

## ADVANCED MACHINERY DYNAMICS

*“Optimizing machinery performance through advanced dynamic analysis and maintenance strategies”*

### Schedule

Date	Venue	Fees (Face-to-Face)
25 - 29 Oct 2026	Doha, Qatar	USD 3495 per delegate

► **Available delivery methods:** Face-to-Face & Online Training

### Introduction

Machinery dynamics play a critical role in ensuring the safety, reliability, and efficiency of industrial equipment. Understanding the dynamic behavior of machines helps prevent failures, reduce maintenance costs, and improve operational performance.

This intensive five-day program equips participants with advanced knowledge and practical skills in machinery dynamics, vibration analysis, and predictive maintenance. Participants will learn how to analyze machine behavior, identify potential issues, and implement strategies to optimize performance and reliability.

### Objectives

By the end of this course, participants will be able to:

- Understand advanced machinery dynamics principles and vibration analysis
- Analyze dynamic behavior of rotating and reciprocating machinery
- Identify potential failures and performance issues
- Implement predictive and preventive maintenance strategies
- Apply diagnostic techniques to enhance machine reliability
- Optimize machinery performance and reduce operational downtime
- Integrate machinery dynamics into maintenance planning and operational decisions

## Why Attend

- Gain practical knowledge of advanced machinery dynamics
- Improve machinery reliability and performance
- Reduce maintenance costs and unplanned downtime
- Learn diagnostic and vibration analysis techniques
- Enhance operational efficiency and safety
- Network with engineering professionals and industry experts

## Target Audience

This program is designed for:

- Mechanical and maintenance engineers
- Plant managers and operations engineers
- Reliability and asset integrity professionals
- Maintenance planners and technicians
- Professionals responsible for machinery performance and safety

## Individual Benefits

Key competencies that will be developed include:

- Advanced knowledge of machinery dynamics and vibration analysis
- Skills to diagnose, monitor, and optimize machine performance
- Ability to implement predictive and preventive maintenance strategies
- Proficiency in using diagnostic tools and techniques
- Improved decision-making for machinery reliability and efficiency
- Enhanced safety awareness and operational knowledge

## Organizational Benefits

Upon completing the training course, participants will demonstrate:

- Improved machinery reliability and operational performance
- Reduced maintenance costs and equipment downtime
- Enhanced safety and compliance in operations
- Better planning and execution of maintenance activities
- Data-driven decision-making for machinery and asset management
- Strengthened overall operational efficiency and productivity

## Instructional Methodology

The course follows a blended learning approach combining theory with practice:

- Strategy Briefings - Principles of machinery dynamics, vibration analysis, and reliability
- Case Studies - Real-world examples of machinery failures and solutions
- Workshops - Hands-on exercises in vibration analysis and predictive maintenance
- Peer Exchange - Group discussions on machinery challenges and lessons learned
- Tools - Templates and techniques for dynamic analysis, monitoring, and reporting

## MAWA EVENTS

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## Course Outline

### Detailed 5-Day Course Outline

Training Hours: 7:30 AM – 3:30 PM Daily Format: 3-4 Learning Modules | Coffee breaks: 09:30 & 11:15 | Lunch Buffet: 01:00 – 02:00

#### Day 1: Fundamentals of Machinery Dynamics

##### Module 1: Introduction to Machinery Dynamics (07:30 – 09:30)

- Principles of machinery dynamics and vibrations
- Importance of dynamic analysis in machinery performance

##### Module 2: Vibration Theory & Concepts (09:45 – 11:15)

- Free and forced vibrations
- Natural frequencies and resonance

##### Module 3: Machinery Systems and Components (11:30 – 01:00)

- Rotating and reciprocating machinery dynamics
- Critical components and failure modes

##### Module 4: Workshop – Vibration Basics (02:00 – 03:30)

- Hands-on exercises in basic vibration measurement and analysis

#### Day 2: Dynamic Analysis and Diagnostic Techniques

##### Module 1: Vibration Measurement & Monitoring (07:30 – 09:30)

- Tools and techniques for measuring vibrations
- Data acquisition and signal processing

##### Module 2: Fault Diagnosis and Analysis (09:45 – 11:15)

- Identifying machinery faults through vibration signatures
- Common failure patterns and indicators

##### Module 3: Case Studies in Machinery Diagnostics (11:30 – 01:00)

- Real-world examples of machinery failures
- Lessons learned and corrective actions

##### Module 4: Workshop – Diagnostic Exercises (02:00 – 03:30)

- Practical exercises in fault detection and analysis

#### Day 3: Predictive and Preventive Maintenance

##### Module 1: Maintenance Strategies (07:30 – 09:30)

- Predictive vs preventive maintenance approaches
- Selecting the right maintenance strategy

##### Module 2: Condition Monitoring Techniques (09:45 – 11:15)

- Temperature, vibration, and acoustic monitoring
- Early warning systems for machinery

##### Module 3: Reliability-Centered Maintenance (11:30 – 01:00)

- FMEA and risk-based maintenance
- Optimizing maintenance schedules

##### Module 4: Workshop – Maintenance Planning (02:00 – 03:30)

- Hands-on exercises in maintenance strategy and planning

#### Day 4: Advanced Machinery Dynamics and Optimization

##### Module 1: Rotor Dynamics and Balancing (07:30 – 09:30)

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Rotor imbalance, misalignment, and vibration control

- Balancing techniques for rotating equipment

Module 2: System Modeling and Simulation (09:45 – 11:15)

- Dynamic modeling of machinery systems
- Predicting performance and failure points

Module 3: Performance Optimization (11:30 – 01:00)

- Enhancing efficiency and reducing energy losses
- Operational best practices

Module 4: Workshop – Optimization Exercises (02:00 – 03:30)

- Hands-on exercises in modeling and performance improvement

Day 5: Integration, Reporting, and Strategic Planning

Module 1: Integrating Dynamics into Operations (07:30 – 09:30)

- Linking machinery analysis to operational decisions
- Strategic planning for machinery reliability

Module 2: Data Analysis & Reporting (09:45 – 11:15)

- Creating reports and dashboards for management
- Decision-making based on vibration and performance data

Module 3: Case Studies and Lessons Learned (11:30 – 01:00)

- Examples of successful machinery optimization
- Key takeaways and best practices

Module 4: Workshop & Course Wrap-Up (02:00 – 03:30)

- Capstone exercise: dynamic analysis and maintenance plan
- Peer review, discussion, and Q&A

## Certification

Participants will receive a Certificate of Completion in Advanced Machinery Dynamics, validating their expertise in analyzing, diagnosing, and optimizing machinery performance using advanced dynamic and maintenance techniques.

## Why Choose MAWA Events

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