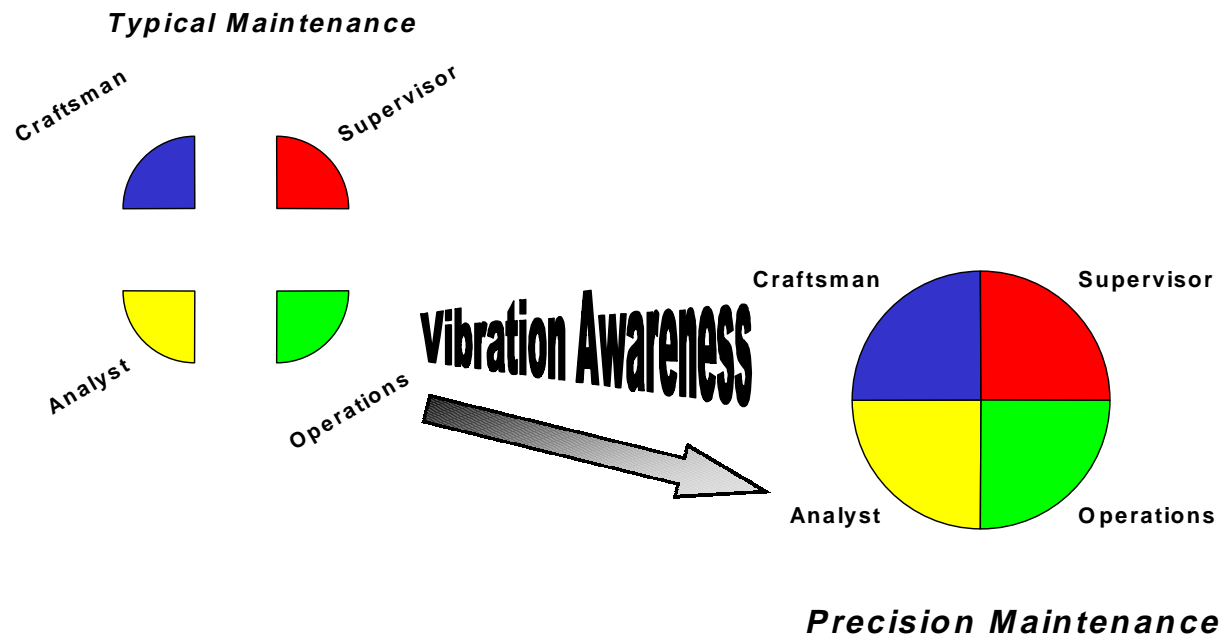


Maximizing Machinery Reliability... Vibration Awareness Seminar Synopsis

Maximizing Machinery Reliability...vibration awareness

Vibration analysis is often the cornerstone of modern machinery reliability programs. In order for machinery reliability programs to be effective, it is necessary for all maintenance personnel to understand the technologies used. This seminar is designed to create an awareness of the terminology, capabilities and limitations of vibration analysis for personnel who play the vital supporting roles in effective machinery reliability programs.

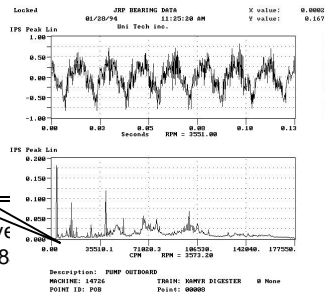


The seminar focuses on the practical application of vibration, detection, analysis and correction techniques. Its goal is to equip craft personnel, managers, supervisors, and operations personnel with the tools required to understand and support condition-based maintenance processes.

Using our unique Activity Based Training™ format, attendees do not just learn concepts, but receive detailed information on how to implement these concepts as a part of an effective machinery reliability program. The many guided hands-on activities are designed to maximize the retention of information.

Activity Based!

**Vibration
Analysis
Overview**



Unive
Phone: (303) 8

This seminar is designed for those who do not necessarily specialize in vibration analysis. Information is presented in a practical manner and using plain language. Personnel who work with and support the performance of vibration analysis processes are encouraged to attend.

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• Online: www.unitechinc.com • MMR Vibration Awareness synopsis.doc

Maximizing Machinery Reliability...

Vibration Awareness

Seminar Synopsis

Who should attend?

This seminar is designed primarily for maintenance, operations, engineering, technical support and management personnel whose job functions involve or relate to maximizing machinery reliability using current condition monitoring technologies. The scope of content is appropriate for those who collect vibration data, analyze machines, perform root cause failure analysis, or investigate and resolve premature machinery failure problems, as well as those who direct such activities.

