



Noria Skills Training

# Fundamentals of MACHINERY LUBRICATION

## Learn Precision Lubrication Skills For Maximizing Machine Reliability

### Here's a Sample of What You'll Learn:

- ▶ How to build a safe and effective lubricant storage and handling program
- ▶ How to rate filters and select the right filtration for the job
- ▶ Lubricant labeling and coding systems – what works and what doesn't
- ▶ Industry's best procedures for greasing electric motor bearings
- ▶ How to get the right lubricant in the right place at the right time and in the right amount



**Enroll Today!** Visit [Noria.com](http://Noria.com) or call 800-597-5460

# Apply What You Learn And Reap The Benefits

## Who Should Attend?

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

## 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:

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

## An Organized And Safe Lubricant Storage Room



### Solve Water-In-Oil Problems

## Reduce Electric Motor Failures and Replacement Costs

## Stop Pesky Oil And Hydraulic Fluid Leaks

Leakage is a festering sore to a machine maintenance program. It is often the symptom of a host of other problems. If left unchecked, reduced machine performance is imminent. Eliminating leakage involves the lubrication and oil analysis programs and should be a principal goal.

## Effectively Troubleshoot Lubricant-related Machine Failures



### Stop Costly Bearing Failures

## Compare And Select The Best Lubricants For The Job

With hundreds of lubricant types, base stocks, additive packages and viscosity grades to choose from, how can a person decide which lubricant is right for a machine? The options are endless... synthetic or hydrocracked?... EP or AW?... naphthenic or paraffinic?... ISO VG 32 or 68?

## Improve Equipment Meantime Between Failures

Extend Machine Life  
By Up To **10X**

## 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 directives for change. Learn a proven action plan for extending fluid life.

## Improve Health And Workplace Safety



## A More Effective Oil Analysis Program

When the goals of a lubrication program are in sync with the oil analysis program objectives, oil analysis becomes far more effective. Learn how to align the programs for maximum results.

## Reduce Energy And Fuel Costs

## Create More Effective Lubrication PMs

## Solve Annoying Hydraulic System Problems



## Spend Less On Lubricants And Filters – Not More

# Take The Guesswork Out Of Machinery Lubrication

If you aren't using the correct lubricant at the right time in the right quantity and in the right place, you could be doing your equipment more harm than good. Modern lubrication programs have changed considerably from "old school" methods that have been passed down through generations.

This course contains a strategic collection of the very best practices for applying and managing lubrication that you can take home and begin using right away.

## You'll Gain Practical New Skills That You Can Use Right Away:



### The Secrets Of Lubricant Selection.

This course will empower you with the knowledge to understand important lubricant properties and strategies to select the correct lubricant for each machine application.



### The Best Practices For Lubricant Storage, Handling And Dispensing.

Learn how award-winning maintenance programs design lube storage areas, dispensing stations and transfer carts.



### The Four Rs Of Lubrication.

Right lubricant, right time, right quantity and right place. If these four basic elements aren't properly addressed, you could be doing your equipment more harm than good. Learn the newest methods for implementing the best lubrication practices.



### Grease Gun Or Lethal Weapon?

In the hands of an untrained operator, a grease gun can deliver pressure up to 15,000 psi. That's 30 times what a typical bearing seal can handle. Once the bearing seal is broken, the bearing is on its way to early failure. This course will teach you proper grease gun practices.



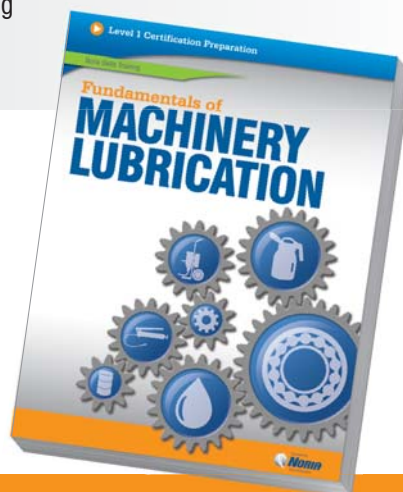
### Effective Oil Analysis With Precision Oil Sampling.

Learn how to get data-rich oil samples, exactly where to install oil sampling ports, and what sampling equipment should and shouldn't be used.

## What You Get When You Attend

- Case Studies
- Checklists
- How To's
- Look-up Charts
- Worksheets

When you leave this course, you'll consider your course manual an indispensable on-the-job reference for years to come.



## Satisfied Customers Say It Best...

"Packed with powerful information that can be applied with measureable results, this course provides the right training to influence a cultural change in maintenance and operation organizations."

