ISO 18436-2 Category 1 Vibration Analysis

3 Days, optional certification exam on day 4

This course is intended for those who are new to machinery vibration analysis. It is appropriate for people who are involved in vibration analysis as well as for those who wish to gain awareness of the technology. Whether you are or will be collecting and analyzing data, managing people who collect vibration data or simply want to understand what vibration is all about; this course is for you!

This course meets and exceeds the requirements for ISO 18436-2. For those seeking certification, an optional 2 hour multiple choice exam is provided on Day 4 in the morning.

Alan Friedman is the founder and CEO of Zenco, a provider of vibration monitoring program audits and training and the author of "Audit it. Improve it: Getting The Most from Your Vibration Monitoring Program."

Alan has more than 29 years experience in helping people set up and manage vibration monitoring programs in every industry type, worldwide. From 1991 – 2006, Alan was a senior engineer at DLI Engineering (now AzimaAI) where he was involved in product development, training, training course development and writing, publishing and presenting technical papers at tradeshows. In 2007, Alan joined the Mobius Institute and has taught vibration analysis in accordance with ISO18436-2 Categories I, II, III and IV to thousands of personnel worldwide. He is CRL, CMRP and ISO18436-2 Category IV certified and he speaks English and Spanish.

www.zencovibrations.com
www.linkedin.com/in/alanfriedmanvibe

Zenco
14180 Madison Ave NE
Bainbridge Island, WA 98110

zencovibe@gmail.com
www.linkedin.com/in/alanfriedmanvibe
www.zencovibrations.com

ZENCO
VIBRATION EXPERTS

Maintenance Practices

- Reactive maintenance
- Run to Failure maintenance
- Preventive (calendar based) maintenance
- Predictive (condition based) maintenance
    - RCM / FMECA
    - P-F Interval
    - Key performance indicators
    - Overall equipment effectiveness (OEE)
- Proactive (reliability centered) maintenance
    - What causes machines to fail?
- Using criticality analysis and FMECA to define condition monitoring program

Condition monitoring technologies

Acoustic emission (ultrasound):

- What is ultrasound?
- How is ultrasound measured? (airborne, structure-borne)
- What can you find with ultrasound?
- How to detect air and steam leaks
- Acoustic emission and electrical faults
- Acoustic emission and bearing lubrication
- How can it be used to detect bearing faults?
- How does it compare to vibration analysis?

Infrared (IR) Thermography

- What is thermography?
- Detecting faults in mechanical and electrical equipment
- Emissivity. Accuracy of the measurements
- How can measurements be misinterpreted?
- Key qualities of thermal imaging cameras

Used oil analysis

- Common tests: viscosity, cleanliness, particle count etc
- Collecting good samples

Wear particle analysis (Ferrography)

- How is it different from used oil analysis?
- What mechanical faults can you find?

Electric Motor testing

- Motor current signature analysis (MCSA)
- Electrical signal analysis (ESA)
- Motor circuit analysis (MCA)
- Vibration analysis of motors (introduction)

Principles of vibration

- Introduction to vibration / Overview
- What is it? How is it measured? What can it find?
- Amplitude: RMS, peak and peak-peak
- Frequency Hz, CPM, Orders
- Phase: What is it? How is it measured? What is it used for?
- Units of vibration (displacement, velocity, acceleration)
- ISO RMS overalls and alarms
- Complex vibration, Time waveform
- Introduction to the vibration spectrum and FFT
- Benefits of the spectrum
- Forcing frequencies introduction
- Orders and order normalization
- Calculating forcing frequencies, relating vibration to machine components
- Intro to resonance

Data acquisition

- How is vibration measured?
- Sensor types: Proximity probes, velocity probe, accelerometer, MEMs sensors, wireless sensors
- Where to take readings on the machine and why it matters
- Mounting the accelerometer
- Dealing with difficult situations
- Test point naming conventions
- Vibration routes: Downloading and following routes
- Field observations and defect detection
- Recognizing bad data (and getting good data)

Signal processing

- How does your analyzer work?
- What are the common settings you need to be aware of?
- Fmax, lines of resolution (LOR), Averaging, ICP power etc.
- Importance of test configuration

Vibration analysis

- How to analyze vibration spectra
- Data presentation
- Intro to trending and alarms

Fault Diagnosis

- Diagnosing common machine faults
- Unbalance, Misalignment, Looseness, Rolling element bearing wear, Electric motor faults, Pumps, fans and compressor faults, Belts and gearbox faults etc.

Setting alarms

- ISO standards for setting alarms; use and limitations
- Mask Alarms, Band alarms etc.