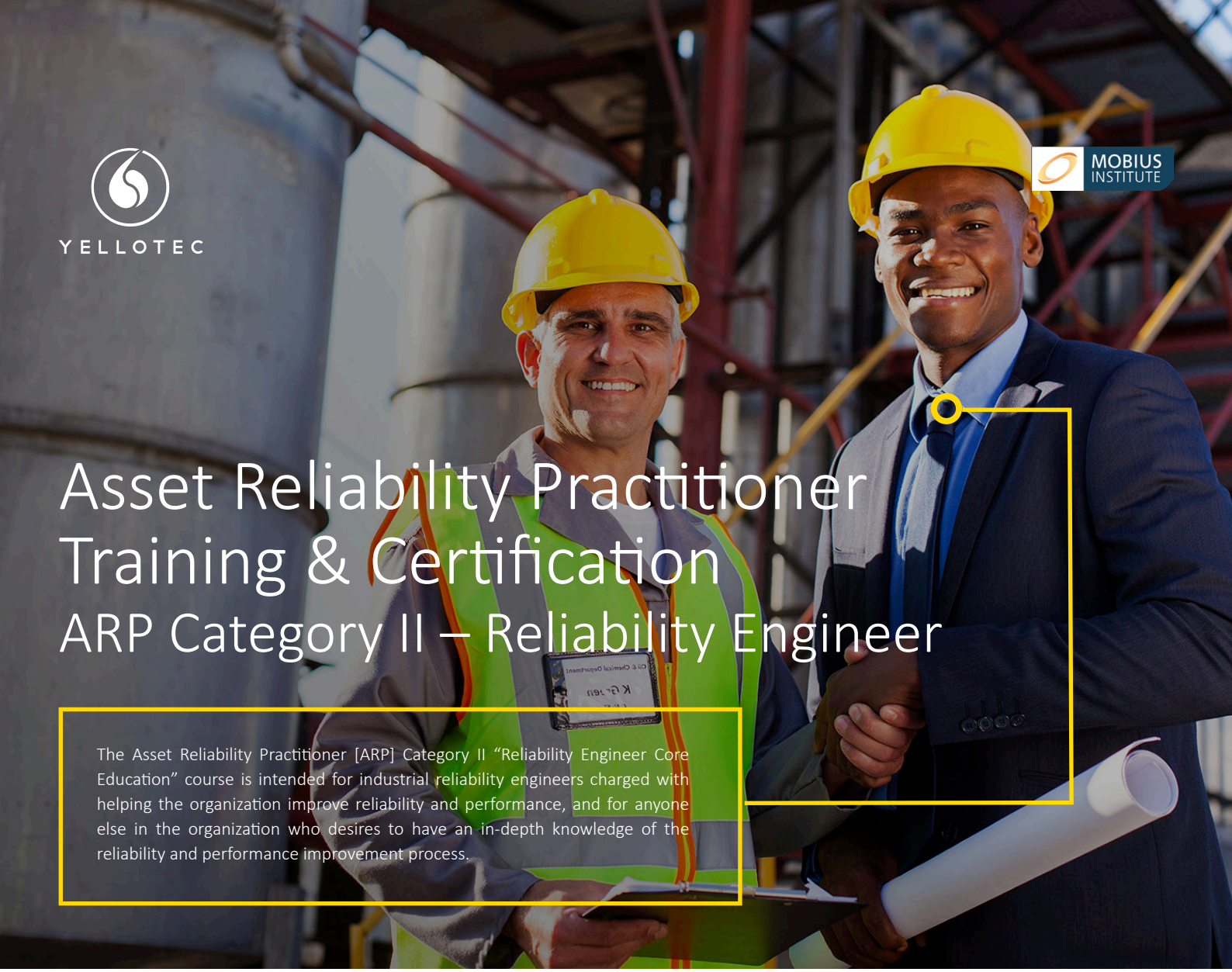

YELLOTEC

MOBIUS INSTITUTE

Asset Reliability Practitioner Training & Certification

ARP Category II – Reliability Engineer

The Asset Reliability Practitioner [ARP] Category II "Reliability Engineer Core Education" course is intended for industrial reliability engineers charged with helping the organization improve reliability and performance, and for anyone else in the organization who desires to have an in-depth knowledge of the reliability and performance improvement process.

Reliability Engineer Core Education

The reliability engineer has a critically important but challenging role. In most organizations there are almost infinite opportunities for improvement but understanding what to change and how to change it is difficult. Analysis is not enough. Action must be taken or nothing will change. But a part of the challenge is that the reliability engineer may not have the authority to make changes; just recommend them. That issue is also addressed in this course.

The course covers the A-Z of reliability improvement. While it is not possible for you to be an expert planner/scheduler, or condition monitoring analyst, or lubrication engineer, you will gain a very solid knowledge in all these areas. You will know how to justify and prioritize your activities and take all the necessary steps to engineer a successful reliability and performance improvement initiative; and avoid the obstacles that have derailed so many programs in the past.

Your challenge will be made easier with the renowned Mobius Institute animations and animated simulations. Complex topics are so much easier to understand. And to ensure your time is put to best use, you can watch any part of the course, or the entire course, online before you attend the live event. And you can take it again soon afterwards to refresh your memory and improve your understanding.

