

WearCheck

WHETHER YOUR OPERATION IS MOBILE, INDUSTRIAL,
MARINE OR AVIATION WEARCHECK HAS THE SERVICES,
TRAINING, AND EXPERIENCE TO ENSURE YOUR OIL
ANALYSIS PROGRAM IS BEST-IN-CLASS.

Maximizing the Value of Your Oil Analysis Program



THE LEADERS IN OIL ANALYSIS

Maximizing the Value of your Oil Analysis Program



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Oil analysis is a very useful predictive maintenance tool that will provide a very high return on investment. For more than 40 years companies have been managing maintenance costs successfully using oil analysis. Taking the time to lay the groundwork for a successful program will ensure that you maximize your ROI from oil analysis.

Alistair Geach
Operations Manager
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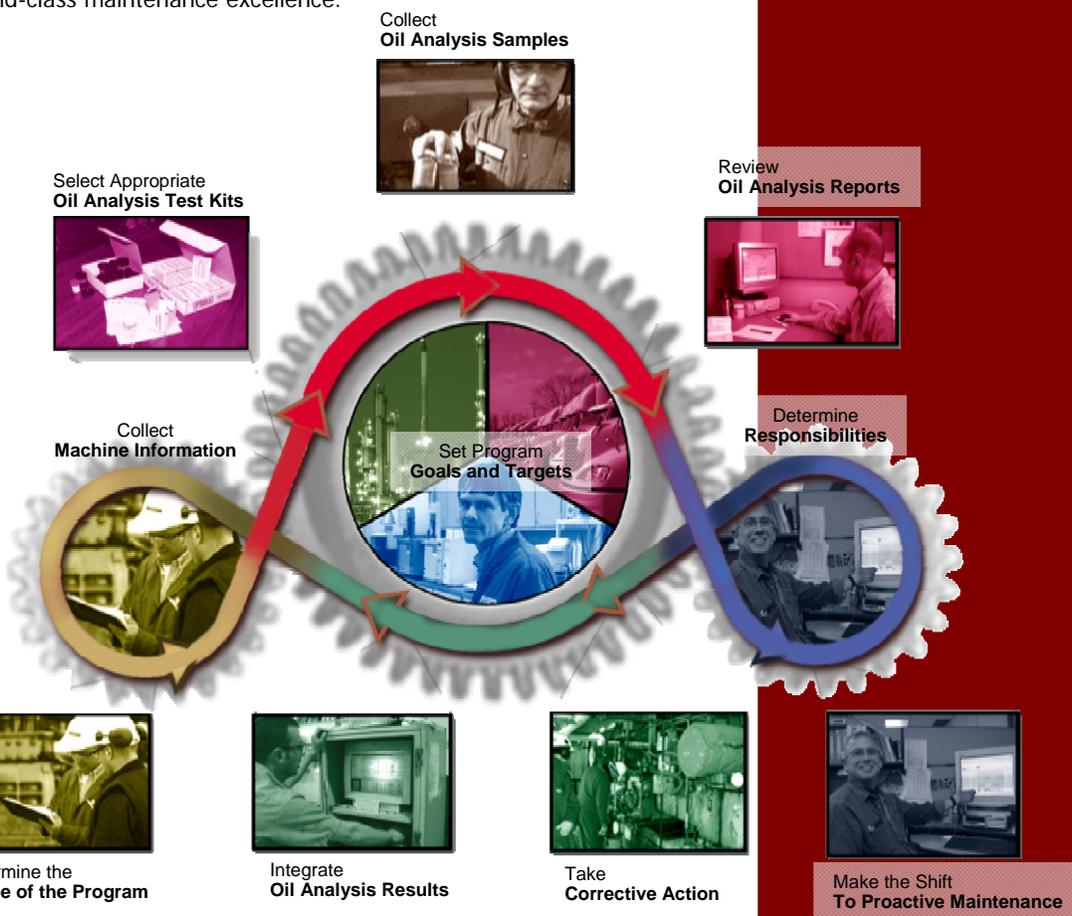
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Getting Value from Your Oil Analysis Program

Laying the groundwork for your oil analysis program will ensure it runs with a minimum of problems and effort and will ensure that you maximize your return on this worthwhile investment. Whether you are starting an oil analysis program from scratch or looking to improve your existing program, review these program recommendations and then schedule an appointment to meet with your current or proposed oil analysis vendor.

