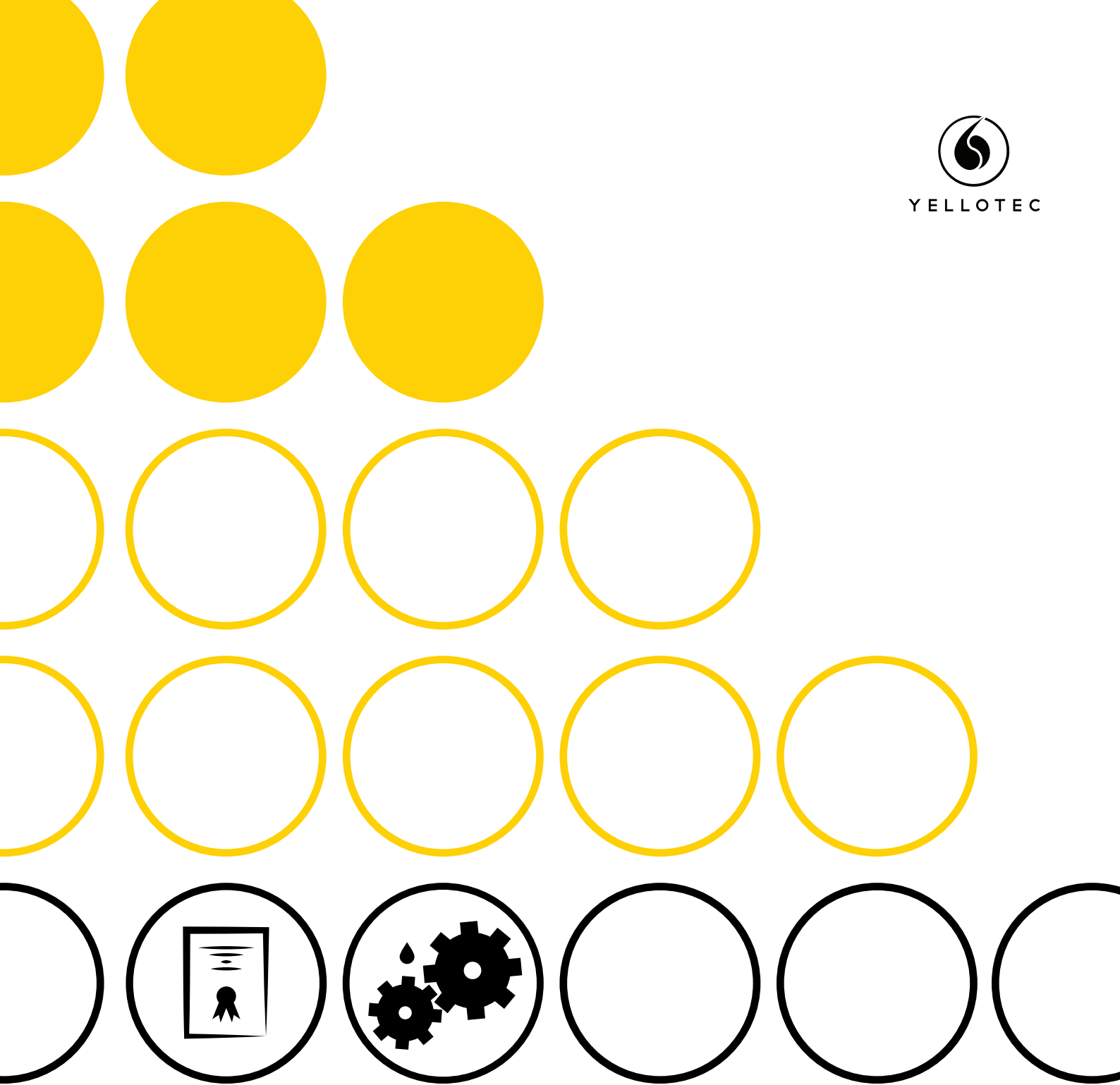




YELLOTEC



# Machinery Lubrication

## Level 1 - 2

Learn Precision Lubrication Skills For Maximizing Machine Reliability

# Take The Guesswork Out Of Machinery Lubrication

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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 labelling 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

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.

## Apply What You Learn And Reap The Benefits

### Compare and Select the Best Lubricants for the Job

With hundreds of lubricant types, basestocks, 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.

### 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.

### 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.

An Organized and Safe Lubricant Storage Room

Solve Annoying Hydraulic Problems

Effectively Troubleshoot Lubricant-related Machine Failures

Reduce Electric Motor Failures and Replacement Costs

Improve Health and Workplace Safety

Reduce Energy And Fuel Costs

Stop Costly Bearing Failures

Extend Machine Life Up To 10X

Improve Equipment Meantime Between Failures

Solve Water-In-Oil System Problems

Create more Effective Lubrication PMs

Spend Less on Lubricants and Filters not More

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

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## 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

## 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 is 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 machinery lubrication 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 machinery lubrication program.

