CERTIFICATION

HRDC CLAIMABLE COURSE

Enhancing Predictive Maintenance through Wear Debris & Oil Analysis

International Council for Machinery Lubrication

MLA II, ICML CERTIFICATION ISO 18436-4, CATEGORY II

📅 **Course Period** : 4 Consecutive Days

📝 **ICML MLA II Exam** : 4th Day

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Enhancing Predictive Maintenance Through Wear Debris & Oil Analysis is an **intermediate-level** intensive training program developed in alignment with the International Council for Machinery Lubrication (ICML) Body of Knowledge for Machinery Lubrication Analyst Level II.

This course equips participants with practical skills and technical knowledge in lubricant sampling, contamination control, wear debris analysis, and the interpretation of lubricant condition to support proactive maintenance decisions. Designed for lubrication technicians, engineers, and maintenance personnel, the training covers critical areas such as the installation of sampling hardware, proper extraction and handling of oil and grease samples, and identification of lubricant degradation and abnormal wear conditions.

Participants will also learn how to integrate oil analysis into a reliability-based maintenance (RCM) program, using data-driven insights to reduce machine failures, extend equipment life, and support predictive maintenance strategies. The course provides a strong foundation for diagnosing lubrication-related issues and developing corrective actions, while also enhancing communication and collaboration between reliability, operations, and maintenance teams.

Introduction

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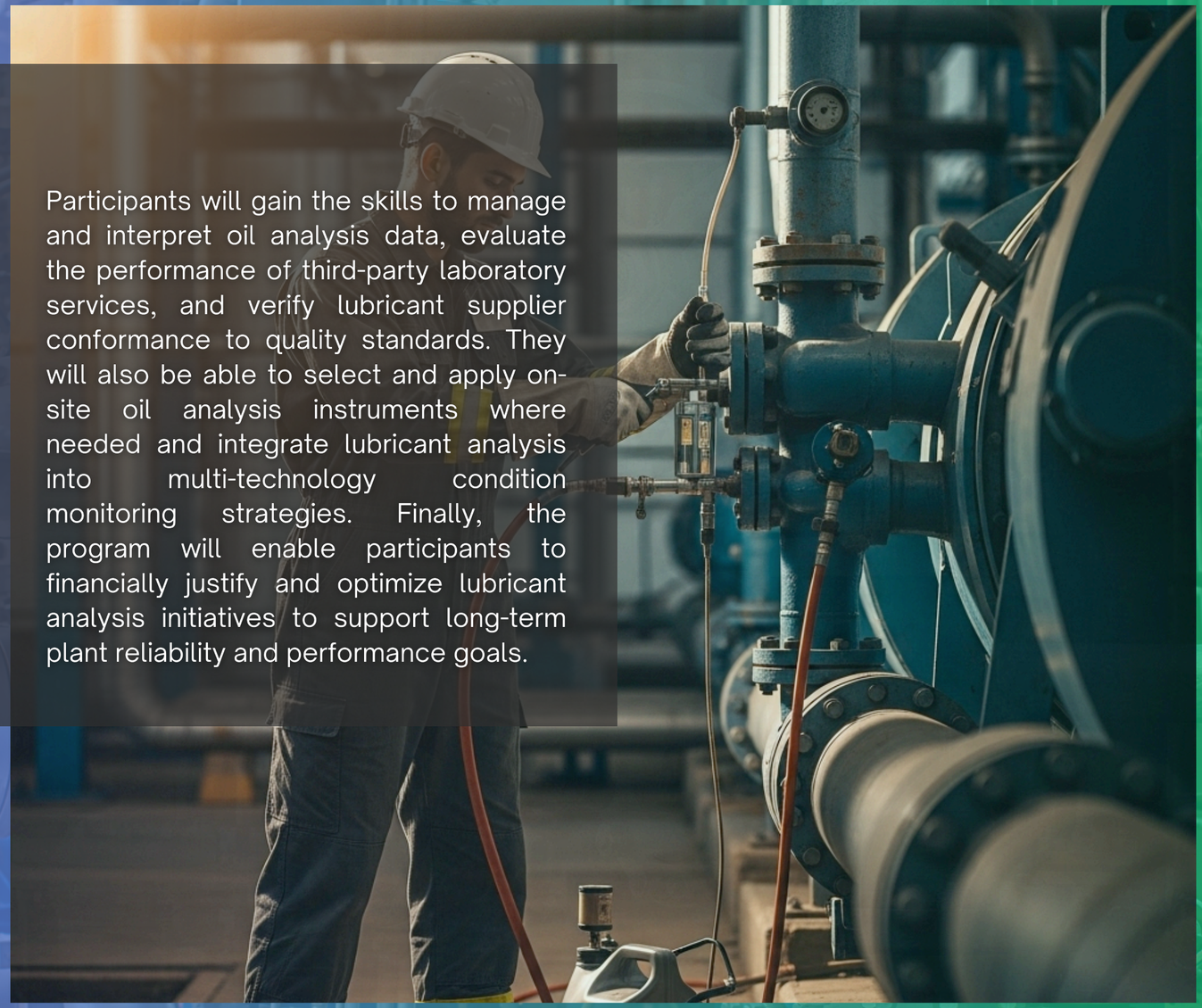
Training Objectives

