



MUE105

Advanced Troubleshooting of Rotating Equipment

Course Introduction:

This advanced program for industry aims to convey the latest thinking and best practice of machinery vibration monitoring and analysis via lectures, case studies, video films, and friendly software and program activities. The program gives a detailed advanced treatment of the detection, location and diagnosis of faults in rotating and reciprocating machinery, using vibration analysis. Industrial case study examples are used throughout the program to emphasize key points and to underline the relevance and applicability of the topics being addressed.

Course Objectives:

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

- ✓ Have a detailed understanding of Advanced Time and Frequency Analysis Techniques
- ✓ Have the knowledge to assess accurately Machinery Condition
- ✓ Have acquired a knowledge of Accurate Diagnosis of Antifriction Bearings
- ✓ Have acquired a knowledge of Accurate Evaluation of Gear Problems
- ✓ Have acquired a knowledge of Structural Troubleshooting
- ✓ Have acquired a knowledge of Predicting Remaining Machine Life

Who Should Attend?

This course is intended for engineers and technicians working in application and management of predictive maintenance, designers, production managers and engineers working in technical and design modification roles within industries.

Course Outline:

Day 1:

VIBRATION SIGNAL PROCESSING AND ASSESSING CONDITION

- Sampling, Aliasing, Digitizing
- Time, frequency and modal domains
- Time & Frequency Representation
- Frequency domain instrumentation
- Fast Fourier transforms

- Windowing
- Filtering
- Averaging
- Amplitude Scales
- Transmission Path Effects
- Harmonic, periodic, random motion
- Generated and excited frequencies
- Frequencies caused by electronic phenomena
- Relationship between velocity, displacement and acceleration
- Band selectable analysis and real time bandwidth
- Speed and load adjusted sensitivity

Day 2:

ADVANCED ANALYTICAL TECHNIQUES

- Principles of the envelope
- Pulse trains and line spectra
- Loaded element modulation
- Definitions of the cepstrum
- The autocorrelation function and coding the cepstrum.
- Comparison with spectrum and phase sensitivity.
- Transmission path effects.
- Zoom cepstra and noise level effects.
- Dynamic range limitations and the effect of filter bandwidth.
- Other demodulation techniques
- Use of phase in diagnostics

Day 3:

ADVANCED TROUBLESHOOTING OF ANTI-FRICTION BEARINGS

- Data collection and transducer selection
- Frequency calculation
- Identifying (inner and outer race; multiple defects; defect severity; nature of defect; deep fatigue spalls; shallow flaking; frosting; acid etching/corrosion; fluting) defects
- Defects on balls/rollers and cage
- Inadequate lubrication

Day 4:

ADVANCED TROUBLESHOOTING OF GEARBOXES

- Transducer selection
- Gear vibration theory
- Gear mesh frequency; harmonics and sub-harmonics
- Hunting tooth frequency
- Planetary gears
- Gear life expectancy

Day 5:

ADVANCED DIAGNOSTICS AND STRUCTURAL TROUBLESHOOTING

- Vibration Control
- Fundamentals of isolator selection
- Structural supports Considerations
- Critical Shaft Speeds
- Vibration in Ducts
- Vibrational control via structural modification
- Electric motor analysis
- Steam turbines
- Pumps, starvation and cavitation
- Dual-channel impact testing
- Modal analysis
- Start-up/coast-down testing
- Critical speeds/damping
- Operational deflection shapes

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

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