## Created by Noria

Founded in 1997 with the single focus of helping industry improve machine reliability through best practice lubrication and oil analysis. Over the past 15 years, Noria's approach has changed how organizations manage and monitor lubricants for maintaining optimum

reliability and safety. They are the trusted advisor to the world's leading organizations.

Noria's practices are disseminated through world-leading training courses, consulting services, publications, videos and books.

# Machinery Lubrication Level 1

## Course Outline

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This course provides foundational training in industrial lubricants, machinery lubrication and oil sampling. It lays the groundwork for establishing a lubrication and oil analysis program, and is designed to help you prepare for the ICML Level I Machine Lubrication Technician (MLT I) or Level I Machine Lubricant Analyst (MLA I) certification.

1. 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
2. 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
3. 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
4. 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
5. 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
6. Food-grade and Environment-friendly Lubricants
  - Important requirements and government regulations for food-grade lubricants
  - What you need to know about foodgrade additives, base oils and grease thickeners
  - Guidelines for food-grade lubricants
7. Lubricant Application
  - What are the unique lubrication considerations of various machine types
  - How the machine's type of work and environment of the machine impact the choice of lubricant
  - The constraints of oil and grease in terms of size, load and speed when choosing a lubricant



*Machinery Lubrication  
Level 1  
Course Outline  
Continues*

- Identify the correct additive systems for specific lubricant applications
  - How environmental and operational influences affect the lubricant selection process
8. Journal and Bearing Application
    - The eight most common journal bearing lubrication problems
    - How to select journal bearing viscosity based on speed and load factors
  9. Rolling-element Bearing Lubricants
    - The nine critical factors affecting rolling-element bearing lubricant selection
    - How to convert the required operating temperature viscosity to ISO viscosity grades
  10. Gear Lubricants
    - Five key requirements for gear oil
    - How to select the best viscosity for a gear lubricant
    - Best-practice guidelines for storing spare gearboxes
    - 10 conditions that may require synthetic gear lubricants
    - Lubrication best practices checklist for enclosed and open gears
  11. Automotive and Mobile Equipment Drive-line Lubricants
    - How to read a motor oil label – what really matters
    - The six critical objectives 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
  12. 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
  13. Steam and Gas Turbine Lubricants
    - Comparing steam and gas turbine oils – how they differ
    - Checklist for best-practice steam turbine lubrication
  14. 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
  15. 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
  16. 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

*Machinery Lubrication  
Level 1  
Course Outline  
Continues*

17. Contamination Control
  - Strategies for building reliability through contamination control
  - The seven most destructive contaminants and how to control them
  - 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
  - Best practices for excluding and removing contaminants for extending machine life
  - 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
18. 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
19. Used Oil Sampling and Analysis Fundamentals
  - 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
20. Essential Field Inspections
  - Application, types and categories of oil analysis
  - Basics of oil sampling, including valve and hardware recommendations
  - Advice for sampling hard-to-reach machines
  - How to properly sample circulating systems
  - Safe, effective high-pressure sampling from hydraulic systems
21. Design and Inspect for Lube Excellence
  - 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
21. 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

# Machinery Lubrication Level 2

## Course Outline

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This course is designed to help you prepare for the ICML Level II Machine Lubrication Technician certification. It covers advanced machinery lubrication topics including lubricant selection, troubleshooting lubrication problems, metrics, PMs and more.

1. 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
2. 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
3. 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
4. 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
5. Accessorizing New Equipment for Lubrication Excellence
  - Checklist of important machine accessories for inspections and sampling
  - Seven strategic machine accessories for contamination control
6. 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
7. Lubricant Application
  - Seven important guidelines for lubricating plain bearings
  - Considerations for proper wormgear 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
8. 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
9. 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
10. 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

*Machinery Lubrication  
Level 2  
Course Outline  
Continues*

- How to convert required operating temperature viscosity to ISO viscosity grades
11. 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
  12. 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
  13. 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
  14. 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



# Certification

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 endeavour.



Among its various activities, ICML offers skill certification testing for individuals in the fields of machine condition monitoring, lubrication and oil analysis.

