring services like Vibration analysis, Alignment services, Thermography, NDT etc to the most Indian Industries. Now AIMIL-LUBXPERT dedicated to provide the best of lubricant testing services to the Indian Industries.

What Oil Analysis Can Do

It's hard for a machine to fail without the oil knowing first. After all, when failures begin and progress over time, there is usually microscopic excavation of machine surfaces producing wear debris. Where does this debris go? It goes into the oil, of course. The oil is like a confessional for the machine. It gets all the bad news quick. For those trying to prevent unscheduled downtime by catching problems early, this is the right media to understand the equipment health condition.

In research conducted at Monash University in Melbourne, Australia, failure in gearboxes was induced under controlled conditions. These conditions included misalignment, oil contamination, tooth fracture and others. During the progression of the failure, the gearboxes were monitored using vibration analysis and oil analysis (ferrous density). At the end of the study, the researchers determined that, on average, oil analysis provided 15 times earlier detection of impending failure compared to vibration analysis. In the case of tooth fracture, oil analysis gave no alarm at all, while vibration alarmed quickly. They further concluded that both are important companion technologies for the best early detection results.

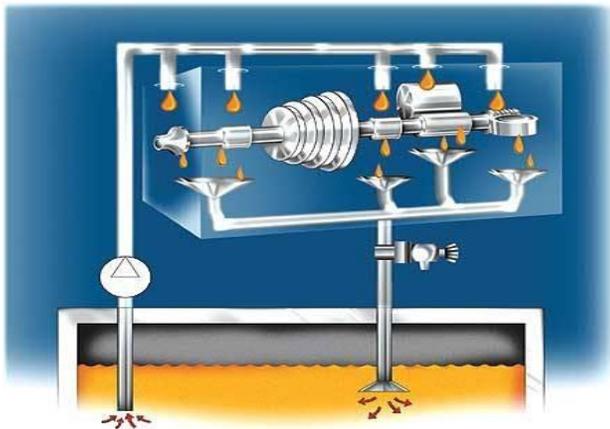
State of art Oil Lab facilities at Vadodara, Gujarat.

AIMIL-LUBXPERT has equipped with most innovative and advanced oil analysis testing instruments for FAST and RELIABLE oil analysis testing. With state of art instruments and Certified Lubrication Specialists provides reliable and accurate interpretation of your lubricants and provide expertise maintenance suggestions.

LUBXPERT oil analysis test facilities, Vadodara is an ISO 9001:2008 quality certified and various accreditations and approvals from OEM's, NABL 17025:2017 etc.

AIMIL-LUBXPERT, Expert review

Each and every oil sample testing is reviewed by team of Certified Machinery Lubricant Analysts and necessary maintenance recommendations given by ISO CAT-II certified Machinery Lubricant Analyst by ICML, USA.



Oil analysis success begins with proper oil sample collection techniques.

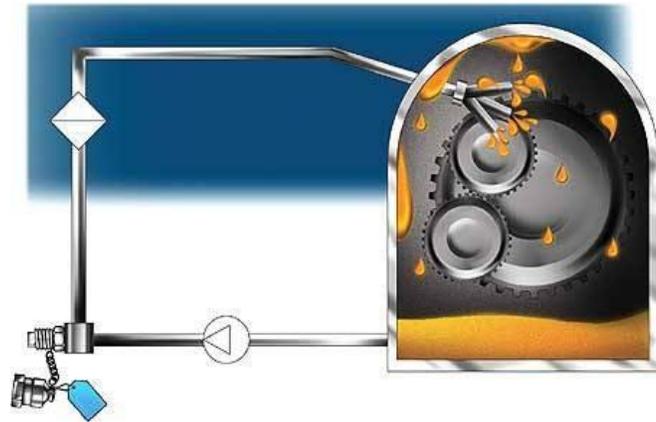
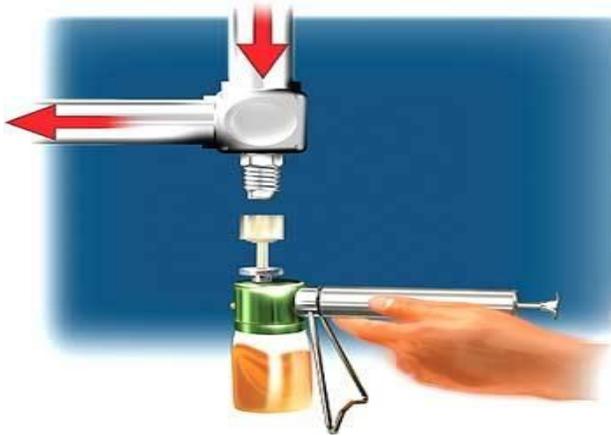
LUBXPERT deputes trained Lubrication technicians who have got exclusive experience in collecting the lube oil samples from various critical equipments with globally approved sampling procedures. A trained Lubrication technician ensures highest level of quality in collecting the most representative oil samples from your equipment.

