

OIL ANALYSIS II & III

Learn How To Unlock The Full Potential Of An Oil Analysis Program In These Intensive Three-Day Courses.

You Will Learn How To:

- ▶ Easily interpret oil analysis reports
- ▶ Squeeze maximum life from lubricants
- ▶ Pull oil samples for optimum results
- ▶ Reduce oil consumption for quick savings
- ▶ Optimize oil analysis limits

Who Should Attend?

- All Maintenance Professionals
- Laboratory Analysts
- Vibration Instrument Specialists
- Craftsmen or Millwrights
- Manufacturing and Industrial Engineers
- Lubrication Technicians and Engineers
- Maintenance Managers
- Maintenance Supervisors
- Equipment Operators
- Operations Managers
- Reliability Engineers
- Predictive Maintenance Technicians

What Industries Will Benefit?

- Aerospace
- Automotive Manufacturing
- Earthmoving
- Food and Beverage
- General Manufacturing
- Lumber and Wood
- Municipal Utilities
- Petrochemical
- Pharmaceuticals
- Power Generation
- Primary Metals
- Process Manufacturing
- Pulp and Paper
- Rubber and Plastic
- Textile
- Transportation

If You Use Any Of These Machines, This Training Is A Must:

- Gearboxes
- Hydraulic Systems
- Compressors
- Final Drives
- Hydrostatic Transmissions
- Rolling Mills
- Motor Bearings
- Paper Machines
- Diesel Engines
- Blowers/Fans
- Process Pumps
- Gas Turbines
- Steam Turbines

Expand Your Oil Analysis Skills And Get Better Results ... A Whole Lot Faster!

If yours is like many companies, you may already be winging your way around oil analysis, perhaps trying to predict failures or just basing oil drains on your oil analysis report recommendations. Either way, you probably know there's a lot about oil analysis you haven't mastered ... and you might be wondering what you are missing. Wouldn't you like to know ALL about what oil analysis can do for you? Now you can!

You'll Learn More Than Just Oil Analysis

Extending oil and machine life are two of the primary goals of oil analysis, but analyzing the oil won't make the oil or machine last any longer. That's why Noria's proven strategy for extending machine and lubricant life by up to 10X is the cornerstone of these courses. You will learn how making small adjustments to lubricant properties can result in huge savings and take your return-on-investment from oil analysis to new levels.

Get Answers to These and All Your Questions About Oil Analysis!

How often should I use oil analysis?

Where is the best place to pull an oil sample?



How clean should I keep my oil and what kind of filter should I use?

What are all these numbers I see on my oil analysis report?

What steps can I take to ensure that I get a good oil sample each time?



What are the best cost-reducing strategies using oil analysis?

How do I know if I should occasionally "sweeten" my oil with additives?

What are the secrets to catching bearing faults with wear debris analysis?

5 What are the 5 most important things I should look for on my oil analysis report?

Are there any good field tests for oil that don't involve expensive instruments?

How do I determine the remaining useful life of my oil?

Oil Analysis Blunders

Don't Let These Happen to You ...

- A large steel mill wanted to make every machine ready for easy oil sampling. After installing more than 1,200 new oil sampling ports, it began getting strange data on oil analysis reports. After investigating, it found that each of the new sampling ports was installed in the wrong location.
- A company that had been using oil analysis for several years wondered why it was never able to detect pending bearing failures. After a bearing failure shut down production for more than a day, it discovered that the oil analysis tests being conducted were not capable of detecting impending failure. Instead, the tests were designed to identify wrong or degraded lubricants only.

An Arsenal of Knowledge for Your Oil Analysis Program

Develop Rapid-Fire Troubleshooting Skills!

Oil analysis provides critical early warning information to impending machine failure. Those trained in the language can "crack the code" of even the most complex problems. Knowing how to interpret changing lubricant properties involves a specific sequence of steps that can be easily learned. Get the answers.

1

Squeeze Maximum Life From Lubricants!

Lubricants and hydraulic fluids can have infinite life when specific operating conditions are stabilized. The rising costs of new lubricants and the disposal costs of used fluids are a directive for change. A proven action plan for extending fluid life is key. Get the answers.

2

Champion A Company-Wide "Clean Oil" Campaign!

High fluid cleanliness is the lynchpin of a successful proactive maintenance program. But how clean? Which filters? How much life extension can be achieved? Get the answers.

3

Take Aim On Reactive Maintenance!

