ISO 18436 Category I

Basic Vibration Analyst Training & Certification

CAT-I

Online Learning & Classroom Course

The Vibration Analysis Cat I course is intended for personnel who are new to vibration monitoring and analysis, and for personnel who have limited vibration analysis experience. The course focuses on periodic, single channel data collection and analysis for condition based maintenance programs. A foundation is established for in-depth understanding of spectrum and waveform relationships. This is the ideal starting place for new vibration analysts, people collecting vibration data, and those who want a better understanding of vibration analysis and condition monitoring. You will come away from this course with a very good understanding of the fundamentals; you will understand how to take good measurements (and understand the importance of repeatability); and you will be ready to begin analyzing vibration spectra.

Detailed topic list:

Maintenance Practices

- What is breakdown maintenance and when should it be employed?
- What is preventive (calendar based) maintenance, and what are its major flaws?
- What is predictive (condition based) maintenance, and what are its benefits?
- What is proactive (reliability centered) maintenance, and what are its benefits?

Condition monitoring

- Acoustic emission (ultrasound):
  - What is acoustic emission?
  - What can it tell you about rotating machinery?
  - How to you detect leaks and electrical faults?
  - How can it be used to detect bearing faults?
- Thermography
  - What is thermography?
  - How can it be used to detect faults in mechanical and electrical equipment?
  - What is emissivity, and how does it affect the accuracy of the measurements?
  - What are the key qualities of thermal imaging cameras?
- Oil analysis
  - How can it be used to check if the machine has a fault condition,
  - How can you test if the lubricant is “fit for purpose”?
  - What do viscosity, cleanliness, particle count, and other tests tell you?
- Wear particle analysis:
  - How are the tests performed?
  - How can you learn about the nature of wear?
  - How can you determine which components are wearing?
  - How does it differ from conventional oil analysis?
- Motor testing
  - What are the most common types of faults?
  - What can motor current analysis tell you?
  - What other test types tell you about the condition of the rotor, stator, and insulation?
- Vibration analysis
  - Quick introduction to vibration analysis
  - Spectrum versus overall level readings
  - Walk-around versus on-line monitoring versus protection systems

Principles of vibration

- Introduction to vibration measurement
  - A quick introduction to the accelerometer and displacement probes
  - A quick introduction to the vibration waveform (via live displays)
- An introduction to the time waveform
  - What is the time waveform?
  - How does it change with higher and lower frequency
  - What is frequency and period?
  - How does it change with amplitude
  - What are rms, peak and peak-peak?
  - What happens when the vibration includes multiple frequencies and amplitudes?
- An introduction to the spectrum
  - What is the spectrum, and what does “FFT” mean
  - How can a spectrum be used to separate each source of vibration into a graph that highlights the different frequencies of vibration

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- An introduction to forcing frequencies
    - Using units of orders instead of Hz or CPM.
    - Calculating forcing frequencies
    - Identifying shaft speed
    - Blade and vane passing frequencies, bearing frequencies, gear mesh frequencies, and more
    - Gear and belt driven machines (multiple shafts with different turning speeds)
- Explaining the different vibration units
    - What is the difference between acceleration, velocity and displacement?
    - When would you use each type of unit?
    - How to convert between each type of unit?
- A brief introduction to phase
    - What is phase (in-phase, out of phase, phase angle)?
    - Why is it important in vibration analysis?
    - How is it measured with a single-channel analyzer, two-channel analyzer, and strobe?

Data acquisition

- A quick review of data acquisition
- How do we measure vibration?
    - The non-contact eddy current displacement probe
    - The velocity probe
    - The accelerometer
- Where to place the sensor on the machine
- Understanding axial, radial, vertical, and horizontal readings
    - Do you really need to measure in three axes?
    - What does one axis tell you that another will not?
- A quick introduction to mounting the accelerometer and surface preparation
    - Comparing handheld probes, magnetic mounts, and quick connect mounts
    - The 3D animations will highlight the important differences
    - What do you do if you cannot access the desired measurement point?
- Naming conventions
    - Where is position “1” on the machine?
    - What does “MNDE” mean?
- What are “routes” and how do you create them?
    - Downloading, following, and uploading routes
    - Why should you record your field observations when you are in the field (and why should you listen to the vibration during data collection)?
    - Recognizing bad data (and deciding what you should do if you get bad data)

Signal processing

- A quick tour of your analyzer
    - Fmax and lines of resolution (LOR)
    - The importance of selecting the correct Fmax and lines of resolution?
- Spectral averaging
    - What does averaging do, and why is it important?

Vibration analysis

- The spectrum analysis process
    - Four steps to success
    - The ISO standard
- What is resonance – a quick introduction
    - How does it affect your machines and your measurements
- Diagnosing common fault conditions
    - Unbalance
    - Misalignment
    - Looseness
    - Rolling element bearing wear
    - Common electric motor faults
    - Common pump, fan and compressor faults
    - Common belt drive and gearbox faults

Setting alarm limits

- The ISO standard for setting alarms
    - How to use them
    - Their limitations
- Band alarms
    - How they can be used to warn you of changes in vibration level
    - How they can aid your analysis process
    - Their limitations
- Envelope alarms
    - How they can be used to warn you of changes in vibration level
    - Their limitations