## Tribology Courses Breakdown

| Technology                       | Noria Course                          | ICML Examination                               |
|----------------------------------|---------------------------------------|--|
| Field Lubricant Analysis Level 1 | Fundamentals of Machinery Lubrication | Level I Machine Lubricant Analyst (MLA I)      |
| Field Lubricant Analysis Level 2 | Practical Oil Analysis                | Level II Machine Lubricant Analyst (MLA II)    |
| Field Lubricant Analysis Level 3 | Advanced Oil Analysis                 | Level III Machine Lubricant Analyst (MLA III)  |
| Machinery Lubrication Level 1    | Fundamentals of Machinery Lubrication | Level I Machine Lubricant Technician (MLT I)   |
| Machinery Lubrication Level 2    | Advanced Machinery Lubrication        | Level II Machine Lubricant Technician (MLT II) |

# Noria Publications

Available at <http://store.noria.com/>

Along with being the publishers of Machinery Lubrication magazine and Reliable Plant magazine, Noria Corporation provides a range of educational (consulting and training) publications related to advanced machine reliability and maintenance technologies.

Find books, certification preparation resources, video training, posters and much more in Noria's online store.

Categories include:

- Lubrication & Lubricants
- Oil Analysis
- Maintenance & Reliability
- Certification Study
- Aids
- Digital Downloads
- Training DVD's
- Posters
- Books
- Technical Papers



# Training Opportunities

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Yellotec offers a full complement of training courses in Condition Monitoring disciplines as well product and Reliability Engineering specific courses. Courses offered are either presented under license from International Certification Bodies or are in accordance with ISO requirements.

## Online Training

Online training is your fast track to implementing Noria's proven strategies for extending machine and lubricant life. This course provides more than 24 hours of foundational training on best practices for machinery lubrication and oil sampling. It lays the groundwork for establishing a world-class lubrication program, and is a Level I certification prep course.

This flexible online training format provides convenience for companies around the world, allowing students to learn at their own pace and schedule. Students can repeat a course as many times as desired during the subscription period and receive a printable certificate upon completion.

- **Affordable:** Reduce training costs while improving productivity. Cost-effective online training can affect your bottom line.
- **Flexible:** Anytime, anywhere. Online training allows your team to learn at their own pace when it is convenient for them.
- **Easy To Use:** No computer knowledge required! Noria's simple click-and-watch training method is easy for anyone to use.

## Private Courses

All our public training courses can also be conducted as an in-house private courses. If you have 12 or more people attending, consider the benefits of an in-house session conducted in the privacy and conveniences of your facilities or a meeting site of your choice. Please contact us so that we can understand your requirements, explore the benefits and make it happen.

## All Courses Offered By Yellotec

Infrared Thermography (IRT)  
IRT Basics, Level 1, Level 2 and Level 3

Shaft Alignment  
Level 1

Vibration Analysis (Mobius)  
Category 1, 2 and 3

Ultrasound  
Level 1 and 2

Field Lubricant Analysis  
Noria Level 1, 2 and 3

Gearbox Maintenance

Failure Analysis

Machinery Lubrication  
Noria Level 1 and 2

Condition Monitoring for Engineers

Oil Analysis Series  
Level 1, 2 and 3

Plant Management – Dr. Mike Vorster

# Registration Form

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Please register each delegate by completing the details below and return by fax to 011 656 9112, or e-mail to [training@yellotec.com](mailto:training@yellotec.com). The company details are intended for accounting purposes and must reflect the details required for the completion and delivery of tax invoice.

## Invoice Details

Company \_\_\_\_\_  
VAT Number \_\_\_\_\_  
Postal Address \_\_\_\_\_  
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Postal Code \_\_\_\_\_  
Person Responsible for Payment \_\_\_\_\_  
Contact Number \_\_\_\_\_  
E-Mail Address \_\_\_\_\_  
Fax Number \_\_\_\_\_  
Payment Method Purchase Order Number \_\_\_\_\_  
Cheque Number \_\_\_\_\_  
Electronic Transfer Ref Number \_\_\_\_\_