Highlights

In this seminar, you will gain knowledge and experience relating to:

- Maximizing Machinery Reliability
- The Benefits of Effective Condition Monitoring
- Vibration Fundamentals and Terminology
- Common Symptoms, Major Causes, General Analysis of and Practical Prevention Techniques for the following vibration problems:
 - Resonance
 - Unbalance
 - Misalignment
 - Looseness
 - Bearings
 - Electrically-induced vibration
 - Flow-induced vibration
- Hands-on Activities on all Subjects

Seminar Duration

The duration of this seminar ranges from 2 1/2 to 3 days depending on client preference, worker availability, and the attendees' backgrounds. While this seminar is designed for a 3 day format, it is available in a 2 1/2 day format upon request to enable two courses to be presented per week.

Maximizing Machinery Reliability...

Vibration Awareness

Seminar Synopsis

Seminar Objectives:

Associated Tasks

VA1: Effectively support your facility's condition-based maintenance program, including:

- A. Understanding terminology associated with predictive maintenance technologies
- B. Communication with predictive maintenance personnel
- C. Understand the benefits of condition-based maintenance
- D. Understanding vibration analysis and machinery troubleshooting processes

VA2: Recognize the common symptoms, major causes, and practical prevention of the following machinery problems:

- A. Resonance
- B. Unbalance
- C. Misalignment
- D. Looseness
- E. Bearing Defects
- F. Electrically-induced Vibration
- G. Flow-induced Vibration

Overall Seminar Goals

Upon completion of this training the student will be able to properly:

1. Explain key elements and the benefits of an effective condition-based maintenance program.
2. Explain the terminology associated with condition-based maintenance and vibration analysis.
3. Explain how to determine vibration severity and associated precautions.
4. Explain precautions associated with data collection using modern FFT instruments.
5. Understand the machinery analysis approach, including the different types of data required.
6. Explain common symptoms, major causes, general analysis of and practical prevention techniques for the following common machinery problems:
 - Resonance
 - Unbalance
 - Misalignment
 - Looseness
 - Bearing Defects
 - Electrically-induced Vibration

Maximizing Machinery Reliability...

Vibration Awareness

Seminar Synopsis

- Flow-induced Vibration

NOTE: The objectives above highlight overall seminar goals. A complete copy of the specific objectives is available upon request.

Typical Seminar Outline/Schedule

Day 1 Subjects

- Introduction
- Maximizing Machinery Reliability Overview
 - Maintenance Philosophies
 - Applying RCM Principles to Select Machines for Precision Repair
 - Benefits of Precision Maintenance
 - Most Common Sources of Premature Failure
- Elements of Condition-based Maintenance
 - Detection
 - Analysis
 - Correction/ Improvement
 - Verification
- Vibration Terminology/Severity
- Vibration Analysis Approach
 - History/ Machine Details
 - Hand Feel
 - Spectrum
 - Phase/Relative Motion
- Data Acquisition Precautions
 - FFT Overview and Precautions
 - Transducer Location and Mounting Overview
- Resonance Introduction
- Symptoms of Resonance
 - Speed Sensitivity
 - Vibration Mode Shapes

Day 2 Subjects

- Symptoms of Resonance (continued)
 - Bump Tests
- Resonance Correction Techniques

Maximizing Machinery Reliability...

Vibration Awareness

Seminar Synopsis

- Bracing
- Mass
- Eliminate Source
- Unbalance Overview
- Symptoms of Unbalance
 - History
 - Interpreting Spectrum
 - Using Phase/relative Motion to Confirm Results
- Common Causes of Unbalance and Prevention Techniques
 - Tolerances and Standards
 - Precision Assembly Techniques
 - Costs vs. Benefits
- Misalignment Overview
- Symptoms of Misalignment
 - History
 - Spectrum/Precautions
 - Phase/Relative motion

Day 3 Subjects

- Common Causes of Misalignment and Prevention Techniques
 - Alignment Methods and Precautions
 - Applying Alignment Tolerances
 - Pre-alignment Checks
 - Detecting and Correcting Soft Foot
 - Detecting and Correcting Dynamic Movement, Thermal Growth, Pipe Strain
- Bearings
 - Common Causes of Bearing Failure
 - Symptoms of Bearing Failure
 - Pattern Recognition
 - Bearing Failure Prevention Overview
- Electric Motors
 - Symptoms of Motor Problems
 - Common Causes and Prevention Techniques
- Analysis Assistant Pattern Recognition Chart