Oil analysis is a very useful predictive maintenance tool that will provide a very high return on investment. For more than 40 years companies have been managing maintenance costs successfully using oil analysis. Taking the time to lay the groundwork for a successful program will ensure that you maximize your ROI from oil analysis.

This guide presents a process to ensure that your oil analysis program is effective within your company. Your success is our success, and this guide details how to start your program off to ensure your program has success. This guide will show you how to entrench the program with your employees. How to use the information from oil analysis to improve your maintenance decisions and better utilize your trades people's time and energy. How to use oil analysis to reduce your maintenance costs, and to increase your piece of mind. How to put your organization on the right track to world-class maintenance excellence.



Determine the Scope of the Program



Integrate Oil Analysis Results



Take Corrective Action



Make the Shift To Proactive Maintenance

Set Goals and Targets for your Oil Analysis Program

Setting program goals is paramount to a successful oil analysis program. All oil analysis programs are not created equal. Discussing your goals with your oil analysis vendor will allow the laboratory to select the appropriate oil analysis tests for each type of equipment within your plant. Doing so will ensure that you are collecting the appropriate oil analysis data to measure your progress towards your lubrication and maintenance goals.

The two primary goals for oil analysis are predictive and proactive maintenance. Oil analysis allows maintenance personnel to act in a predictive manner by providing forewarning of a machine failure in time to schedule appropriate maintenance. Oil analysis also provides the necessary data to allow companies to act more proactively. While the oil analysis provides the raw input data to the process, generally companies require consultants to assist them in understanding the overall trends in the data, and to assist in selecting appropriate lubrication-related solutions to prevent common lubrication related issues from re-occurring.

To maximize your investment in oil analysis, seek out oil analysis vendors that can assist you in achieving both your predictive and proactive goals.

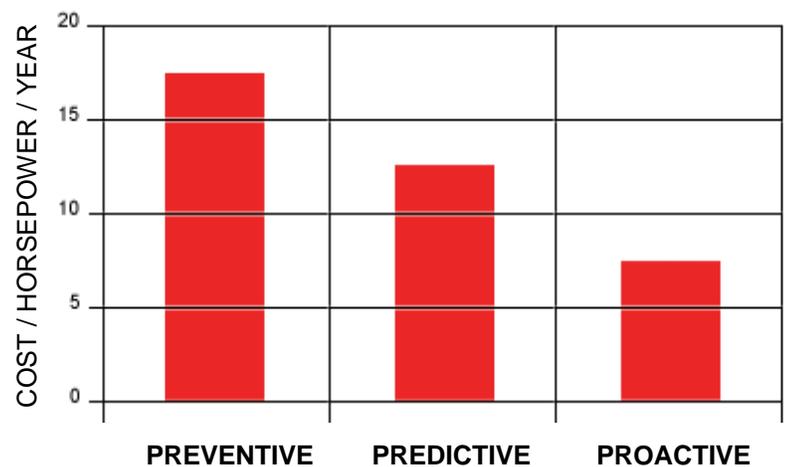
Primary Goals - Predictive

- Provide effective maintenance scheduling
- Minimize effects of installation errors
- Optimize oil drain intervals
- Verify service or warranty claims

Secondary Goals - Proactive

- Minimize unscheduled downtime
- Extend equipment life
- Improve equipment reliability
- Reduce maintenance costs

Maintenance Cost per Horsepower for General Industrial Rotating Machinery



Determine Responsibilities

Like any successful program it is necessary to designate personnel to tasks and provide training to ensure that tasks are performed properly.