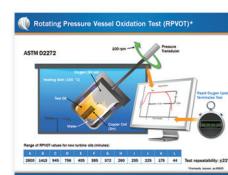
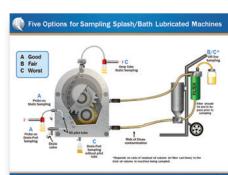
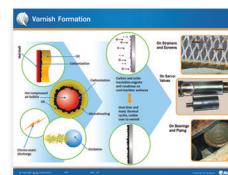
On a global scale, maintenance organizations are undergoing a renaissance of change. Gone are the days when maintenance functions centered around corrective repairs and damage control. Today's battle cry of "condition-based maintenance" has transformed common mechanics and repairmen into high-tech instrument operators and machine diagnosticians. Discover how oil analysis and proactive maintenance are leading the charge.

4

What's Different About This Training?

Plenty. For starters, you won't be listening to someone lecture on textbook theories. Instead, you'll get a lot of straight-shooting advice from a seasoned professional, an authority on oil analysis and a dynamic speaker with years of experience.

These courses throw useless trivia out the window and get right to the meat of what you need to know. You'll get the most important, up-to-date information that will be invaluable to your oil analysis program.



Presentation slides are full-color and high-quality, making the information easy to comprehend and remember.

Satisfied Customers Say It Best...

"For any program looking to start a fluid sampling program, this is the place to start."

Justin Youtz, Hydraulics IPT Lead,
General Dynamics Amphibious Systems

"Excellent combination of introductory and advanced material."

Ben Staats, Reliability Maintenance Engineer,
Cariboo Pulp & Paper

"As a vibration analyst, I have a new perspective on how oil analysis detects potential problems long before vibration analysis would identify it."

Scott Pitre, U.S. Navy

"Excellent learning forum. Provided substantial information that will be immediately useful in improving an existing oil analysis program."

Steve Fox, Maintenance Engineer, Aera Energy

"I learned more in a few days than I have in the past year. This training has opened up some issues I have in my plant that I would have never thought of."

Burt Jimenez, Maintenance Planner, Inland Steel

"This course produced instantly usable knowledge, which will definitely result in changes in the way we handle lubricants and lubrication systems."

Joe Kelly, Maintenance Engineer, Akzo Nobel

"Easy to understand, very informative and delivered in a professional way."

Terry Craswell, Maintenance Technician,
Alberta Pacific Forest Inc.

"This class is a true pathway into world-class maintenance."

Gary Stamper, Maintenance Superintendent,
Meadwestvaco

"Vendor-neutral Makes A Difference!"

Alfredo Romaro
Maintenance Technician,
Kawneer Company



Join This List Of World-Class Companies That Have Benefited From Noria Training

3M
Air Products
Akzo Nobel
Alabama Power
Alcoa
Ameren
Arco
BHP Copper
BP Amoco
Bristol Myers
Boeing
Boise Cascade
Borg Warner
Cargill
Castrol
Caterpillar
Centralia Mining
Chevron
Citgo
Clopay
ConocoPhillips
Destec Energy
Detroit Edison
Dow Chemical
Dow Corning
Duke Power
DuPont
Eastman Kodak
Eli Lilly
Entergy
ExxonMobil
First Energy
Florida Power
Ford Motor Co.
Formosa Plastics
General Electric
General Motors
Geneva Steel
Georgia Pacific
Georgia Power
Goodyear
Great Lakes Chemical
Harley-Davidson
HB Zachry
Holcim
Intel
Houston Metro Transit
International Paper
John Deere
Kinder Morgan
Koch Industries
LaFarge Canada
Lockheed Martin
Lukens Steel
M&M Mars
MillerCoors
Michelin
Nova Chemicals
Owens Corning
Oxy Chemical
Pacific Gas & Electric
Peabody Energy
PPG Industries
Procter & Gamble
Reliant Energy
Rio Tinto
Seattle Times
Seminole Electric
Shell Oil
Southern Companies
Sun Company
Temple-Inland
Texaco
Texas Instruments
Texas Utilities
U.S. Army
U.S. Navy
U.S. Postal Service
Via Rail Canada
Westinghouse
Weyerhaeuser
Whirlpool
Wyeth

Oil Analysis II Course Outline

Proceed to this course after
Machinery Lubrication I

World-class Maintenance Philosophies

- Five prevailing features of world-class maintenance programs
- The 80:20 rule for maintenance
- Three successful elements of a CBM program