*Brian Baldwin, Reliability Engineering Manager, Dynergy*

"ABSOLUTELY AWESOME! Should reduce downtime 25 to 50 percent."

*Scott Gilreath, Lube Tech, UNICCO*

"Until I attended this training, I had no idea how poor our best practices were. Improvements will be easy. Justifications will be easy. Recouping the cost of this class will take about a week!"

*Tim Pendley, Mechanical Engineer, Westlake Chemical*

"Implementing the basic principles taught during this training would prevent premature failure of most all of our rotating machinery!"

*Brittany Russo, Reliability Engineer, Braskem*

"I think the information I learned can improve our hydraulic systems by 40 percent."

*Vernon Player, PDM Tech, International Paper*

"This training set a good foundation of knowledge to make a measurable difference in our lubrication program."

*David Hull, Reliability Supervisor, Holcim, Inc.*

"This course has provided me with an in-depth view on how to create a world-class lubrication program."

*Dennis Hill, Facility Engineer, Alcoa*

**"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	Heinz
Alabama Power	Houston Metro Transit
Alcoa	International Paper
Alumax	Invista
Ameren	John Deere
American Electric Power	Kinder Morgan
ArcelorMittal	Koch Industries
Archer Daniels Midland	Lockheed Martin
Barrick Goldstrike	Lukens Steel
BHP	M&M Mars
Boeing	MillerCoors
Boise Cascade	Michelin
BP	Mosaic
Cargill	Noranda Aluminum
Castrol	Nova Chemicals
Caterpillar	Owens Corning
Centralia Mining	OxyChem
Chevron	Pacific Gas & Electric
Citgo	Peabody Energy
Clopak	Pfizer
ConAgra Foods	Powder River Coal
ConocoPhillips	PPG Industries
Constellation Energy	Procter & Gamble
Dow Chemical	Progress Energy
Dow Corning	Reliant Energy
DTE Energy	Rio Tinto
DuPont	Seattle Times
Dynegy	Seminole Electric
Eli Lilly	Shell Oil
Entergy	Southern Company
ExxonMobil	Temple-Inland
First Energy	Texaco
Florida Power	Texas Instruments
Ford Motor Co.	Toyota
Formosa Plastics	TXU Energy
General Electric	Unilever
General Motors	U.S. Army
Geneva Steel	U.S. Navy
Georgia Pacific	U.S. Postal Service
Georgia Power	USG Corporation
Goodyear	Verso Paper
Great Lakes Chemical	Via Rail Canada
Harley-Davidson	Westinghouse
Holcim	Weyerhaeuser
Honeywell	Whirlpool
Intel	Willamette Industries

## Course Outline

### How Lubrication Affects Machine Reliability

- Financial benefits from achieving lubrication excellence
- Four equipment maintenance strategies and when each applies
- Important implementation steps to lubrication excellence

### Lubrication Fundamentals

- Six important functions of lubricating oils
- How oils and greases are formulated and why it is important
- How friction is generated in lubricated machinery
- The importance of oil film thickness and critical clearances

### Understanding Additives, Base Oils And Grease Thickeners

- How lubricant properties irreparably change
- Seven important physical properties of a base oil
- The importance of API's five base oil categories
- What causes grease to dry out and 18 ways to prevent it
- How to detect the root causes of lubricant oxidation
- When to select one of the six most commonly used synthetic base oils
- How to use temperature to determine the right base oil for your machine
- How to select grease thickeners for your application

### Lubricant Performance Properties

- Key additives that enhance lubricant performance
- Viscosity grades, measurement and reporting
- Why Viscosity Index is important
- What causes oil viscosity to change and how to set monitoring limits
- Lubricant performance tests and reporting – what you need to know
- How water contamination generates other contaminants
- How to control and eliminate aeration problems

### Food-grade And Environment-friendly Lubricants

- Important USDA requirements and government regulations for food-grade lubricants
- What you need to know about food-grade additives, base oils and grease thickeners
- Guidelines for food-grade lubricants

### Lubricating Grease Application Methods

- How to protect against incompatible grease mixtures
- Advantages and disadvantages of centralized lubrication systems
- Best practices for greasing motor bearings
- How to control pressure when greasing bearings
- The unique problems caused by over-greasing – specific steps to eliminate
- 3 critical instructions to give your electric motor rebuild shop
- Comparing single- and multi-point lubrication options
- How to calculate greasing intervals and quantity
- Best practices for ultrasonic/sonic-based greasing