Oil sampling is typically carried out by tradespersons, oilers, or lube technicians. Ensuring that personnel who take oil samples are properly trained and have the correct sampling hardware is important to ensure the integrity of oil samples. Maintenance managers, reliability engineers and technicians are typically responsible for reviewing the oil sample reports. It is important that the personnel responsible for reviewing the sample reports can interpret the oil analysis data and laboratories recommendations, and translate these into appropriate maintenance tasks. It is equally important that these personnel have the authority to add maintenance tasks to the maintenance system.

In many cases the same people taking the samples will be carrying out the maintenance tasks that are recommended by the oil analysis reports. As a result ensure that there are lines of communication between those personnel that take oil samples, review the oil analysis results, and those that affect the corrective actions. Feedback both up and down the chain of responsibility will ensure that the oil analysis program becomes well entrenched in the culture. A lack of communication can quickly erode confidence in the program at any level.

The oil analysis program manager is responsible for ensuring the overall effectiveness of the program. The manager should ensure that maintenance tasks are being carried out on actionable oil sample reports and that those tasks are correcting the problems identified by oil analysis. Additionally the program manager should review the overall oil analysis program on a quarterly basis to assess progress towards set goals and targets. Your oil analysis vendor should be able to provide you with software or reports that can help you track your progress.



Reliability Engineer

- Determines the Scope of the Condition-Based Monitoring Program
- Ensures protocols and procedures are in place
- Reviews critical / abnormal sample reports and creates work orders
- Reviews the CBM Program on a Semi-Annual basis

Planner / Foreman

- Reviews and approves work orders for maintenance activities
- Reviews sample reports for equipment where condition-based maintenance activities have been requested.
- Follows-up to ensure that maintenance activities were carried out
- Reports back to reliability engineer on maintenance findings

Millwright / Operator / Oiler

- Take oil analysis samples
- Carry out condition-based maintenance activities
- Review sample reports for equipment requiring condition-base maintenance
- Report back to planner/foreman on maintenance findings

Maximizing the Value of your Oil Analysis Program



Determine the Scope of the Oil Analysis Program

Initially it is not necessary nor recommended to sample every lubricated machine within the plant. In many cases this is impractical due to the sheer quantity of lubricated machinery. In other cases equipment may not be well maintained, so the first round of oil samples inevitably creates a lot of emergent maintenance tasks that cannot reasonably be performed. Taking on too much at the start can undermine the whole oil analysis program.

The best approach is to evolve the oil analysis program. Start with the most critical machines in the plant, or the bad actors, and then gradually add more machines (based on criticality) to the program over subsequent sampling runs. Remember, if you don't have adequate resources (people, time and money) in place to take the samples, review the result, and carry out the resultant maintenance tasks, then the oil analysis program is going to stall. Evolving the program over time will ensure that your personnel have time to be trained and learn the skills necessary to make the program successful over the long run.

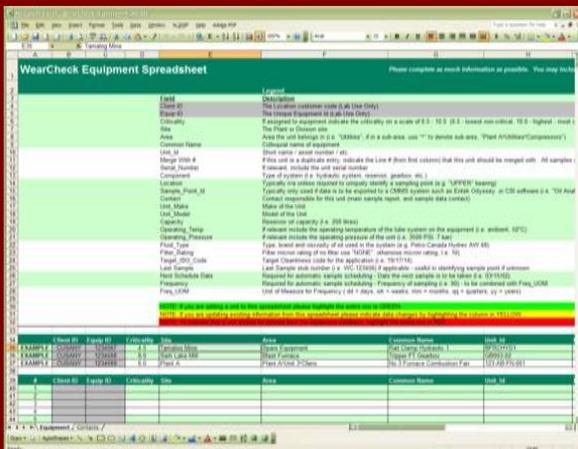
Collect Machine Information

Before you collect your first oil sample take the time to collect all the required equipment information in electronic format, and forward to your oil analysis vendor. Providing this information goes a long way to ensure accurate diagnosis and meaningful recommendations.