Introduction to Machinery Lubrication

- Oil formulation and its importance in effective machinery lubrication
- Six key functions of lubricating oils
- Three primary lubrication regimes
- Introduction to base oils and additives
- Choosing the correct base stock
- Conditions that dictate the use of synthetic oils
- Antioxidant additives and their role in oil life
- Dispersants and detergents – the key to controlling soot
- Controlling wear with additive chemistry

Oil Analysis Fundamentals

- Interpreting the language your oil is speaking
- Prevailing myths about oil analysis
- Common applications for sampling and analysis
- Three categories of oil analysis

Oil Sampling – The Very Best Practices

- 11 elements of a successful oil analysis program
- How clean should sample bottles be?
- How to find the best sampling locations
- Sampling valves and hardware recommendations
- A quick method for optimizing sampling intervals
- The importance of primary and secondary sampling points
- How to properly sample circulating systems
- Safe, effective high-pressure sampling from hydraulic systems
- Best practices for sampling splash-, collar – and ring-lubricated systems

Fluid Properties Analysis

- Four common root causes of oil degradation
- Recognizing and controlling oil oxidation
- Monitoring lubricant degradation using acid number
- Monitoring lubricant health using FTIR
- Determining oil life using RPVOT
- Recognizing and controlling thermal failure
- How to recognize additive depletion or degradation

Our Approach

We go to great efforts not to overcomplicate the course material. You will leave with the feeling of "This isn't so hard. I can do it." We won't overwhelm you or try to impress you with our skill. We want you to be impressed with your own skill by the time you leave.

Our approach and materials are drawn from years of experience in the field. We base our training on a realistic hands-on approach to oil analysis. All of our materials are based on well-documented research and field – proven principles.

We continually improve our training courses based on trainee suggestions and feedback. Our goal is to make our courses as "user-friendly" and complete as possible.

- Using paper chromatography (blotter spot test) to detect additive and base oil degradation
- Four ways to detect the addition of wrong oil

Contamination Control and Proactive Maintenance

- Seven common contaminants
- Oil cleanliness and oil life extension benefits
- Using the ISO Solid Contamination Code
- Proactive maintenance in three easy steps
- Case studies for proactive maintenance
- Oil filter and breather recommendations
- Portable filtration carts — three ways to use them
- Setting targets for oil cleanliness
- Detecting and controlling moisture contamination
- Selecting moisture removal/filtration methods
- The effects of heat on lubricants
- Controlling air entrainment and foam
- Glycol contamination
- Dealing with soot
- Understanding fuel contamination

Fault Detection and Wear Particle Analysis

- How wear metals are measured using RDE and ICP spectrometers
- Measuring larger particles with rotrode filter spectroscopy
- Using ferrous density to determine the severity of a wear problem
- Using analytical ferrography for advanced fault detection
- Using ferrography for root cause analysis
- Four primary sources of friction in lubricated machinery
- The 10 wear mechanisms that reduce machine life
- The most common wear modes in plain, rolling – element and thrust bearings
- Understanding gear wear
- Understanding wear in hydraulic systems
- Instrument – free onsite tests
- How to inspect vents and breathers
- Tips for effective sight – glass inspection
- Getting valuable information from used filters
- Inspecting reservoirs for clues about lube trouble
- Scenting lubricants to find problems
- Getting visual clues from the oil sample before mailing it out
- Getting into particle analysis for less than \$100

- Turn your kitchen blender into a test for demulsibility and foam tendency
- Screening for water with a simple hot plate
- How an unwanted business card can reveal oil degradation

Interactive Case Studies Workshop

- Individual and group participation in problem-solving exercises
- Exercises in how to read an oil analysis report



Onsite Training

Need to train your team, but it's always been too expensive? More and more companies are realizing the value of bringing training onsite. This flexible and cost-effective option allows you to train as many employees as desired.

The benefits of onsite training are obvious and rewarding:

- > Tailored curriculum to address your company's needs in a more personable, intimate setting
- > Cost-effective return on investment – with significant savings onsite versus travel expenses and time away from the plant, downtime and schedule disruptions are minimized
- > Confidential company issues and solutions may be discussed freely onsite
- > Strong team-building opportunities

Lubrication is the foundation of reliability, lubrication training is the catalyst for change, and Noria is the world leader in lubrication and oil analysis education and consulting. Bring us onsite for tailored, private team training. Call us today at 800-597-5460.



