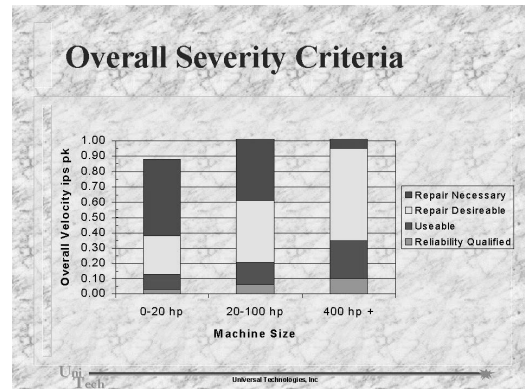


Managing Reliability and PdM Technologies Seminar Synopsis

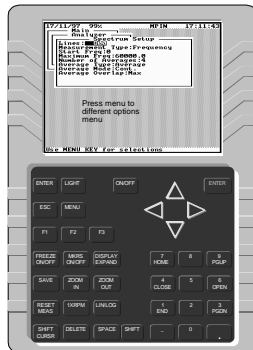
Abstract

Designed specifically for those who have management or supervisory roles within the organization, this seminar increases management personnel awareness of the need for a “precision” approach through use of extensive case histories and success stories. It also provides information on proven methods for justifying the investment in PdM tools, time and training, as well as setting up the organization and implementing machinery reliability programs.



This course begins with a discussion of different maintenance philosophies and methods, including use of Reliability-centered Maintenance (RCM) practices, as well as examples of how and where each maintenance strategy is appropriately applied. Case histories and practical examples drive home key points and reduce confusion often created by use of the many buzzwords surrounding machinery reliability.

Each of the primary condition monitoring/PdM technologies in use today is discussed, including the benefits of each:



- Visual Inspection and Monitoring
- Vibration Detection and Analysis
- Oil Analysis
- Infrared Thermography
- Ultrasonics
- Performance Monitoring
- Motor Analysis Techniques

Understanding and even using each of these technologies has proven over and over again NOT to be enough! If maximizing machinery reliability is the goal, processes must be in place not only to detect problems, but also to analyze them, determine the root cause of the problem, correct the problem, and verify the problem has indeed been corrected. Key elements of successful machinery reliability programs are discussed.

Throughout this seminar, instructor demonstrations reveal the impact of course content on machinery reliability, vibration levels, bearing life, etc. Attendees will leave this seminar with a *refreshed understanding* of maintenance principles and procedures they had forgotten, never used, or never learned. This seminar provides practical, easy-to-implement techniques and processes for ensuring maintenance tasks are performed *confidently right the first time*.

Managing Reliability and PdM Technologies Seminar Synopsis

Seminar Duration

The duration of this seminar is 2 days in a public format, and ranges from 1 to 2 days in plant depending on client preference, worker availability, and the attendees' backgrounds.

Who should attend?

This seminar is designed primarily for maintenance, engineering, technical support and management personnel whose job functions involve rotating machinery repair/asset management. The scope of content is appropriate for management personnel, as well as technicians or other employees who will benefit from an overview of machinery reliability processes and requirements.

Managing Reliability and PdM Technologies

Seminar Synopsis

Associated Tasks

Manage plant personnel involved with implementation of a Machinery Reliability program and use of PdM technologies.

Demonstrate technical understanding sufficient to provide program leadership and assess the program's effectiveness.

Objectives:

1. Explain the following maintenance philosophies, including the role each plays in an overall machinery reliability improvement process:
 - Breakdown/Repair
 - Preventive Maintenance (PM)
 - Predictive Maintenance (PdM)
 - Precision Maintenance

2. Explain six primary patterns of component failures, including the general percentages of age-related vs. random failures and the impact of these failure patterns on maintenance strategies.