Most laboratories can provide you with a spreadsheet template that you can complete with your machine information. Once the laboratory has imported your machinery into their database, most labs can either provide pre-printed labels or software that allows you to print your own labels that can subsequently be used in place of the standard Sample Information Forms (SIFs). Not having to complete SIFs with your oil samples will save you a lot of time, and pre-printed labels ensure accurate machine information when the laboratory receives your samples.

Our staff will import the information from the spreadsheet that you supply, and set up your equipment database. Once your WearCheck account has been set-up you can use our WebCheck service to manage your equipment database records on-line.

If your company does not currently have plant equipment information available, you should consider conducting a lubrication survey of the plant before undertaking any lubrication and/or reliability programs. Our Lubrigard division provides lubrication survey services if your company does not have the resources to conduct this type of survey in-house.



WearCheck provides a Machine Information Template for new customers. This spreadsheet can be used to provide a machine list for new customers, or for updating a machine list for existing customers. To receive the MS Excel template send an e-mail to info.sales@wearcheck.ca.



WebCheck simplifies the management of your oil analysis program by providing the tools to view sample reports, generate management summary reports, set-up and track sample schedules, track the status of plant equipment and to manage the machine database on-line.



Select Appropriate Oil Sample Test Kits

Having determined goals for the oil analysis program it is necessary to select the appropriate testing protocols to ensure that progress towards these goals can be tracked. Typically the information provided by you on the machine spreadsheet will enable WearCheck to establish the appropriate oil analysis testing protocols for your machines.

For industrial equipment WearCheck provides specific IND oil analysis test kits. Generally Industrial Level 2 (IND 2) sample kits meet the testing requirements for almost all industrial machinery. For less critical machines the Level 1 (IND 1) sample kit may suffice, but for critical equipment the Level 3 (IND 3) sample kit may be recommended. WearCheck will use the machine information you have provided to determine the appropriate sample kit for each machine on the oil analysis program. The table below summarizes the industrial oil analysis testing protocols by test kit.

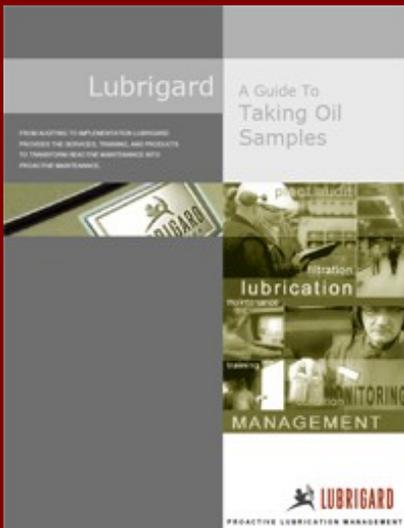
Additionally WearCheck provides sample test kits for Marine (MAR), Aviation (AVI), and Mobile (MOB) applications as well as Advanced Oil Monitoring (AOM) programs for Industrial Turbines.



Test	Method	IND 1	IND 2	IND 3
 ICP Analysis ASTM D5185	Determines the parts per million (ppm) of all wear metals (Fe, Cr, Ni, Pb, Cu...), contaminants (Si, Na, K...), and additives (Ca, P, Zn, Mg, Mo...).	●	●	●
 Viscosity @ 40°C ASTM D445	Determine the viscosity of the oil at 40°C to determine if oil is still within specification. High viscosity can indicate oxidation, low viscosity can indicate contamination, improper make-up oil.	●	●	●
 Visual Screen In-house method	A picture of both the oil color/clarity and the bottom of the sample bottle are taken, and any level of contamination, visual oil problems or visible wear debris of the oil is recorded.	●	●	●
 AN ASTM D664	Determines overall acidity of the oil which is an indication of degradation. Single best test to determine change-out interval.		● ²	● ²
 KF ASTM D6304	Determines level of moisture or water contamination in the oil.		● ²	● ²
 Particle Count ISO 4406:1999	Determine cleanliness levels of oil. High particle count levels can indicate gross contaminant ingress, wear, filter by-pass or all of these issues.		● ²	● ²
 PQ Index In-house method	Provide a rapid indication of metallic debris in an oil sample. Detect ferrous wear debris that may be missed by spectrometric analysis.		● ²	● ²
 Analytical Ferrography	A detailed morphological analysis of the wear debris particles suspended in the oil. A-Ferr can determine the type of wear process and cause of wear in a lubricated system.			●