LUBXPERT Sampling Point Audit

Prior to the Oil Samples collection, LUBXPERT does detailed technical audit of existing sampling points from various critical equipment's and understands the current sampling practices and suggests the best possible-appropriate sampling locations & practices for your equipment.

LUBXPERT Oil analysis Solutions provide..

- Vital information on lubricant health condition.
- Diagnose your Machinery components health condition.
- Monitor, control & correct your contamination control practices.
- Improving the equipment reliability and minimizes the down time.
- Safely reduces the oil change intervals or extends the oil drain intervals.



Recommended Oil Sampling Frequencies:

Engine - Diesel

Industry - Application	Hours	Kilometers
Highway		15,000 kms and just prior to oil drain
Off-Highway	250 hours and just prior to oil drain	
Marine Diesel Engine - Main Engine/ Diesel Engine - Auxiliary Engine/ Diesel Engine - Generator	500 hours or one month and just prior to oil drain	
Industry - Application	Normal Use	Intermittent Use
Diesel Engine in Manufacturing and Processing Plant	Monthly, 500 hours and just prior to oil drain	Quarterly and just prior to oil drain
Diesel Engine as Generator	250-500 hours and just prior to oil drain	Quarterly and just prior to oil drain
Natural Gas Engine	500 hours or one month and just prior to oil drain	Quarterly and just prior to oil drain
Landfill Gas Engine Bio Gas Engine Sewer Gas Engine	250 to 500 hours* or half-month to month and just prior to oil drain	Quarterly and just prior to oil drain

Turbine (gas and steam)

Industry - Application	Normal Use	Intermittent Use
Steam Turbine / Gas Turbine	500 hours or one month and just prior to oil drain	Quarterly and just prior to oil drain

Pump, Vacuum pump, Fan, Blower, Motor (gear and bearing lubrication)

Industry - Application	Normal Use	Intermittent Use
Pump, Vacuum Pump, Fan, Blower, Motor (gear and bearing lubrication)	500-700 hours or one month and just prior to oil drain	Quarterly and just prior to oil drain

Gear System

Industry - Application	Hours	Kilometers
Highway (Gear, differential, transmissions) Off-Highway (Gear, differential, transmissions) Marine Gear - Main Propulsion System Reduction gear		20,000 kms and just prior to oil drain
Gear - Supporting System Deck Gear Drive	2,000 hours or quarterly and just prior to oil drain	
Industry Gear - low speed	Bi-monthly, 1,000 hours and just prior to oil drain	Quarterly and just prior to oil drain
Gear - high speed	Monthly, 300-500 hours and just prior to oil drain	Quarterly and just prior to oil drain

Hydraulic System

Industry - Application	Hours	Kilometers
Off-highways - Hydraulics	500 hours and just prior to oil drain	
Marine Hydraulics - Main Propulsion Steering Gear Hydraulics	500 hours or one month and just prior to oil drain	

Hydraulics - Supporting System Deck Hydraulics	2,000 hours or quarterly and just prior to oil drain	
Industry - Hydraulics Gear - low speed	Monthly, 700 hours and just prior to oil drain	Quarterly and just prior to oil drain

Compressor (air, gas, refrigerant)

Industry - Application	Normal Use	Intermittent Use
Screw ,Rotary,Reciprocating Centrifugal	500 hours or one month and just prior to oil drain	Quarterly and just prior to oil drain

Oil Analysis tests and their importance

There are so many tests available, some appropriate for the application, others not. Having an idea about what the various tests are, what they can accomplish, and taking into account the maintenance philosophy being practiced, test slates can easily be drawn up to accomplish the desired results.