### Lubricating Oil Application Methods

- Overview of oil lubrication methods and devices
- How to use oil mist and other automatic lubrication methods
- Using pressure spray methods for gearboxes
- Best practices for the maintenance of grease guns and fittings
- How to protect against problems caused by constant-level oilers
- Overview of single-point direct lubrication systems

### Journal Bearing Lubricants

- The 8 most common journal bearing lubrication problems
- How to select journal bearing viscosity based on speed

### Rolling-element Bearing Lubricants

- The nine critical factors affecting rolling-element bearing lubricant selection
- How to convert required operating temperature viscosity to ISO viscosity grades

### Gear Lubricants

- 5 key requirements for gear oil
- How to select the best viscosity for a gear lubricant
- Best practice guidelines for storing spare gearboxes – lubrication matters!
- 10 conditions that may require synthetic gear lubricants
- Lubrication best practices for enclosed gears – a 12-point checklist
- Mastering the challenges of open gear lubrication



## Automotive And Mobile Equipment Drive-line Lubricants

- How to read a motor oil label – what really matters
- The six critical objectives a motor oil must accomplish
- Understanding API service classifications for engine and gear oils
- The No.1 reason automatic transmission fluids fail and how to protect against it
- Service classifications for automotive greases – how to select
- Extending engine life – surprising engine oil filter study results

## Compressor Lubricants

- Steps you can take right now to combat compressor lubricant failure
- The most common compressor lubricant stressors
- When to use synthetic compressor lubricants and why

## Steam And Gas Turbine Lubricants

- Why turbine/generator lubricants are the No.1 contributor to forced outages
- Comparing steam and gas turbine oils – how they differ
- Checklist for best practice steam turbine lubrication

## Hydraulic Fluids

- How to select the ideal hydraulic fluid viscosity for gear, vane and piston pumps
- Nine key hydraulic fluid requirements and why they matter
- Specific conditions that may require a synthetic hydraulic fluid
- Fire-resistant hydraulic fluids – what you need to know
- Hydraulic system maintenance best practices – 21-point checklist

## Contamination Control

- Strategies for building reliability through contamination control
- The seven most destructive contaminants and how to control them
- Specific steps for managing a proactive lubricant management program
- The ISO Solid Contaminant Code – understand it, track it
- 10 ways to get more mileage out of portable filter carts
- How dirt, metal particles and soot mechanically destroy machine surfaces

- Guidelines for controlling machine surface fatigue and extending machine life
- The No.1 cause of machine wear and how to manage it
- How to set realistic cleanliness levels for lubricants
- Effective lubricant contamination control strategies for extending machine life
- 4 ways water contamination attacks lubricant additives
- How to set limits for water-in-oil contamination
- Managing the root causes of foam and aeration
- Best practices for excluding and removing contaminants
- The right way to control contamination in tanks and sumps
- How oil filters are rated
- Calculating the clean-up rate for portable filters
- Best practices for removing water contamination from oil
- The unique problems created by varnish – how to remove and stop it

## Oil Drains, Flushing And Reservoir Management

- How to optimize and extend oil change intervals
- Interval vs. condition-based oil changes – pros and cons
- Metrics for monitoring lubricant consumption
- Best practices for oil changes
- Know how and when to perform a flush
- The best procedures for oil draining and refilling
- How and when to use the bleed-and-feed strategy for extending oil drains
- Selecting the right cleaning and flushing procedures

## Storing, Handling And Managing Lubricants

- How to set up a world-class lube room
- How to know when to reject a new oil delivery
- How to optimize your lubricant selection and procurement process
- How to implement a lubricant consolidation program and select suppliers
- Used lubricant storage, handling and disposal best practices
- Bulk lubricant storage do's and don'ts
- Guidelines for storing and handling drums
- Lubricant dispensing options and what you must avoid
- Lubricant coding and identification systems – what works and what doesn't

- Portable oil transfer and filter cart selection advice
- How and where to store oil transfer and filter carts
- Understanding and managing lubricant storage life
- Keeping grease fresh – best practices for storage

## Design And Inspect for Lube Excellence

- World-class strategies for accessorizing equipment for lubrication excellence
- Seven critical accessories for lubricant inspection and sampling
- The right machine accessories for effective contamination control