2 – Customer may select two (2) of any of these tests

Maximizing the Value of your Oil Analysis Program



For further information on sampling hardware see the "A Guide to Taking Oil Samples" which can be viewed at:
<http://www.lubrigard.com/products/literature/LG-SAMPLING-GUIDE-CA.pdf>

Review Sampling Frequency and Hardware

The oil analysis results will be heavily influenced by the sampling process. Sampling consistency is very important and should be as repeatable as possible. Samples should be taken from the same location, while the equipment is in operation, if possible, or soon after shut-down, using the sample sampling procedure and sampling hardware, and at the same sampling frequency.

Sample points should be clearly identified, and proper sampling ports should be installed. Your laboratory should be able to provide consultation on recommended sample point locations, hardware and procedures. There are many sources of readily available training on oil sampling, and your personnel should be trained on this important task.

Samples should be taken at regular frequencies. Most industrial machinery can be sampled every 3 months, however critical components may require sampling every month, and non-critical components may require sampling only every 6 months. Again your oil analysis vendor should provide assistance in setting reasonable oil sampling frequencies.

WearCheck provides scheduled sampling services. When setting up your machine database you can specify sampling intervals, test kits, and start date, and WearCheck will automatically generate pre-labeled sampling kits and ship them on a monthly basis.

Criticality	Reservoir size		
	IND 1	IND 2	IND 3
6 Months	© low ® small	© med ® small	© high ® small
3 Months	© low ® med	© med ® med	© high ® med
1 Month	© low ® large	© med ® large	© high ® large

Sampling frequency and appropriate test kit can be determined using this simplified matrix. Sampling frequency is on the left and sample test kit is on the top. The deciding criteria are the machine criticality (© = low, medium or high) and the reservoir size (® = small < 10 gallons, medium < 250 gallons, or large > 250 gallons).



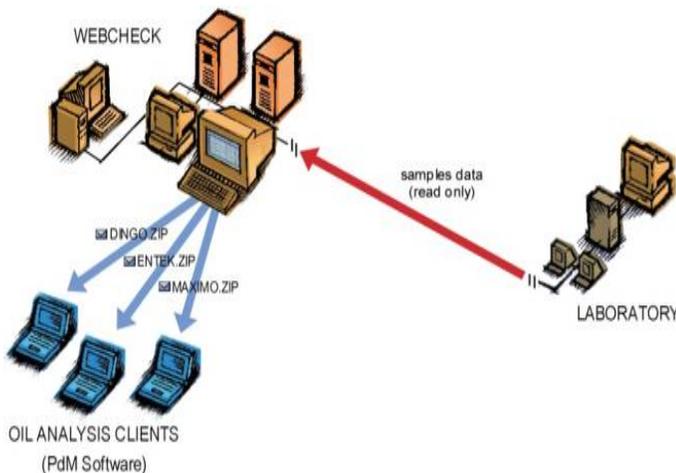
Maximizing the Value of your Oil Analysis Program