By the end of this training,

Participants will be able to diagnose abnormal machine and lubricant conditions, make informed decisions, and recommend or oversee appropriate corrective actions. They will be equipped to clearly communicate the role and value of lubricant analysis within a Reliability-Centered Maintenance (RCM) program to managers, supervisors, and technicians. The course also emphasizes the use of proactive lubrication monitoring techniques to reduce equipment failure rates and extend machine life, while ensuring that lubricant sampling and analysis procedures are properly developed, deployed, and managed.



Participants will gain the skills to manage and interpret oil analysis data, evaluate the performance of third-party laboratory services, and verify lubricant supplier conformance to quality standards. They will also be able to select and apply on-site oil analysis instruments where needed and integrate lubricant analysis into multi-technology condition monitoring strategies. Finally, the program will enable participants to financially justify and optimize lubricant analysis initiatives to support long-term plant reliability and performance goals.

Course Outline 1

MODULE I.
Lubricant roles and functions

A. Base oil
  1. Functions
  2. Properties
B. Additive functions
  1. Surface active additives and their functions
  2. Bulk oil active additives and their functions
C. Synthetic lubricants
  1. Synthetic lubricant types
  2. Conditions dictating their use
D. Lubrication regimes
  1. Hydrodynamic
  2. Elasto-hydrodynamic
  3. Boundary

MODULE II.
Oil Analysis Maintenance Strategies

A. Fundamental aspects of Reliability-Centered Maintenance (RCM)
B. Fundamental aspects of Condition-Based Maintenance (CBM)
  1. Predictive maintenance strategies
  2. Proactive maintenance strategies

MODULE III.
Oil Sampling

A. Objectives for lube oil sampling
B. Equipment specific sampling:
  1. Gearboxes with circulating systems
  2. Engines
  3. Single and multi-component circulating oil systems with separate reservoirs
  4. Hydraulic systems
  5. Splash, ring and collar lubricated systems
C. Sampling methods
  1. Non-pressurized systems
  2. Pressurized systems - Low
  3. Pressurized systems - High
D. Managing interference
  1. Bottle cleanliness and management
  2. Flushing
  3. Machine conditions appropriate for sampling
E. Sampling process management
  1. Sampling frequency
  2. Sampling procedures
  3. Sample processing

MODULE IV.
Lubricant health monitoring

A. Lubricant failure mechanisms
  1. Oxidative degradation
    a) The oxidation process
    b) Causes of oxidation
    c) Effects of oxidative degradation
  2. Thermal degradation
    a) The thermal failure process
    b) Causes of thermal failure
    c) Effects of thermal degradation
  3. Additive depletion/degradation
    a) Additive depletion mechanisms
    b) Additives at risk for depletion/degradation by the various mechanisms.
B. Testing for wrong or mixed lubricants
  1. Baselining physical and chemical properties tests
  2. Additive discrepancies
C. Fluid properties test methods and measurement units
  1. Kinematic Viscosity (ASTM D445)
  2. Absolute (Dynamic) Viscosity (ASTM D2983)
  3. Viscosity Index (ASTM D2270)
  4. Acid Number (ASTM D974 et al)
  5. Base Number (ASTM D974 et al)
  6. Fourier Transform Infrared (FTIR) analysis
  7. Rotating Pressure Vessel Oxidation Test (ASTMD2272)
  8. Atomic Emission Spectroscopy