About the ARP Training & Certification Program

Practitioners and leaders involved with the important role of improving the reliability and performance of an industrial facility should be recognized for their knowledge, experience, and contribution.

The new Mobius Institute Asset Reliability Practitioner (ARP) certification scheme will recognize the knowledge and basic experience of people at three levels; the Advocate who contributes to the initiative, the Reliability Engineer, and the Leader of the program. In addition, the certification scheme will separately recognize reliability engineers and leaders who have proven competence.

Prior experience is not required for attending the training course, but 2 years of general industrial experience is required for certification.

Course Breakdown

Introduction
- Goals of the course
- Goals of reliability improvement
- How reliability/performance improvement is aligned with asset management, operational excellence, TPM, and lean
  - An introduction to ISO 55000
- The role of the reliability engineer
  - Making improvements
  - Providing data and recommendations
  - Supporting the Category III Program Leader

Strategy And Implementation
- Benefits of reliability and performance improvement
  - Aligning the program to meet the business goals
- The need for the business case
  - How to provide data to support the business case
- How to assist in the development of the "roadmap" plan
  - What are the "essential elements" of a holistic approach
  - How do you break out of the reactive maintenance cycle
- Understanding the maintenance strategies
  - Reactive maintenance
  - Strategic maintenance in summary
    - Run-to-fail
    - Condition-based maintenance [CBM]
    - Interval-based (preventive) maintenance
    - Hidden-failure finding tasks

People Management
- Culture change
- Helping to gain and retain senior management support
- Engaging people in the reliability and performance improvement effort
  - Training and certification
  - Skills development
  - Awareness sessions
- Human error and psychology
  - Why errors are made
  - Why knowledge and observations about failure may be flawed
- Steering committee
  - The role of the RE with the steering committee

Defect Elimination
- Overview
- Design for reliability
- Procurement for the lowest lifecycle costs
- Transportation for minimal degradation
- Managing outside contractors
- Managing vendors
- Acceptance testing
- Work management - introduction
- Spares management/caring for spares
- Precision and proactive maintenance – introduction
- Precision operation and operator driven reliability [ODR]

Reliability Engineering
- Reliability fundamentals
- Understanding equipment "failure patterns"
  - Does all equipment wear out with age?
  - What are "random failures"
  - Early age "infant mortality" failures
  - Nolan and Heap and other studies
  - Understanding failure modes
  - Understanding failure consequences
  - Understanding hidden-failures
  - Collecting failure data to aid PMO, RCM, FMECA, Pareto analysis and RBDs
    - Develop meaningful, useful, useable failure codes
  - Determining the reliability of an item
    - Strengths and weakness of MTBF
  - The basic principles and pros/cons of CM and CBM
  - The basic principles and pros/cons of interval-based (preventive) maintenance
- Analyzing reliability data
  - Weibull and other analysis techniques
- Reliability block diagrams [RBD]
  - An introduction to constructing RBDs
  - Estimating system reliability and availability based on RBDs
- Lifecycle cost analysis [LCCA]
  - The principle of lifecycle costs versus purchase price
  - An introduction to LCAA

Asset Strategy Development
- Getting the house in order
  - Developing the master asset list [MAL] aka asset register [AR]
    - Utilizing ISO 14224 to define the hierarchy
  - Developing the Bill of Materials [BOM]
    - The importance of having an accurate BOM
- Developing an asset criticality ranking [ACR]
  - The importance of having an ACR
  - Understanding criticality
  - A methodology to develop the ACR
  - Prioritizing maintenance, reliability, and other decisions based on criticality
- Utilizing Preventive Maintenance Optimization [PMO]
  - What is PMO
  - Assessing existing PMs and either keep them, improve them, or remove them
  - The strengths and weakness of PMO
- Utilizing Failure Modes, Effects and Criticality Analysis [FMECA]
  - How the process may be used in asset strategy develop
  - The overlap between FMECA and RCM
- Utilizing Reliability Centered Maintenance [RCM]
  - What is "classic" RCM
  - Understanding the seven key elements of the RCM process according to SAE JA1011
  - How to prioritize the RCM process
  - The logical process to establish the mix of the following outcomes on each asset
    - Run-to-fail [RTF]
    - Condition-Based Maintenance [CBM]
    - Interval-based Maintenance [IBM] or Preventive Maintenance [PM]
    - Hidden-failure finding task [HFFT]
    - Redesign for improved reliability or performance
- Utilizing Pareto analysis
  - What is Pareto analysis
  - How to collect accurate, reliable failure data
  - Analyzing the data
  - Utilizing Pareto analysis to prioritize maintenance and reliability decisions

Work And Spares Management
- An overview of work management and spares management and how they are connected
  - How they relate to preventive work, condition-based work, work requests, and break-in work
  - How they relate to shutdowns/ turnarounds/outages
  - The benefits of work and spares

Course Breakdown Cont.