## Used Oil Sampling And Analysis Fundamentals

- What oil analysis can tell you
- Types and categories of oil analysis
- Applications for oil analysis
- Overview of oil analysis tests
- Elements of a successful oil analysis program
- How clean should oil sample bottles be?
- How to find the best sampling locations
- Oil sampling valve and hardware recommendations
- A quick method for optimizing sampling intervals
- An oil sampling technique that ruins trending
- The importance of primary and secondary sampling points
- Advice for sampling hard-to-reach machines
- How to properly sample circulating systems
- Safe, effective high-pressure sampling from hydraulic systems

## Essential Field Inspections

- 12 questions your oil filter will answer about your machine
- Visual inspections you can get big results from right now
- Quick tips for using scent, sound and touch to inspect lubricants



**Take This Course Online!**  
**Get Started Now**  
**Visit [LubeIQ.com](http://LubeIQ.com)**

## Get Certified!

Level I certification testing will be held on the Friday following the training by the International Council for Machinery Lubrication.



## How To Certify

There are two ways to register for a certification exam.

Online: [www.LubeCouncil.org](http://www.LubeCouncil.org)  
Phone: 918-259-2950

## Which Certifications?

This course is designed to help you prepare for the following ICML certification exams:

- Level I Machine Lubricant Analyst (MLA)
- Level I Machine Lubrication Technician (MLT)

Find out more about these ICML certification exams at the ICML web site: [www.LubeCouncil.org](http://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.

## On-Site Training

 We can customize Fundamentals of Machinery Lubrication – or any of our other courses – to meet your unique needs. We'll provide expert instruction at a time and place most convenient for your group. Want to know more? Call 800-597-5460. Whether you have 5 or 500 people to train, Noria is the answer.

## Trainers



### Jim Fitch

Jim Fitch, a founder and president 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.



### Jeremy Wright

Jeremy Wright, a Noria senior instructor, provides a lively interactive forum for learning at his courses. As a consultant, Jeremy has helped numerous Fortune 500 companies develop lubrication procedures, benchmark to best practices and implement world-class lubrication programs.



### 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+ years of experience with lubricants, lubrication and oil analysis and come away from the training with solid, practical skills.

## From Our Resource Center...

### The Level 1 Study Packet

The Level 1 MLT / Level 1 MLA Study Packet Includes:

- **Flash Card Pack** 385 flash cards to help you prepare for both ICML Level I MLT and Level I MLA certification.
- **125-Question Practice Exam** This multiple-choice practice test is a great self-assessment tool and helps you prepare for both ICML Level I MLT and MLA certification. Licensed for use by one person.
- **How To Take A Multiple-Choice Exam** Includes advice from professionals who have passed ICML certification exams as well as helpful hints for the night prior to the exam, steps to take before entering the exam room, techniques to manage your time during the exam and advice for handling different types of questions.
- **Lubrication Fundamentals** Discusses lubricant basics, machine elements that require lubrication, methods of application, lubrication, lubricant storage and handling, and lubricant conservation.
- **Oil Analysis Basics** Presents the fundamentals of oil analysis for machinery condition monitoring in an easy-to-understand format. You'll learn everything from how to take a proper oil sample to how to select a test slate for your applications.
- **The Practical Handbook Of Machinery Lubrication** Once you start reading this book, you probably won't stop until you finish it. It is that easy to read. You'll find understandable explanations of how lubricants work, what they're made of and how they break down. Topics ranging from engine lubricants to industrial oils and hydraulic fluids are covered.



Preparation Tools For  
ICML Level 1 MLT  
And Level 1 MLA

Retail Price: \$410.95

**Your Price: \$355**  
Plus \$14 for shipping in the U.S.

# Fundamentals Of Machinery Lubrication Registration Form

**YES!** Please register me for the three-day *Fundamentals of Machinery Lubrication* training course for only \$1,195 per person.

## 4 Ways To Register



Online  
[www.noria.com](http://www.noria.com)



Call toll-free!  
800-597-5460 Or 918-749-1400



Mail the  
registration form!