Oil Analysis III

Course Outline

Base Oil Fundamentals

- How mineral base oil groups compare on nine criteria
- How synthetic oils compare to mineral oils
- Advantages and disadvantages of common synthetic lubricants
- How wear and friction control additives work
- The role of fatty acids, AW and EP lubrication films

Understanding and Analyzing Machine Wear

- 16 factors that cause changes in wear debris concentrations
- Effects of water on bearings
- 31 factors leading to abnormal engine wear
- How to enhance the detection of abnormal wear particle trends
- One simple technique to help you detect faults earlier
- Review of technologies used to analyze wear debris
- Particle size sensitivities of wear particle technologies
- Comparison of laboratory emission spectrometers
- How wear particle size influences spectrometric analysis
- How to determine the severity of a wear problem
- How to evaluate lock-step trends
- How to normalize for makeup oil
- Potential sources of metals in oil
- Best applications for elemental analysis of wear metals
- Advantages and disadvantages of analytical ferrography
- How filtergrams compare to ferograms
- How to characterize particle composition by visual inspection
- Shape features of common wear particles
- Common machine wear mechanisms and how to identify them
- 11 sources of spherical wear particles and how to identify them
- How to recognize wear zones in gearing

Integrating Oil Analysis with Vibration Analysis

- Failure detection zones of oil vs. vibration analysis
- Where oil and vibration analysis overlap
- Strengths and weaknesses of oil and vibration analysis on detecting 13 machine problems
- Combining vibration with wear debris analysis for bearing failure analysis

Fluid Properties Analysis

- How viscosity index impacts an oil's ability to lubricate
- Best practices for onsite viscosity analysis
- Four root causes of oxidation and why they are important
- The role of antioxidants and how they work
- Five indicators of oil oxidation
- How to measure oxidation stability
- How acid numbers trend with different types of oils
- Machine diagnostics using neutralization numbers
- Detecting base oil oxidation with FTIR
- Strengths and weaknesses of FTIR
- How sludge and varnish are formed and how to detect them
- Recommendations for a new lubricant testing plan

Additive Depletion

- 14 ways additives are depleted from oil
- How to detect depletion of 10 common additives
- How to find the additive date on an oil analysis report

Contamination Analysis

- Five ways to count and size particles
- Monitoring dust and dirt contamination by elemental analysis
- Tests for high soot load and fuel contamination
- How defoamants work and how they are depleted
- 16 water ingressions sources
- Six additives that are attacked by water contamination and results of each
- Machine effects of water-related problems
- Review of water detection technologies
- How to detect glycol in crankcase oil

Grease Analysis

- Methods for sampling grease
- Common used grease tests and what they measure
- 7 grease performance concerns and how to test
- How grease properties change due to incompatible mixtures

Onsite Oil Analysis Options

- How to integrate onsite with offsite oil analysis
- How to prepare a filter patch for particle contamination assessment
- Review of onsite viscometry, FTIR and particle counter options
- Small, medium and large budgets for an onsite lab: what to buy
- Tips for designing an onsite lab space

Designing an Oil Analysis Program

- How to select candidate machines for oil analysis
- Four steps to optimizing interval-based oil changes
- Considerations for condition-based oil changes
- Factors influencing oil sampling frequencies
- Tips on working with an offsite lab
- Five applications for goal-based limits
- How aging limits signal the approaching end of useful oil life
- Four applications for rate-of-change limits
- Interpreting elemental trends using level limits

Cost—Benefit Analysis

- Seven cost-saving areas for quantifying benefits
- Estimating the value of a predictive maintenance "save"
- Estimating annual savings per machine
- Three project evaluation decision tools
- How to track your program: lubrication KPIs

Trainers



Jim Fitch

Jim Fitch, a founder and CEO of Noria Corporation, is a highly sought-after consultant and trainer described by his clients as "insightful, dynamic and thorough." He has advised hundreds of companies on developing their lubrication and oil analysis programs and has taught more than 400 training courses in more than 20 countries.



Wes Cash

Wes Cash, a Noria senior technical consultant, is an enthusiastic, relatable speaker who connects comfortably with his audience. Wes' style and easy-to-understand approach to the curriculum creates an interactive forum for learning. He is certified by the International Council for Machinery Lubrication as a level II Machinery Lubrication Technician and a level II Machine Lubricant Analyst.



Bennett Fitch

Bennett Fitch, a Noria senior technical consultant, is product manager for Lubrication Program Development, Noria's flagship service. He received his bachelor's degree in mechanical engineering from Georgia Institute of Technology with a concentration in applied tribology. Bennett holds Level II Machine Lubrication Technician and Level III Machine Lubricant Analyst certifications through the International Council for Machinery Lubrication.



