

Training Title

Mechanical Vibration Causes, Effect, Analysis & Prevention Techniques

Training Duration

5 days

Training Date

Ref ME125	Mechanical Vibration Causes, Effect, Analysis & Prevention Techniques	5	23 – 27 Sept '18	\$4,250	Dubai, UAE
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In any of the 5 star hotels. 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.

Language: English

COURSE DESCRIPTION

Vibration Analysis is one of the most powerful condition based maintenance technologies, and the cornerstone of many predictive maintenance programs. It is also widely utilized for troubleshooting and fault diagnosis of machinery and structures. In recent years, much emphasis has been given to on-line or permanently installed vibration monitoring for machinery that is inaccessible, critical to process, and/or very expensive.

The future advancement of equipment condition monitoring technologies is intrinsically tied to the application and development of on-line or permanently installed systems. As the advantages of asset management and reliability strategies become widely accepted and aggressively implemented, significant emphasis is being placed on equipment condition monitoring. In fact, the historic barrier between production and maintenance will soon fall victim to the understanding that equipment condition data is as important as process parameters, and significantly influences production, quality, safety, and profitability.



For many petroleum facilities, on-line vibration monitoring systems are used as machinery protection systems, and therefore installed only on critical equipment. The objective is to eliminate process downtime through equipment that is 100% available and reliable. At the same plant, there may also be monitoring of general purpose machinery using portable instruments. The objective of this program is to reduce maintenance expense through early detection of equipment and component defects. As on-line systems become readily available and accepted, walk around monitoring programs are improved using permanently installed sensors and hardware, typically installed at inaccessible or hazardous locations.

This course provides a detailed examination of the detection, location and diagnosis of faults in rotating and reciprocating machinery using vibration analysis. The basics and underlying physics of vibration signals are first examined. The acquisition and processing of signals are then reviewed followed by a discussion of machinery fault diagnosis using vibration analysis. Hereafter the important issue of rectifying faults that have been identified using vibration analysis is covered. The course is concluded by a review of the other techniques of predictive maintenance such as oil and particle analysis, ultrasound and infrared thermography.

COURSE OBJECTIVES

The training course aims to provide a treatment of the detection and diagnosis of faults in rotating equipment using vibration measurement and analysis. The course starts with an in-depth look at the measurement and the characteristics of vibration. Emphasis shall be laid on topics relevant to basics of vibration, vibration measurements, fault detection & diagnosis, analysis of bearing, coupling and other rotating machinery components.

- An understanding of the basics of vibration measurement
- The basics of signal analysis
- Understanding the measurement procedures and the characteristics of vibration signals
- Ability to use Data Acquisition equipment for vibration signals
- How to apply vibration analysis for different machinery faults
- How to apply specific techniques for pumps, compressors, engines, turbines and motors
- How to apply vibration based fault detection and diagnostic techniques
- The ability to diagnose simple machinery related problems with vibration analysis techniques
- How to apply advanced signal processing techniques and tools to vibration analysis
- How to detect, locate and diagnose faults in rotating and reciprocating machinery using vibration analysis techniques

- Ability to identify conditions of resonance and be able to rectify these problems
- How to apply basic allied predictive techniques such as oil analysis, thermography, ultrasonics and performance evaluation.

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.

All presentations are made in excellent colorful power point. Very useful Course Materials will be given.

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

WHO SHOULD ATTEND

- Instrumentation & Control Engineers
- Maintenance Engineers
- Mechanical Engineers & Technicians
- Control Technicians
- Electrical Engineers
- Electricians
- Maintenance Engineers & Technicians
- Process Engineers
- Consulting Engineers
- Automation Engineer

COURSE OUTLINE

What Is Vibration And How Can It Be Used To Evaluate Machinery Condition?

- Introduction
 - What Is Vibration Frequency And How Does It Relate To A Time Wave Form?
 - What Is Vibration Displacement ?
 - What Is Vibration Velocity ?
 - What Is Vibration Acceleration ?

- **What Is Vibration Phase ?**
 - **What Is The Vibration Spectrum ?**
 - **Difference Between RMS, Peak And Peak-Peak Vibration Amplitude ?**
 - **When To Use Displacement, Velocity Or Acceleration ?**
 - **How Much Is Too Much Vibration ?**
 - **What Is Overall Vibration ?**
 - **Understanding Phase And Its Application ?**
 - **How To Make Phase Measurements ?**
 - **Using Phase Analysis In Vibration Diagnostics ?**

Overview Of Vibration Transducer And How To Properly Select Them

- **Introduction**
 - **Types Of Vibration Transducers And Their Optimum Applications**
 - **Accelerometers**
 - **Velocity Pickups**
 - **Noncontact Eddy Current Displacement Probes**
 - **Shaft Contact Displacement Probes**
 - **Shaft Sticks**
 - **Shaft Riders**
- **Selection Criteria**
 - **Mounting Of Transducer**
 - **Transducer Mounting Application**

Proven Method For Specifying Spectral Band Levels And Frequencies Using Today'S Predictive Maintenance Software System

- **Brief Review Problems Detectable By Vibration Analysis**
- **Specification Of Overall Vibration Alarm Bands For Various Machine Types**
- **How To Specify Spectral Alarm Bands For Various Machine Types And Configurations**
- **Examples Of Various Machines With Spectral Alarm Bands Specified For Them**

Common Pitfalls In Everyday Vibration Measurements

- **Introduction**
- **Choosing Measurements Location**
- **Machine And Point Identification**
- **Measurement Parameters**
- **Instrument Selection, Setup, And Condition**
- **Measurements Techniques**
- **Transducer Mounting And Probes**

- Effect Of Transducer Mounting On Vibration Measurements

Digital Signal Processing

- Introduction
 - Related Time waveform Length And Frequency Band Width To Sampling Rate And Sample Size
 - Choose The Correct Analysis Window For Each Vibration Analysis Opportunity
 - Recognize Limitation Of Digital Signal Processing

Introduction To Vibration Signature Analysis And How To Diagnose Machine Operating Condition

- A. Mass Unbalance
- B. Eccentric Rotors
- C. Bent Shaft
- D. Soft foot
- E. Misalignment
- F. Mechanical Looseness
- G. Tracking Of Rolling Element Bearings Failure Stage Using Vibration Signature Analysis
- H. Practical case study
- I. Journal Bearings Failure
- J. Gear Problem Detection
- K. Electrical Problem Detection
- L. Belt Drive Problem
- M. Resonance Problem
- N. Hydraulic And Aerodynamic Forces Problem
- O. Rubbing
- P. Practical case study

NOTE:

- Pre & Post Tests will be conducted
- Case Studies, Group Exercises, Group Discussions, Last Day Review & Assessments will be carried out.

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