Fax your registration!  
918-746-0925

## 1 Training Course

Course City: \_\_\_\_\_

Course Date: \_\_\_\_\_

## 2 Who Will Be Attending

Mr./Ms.: \_\_\_\_\_

Job Title: \_\_\_\_\_

E-mail: \_\_\_\_\_

*(Please list additional registrations on a separate sheet and attach)*

## 3 Company Information

Organization: \_\_\_\_\_

Address: \_\_\_\_\_

Mail Stop: \_\_\_\_\_

City: \_\_\_\_\_ State/Province: \_\_\_\_\_

Country: \_\_\_\_\_ Zip/Postal Code: \_\_\_\_\_

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_

E-mail: \_\_\_\_\_

## 4 Industry Information

- |   |   |  |
|---|---|--|
| <input type="checkbox"/> Agricultural                       | <input type="checkbox"/> General Manufacturing or Other | <input type="checkbox"/> Pulp & Paper, Lumber                    |
| <input type="checkbox"/> Automotive Manufacturing           | <input type="checkbox"/> Government/Military            | <input type="checkbox"/> Textiles & Apparel                      |
| <input type="checkbox"/> Aviation, Rail, Maritime, Trucking | <input type="checkbox"/> Laboratory                     | <input type="checkbox"/> Tire/Rubber                             |
| <input type="checkbox"/> Chemicals & Allied Products        | <input type="checkbox"/> Mining/Metals                  | <input type="checkbox"/> Tobacco                                 |
| <input type="checkbox"/> Construction & Allied Products     | <input type="checkbox"/> Petroleum Products & Refining  | <input type="checkbox"/> Utilities (Electric, Water, Gas, Waste) |
| <input type="checkbox"/> Consulting/Services/Training       | <input type="checkbox"/> Pharmaceutical                 | <input type="checkbox"/> Other                                   |
| <input type="checkbox"/> Food Process Manufacturing         | <input type="checkbox"/> Plastics & Allied Products     |  |

## 5 Certification Study Packet

The Level I MLT/MLA Certification Study Packet - \$355

*\$14 for shipping will be added to all study packet orders.*

Quantity \_\_\_\_\_

## 6 Method Of Payment

Payment is due before the course

Check enclosed payable to:  
Noria Corporation

Mail to:  
Noria Corporation  
ATTN: Training  
1328 East 43rd Court  
Tulsa, OK 74105

Charge to:



Card Number: \_\_\_\_\_

Expiration Date: \_\_\_\_\_

Name on Card: \_\_\_\_\_

Signature: \_\_\_\_\_

Our Purchase Order is attached.  
P.O.# \_\_\_\_\_

## Locations And Dates

The phone numbers below are for booking hotel reservations only. To register for the course call 800-597-5460.

### Houston, TX

May 22-24, 2012  
Doubletree  
15747 John F. Kennedy Blvd.  
Houston, TX 77032  
281-848-4000

### Nashville, TN

August 7-9, 2012  
Renaissance Nashville  
611 Commerce Street  
Nashville, TN 37203  
615-255-8400

### Milwaukee, WI

July 10-12, 2012  
Hilton Milwaukee River  
4700 North Port Washington Rd.  
Milwaukee, WI 53212  
414-962-6040

### Las Vegas, NV

October 23-25, 2012  
Embassy Suites Convention Center  
3600 Paradise Road  
Las Vegas, NV 89169  
702-893-8000

### Toronto, ON Canada

July 24-26, 2012  
Novotel Toronto Centre  
45 The Esplanade  
Toronto, ON, M5E 1W2  
416-67-8900

*Check Noria.com for more dates and locations*

## Registration Information

Check-in: Tuesday, 7:30 a.m. – 8:00 a.m.

Program: Tuesday – Thursday, 8:00 a.m. – 4:00 p.m.

The fee for Fundamentals of Machinery Lubrication is \$1,195 per person. For fast registration, call 800-597-5460 toll-free between 8 a.m. and 5 p.m. central time Monday through Friday. Or, fax your registration form to 918-746-0925 at any time. The fax line is open 24 hours a day, seven days a week. We will send a confirmation of your registration via e-mail. If your confirmation does not arrive within 48 hours, please contact us to process your registration immediately. In lieu of cash, check and credit cards are preferred when paying at the training site.

## What's Included

Your fee provides you the best training around, a comprehensive manual, a free package of training materials, continental breakfast, lunch each day and refreshments. Certification exam fees are not included.

## Cancellations And Substitutions

You may cancel your registration prior to the course date or send a substitute. If you cancel prior to the course date, we will refund your entire payment, cancel your invoice or, if you prefer, apply your payment to another Noria program of your choice scheduled within 12 months of your original event. Please note that if you do not cancel and do not attend, you are still responsible for payment.

## Certification Exams

Certification testing is offered by the ICML the morning following this training course at the same hotel. Please contact the ICML to register for the certification exam or register online at their web site:

International Council for Machinery Lubrication

Phone: 918-259-2950 • Fax: 918-259-0177

E-mail: [info@lubecouncil.org](mailto:info@lubecouncil.org) • Online: [lubecouncil.org](http://lubecouncil.org)

Note: If you've already registered by phone, fax or online, please do not return this form.