Brüel & Kjær Vibro
a spectris company

VA ISO 18436 Category III
Advanced Vibration Analyst Training & Certification

CAT - III

Brüel & Kjær Vibro is an accredited Partner of the Mobius Institute©

The Advanced Vibration Analyst CAT III course is intended for personnel who have at least 3 years of vibration analysis experience.

The course provides an in-depth study of diagnostic measurement techniques and the associated applications of the techniques. It is expected that the attendee is either the leader of the vibration team, or takes a leading role in diagnosing faults and making the final recommendation. This person must fully understand all data collector options, special test capabilities, all analysis tools and must understand the widest range of fault conditions.

Course Information:

Course Format: 4-day Public classroom (and live stream) courses in Nærum (Denmark) or Darmstadt (Germany). Private and on-site courses for a single company (min. 5 students) are available.

Optional: Certification examination, 4 hours, 100 multiple-choice questions, 70% passing grade. Can be taken online or in the classroom.

Certification Prerequisite: Prior CAT-II certification by a MIBoC approved training centre and 36 months experience in vibration measurement is required for certification.

The certification scheme is compliant with ISO 18436 and ISO/IEC 17024.

Detailed topic list:

Signal processing and data acquisition

- Filters:
  - Low pass
  - band pass
  - high pass
  - band stop
- Signal to noise ratio
- Analog integration
- Digital integration
- Testing low speed machines
- Sampling
- Aliasing
- Dynamic range
- Data collection time
  - Resolution
  - Fmax
- Averaging:
  - Linear
  - Overlap
  - peak hold
  - negative averaging
  - time synchronous
- Windowing and leakage
- Order tracking
- Cross channel testing
- Correlation and coherence

Time waveform analysis

- Collecting data - ensuring you have the correct setup
- When should you use time waveform analysis
- Diagnosing:
  - Unbalance
  - Misalignment
  - Bent shaft
  - Eccentricity
  - Cocked bearing
  - Resonance, looseness

Phase analysis

- Review of phase
- Collecting data
- Bubble diagrams
- Diagnosing:
  - Unbalance
  - Misalignment
  - Bent shaft
  - Eccentricity
  - Cocked bearing
  - Resonance
  - Looseness

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Dynamics (nat. frequencies and resonances)

- Natural frequencies and resonances
- Mass, stiffness and damping
- SDOF and MDOF

Testing for natural frequencies

- Run-up coast down tests
- Bode plots and Nyquist (polar) plots
- Impact and bump tests

Operating Deflection Shape (ODS)

- Can we prove the existing of a natural frequency?
- Visualizing vibration
- Setting up the job
- Collecting phase readings correctly
- Interpreting the deflection shape

Modal analysis and intro to FEA

- How does modal analysis differ from ODS?
- How does Finite Element Analysis (FEA) differ from modal analysis?
- A quick review of the modal testing process

Correcting resonances

- The effect of mass and stiffness
- Beware of nodal points
- Adding damping
- A 'trial and error' and 'scientific' approach
- Isolation
- Tuned absorbers
- Tuned mass dampers

Rolling element bearing fault detection

- Why do bearings fail?
- Cocked bearing
- Sliding bearing on the shaft
- Sliding bearing inside the housing
- Looseness
- EDM and DC motors and VFDs
- Bearing frequencies and what to do when you don't have all the details
- The four stages of bearing degradation
- Ultrasound
- High-frequency detection techniques:
  - Shock Pulse
  - Spike Energy
  - PeakVue
- Demodulation/enveloping
- Selecting the correct filter settings
- Spectrum analysis
- Time waveform analysis
- Low-speed bearings

Journal bearing fault detection

- What are journal bearings?
- Measuring displacement
- Introduction to orbit plots
- Using your analyzer to acquire orbit plots
- Introduction to centerline diagrams
- Eccentricity ratio
- Glitch removal
- How the orbit changes:
  - Pre-load
  - Unbalance
  - Misalignment
  - Hydraulic instabilities oil whir and whip

Electric motor testing

- How do motors work?
- Diagnosing a range of fault conditions:
  - Eccentric rotor
  - Eccentric stator
  - Soft foot
  - phasing
  - Broken rotor bars
  - Rotor bar and stator slot pass frequencies
- Motor current analysis

Pumps, fans, and compressors

- Blade/Vane passing frequency
- Unique fault conditions
  - Flow turbulence
  - Recirculation
  - Cavitation

Gearbox fault detection

- Spectrum analysis versus time waveform analysis
- Wear particle analysis
- Gearmesh
- Gear assembly phase frequency
- Hunting Tooth Frequency
- Gear Wear
- Tooth load
- Broken teeth
- Gear eccentricity
- Gear misalignment
- Backlash and more

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Corrective action

- General maintenance repair activities
- Review of the balancing process and ISO balance grades
- Review of shaft alignment procedures

Running a successful condition monitoring program

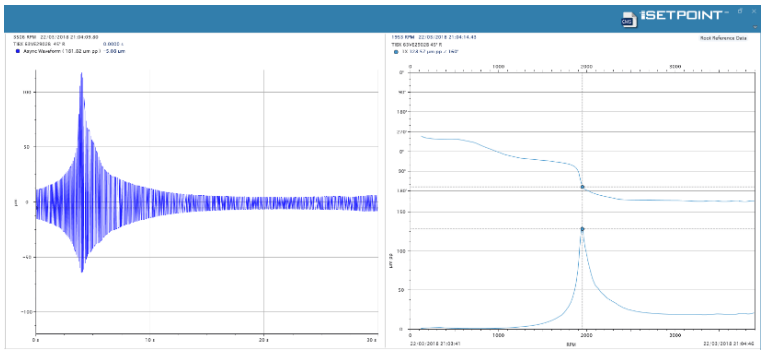
- Defining the program
- Setting baselines
- Setting alarms: band, envelope/mask, statistical
- Setting goals and expectations (avoiding common problems)
- Report generation
- Reporting success stories

Acceptance testing

- Commissioning/Acceptance of machines

Review of ISO standards

- References



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