Item	Test	Onsite Laboratory	Commercial Laboratory
1	Particle Counting	✓	✓
2	Water (crackle test)	✓	✓
3	Water (Karl Fischer)		✓
4	Viscosity	✓	✓
5	Ferrous Density		✓
6	Analytical Ferrography		✓
7	Filter Analysis	✓	✓
8	Acid Number	✓	✓
9	FTIR (oxidation)		✓
10	Patch Test	✓	✓
11	Elemental Analysis		✓

Table 1. Common oil analysis tests.

Eleven commonly performed tests are listed in Table 1. These tests are not all the tests that can be performed, but do include all the most common ones. The table also indicates whether the test can be reasonably done as at an onsite laboratory or whether they are more likely to be performed in a commercial oil analysis laboratory. Onsite laboratories range from very simple to very complex, and the third column in Table 1 represents an industry average of what might be found in an onsite laboratory.

It is worth noting that test packages can be purchased from most laboratories at a price substantially cheaper than the sum of the individual tests purchased separately. Where possible these test packages should be used and complimented with extra tests if desired.

Oil analysis can be broadly divided into three different categories: fluid condition, contamination and wear.

Particle Counting

The particle counter produces a count, in different size ranges, of particles per 1 ml of oil. It is concerned primarily with contamination, but as some of this contamination may be internally generated, the wear aspect of oil analysis is also addressed. With most particle counters differentiating between internal and external wear is impossible, but there are new technologies available which are addressing this.

A particle counter produces a number for each of the different size ranges, Increasing numbers as evaluated on a trend basis indicate the fluid is getting dirtier and decreasing numbers indicate the fluid is becoming cleaner.

It is worth mentioning that there are interferences that can cause anomalies in the results. The interferences depend on the technology being used, but can include water droplets, air bubbles and heavily discolored oil. If significant differences in particle counts are noticed, the first course of action should be to ensure, as much as possible, that interferences have been dealt with in the testing process and that other significant test results have not changed, such as water contamination.

Water (Karl Fischer)

The Karl Fischer method is used to determine the exact water content of an oil sample. It reports results as ppm water. It should absolutely be run as a routine test in situations where water content below 1,000 ppm is important, such as electrical transformers, hydraulic and turbine oils.

Viscosity

Viscosity is a fluid's resistance to flow. It is an important indicator of the condition of the oil and can also be negatively affected by contamination. There are various means of carrying out the viscosity test and it can be reported at temperatures of 40 deg.C or 100 deg.C. For most industrial applications a viscosity measurement at 40deg.C is required. Viscosity trending is considered to be most important in understanding the fluid film formation capabilities.

Ferrous Density

Ferrous density is a determination of the content of magnetic debris in the oil. As most wear metal is iron-based, this test is, in most cases, a good indicator of the amount of wear debris in the oil. There are several different instruments for performing the test, like Direct Reading Ferrograph that gives the wear particle concentration(WPC), PQ Index that provides an indexing number of Iron concentration etc.

Analytical Ferrography

Analytical ferrography is the visual analysis of solid contaminants removed from the oil sample. As the name suggests, it is biased toward contaminants of a ferrous nature, i.e., wear metal, but some non-magnetic debris gets trapped as well. The test uses magnetic fields to separate the ferrous debris into different size ranges on a microscope slide, then examined under a compound microscope. It is an expensive test to perform and the results are subjective, so this test is usually only performed as an exception test.

Filter Analysis

Filter analysis is a visual analysis of solid contaminants removed from the filter. It involves washing out a piece of the filter membrane and depositing the contents onto a filter patch for microscopic analysis. The debris can be separated into magnetic and non-magnetic components if desired, but unlike analytical ferrography, the particles are not separated according to size. Like ferrography, the test is time consuming, expensive and subjective. It provides better resolution of non-magnetic debris than analytical ferrography. This test should be carried out on filtered systems as an exception test, possibly generated by an out-of-specification elemental analysis, ferrous density or particle count.

