

**Training Title**

**MACHINERY FAILURE ANALYSIS, PREVENTION AND TROUBLESHOOTING**

**Training Duration**

5 days

**Training Venue and Dates**

REF ME056	Machinery Failure Analysis, Prevention and Troubleshooting	5	28 Apr – 2 May, 2019	\$4,250	Dubai, UAE
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In any of the 5 star hotel. The exact venue will be informed once finalized.

**Training Fees**

- 4,250 US\$ per participant for Public Training includes Materials/Handouts, tea/coffee breaks, refreshments & Buffet Lunch

**Training Certificate**

Define Management Consultancy & Training Certificate of course completion will be issued to all attendees.

**TRAINING OVERVIEW**

**TRAINING DESCRIPTION**

The course presents understanding of equipment failure characteristics. To achieve an optimal maintenance program that meets specified safety, environmental, and economic goals. Participants will learn to preserve equipment functions by identifying appropriate predictive maintenance (PdM) tasks, failure finding tasks and other actions that protect against failure or mitigate the consequences of failure

This course present a systematic approach to fault diagnosis and failure prevention in a broad range of machinery used in many industries. The key routes to preventive maintenance are demonstrated through both overview and the study of examples in different failure analysis and a sequential approach to machinery trouble-shooting and problem solving

Failure analysis, Troubleshooting and Predictive & Planned Maintenance techniques, including vibration analysis, oil analysis, and others techniques are discussed in the course with a view to optimising the maintenance engineering effort while maximising production

This course provides the fundamentals of PdM and condition monitoring applicable to plants, facilities and manufacturing lines. Predictive Maintenance & Condition Monitoring will provide Participants with a framework to make the right decisions on what equipment needs condition monitoring, what technologies to use to meet their needs and how to measure the effectiveness of their decisions

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### **TRAINING OBJECTIVES**

Participants will learn how to collect, analyze and interpret failure statistics and will also gain an understanding of FMECA.

Participants will be instructed in condition monitoring methods and will be taught how vibration analysis can be used to detect, locate, severity assess and diagnose a range of common faults in machines

Upon the successful completion of this course the participant shall be able to:

- understand the principles of failure analysis in process plant
- An understanding of Machine Failure Analysis and Troubleshooting techniques
- learn about machinery troubleshooting in pumps, centrifugal compressors, , gas turbines and electric motors
- Describe the Benefits of a PdM & Condition Monitoring Program
- Identify What Equipment to Monitor
- Predict What Maintenance Needs to be done and When
- An understanding of a range of Planned & Predictive Maintenance Technologies
- Knowledge of the potential contribution of each these technologies to maintenance efficiency
- Guidelines indicating how these technologies can interact with and support each other

### **WHO SHOULD ATTEND**

- ★ This seminar is directed towards Supervisors, Team Leaders and Managers in Maintenance, Engineering and Production. The seminar will also benefit anyone who wishes to update themselves on Predictive Maintenance Technologies and Failure Analysis techniques, as well as those who have to judge the suitability of these technologies for their needs, and learn how to implement them for the benefit of their organizations

### **TRAINING METHODOLOGY:**

A highly interactive combination of lectures and discussion sessions will be managed to maximize the amount and quality of information and knowledge transfer. The sessions will start by raising the most relevant questions, and motivate everybody find the right answers. You will also be encouraged to raise your own questions and to share in the development of the right answers using your own analysis and experiences. Tests of multiple-choice type will be made available on daily basis to examine the effectiveness of delivering the course.

Very useful Course Materials will be given.

- 30% Lectures
- 30% Workshops and work presentation
- 20% Group Work& Practical Exercises
- 20% Videos& General Discussions

### **DAILY OUTLINE**

#### **Module 1**

#### **Failure Analysis techniques**

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Equipment failure  
Six patterns of component failure rate over life  
Controlling introduced failure  
Failure rate bathtub curve  
Where to start: equipment criticality or risk

Failure analysis tools  
Failure Mode & Effects Analysis  
Reliability Centered Maintenance  
Computer Maintenance Management Systems  
Failure analysis - closing the loop  
Root cause failure analysis (rcfa)

Building a system for equipment condition indicating

- Equipment data
- Failure data
- Maintenance data
- Data format

## Module 2

Failure and maintenance notations  
Failure descriptors  
Failure causes  
Method of detection  
Maintenance activity

Data requirements for various applications  
Electrical motor  
Gas turbines  
Pumps  
Compressors

## Module 3

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The Basic Concept of Predictive Maintenance  
The Top 6 Benefits of Predictive Maintenance  
Establishing a Predictive Maintenance Program  
Goals, objectives, and benefits  
Functional requirements  
Selling predictive maintenance programs  
Selecting a predictive maintenance  
System  
Database development  
Getting started  
The optimum predictive maintenance Program

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**How to Choose the Right PdM Technologies**  
**Four Reasons Why PdM Doesn't Work**  
**Are You Collecting The Right Data?**

**World-Class Maintenance**

**Module 4**

**Predictive Maintenance – PdM**

**Scheduled predictive**

**Predictive Technologies**

**Condition Monitoring Technologies**

**Vibration Analysis**

**General Analysis Method**

**IR Thermography**

**Ultrasonic Leak Detection**

**Oil and Wear Particle Analysis**

**Oil Analysis**

**Motor Circuit**

**Surface Flaw Detection**

**Liquid Penetration**

**Magnetic Particle**

**Sub-Surface Flaw Detection**

**Ultrasonic Thickness (Auto/Manual)**

**Eddy Current**

**Radiography**

**Endscope (Borescope) inspection**

**Module 5**

**Vibration analysis**

**Introduction**

**Data acquisition**

**Data interpretation**

**Vibration due to plane (journal) bearings**

**Vibration due to resonance**

**Turbomachinery problems**

**Vibration problems with specific machinery types**

**Gearbox vibration**

**Condition Monitoring**

**Condition Monitoring**

**The machine life cycle**

**Standards Organizations**

**List of BS/ ISO condition monitoring standard**

**BS ISO 17359**

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## Computer application in machine condition monitoring

**NOTE:**

**Pre & Post Tests will be conducted**

**Post tests will be with minimum pass marks**

**Case Studies, Individual & Group Exercises, Project works (making in to groups), Role plays, Group Discussions, Last Day Review & Assessments will be carried out as applicable.**



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