“The information from this course could save my company as much as $20,000 in monthly oil costs.”

- Jeff Smith, Maintenance Planner, Mueller Copper Tubes

Level I & II

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

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Certification Series

Presented by Noria Corporation
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

What Industries Will Benefit?
• Aerospace
• Automotive Manufacturing
• Earthmoving
• Food and Beverage
• General Manufacturing
• Lumber and Wood
• Municipal Utilities
• Petrochemical
• Pharmaceuticals
• Primary Metals
• Power Generation
• 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

Apply What You Learn And Reap The Benefits

An Organized and Safe Lubricant Storage Room

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.

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?

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.

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.

Create More Effective Lubrication PMs

Stop Costly Bearing Failures

Effectively Troubleshoot Lubricant-related Machine Failures

Solve Water-in-Oil Problems

Reduce Energy And Fuel Costs

Improve Equipment Meantime Between Failures

Solve Annoying Hydraulic System Problems

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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.

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

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.

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. These courses will teach you proper grease gun practices.

What You Get When You Attend
• Case Studies
• How To’s
• Worksheets
• Checklists
• Look-up Charts

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

Vendor-neutral Makes A Difference!

Alfredo Romaro, Maintenance Technician, Kawneer Company

Satisfied Customers Say It Best...

“Packed with powerful information that can be applied with measurable 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

“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
How Lubrication Affects Machine Reliability
- The causes of machine failure
- Understanding the importance of choosing the right maintenance strategy
- How to identify which strategy is currently being used in your plant
- Recognize how your current maintenance strategy impacts profitability
- Effective lubrication strategies that prevent failure
- Differentiate when to apply preventive, proactive and predictive maintenance
- Understand the value of predictive technologies

The Fundamentals of Tribology
- The six components of a tribological system and their importance to reliability
- Six important functions of lubricants
- The fundamental relationship between speed, load and viscosity
- How friction is generated and the impact of wear in lubricated machinery

Lubricant Fundamentals
- The three lubricant film types and the importance of film thickness and critical clearances
- How kinematic and absolute viscosity are measured
- The impact of temperature when determining viscosity selection for your machine
- What causes oil viscosity to change
- Viscosity index and more than 10 characteristics that impact lubricant selection
- How oils and greases are formulated and why it is important
- Understand the difference between mineral, synthetic and vegetable base oils and when to use each
- Seven important physical properties of a base oil
- The importance of the API’s five base oil categories

Key Lubricant Additives
- The three important roles of an additive and how they work to increase lubricant effectiveness
- Eight key additives that enhance lubricant performance and when to choose the right one for your machine’s needs

Grease Lubricants
- How to select grease thickeners for your application
- How to avoid potential compatibility and performance challenges with More than 13 different types of thickeners
- Understand the advantages and disadvantages with grease lubrication
- Using the NLGI to choose the right grease
- What causes grease to dry out and 18 ways to prevent it

Food-grade and Environment-friendly Lubricants
- Important 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

Lubricant Application
- A basic overview of lubrication considerations based on machine type
- How environmental and operational influences affect the lubricant selection process

Journal and Bearing Application
- The eight most common journal bearing lubrication problems
- How to select journal bearing viscosity based on speed and load factors

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
- Five key requirements for gear oil
- How to select the best viscosity for a gear lubricant
- 10 conditions that may require synthetic gear lubricants
- Lubrication best-practices checklist for enclosed and open gears

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
- 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

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
• How to protect against problems caused by constant-level oilers
• Overview of single-point direct lubrication systems

Lubricating Grease Application Methods
• 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
• Three 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

Contamination Control
• Strategies for building reliability through contamination control
• The seven most destructive contaminants and how to control them
• Know the factors that contribute to lubricant failure
• Understand the thermal and oxidation process, its effects on lubricants and additives
• Recognize what causes lubricant degradation
• Recognize the byproducts of lubricant failure and wear debris
• Distinguish the specific test that measures the forms of lubricant degradation and wear debris monitoring
• Interpret data to set alarms and limits based upon test results
• 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