Acid Number

The acid number (AN) test measures the acid content of a sample. The AN is an indication of how much the fluid has oxidized or degraded. AN also is used to determine the rate of depletion of the anti-oxidant additive. It is primarily focused on the condition of the oil, although some contaminants can also affect the AN. Units are mg KOH/gram oil. An increasing AN indicates increasing oxidation of the oil. Unlike some conditions, like contamination, which can be reversed, a high AN cannot be.

FTIR

Fourier-Transform Infra-Red (FTIR) spectroscopy uses infra-red light of varying frequencies to search for the presence of absence of certain compounds in the oil. The scope of the test can range from very simple, or inexpensive, to very complex and expensive, depending on the desired results. FTIR examines both the condition and contamination of the sample.

For most industrial applications the simple tests can give sufficient information. The primary property sought here is oxidation.

FTIR is seldom found in onsite laboratories due to its high costs and moderate complexity of operation. It is worth noting that prices on the spectrometers are decreasing and the feasibility of including one of the devices in an onsite laboratory is increasing.

Elemental Analysis

The most important test in the oil analysis arsenal is elemental analysis and it provides information on all three aspects of oil analysis: the condition of the fluid (levels of some additives), contamination and machine wear. The commonly used method is inductively-coupled plasma (ICP) spectroscopy, which utilizes light in the visible and ultra-violet ranges. It reports results in ppm of various elements.

The major drawback of this test is the size of the particles it can detect. Particles larger than 5 to 8 microns in size are not detected by this test. However, in most wear situations, there will be an increase in wear particle sizes across the range, so elemental analysis can still provide excellent results. A knowledge of the metallurgy of the machine is vital in the interpretation of the results. It is also important to employ exception tests when anomalies in the elemental analysis are detected.

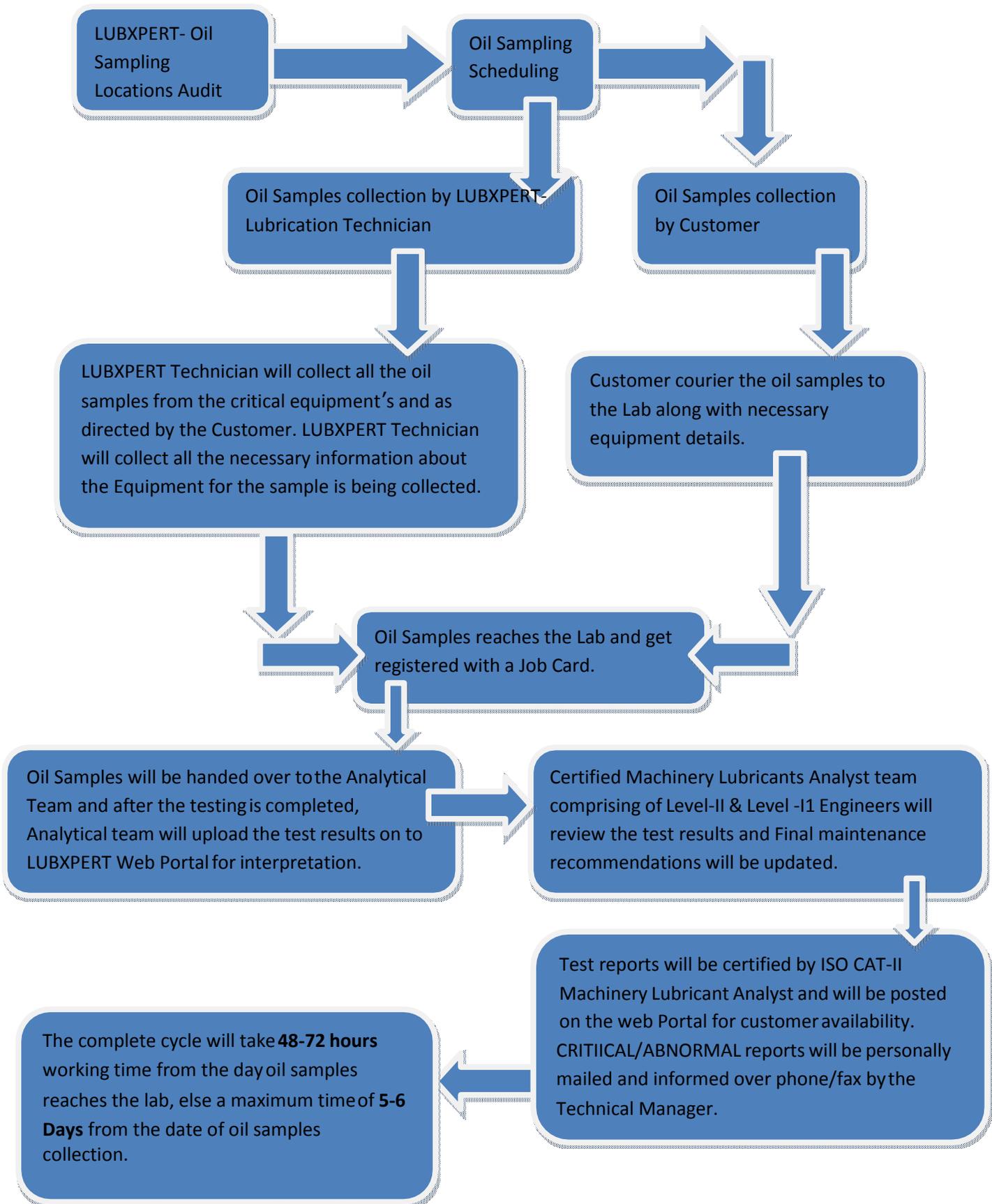
Due to the high capital costs and complexity of operation, ICP spectrometers are found in only the most sophisticated of onsite laboratories.

