

# VIBRATION ANALYSIS 2-DAY CLASSROOM

## CLASS FORMAT:

Classroom

## STANDARD CLASS SIZE:

NTT recommends a course size of 12 participants to obtain the best results.

## NTT PROVIDES:

- 2-day regional course—classroom format
- On-site instruction
- Textbooks
- Classroom consumables
- Completion certificates
- Shipping and instructor travel logistics.

## CLIENT PROVIDES:

- Classroom of 500 square feet or greater
- Projection screen, white board and/or flip chart(s).

*This two day course was developed to assist individuals who work in the field on various equipment to learn how to use, read, and apply the instruments and feedbacks related to vibration on rotating machinery.*

Basic vibration theory will be discussed along with the existing maintenance systems, predictive and preventative maintenance programs, and procedures for a good condition monitoring system. You may not walk out as an expert, however, you will leave the seminar with a very good understanding of what is necessary to make a valuable contribution at your facility.

## TOPICS

### VIBRATION BASICS

### CONCEPTS AND THEORIES

### INSTRUMENTS

### TYPICAL VIBRATION PROBLEMS

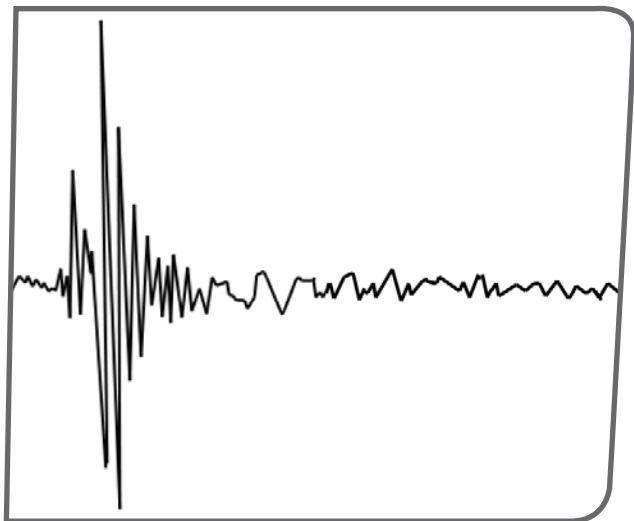
### TECHNIQUES

### MACHINE DIAGNOSTICS

### TRENDING

### ACOUSTICS

### FINAL REMARKS



# VIBRATION ANALYSIS 2-DAY CLASSROOM

## COURSE AGENDA | 2-Day Classroom

### VIBRATION BASICS

What is vibration (causes and characteristics)

- Earthquakes and Wind
- Music
- Acoustics
- Finite Element Analysis
- Modal Analysis
- Vibration Testing
- Shock
- Generating Vibration
- Machine Monitoring
- History

### CONCEPTS AND THEORIES

- Oscillation
- Mass, Spring, Damper
- Sine Waves
- Amplitude, Frequency, Phase
- Random Vibrations and Shock Pulse
- Time and Frequency Domains
- Vectors
- Displacement, Velocity, and Acceleration
- Natural Frequency and Resonant frequency
- Damping
- Mechanical Impedance
- Isolation
- Critical speed
- Life Cycle of Machinery

### INSTRUMENTS

- Ears, Hands, and Watch
- Types of vibration transducers
- Cables
- Meters and Filters
- FFT analyzer
- Sampling, Allasing, and Windows
- Averaging
- Zoom
- Linear and Log Scaling
- Triggers
- Comparator

- Memory
- Data Loggers and Computers
- Ancillary Instruments

### TYPICAL VIBRATION PROBLEMS

- Sources of Vibration
- Imbalance
- Misalignment
- Resonance
- Bearings
- Gears
- Vane Passing
- Fan
- Motor Vibration
- Cavitation
- Oil Whirl
- Piping
- Bent Shaft and Bowed Rotor
- Looseness
- Belts and pulleys
- Structural Vibration
- Foundations
- Sympathetic Vibrations
- Machinery Soft Foot
- Assembly Variables
- Beats
- Turbulence
- Reciprocating Machines
- Turbomachinery
- Torsional Vibrations
- Case Histories

### TECHNIQUES

- Amplitude Mapping
- Loose Part Monitoring
- Transducer Mounting Methods
- Phase Relationship
- Bode, Polar, and Waterfall Plots
- Test for Resonance
- Sand Patterns
- Deflection- Mode Shapes
- Uncoupled Driver

# VIBRATION ANALYSIS 2-DAY CLASSROOM

## COURSE AGENDA | 2-Day Classroom

### TECHNIQUES, continued

- Orbits
- Synchronous Time Average
- Crack Detection
- Time Wave Form

### MACHINE DIAGNOSTICS

- Narrow Band Frequency
- Standards
- Acceptance Testing

### TRENDING

- Managing Maintenance
- Preventive vs Predictive Maintenance
- Screens
- Setting up
- Permanent Monitoring

### ACOUSTICS

- The Physics of Sound
- Machinery Noise
- Sound Measurements
- Buildings
- Case Histories

### FINAL REMARKS

- Safety Precautions
- Approaching a Vibration Problem
- Do's