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HRDC CLAIMABLE COURSE

CERTIFICATION

# EXCELLENT LUBRICANT MANAGEMENT FOR EQUIPMENT RELIABILITY

International Council for Machinery Lubrication

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

📅 Course Period : 4 Consecutive Days

📝 ICML Exam : 4th Day

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# INTRODUCTION

**EXCELLENT LUBRICANT MANAGEMENT FOR EQUIPMENT RELIABILITY** is an advanced-level intensive course designed in alignment with the Body of Knowledge for Machine Lubricant Analyst Level III (MLA III) certification by the International Council for Machinery Lubrication (ICML). It equips lubrication technicians, engineers, and maintenance professionals with advanced skills in lubricant sampling, contamination control, degradation analysis, and abnormal wear diagnosis. Participants will learn how to design effective lubricant analysis programs, recommend corrective actions, and integrate oil analysis with other predictive maintenance technologies to reduce failures and improve equipment reliability. The course also emphasizes the role of lubrication in a reliability-centered maintenance (RCM) strategy and prepares participants to provide technical guidance to operations and maintenance teams in implementing world-class lubrication practices.

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# TRAINING OBJECTIVES

**By the end of this training program, participants will be able to:**

- Design and implement an effective oil analysis program, including selecting appropriate tests, setting alarm limits, determining sampling frequency, and applying machine-specific sampling methods.
- Diagnose abnormal lubricant and machine conditions, recommend corrective actions, and oversee their implementation.
- Effectively communicate the value of oil analysis within a Reliability-Centered Maintenance (RCM) framework to managers, supervisors, and lubrication personnel.
- Utilize proactive lubrication monitoring to reduce component failure rates and extend equipment life.
- Evaluate and manage the performance of third-party oil analysis laboratories, including making necessary adjustments.
- Use oil analysis to verify lubricant supplier quality conformance.
- Develop, deploy, and manage standardized procedures for lubricant sampling and analysis.
- Select and operate on-site oil analysis instruments where applicable.
- Integrate oil analysis with other condition-monitoring technologies for a more comprehensive maintenance strategy.
- Financially justify and optimize the ROI of lubricant analysis programs.

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# COURSE OUTLINE 1

## MODULE I.
### Lubrication Fundamentals

1.Lubrication Regimes
- Hydrodynamic
- Elasto-hydrodynamic
- Boundary

2.Base oils
- Common mineral oil characteristics
  - a) Paraffinic
  - b) Naphthenic
- Common synthetic oil characteristics, advantages and disadvantages
  - a) Synthesized hydrocarbons
  - b) Phosphate esters
  - c) Dibasic acid esters
  - d) Polyglycols

3.API and other base oil classifications

4.Basic lubricant additive functions
- Antioxidants/oxidation inhibitors
- Rust inhibitors
- Corrosion inhibitors
- Demulsifying agents
- Viscosity index (VI) improvers
- Detergents
- Dispersants
- Pour-point depressants
- Foam inhibitors
- Anti-wear (AW) agents
- Extreme pressure (EP) agents

## MODULE II.
### Fundamentals of Machine Wear

1.Common Machine Wear Mechanisms
- Abrasive wear
  - a) Two-body abrasive wear
  - b) Three-body abrasive wear
- Adhesive wear
- Surface fatigue
- Corrosive wear
- Fretting wear
- Erosive wear
- Electrical wear
- Cavitation wear
  - a) Gaseous cavitation
  - b) Vaporous cavitation

2.Common Machine-specific Wear Modes
- Gearing
- Plain bearings
- Rolling element bearings
- Hydraulics

## MODULE III.
### Wear Debris Analysis

1.Analytical ferrography
- Wear debris analysis techniques
  - a) Light effects
  - b) Magnetism effects
  - c) Heat treatment
  - d) Chemical treatment
  - e) Morphology
  - f) Surface detail
- Wear particle types, origins and probable causes
  - a) Cutting wear particles
  - b) Spherical particles
  - c) Chunky particles
  - d) Laminar particles
  - e) Red oxide particles
  - f) Black oxide particles
  - g) Corrosion particles
  - h) Non-ferrous particles
  - i) Friction polymers

2.Atomic emission elemental spectroscopy
- Basic determination of wear particle metallurgy from elemental composition
- Evaluating sequential trends
- Evaluating lock-step trends
- Particle size limitations of common atomic emission spectrometers
- Advanced techniques
  - a) Acid/microwave digestion
  - b) Rotrode filter spectroscopy
- X-ray fluorescence (XRF) and other advanced elemental spectroscopy methods