Integrate Oil Analysis Results

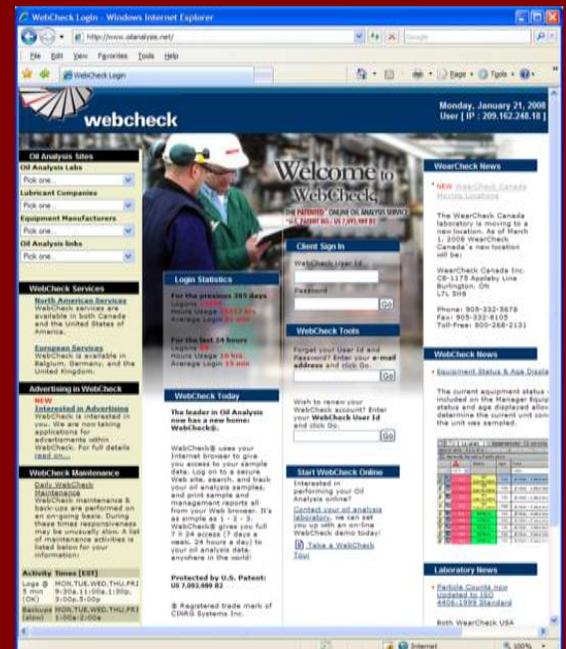
Very few reliability personnel today receive hard-copy oil analysis reports. Most, if not all, oil analysis vendors provide oil analysis-based software, whether stand-alone or web-based. This software is a critical part of an industrial-based oil analysis program.

WearCheck offers all our customers access to our on-line oil analysis system, WebCheck, so it is no longer necessary to review paper reports. WebCheck automatically alerts you to oil-related problems via e-mail. WebCheck automatically tracks the status of your oil analysis program and gives you quick access to critical and problem samples. The Trouble Log automatically tracks bad-actors within your plant. With tools to track machine condition, track maintenance actions, sort and find units, WebCheck puts your entire oil analysis program at your fingertips. It is essential that the key personnel involved in the oil analysis program have access to a WebCheck account.

Oil analysis vendors software should work in conjunction with your existing reliability software platform. Most oil analysis vendors provide data export capabilities for common reliability software packages, or standard CSV or XML data files at a minimum. Integrating the oil analysis data into your existing reliability software platform ensures that the reliability group has ready access to the oil analysis data in an environment they are familiar with, and can review this data alongside other CBM data (i.e. vibration, thermography, ultrasonics).



WearCheck can provide automated data export for industry standard software including Maximo, Enshare, MAINTElligence, Dingo, CSI, Avantis, EnergyDI, and SKF.



WebCheck is an on-line oil analysis service provided at no extra charge to WearCheck customers.



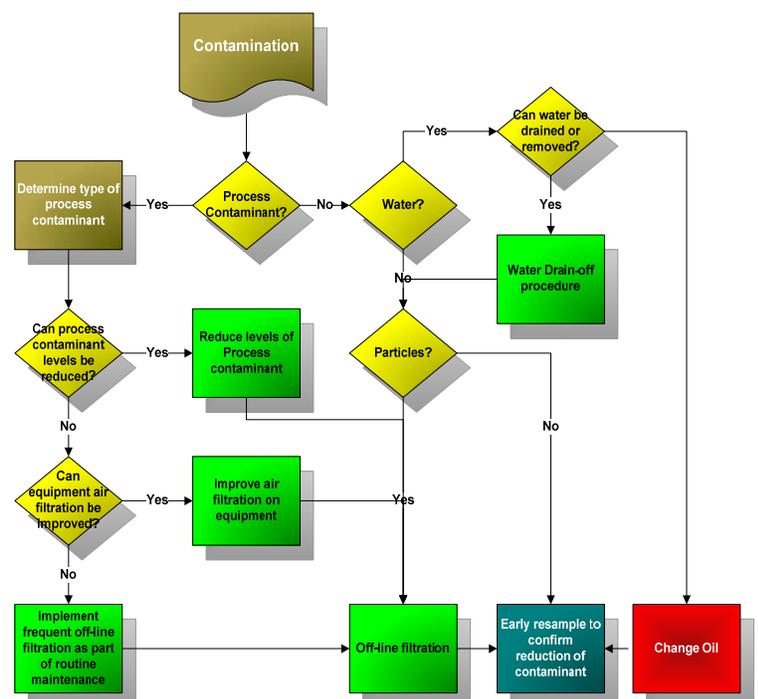


Take Corrective Action

In a typical oil analysis program roughly 80% of sample results are normal, 15% are abnormal, and 5% are critical. The largest return on investment from your oil analysis program comes from averting machinery failure in the critical 5% of instances. To realize these returns it is incumbent on the reliability and maintenance departments to ensure that appropriate maintenance activities are carried out based on the oil analysis recommendations.