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
• Used lubricant storage, handling and disposal best practices
• Bulk lubricant storage do’s and don’ts
• Best practices for the maintenance of grease guns and fittings
• 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-oil and grease stock rotation principles

Used Oil Sampling and Analysis Fundamentals
• What oil analysis can tell you
• Application, types and categories of oil analysis that assure lubrication effectiveness
• Learn industry best practices for oil sampling, including valve and hardware recommendations
• Develop a sampling procedure that identifies machines to sample, sample locations and frequency
• How clean should your sample bottles be?
• Quick methods for optimizing sampling intervals
• Advice for sampling hard-to-reach machines
• How to properly sample circulating 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 all your senses to inspect lubricants

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

Take This Course Online! Get Started Now. Visit LubeIQ.com
Level II
Machinery Lubrication
Course Outline

Lubrication PM Optimization and Design
• Five questions to ask about every lubrication PM
• How to rationalize and modernize your lubrication PMs
• What causes grease dry-out and when it should be refreshed

Troubleshooting Lubrication Problems
• How to troubleshoot lubrication problems effectively
• Four troubleshooting data-collection guidelines
• How to recognize wear patterns on gear teeth
• 28 tips for preventing gear failures
• How to effectively troubleshoot bearing failures

Lubrication and Oil Analysis Metrics
• Four metrics for measuring lubrication effectiveness
• How to track costs and savings
• Measuring the impact of lubrication excellence on RONA

Oil Drains, Flushing and Reservoir Management
• 10 ways to ensure sump lubricant health
• How to optimize interval-based oil changes
• Strategies for condition-based oil changes
• How to use a bleed-and-feed strategy for extending oil drains
• How to trend oil consumption ratios
• Best practices for oil draining and refilling

Accessorizing New Equipment for Lubrication Excellence
• Checklist of important machine accessories for inspections and sampling
• Seven strategic machine accessories for contamination control

Lubricating Grease Application
• What to do before and after installing an electric motor
• How to calculate ideal relubrication volume for electric motors
• How to optimize bearing regreasing intervals
• Strategy for ultrasonic/sonic-based regreasing volume
• How to determine bearing grease fill levels

Lubricant Application
• Seven important guidelines for lubricating plain bearings
• Considerations for proper worm-gear lubrication
• Best practices for selecting and applying open gear lubricants
• Relubrication frequency recommendations for gear and grid couplings
• 14 best practices for steam turbine lubrication
• Best practices for process pump lubrication
• Best practices for lubricating compressors

Lubrication Fundamentals
• Factors that influence hydrodynamic lubrication
• Five things that can change oil film thickness
• How gear speed influences lubrication
• Seven lubrication factors for finding the “sweet spot” for energy consumption

Base Oils
• API base oil groups and why they are important
• How synthetic base oil properties compare
• Strengths, weaknesses and applications for six synthetic base oils
• Compatibility of eight seal materials with different fluid types

Viscosity and Viscosity Index
• Understanding the viscosity/temperature chart
• Cold temperature motor oil viscosity basics
• How oil aging affects oil viscosity
• How slight errors in viscosity selection can result in wear and energy losses
• How to convert required operating temperature viscosity to ISO viscosity grades

Oxidation and Thermal Stability
• How antioxidants alter oil life
• How oxidation stability is measured and why it’s important
• Why varnish, sludge and deposits are a problem
• The typical sequence of events leading to varnish

Air Release and Foam Control
• Causes of poor air release and foaming in oil
• How to know when oil foam is a problem and how to troubleshoot
• Strategies for controlling aeration and foam

