PdM-301:
The Advanced Vibration Analyst

Associated Task(s)

1. Given common machinery applications, set up a vibration instrument and acquire the following analysis data:
   A. Phase / relative motion
   B. Time waveform
   C. Resonance data
   D. High frequency demodulation data

2. Gather, and analyze data and make suggestions for resolving the following vibration problems:
   A. Resonance
   B. Unbalance
   C. Misalignment
   D. Looseness
   E. Bearing Defects
   F. Electrically-induced Vibration

Seminar Objectives

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

1. Acquire phase analysis data with their vibration instrument using a variety of techniques including strobe light, reference transducer, and multi-channel functions.

2. Use phase data to help analyze the following problems:
   A. Unbalance
   B. Misalignment
   C. Looseness
   D. Resonance

3. Explain the precautions associated with the interpretation of phase data.

4. Explain the use of operating deflection shapes to analyze machinery problems and associated precautions, including:
   A. Unbalance
   B. Misalignment
   C. Resonance
   D. Looseness

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E. Soft foot

5. Explain the causes and effects of resonance on plant machines and structures.

6. Gather and interpret the appropriate vibration data to successfully analyze resonance.

7. Explain the steps required to effectively correct resonant conditions on plant machines and structures.

8. Explain the purpose of time waveform analysis and its application in modern condition monitoring programs.

9. Acquire appropriate time waveform data from a variety of plant machinery.

10. Use time waveform data to enhance existing analysis techniques.

11. Explain the precautions associated with use of time waveform analysis techniques.

12. Explain the use of orbit analysis in the diagnosing vibration problems on large rotating equipment.

13. Explain the operation of, common problems with, and the effective analysis of the following machines and components:
    A. Rolling Element Bearings
    B. Motors

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Seminar Outline

1.0 Introduction

2.0 Maximizing Machinery Reliability Overview

3.0 Review of Analysis II Information

4.0 Phase Acquisition
- 4.1 Strobe
- 4.2 Reference Signal
- 4.3 Multi-channel Functions

5.0 Phase Interpretation
- 5.1 Unbalance
- 5.2 Misalignment
- 5.3 Looseness
- 5.4 Resonance

6.0 Precautions
- 6.1 Vertical Pumps
- 6.2 Rigid Body Modes

7.0 Resonance Causes and Effects

8.0 Resonance Analysis
- 8.1 Mode Shape Plots
- 8.2 Bump Tests
- 8.3 Negative Averaging
- 8.4 Start-up/Coast-down/Waterfall
- 8.5 Phase Relationships
- 8.6 Shakers
- 8.7 Introduction to Modal Analysis (2 Channel Functions)

9.0 Resonance Correction
- 9.1 Stiffness
- 9.2 Mass
- 9.3 Damping
- 9.4 Absorbers

10.0 Time Waveform Introduction
- 10.1 Stiffness

11.0 Limitations of FFT Process

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12.0 Basics of Time Waveform Analysis Limitations of FFT Process
- 12.1 F=1/p

13.0 Instrumentation set-ups for Time Waveform
- 13.1 Gathering Valid Time Waveform Data
- 13.2 Using Triggers

14.0 Synchronous Time Averaging

15.0 Interpretation of Data
- 15.1 Pattern Recognition
- 15.2 Impacts
- 15.3 Rubs
- 15.4 Rolling Element Bearings
- 15.5 Gearboxes
- 15.6 Variable Speed
- 15.7 Electrical Faults
- 15.8 Reciprocating Machinery

16.0 Electric Motor Introduction
- 16.1 Principles of Operation AC/DC

17.0 Electric Motor Analysis
- 17.1 AC Induction Motors
- 17.2 DC Motors

18.0 Motor Current Signature Analysis

19.0 Vendor Specifications

20.0 Analysis Using HF Demodulation Techniques
- 20.1 Rolling Element Bearings
- 20.2 Gearbox Analysis

21.0 Electric Motor Introduction
- 21.1 Effective Condition Monitoring Program Overview

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