Loren Green

Loren Green, a Noria senior technical consultant, is product manager for Training and Education services. He has nearly 30 years of experience in rotating equipment and lubrication, including gauge calibration, electro-pneumatic boiler controls systems, pump repairs and installation, and laser alignment. For Noria, he provides public and private training seminars, as well as specialized lubrication program development.



Alejandro Meza

Noria's Alejandro Meza offers more than 20 years of experience in the lubricant industry, technical services, quality assurance, training, consulting and development in Brazil, Mexico, the United States and the Americas region. He has represented Noria in Brazil, developing and delivering training programs along with field and consulting services, and has also delivered Noria services in Australia, Argentina and Surinam.



Jerry Putt

During a 38-year tenure with Goodyear, Jerry Putt held numerous corporate positions, including managing the mechanical facilities, process engineering and plant engineering departments. In addition to having been an executive member of the Society for Maintenance and Reliability Professionals (SMRP), Jerry has been on the advisory board for the International Council for Machinery Lubrication (ICML) since 2001 and is currently serving as chairman.



Bob Scott

Bob Scott brings to his courses a wealth of "in the trenches" experience. His practical "how to" advice and engaging teaching style consistently receive top scores from audiences. You'll reap the benefits from his 25 plus years of experience with lubricants, lubrication and oil analysis and come away from the training with solid, practical skills.

Get Answers to These and All Your Questions About Oil Analysis!

- How often should I use oil analysis?
- Where is the best place to get an oil sample?
- What are the benefits and drawbacks of screening oil samples before sending them to my lab?
- How clean should I keep my oil and what type of filter should I use?
- What are all these numbers I see on my oil analysis report?
- How do I know which oil analysis lab is right for me?
- How do I set caution and critical alarms for wear metals and additives?
- What steps can I take to ensure that I get a good sample each time?
- How do I determine the remaining useful life of my oil?
- How do I know if I should occasionally "sweeten" my oil with additives?
- What is the best temperature for trending viscosity?
- What are the secrets to catching bearing faults with wear debris analysis?
- Are there any good field tests for oil that don't involve expensive instruments?
- What are the five most important things I should look for on my oil analysis report?
- What are the best cost-reducing strategies using oil analysis?



From Our Resource Center

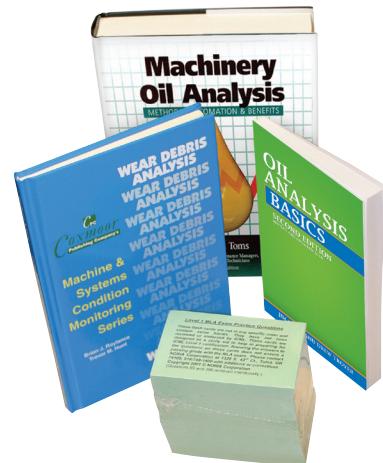
The Level II MLA Certification Study Packet

Level II MLA Flash Cards — More than 440 flash cards give you a head—start for preparing for the ICML Level II MLA certification exam.

Oil Analysis Basics — Our No.1 best-selling book makes oil analysis for machinery condition monitoring easy to understand.

Wear Debris Analysis — Consisting of more than 70 illustrations, figures and tables, this book gives a practical look at wear debris and wear particle analysis in many forms.

Machinery Oil Analysis — Uniquely presenting the entire practice of oil analysis as a condition monitoring tool for machines this in-depth analysis describes the what, when, where and how-to for machinery lubrication concepts, machinery failure and maintenance concepts, machinery failure modes, oil sampling and testing plus statistical analysis and data interpretation.



Your Price: **\$310**

Retail Price: ~~\$378.95~~ Plus \$14 for shipping in the U.S.

Get Certified!

Certification testing will be held on the Friday following the training by the International Council for Machinery Lubrication

How To Certify

To register for a certification exam Visit www.LubeCouncil.org.

Which Certifications?

These courses are designed to help you prepare for the following

ICML certification exams:

- Level II Machine Lubricant Analyst (MLA)
- Level III Machine Lubrication Analysis (MLA)

Find out more about these ICML certification exams at the ICML website: www.LubeCouncil.org.

What Is ICML?

The International Council for Machinery Lubrication (ICML) is a vendor-neutral, not-for-profit organization founded to facilitate growth and development of machine lubrication as a technical field of endeavor. Among its various activities, ICML offers skill certification testing for individuals in the fields of machine condition monitoring, lubrication and oil analysis.

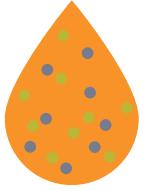


5

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