## Delegate Details

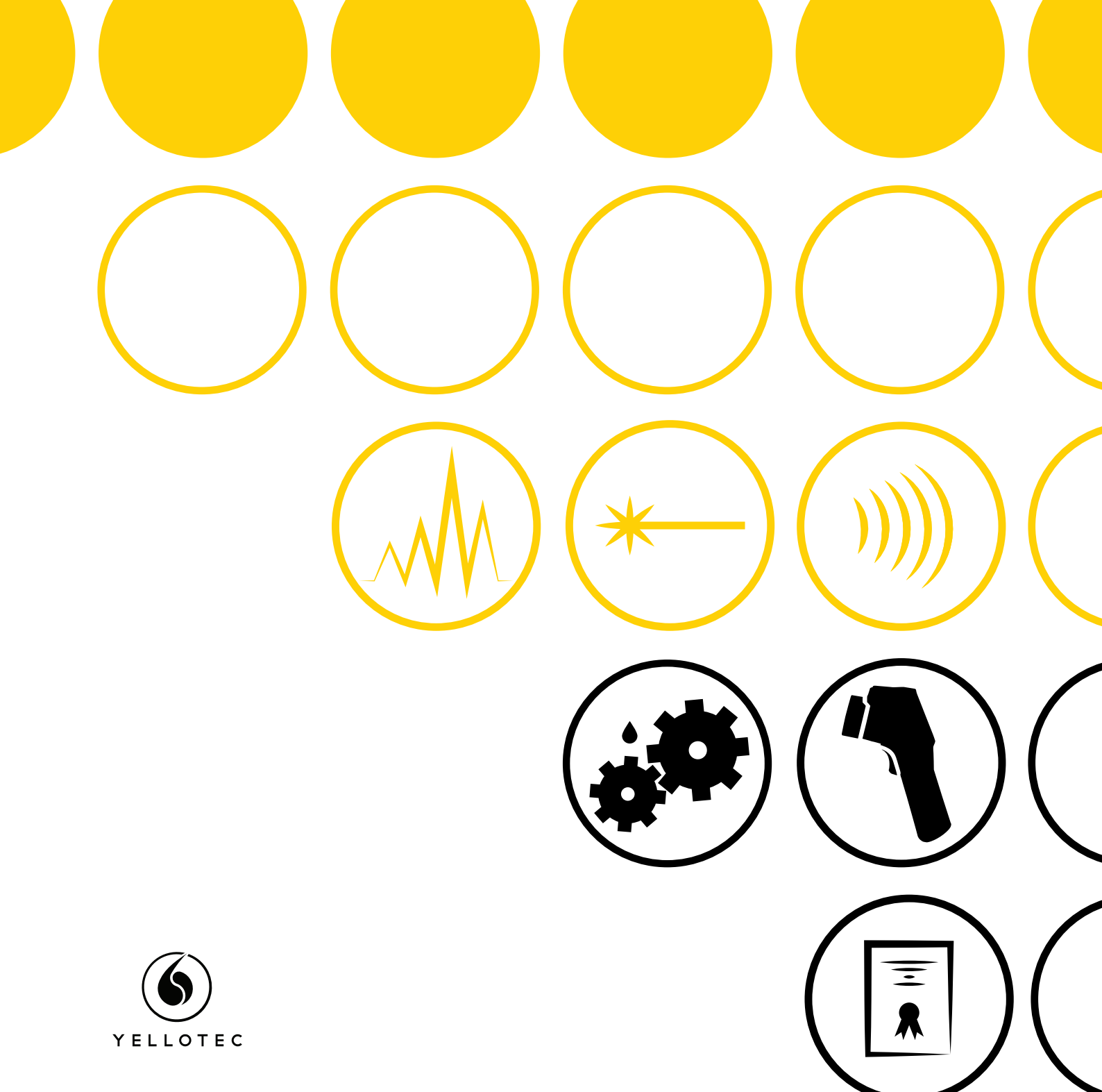
Delegate Name \_\_\_\_\_  
Contact Number \_\_\_\_\_  
Fax Number \_\_\_\_\_  
E-mail Address \_\_\_\_\_  
Do you have Halaal requirements? Yes  No

## Course Details

Course \_\_\_\_\_  
Dates \_\_\_\_\_  
Cost (Excl. VAT) \_\_\_\_\_

### Terms and Conditions

1. All course fees are payable upon confirmation of booking and an invoice will be sent as per the details indicated above. Bookings cannot be secured until payment of invoice or valid purchase order is received.
2. Only cancellations received in writing 10 days before the start of the course will be refunded in full.
3. There will be no charge if a substitute person wishes to replace the original delegate.
4. Yellotec reserves the right to cancel any course at any time without liability. In these circumstances, delegates will be offered an alternative date, or a full refund.
5. All Halaal requirements will be charged at an extra cost.
6. Delegate no shows, partial attendance or late cancellations will be liable for full cost.



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Yellotec is a products, service and training provider in the following specialist fields:

1. Complete solutions for the implementation and management of Condition Based Maintenance.
2. Remote Diagnosis of Vibration Analysis.
3. Full on-site CBM services, ranging from single individuals to complete department.
4. Oil Analysis Laboratory Services.
5. Vibration Analysis Services.
6. Thermographic Analysis Services.
7. Laser Alignment & Balancing Services.
8. Training in all specialist areas of Condition Based Maintenance
9. Direct agents for Flir Systems (Sweden) and Prüftechnik(Germany).