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Course Outline 2

MODULE V.
Lubricant contamination measurement and control

A. Particle contamination
  1. Effects on the machine
  2. Effects on the lubricant
  3. Methods and units for measuring particle contamination
  4. Techniques for controlling particle contamination
B. Moisture contamination
  1. Effects on the machine
  2. Effects on the lubricant
  3. States of coexistence
  4. Methods and units for measuring moisture contamination
  5. Demulsibility measurement
  6. Techniques for controlling moisture contamination
C. Glycol coolant contamination
  1. Effects on the machine
  2. Effects on the lubricant
  3. Methods and units for measuring glycol contamination
  4. Techniques for controlling glycol contamination
D. Soot contamination
  1. Effects on the machine
  2. Effects on the lubricant
  3. Methods and units for measuring soot contamination
  4. Techniques for controlling soot contamination
E. Fuel contamination (fuel dilution in oil)
  1. Effects on the machine
  2. Effects on the lubricant
  3. Methods and units for measuring fuel contamination
  4. Techniques for controlling fuel contamination
F. Air contamination (air in oil)
  1. Effects on the machine
  2. Effects on the lubricant
  3. States of coexistence
  4. Methods for assessing air contamination
    a) Air release characteristics (ASTM D3427)
    b) Foam stability characteristics (ASTM D892)
  5. Techniques for controlling air contamination

MODULE VI.
Wear Debris Monitoring and Analysis

A. Common wear mechanisms
  1. Abrasive wear
    a) Two-body
    b) Three-body
  2. Surface fatigue (contact fatigue)
    a) Two-body
    b) Three-body
  3. Adhesive wear
  4. Corrosive wear
  5. Cavitation wear
B. Detecting abnormal wear
  1. Atomic emission spectroscopy methods
    a) Inductively coupled plasma (ICP) spectroscopy
    b) Arc-spark emission spectroscopy
  2. Wear particle density measurement
C. Wear debris analysis
  1. Ferrogram preparation
  2. Filtergram preparation
  3. Light effects
  4. Magnetism effects
  5. Heat treatment
  6. Basic morphological analysis

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Machine Lubricant Analyst, Level II (ISO 18436-4, II)

Requirements :

1. Work Experience

Candidates must have at least 24 months of experience in lubricant-analysis-based machinery condition monitoring, with a minimum of 16 hours per month, totaling 384 hours over two years.

Candidates must also meet one of the following:

- Hold a valid MLA I Certification
  OR
- Qualify as a Mature Entry Candidate by submitting:
  - An additional 576 hours of relevant work experience (totaling 960 hours)
  - A minimum of 24 hours of training aligned with the MLA I Body of Knowledge, which can include instructor-led sessions, workshops, seminars, or documented hands-on practice.

2. Training

Candidates must complete an additional 24 hours of formal training specifically aligned with the MLA II Body of Knowledge, bringing the total required training to 48 hours (including the 24 hours from MLA I or Mature Entry).

- Online or recorded content may count for up to 4 hours of the total.
- Training records must include the candidate's name, instructor's name and signature, training dates, and total hours completed.

Note: ICML does not endorse any specific training provider. Candidates are responsible for ensuring that their chosen training covers all topics listed in the official Body of Knowledge and that instructors are certified at the appropriate level.

3. Examination

Candidates must pass a 100-question, closed-book multiple-choice exam within 3 hours.

- A minimum score of 70% is required to pass.
- Exams may be available in multiple languages. Please check with ICML for availability.

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Who Should Attend

Whether you're working on the shop floor or managing assets and maintenance strategies, this course provides valuable knowledge to enhance reliability and plant performance.

This course is ideal for individuals involved in lubrication, maintenance, and machinery condition monitoring, including but not limited to:

Maintenance Technicians or Engineers or Managers

Lubrication Technicians or Engineers or Managers

Reliability Engineers or Managers

Industrial and Manufacturing Engineers

Rotating Engineers

Sales and Field Service Engineers

***And anyone responsible for or interested in lubrication practices and oil analysis.

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Register Now

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