LUBXPRT Oil Analysis Test Solutions.

OIL ANALYSIS TESTS	GEARS/ BEARINGS	HYDRALICS	TURBINES/ COMPRESSORS	ENGINES
Routine (Monthly or every 3 months depending on equipment criticality)	1.Kinematic Viscosity @ 40,@100 deg.c & Viscosity Index 2. Moisture content 3. Total Acid Number 4. Ferrography Analysis	1.Kinematic Viscosity @ 40 deg.c 2. Moisture content 3. Total Acid Number 4. Particle count/NAS value 5.Spectroscopy analysis	1.Kinematic Viscosity @ 40,@100 deg.c & Viscosity Index 2. Moisture content 3. Total Acid Number 4. Particle count/NAS value 5.Spectroscopy analysis	1.Kinematic Viscosity @100 deg.c 2. Moisture content 3. Total Base Number 4. Flash point 5.Soot % 6.Spectroscopy analysis 7. Coolant dilution 8.Oxidation, Nitration, Sulphation
Once in a 6 months/ Need based	1.Foaming Characteristics 2.Spectroscopy	1. Emulsion Characteristics 2.Foaming Characteristics	1. Ferrography 2. Emulsion Characteristics 3.Foaming Characteristics.	1. Ferrography
Advanced tests once in a Year or as suggested by OEM	RPVOT for large sumps. Rust Prevention characteristics.	1. RPVOT 2. Air release Value	1. RPVOT 2. Air release Value 3. RULER & MPC	1.Cylinder Scrape down analysis and any other tests suggested by OEM.

We provide any other tests also as per your requirement.

Oil Samples Analysis Process Flow Chart



Equipment and Sample Information

Equipment data sheet: In order to provide the accurate diagnosis and maintenance recommendations, LUBXPERT collects maximum useful data about the equipment operating, working and environmental conditions. In addition to the above data LUBXPERT technician will collect very important data of Mechanical components, Wear & Tear and Metallurgy of the components which helps the analyst in pin pointing the exact sources of wear.

Samples Shipping Please do coordinate with LUBXPERT as we have got known couriers who handle oil samples for you with some paper work.

Sampling accessories- Oil Sampling bottles, Sampling pipe, Sampling Pump, Sample bottle labels etc will be provided by the LUBXPERT team.

Please feel free to contact us for any of lube oil analysis, Lubrication Management & Lube training requirements.

Lube Oil Analysis/Lubrication Management/Lube Trainings.

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