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# COURSE OUTLINE 2

## MODULE IV.
## Analyzing lubricant degradation

1.Oxidative base oil failure
- Causes of oxidative base oil failure
- Recognizing at-risk lubricants and applications
- Strategies for deterring or mitigating base oil oxidation
- Recognizing the effects of base oil oxidation
- Strengths, limitations and applicability of tests used to detect and troubleshoot base oil oxidation
  a) Acid number
  b) Viscosity
  c) Fourier Transform Infrared (FTIR) analysis
  d) Rotating Pressure Vessel Oxidation Test
  e) Sensory inspection

2.Thermal failure of base oil
- Causes of thermal degradation
  a) Hot surface degradation
  b) Adiabatic compression induced degradation
- Strengths, limitations and applicability of tests used to detect and troubleshoot thermal failure of the base oil
  a) Acid number
  b) Viscosity
  c) Fourier Transform Infrared (FTIR) analysis
  d) Thermal stability test (ASTM D 2070-91)
  e) Ultracentrifuge detection of carbon insolubles
  f) Sensory inspection

3.Additive depletion/degradation
- Assessing risk for common additive depletion or degradation mechanisms
  a) Neutralization
  b) Shear down
  c) Hydrolysis
  d) Oxidation
  e) Thermal degradation
  f) Water washing
  g) Particle scrubbing
  h) Surface adsorption
  i) Rubbing contact
  j) Condensation settling
  k) Filtration
  l) Aggregate adsorption
  m) Evaporation
  n) Centrifugation
- Strengths, limitations and applicability of methods for measuring additive depletion/degradation
  a) Atomic emission spectroscopy
  b) Fourier Transform Infrared (FTIR) spectroscopy
  c) Acid number
  d) Base number
  e) Viscosity index (VI)
  f) Rotating Pressure Vessel Oxidation Test
  g) Blotter spot test

4.Detecting wrong lubricant addition
- Viscosity
- Neutralization number (AN/BN)
- Elemental spectroscopy
- Fourier Transfer Infrared Analysis
- Other Tests

## MODULE V.
## Oil analysis program development and program management

1.Machine-specific test slate selection
2.Optimizing frequency of analysis
3.Setting alarms and limits
- Setting goal-based limits for contamination
- Statistically derived level limits
  a) Editing data
  b) Calculating averages
  c) Calculating standard deviation
  d) Setting upper and lower limits using the mean and standard deviation
  e) How changes in system operation or maintenance influence statistically derived inferences
- Rate of Change Limits
  a) Calculating rate of change
  b) Slope-based alarms
  c) Statistically derived rate of change limits
- Setting aging limits for fluid properties
  a) Physical properties
  b) Chemical properties
  c) Additive properties

4.Managing oil analysis information
5.Creating and managing oil analysis procedures
6.Scoping oil analysis training for reliability technician, trades people and management
7.Performing cost/benefit analysis for oil analysis and contamination control programs
- Calculating program costs
- Estimating program benefits
- Calculating return on investment metrics
- Generating an effective business proposal

8.Quality Assurance
- Of onsite oil analysis
- Of offsite oil analysis providers

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# MACHINE LUBRICANT ANALYST LEVEL III (ISO 18436-4, III)

## Requirements:

### 1. Work Experience

- A minimum of 36 months of experience in lubricant-analysis-based machinery condition monitoring (based on at least 16 hours per month).

### 2. Prerequisite Certification

- Candidates must already be certified at Machine Lubricant Analyst Level II (MLA II) prior to applying for MLA III.

### 3. Training Requirements

- Completion of 32 hours of documented formal training aligned with the MLA III Body of Knowledge.
- Training may include online or recorded content; however, only up to 5 hours of the required 32 may be self-paced components (e.g., exercises, lab tasks, practice exams).
- This is in addition to the 48 hours previously required for MLA I and II, totaling 80 cumulative hours across all levels.
- Training records must include: candidate's name, instructor's name and signature, training dates, and total hours.

### 4. Examination

- Candidates must pass a 100-question multiple-choice exam based on the MLA III Body of Knowledge.
- The exam is closed-book and must be completed within three hours.
- A minimum score of 70% is required to pass.
- Exams may be available in languages other than English – please contact ICML for availability.

*Note: ICML does not endorse or approve specific training providers. Candidates are responsible for selecting a provider whose course content aligns with the Body of Knowledge for MLA III. It's also the candidate's responsibility to ensure their instructor is certified at or above the level of training provided. ICML's Bodies of Knowledge are publicly available and should be used as a benchmark for selecting appropriate training.*

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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.

## Contact Us


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