In cases where machinery inspections are recommended it is essential to take immediate action, consult with the operators, utilize additional CBM techniques (i.e. vibration, thermography, ultrasonics) and collect all the necessary information to make a decision on when to take a machine out of service for inspection and possible repairs. At these times you should enquire with your laboratory about additional advanced level testing (e.g. analytical ferrography) that may assist in making the decision more clear.

Aside from critical samples, do not forget the 15% of samples that show abnormal oil quality or contamination issues. Many plants fail to adequately address the underlying issues that lead to oil-related problems which subsequently shorten both machinery and lubricant life. These abnormal oil samples provide the input that experienced consultants can use to recommend proactive solutions that will increase machinery and lubricant life. Talk to your oil analysis vendor about their proactive lubrication services or find a consultant that can help you maximize the ROI from your oil analysis program.



Maximizing the Value of your Oil Analysis Program

Make the Shift to Proactive Maintenance

Developing a world-class program and putting the program into action can be challenging when starting from scratch. Lubrigard is the solutions division of WearCheck, and offers the products, services and training designed to help you improve your maintenance and lubrication practices. Understanding is the key to change. Lubrigard provides services to benchmark the current practices in your organization to industry best-in-class solutions. Change is good! Lubrigard provides the products that will advance your organization from your current lubrication practices to best in class for your industry.

Lubrigard represents the best-in-class Lubrication Management products

- Oil Safe
- IFH Lubrication Storage Solutions
- Des-Case Desiccant Breathers
- Harvard Filtration Systems
- *And many more...*

Lubrigard offers best-in-class Lubrication Management Services

- Plant Benchmarking Services
- Lubrication Surveys
- Oil Analysis Program Design & Set-up
- Lubrication Room Design & Set-up
- Lubrication Management Outsourcing

Lubrigard offers best-in-class Training Programs

- Oil Analysis
- Advanced Oil Analysis
- Equipment Lubrication



The Lubrigard Web site (<http://www.lubrigard.com/>) contains information on all our proactive products, services and training.

Maximizing the Value of your Oil Analysis Program



You can use this form to make a self-assessment of the state of your oil analysis program.

If you would prefer to have WearCheck send a technical representative to meet with you and discuss your needs call 1-800-268-2131 or complete the set-up checklist and fax to 1-905-569-8605.

Oil Analysis Program Set-up Checklist

Use the following checklist to ensure that you are maximizing the value of your oil analysis program.

Items prefaced with an asterisk () are free services WearCheck can assist with. Those prefaced with a double-asterisk (**) are services that can be contracted from Lubrigard.*

Set Program Goals and Targets

- *Oil analysis targets and goals set
- *Metrics selected to monitor progress towards goals/targets
- *Management reports in place to assess progress.

Determine Responsibilities

- Oil Analysis Program Manager selected
- Channel of communication set-up between reliability personnel and maintenance/operations personnel
- Oil sampling personnel selected
- **Reliability personnel received oil analysis training

Determine the Scope of the Program / Collect Machine Information

- **Machinery criticality assessed
- **Machine Information collected and available electronically
- *Machinery selected for Oil Analysis program

Select Appropriate Sampling Kits / Review Sample Frequency and Hardware

- *Oil Analysis testing protocols selected for machinery
- *Sampling frequencies established
- **Sampling points selected
- **Sampling ports installed on machinery
- *Oil Sampling schedules configured in WebCheck (pre-labeled kits)
- **Oil sampling personnel trained
- Oil analysis vendor selected
- *Oil Analysis kits selected and purchased

Integrate Oil Analysis Results

- *Oil Analysis software (WebCheck) set-up for all required personnel
- *Oil Analysis data transfer set-up for existing CMMS system

Company Name _____

Contact Name _____

Job Title _____

Contact Phone _____ Fax _____

E-Mail Address _____

Address _____

City _____ State/Prov _____ Zip/Postal _____

