



MUE242

Advanced Rotating Equipment: *Troubleshooting of Pumps*

Course Introduction:

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 is 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. The latest approaches and equipment used together with current research techniques in vibration analysis are also highlighted in the course.

Course Objectives:

Upon successful completion of this course, the delegates will be able to:

- ✓ Understand the fundamental technology of rotating and reciprocating machines, in terms of how they work and how they fail
- ✓ Recognize wear and fatigue related failure mechanisms and the role of lubrication
- ✓ Demonstrate the interaction of the machine with the process and the need for maintenance and condition monitoring personnel to work more closely together
- ✓ Inspect and maintain machinery and to make informed decisions about the condition of plant
- ✓ Explain an introduction to condition based maintenance and condition monitoring and dispel rumors and demonstrate capabilities
- ✓ Understand the basics of vibration measurement
- ✓ Demonstrate the basics of signal analysis
- ✓ Understand measurement and the characteristics of vibration signals
- ✓ Use Data Acquisition Equipment for vibration signals
- ✓ Apply vibration analysis for different machinery faults
- ✓ Apply specific techniques for pumps, compressors, engines, turbines and motors
- ✓ Apply vibration based fault detection and diagnostic techniques
- ✓ Diagnose machinery related problems with vibration analysis techniques
- ✓ Apply advanced signal processing techniques and tools to Vibration analysis
- ✓ Detect, locate and diagnose faults in rotating and reciprocating machinery using vibration analysis techniques
- ✓ Identify conditions of resonance and be able to rectify these problems
- ✓ Apply allied predictive techniques such as oil analysis, Thermography, ultrasonic and performance evaluation

Who Should Attend?

This course is intended for maintenance engineers, supervisory and technical staffs working in maintenance related roles, which need either a greater awareness of, or to get more involved in, preventive maintenance activities and the troubleshooting of rotating and reciprocating machines. Because the methods and examples are generic, personnel from all industries will benefit.

Course Outline:

Day 1:

The Technology of Machines

- Parts of the machine: casing, rotor, bearing, coupling.
- Machinery mounting
- The role of foundations

Machinery Maintenance Requirements

- Strip-down
- Assembly
- Inspection
- Clearances
- Adjustment

Typical Trouble

- Imbalance
- Looseness
- Misalignment
- Gear problems
- Bearing problems.
- Operating issues.
- Provocative maintenance.

Day 2:

Lubrication

- The role of lubrication
- Selection of lubricant

Bearings

- Anti-friction bearings: types, lifetime, mounting, applications, related problems
- Plain and pad bearings, thrust bearings: operation, maintenance, incidents

Day 3:

Couplings & Alignment

- Different types of couplings, related problems
- Different methods of alignment
- Performing and alignment

Sealing Devices

- Mechanical pump seals, types, operation, related problems
- Other seals for positive displacement pumps and reciprocating compressors

Day 4:

Rotors and Shafts

- Types of imbalance
- Balancing procedures
- Performing a balance

Wear Induced Failures

- Typical damage to machines
- Origin of problems
- Causes of failures
- Fatigue

Day 5:

The Role of Vibration Monitoring

- What to monitor and where.
- Measurement devices
- Overall and spectral measurements.
- Vibration limits
- Introduction to spectrum analysis.

The Role of Lubricant Monitoring

- What to monitor and where.
- Shape, size, amount, chemical composition of debris.
- Debris limits.
- Analytical techniques

Course Certificate:

International Center for Training & Development (ICTD) will award an internationally recognized certificate(s) for each delegate on completion of training.

Course Methodology:

A variety of methodologies will be used during the course that includes:

- (30%) Based on Case Studies
- (30%) Techniques
- (30%) Role Play
- (10%) Concepts
- Pre-test and Post-test
- Variety of Learning Methods
- Lectures
- Case Studies and Self Questionnaires
- Group Work
- Discussion
- Presentation

Course Fees:

To be advised as per the course location. This rate includes participant's manual, hand-outs, buffet lunch, coffee/tea on arrival, morning & afternoon of each day.

Course Timings:

Daily Course Timings:

08:00 - 08:20	Morning Coffee/Tea
08:20 - 10:00	First Session
10:00 - 10:20	Recess (Coffee/Tea/Snacks)
10:20 - 12:20	Second Session
12:20 - 13:30	Recess (Coffee/Tea/Snacks)
13:30 - 15:00	Last Session