Lubricant Degradation
• How to detect mixed lubricants
• Five ways lubricants degrade irreparably
• Nine ways additives are rendered useless
• Lubricant shelf life – factors to control leakage stability
• How fluid properties affect seal performance
• How to use dye for efficient leak detection
• Pros and cons of quick-stop leak agents
Lubricant Selection and Consolidation
- The seven most critical factors when selecting a grease
- Properties of grease that affect pumpability
- How service temperature affects different grease types
- How grease properties change due to incompatible mixtures
- Importance of grease properties by application
- Eight critical factors for selecting a lubricant
- Basic and advanced approaches for consolidating lubricants
- Matching lubricants to machines based on robustness, price and usage
- Managing the lubricant vendor service and delivery quality
- How new lubricant quality can be compromised
- How to read an oil can
- How to determine when to select a monograde vs. a multigrade oil
- Using bearing speed factors to determine NLGI numbers
- Selection criteria for electric motor grease
- 10 desired properties for refrigeration lubricants
- Five requirements for gear oils and why they are important
- How to decide when synthetic gear lubes are required
- Three methods for selecting gear oil viscosity
- Conditions when synthetic hydraulic fluids may be required
- How to select the correct hydraulic fluid viscosity
- How the hydraulic fluid selection process can save money
- Four important characteristics every chain lubricant should have

Four BIG Reasons to Attend

1. Our trainers are the best...period. Noria technical consultants are the “best and brightest” with a proven track record of teaching complex technical theories and practices in an easy-to-understand format. What’s more, these approachable, exciting communicators will provide you with the most powerful seminar you’ve ever attended.

2. We give you the most important, up-to-date information. There’s a lot of information out there that could take years to gather on your own. In a few fast-paced days, we’ll give you what we know to be the most current and important information to help you and your company in the journey toward world-class status.

3. Practicality is emphasized. You will leave this seminar with specifics to apply immediately. We promise to arm you with the knowledge to improve your lubrication program.

4. Our guarantee is unconditional, straightforward and the very best in the industry. How can we be so confident? Because we work hard before the seminar to make sure you’re happy after the seminar. Pertinent, up-to-date information, a simple registration process, a convenient meeting location and a trainer who captures your attention and takes you on an exciting journey you won’t soon forget are just a few of the things Noria provides for you. Thousands of satisfied participants from around the world are sold on Noria seminars. Why not join them?
Join This List Of World-Class Companies That Have Benefited From Noria Training


Onsite Training

Need to train your team, but it has 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.
The Level I MLT Study Packet
This Study Packet is designed to be used for both ICML Level I MLT and Level I MLA certification. It includes:

**Flash Card Pack** — 385 flash cards to help you prepare for ICML Level I MLT certification.

**125-Question Practice Exam** — This multiple-choice practice test is a great self-assessment tool and helps you prepare for ICML Level I MLT 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.

**Machinery Lubrication Reference Guide** — is packed with useful checklists, look-up tables, charts and illustrations and is designed to make information easily accessible where you need it.

**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.

**From Our Resource Center**

**Retail Price:** $334.95  
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Plus $14 for shipping in the U.S.

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

- Level I Machine Lubrication Technician (MLT)
- Level II Machine Lubrication Technician (MLT)

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.
We can customize Level I or II 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 five or 500 people to train, Noria is the answer.

**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.

**Jeremy Wright**
Jeremy Wright, Noria’s VP of Technical Services, is a senior instructor who provides a lively, iterative 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.

**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.

**Customize Your Courses**

We can customize Level I or II 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 five or 500 people to train, Noria is the answer.
Course Fees: Level I or Level II: $1,295

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

3. COMPANY INFORMATION
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Check Noria.com for 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 either Level I or Level II is $1,295 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 available, a comprehensive manual, a free package of training materials. Certification exam fees are not included.

Cancellations and Substitutions
   If your plans change and you cannot attend the course, a colleague can attend in your place. Registrations cancelled at any time prior to 10 days before the course are not subject to any fee. Cancellations after that time are subject to a $75 service charge. Or, your registration fee can be transferred to another program of your choice to be taken within 12 months. Visit www.noria.com/train/registration for the complete cancellation and transfer policy.

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 website:

International Council for Machinery Lubrication
   Fax: 918-259-0177
   E-mail: info@lubecouncil.org • Online: lubecouncil.org

Find a location near you.
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