management and key benchmarks
    - Key components
        - Handling maintenance requests via observations and CM
        - Spares management
        - Managing preventive tasks (PMs, CM tasks, proactive tasks)
        - Scheduling
        - Managing break-in work
    - Reporting, and KPIs to collect and trend
    - Ensuring there is feedback for continuous improvement
- MRO spares and material management
    - The consequences of a poor MRO spares management
    - Spares policy identification
    - The definition of a “critical spare”
    - Spares sourcing
    - Inventory control
    - Spares issuance
    - Documentation and analysis
- Maintenance planning
    - Creating a job plan
    - Allocating people to work
    - Determining time, tools, skills, equipment, and safety requirements
    - Job kitting
- Maintenance scheduling
    - How to prioritize jobs
    - Coordinating with production
- Managing break-in work
- Shutdowns, turnarounds, and outages
    - Scope, time, quality, communications, human resources (site and contractor), and risk management
- The computerized maintenance management system [CMMS] or enterprise asset management [EAM] system
    - Information and data that should be managed
    - The link with work and spares/material management
    - Failure codes

Precision Skills (Precision And Proactive Maintenance)

- What is precision and the importance of precision work
    - A detailed introduction to:
        - Precision shaft and belt alignment
        - Precision soft foot correction
        - Precision mechanical and electrical fastening
        - Precision balancing and balancing tolerances/standards, and
        - Other common mechanical and electrical tasks
    - The importance of developing and following written procedures
    - The importance of precision installation in components such as bearings (rolling element and journal/sleeve), seals, gears, belts, pumps, electrical equipment, and other equipment
    - Understand the key operating principles of rolling element and journal bearings, seals, gears, pumps, fans, transformers, steam traps, and valves
    - Understand how to verify electrical systems: fault current, earth loop, impedance, insulation resistance, and protection testing
    - Understand the issues related to power quality: earth loops, power factor, harmonics, EN60130
- Understand mechanical and acoustic resonance and the basic correction techniques
- Proactive maintenance
    - The importance of taking proactive steps to avoid future problems
    - A detailed introduction to:
        - Precision lubrication (oil and grease) including selection, receipt, filtering, storage, issue, and replenishment and the effect these have on contamination
        - Resonance correction
        - Power quality control, and
        - Keeping equipment and workplaces clean and organized
- The importance of commissioning
    - Safety practices and preparation
    - The importance of following the correct start-up procedures
    - Calibration

Condition Monitoring

- Overview of CM principles for mechanical and electrical equipment
- The relationship between CM and planning/scheduling and operations
- A detailed introduction of the technology and application of:
    - Vibration analysis
    - Ultrasound
    - Oil analysis
    - Wear particle analysis
    - Electric motor testing
    - Infrared analysis
    - Electrical equipment and insulation testing
    - Transformer testing
    - Partial discharge
    - Non Destructive Testing [NDT]
    - Process/performance monitoring
    - Visual inspections
- The future of CM and predictive analytics

Continuous Improvement

- The principle of and importance of continuous improvement, Kaizen, PDCA, and Lean
- The need to reassess business conditions and what is critical
- Utilizing metrics to measure and improve performance
    - Benchmarking against industry and the facilities “best day”
    - The importance of establishing the right KPIs
    - Suggested metrics and KPIs and the most effective use of KPIs
    - The importance of accurate data collection
- The importance of constant communication
- Root cause (failure) analysis [RCA and RCFA]
    - The importance of conducting RCA/RCFA
    - The importance of making the improvements
    - How to perform RCA/RCFA
        - Determining when it is justified to perform RCA/RCFA and selecting the appropriate process
        - A review of 5-whys, fault-tree, Ishikawa, and other techniques
        - A systematic approach to determining the root cause(s), determining the solution(s), selecting the best solution, implementing the solution, and verifying the solution – all in a cost justified manner
- The need for on-going education, skills, and awareness training

The Asset Reliability Practitioner (ARP) certification scheme follows the independent format of the time-tested ISO certification programs, such as ISO 18436, and it follows the guidelines defined under ISO/IEC 17024 – the same process followed by the independently accredited Mobius Institute Board of Certification [MIBoC] certification scheme that has already certified tens of thousands of men and women from over 170 countries.

Reliability Training

Yellotec offers a full complement 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.

All Courses Offered By Yellotec

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

Vibration Analysis (Mobius)
Category 1, 2 and 3

Field Lubricant Analysis
Noria Level 1, 2 and 3

Machinery Lubrication
Noria Level 1 and 2

Oil Analysis Series
Level 1, 2 and 3

Ultrasound
Level 1 and 2

Asset Reliability Practitioner Training
Category 1 and 2

Shaft Alignment

Gearbox Maintenance

Failure Analysis

Condition Monitoring for Engineers

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.

About Yellotec

Yellotec is a reliability solutions specialists that provide complete solutions for the implementation and management of Condition Based Maintenance. We stand proud in the belief that all failures are preventable.

We provide service, product and training solutions through the application of the following technologies:

- Vibration Analysis
- Oil Analysis
- Infrared Thermography
- Laser Alignment & Balancing
- Structural and Air borne Ultrasound
- Failure Analysis
- Fluid Management
- Conveyor Monitoring
- Electric Motor Testing