3. Briefly explain the following condition monitoring/PdM technologies, including examples of the capabilities and limitations of each:
 - Visual Inspection and Monitoring
 - Vibration Detection and Analysis
 - Oil Analysis
 - Infrared Thermography
 - Ultrasonics
 - Performance Monitoring
 - Motor Analysis Techniques

5. Explain the following elements of an effective condition monitoring program:
 - Detection
 - Analysis
 - Correction
 - Verification

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6. Explain the meaning and application of the following vibration terms:
 - Displacement
 - Velocity
 - Acceleration
 - Frequency
 - Phase/Relative Motion

7. Briefly explain how to determine vibration severity, including the limitations of using overall vibration levels.

8. Explain the root cause failure analysis process, including the importance of the following steps:
 - History
 - Machine Details
 - Amplitude /Hand Feel
 - Spectrum
 - Phase/Relative Motion
 - Time Waveform

9. Explain the following sources of machinery vibration and identify their typical spectral symptoms:
 - Misalignment
 - Unbalance
 - Resonance
 - Bearings
 - Looseness
 - Flow-related problems
 - Electrical
 - Bent Shaft

10. Explain the major causes of unbalance and how to prevent them, including:
 - Standards, Methods and Tolerances
 - Assembly Errors
 - Operational Factors

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11. Explain the major causes of misalignment and how to prevent them, including:

- Tolerances
- Precision Alignment Processes
- Prealignment Considerations
- Dealing with Dynamic Movement
- Base and Foot-related Problems

12. Explain methods for verifying the effectiveness of condition monitoring, including:

- Establishing and tracking Key Performance Indicators (KPI's)
- Cost and Benefit Analysis

13. Briefly explain 12 key steps for implementing a plan for improving machinery reliability.

14. Explain the major components of a “precision repair,” including management and supervisory concerns that should be addressed.

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Seminar Synopsis

Seminar Schedule

Day 1 AM

1. Introduction
 - A. Who is Universal Technologies
 - B. Seminar Goals and Overview
2. Maintenance Philosophies
 - A. Breakdown
 - B. Preventive
 - C. Condition Based
 - D. Precision Maintenance
 - E. RCM Introduction
 - F. Failure Patterns
 - G. Examples of Where Each is Appropriate—Case Histories
 - H. How these philosophies are currently applied

Day 1 PM

3. Effective Condition Monitoring...the cornerstone of reliability improvement
 - A. The 4 Steps in an effective condition monitoring program
 - **Detection**...routine data collection picking out bad actors
 - **Analysis**...Root cause Failure Analysis
 - **Correction/Improvement**...Assembly, Tolerances, Alignment, PM tasks, attention to detail
 - **Verification**...Standards, QC check
 - B. Overview of Condition Monitoring Techniques
 - Touch-Feel...Overview, Capabilities and Limitations
 - Vibration...Overview, Capabilities and Limitations
 - Ultrasonics...Overview, Capabilities and Limitations
 - Oil Analysis...Overview, Capabilities and Limitations
 - Infra Red...Overview, Capabilities and Limitations
 - Performance Monitoring...Overview, Capabilities and Limitations

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Seminar Synopsis

Day 2 AM

C. Detection

- Vibration Terminology
 - Displacement
 - Velocity
 - Acceleration
 - Frequency
 - Phase
- Assessing Vibration Severity and exception/alarm reports
- Data collection requirements measurement quantity, location, quality.
- On-line vs. walk around systems

D. Analysis

- Overview of common vibration Problems
- The Analysis Process
- The Importance of history / machine details
- Hand feel
- Overview of vibration spectrum symptoms
 - Unbalance
 - Misalignment
 - Looseness
 - Resonance
 - Bearing defects
 - Electrical faults
 - Flow related
- Overview of vibration spectrum symptoms (continued)
- Phase
- Use all the tools at your disposal for effective analysis
- Bearing Failure Example...demonstration

E. Correction/ Improvement.....Maintaining for Reliability

- Unbalance Prevention
- Standards, Methods and Tolerances
- Assembly Errors...key length, set screws, eccentricity, accumulation of tolerances, etc.
- Operational Factors
- Misalignment Prevention
- Tolerances
- Precision Alignment Processes
- Prealignment Considerations

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- Dealing with Dynamic Movement
- Base and Foot-related Problems

Day 2 PM

F. Verification

- Proving Improvement
- Reports
- Establishing and reporting KPI's
- What are the Benefits?
- How much does precision cost?
- Power Savings
- Case Histories
- Class selection of machines to improve
- Development of Improvement Plan

3. Application of the Reliability Improvement Cycle

- A. 12-steps for Machinery Reliability
- B. Generic Precision Repair Procedure
- C. Where to Start
- D. Managing Cultural Change
- E. Rolls Royce Mentality
- F. Action Plan/To-Do List Development