VCAT-III Senior Vibration Analyst

ISO 18436-2 Category III

Learn to be an effective vibration leader and master analyst - capable of managing the condition monitoring program, diagnosing the widest range of fault conditions, verifying and correcting resonance problems, performing complex balancing machinery - with advanced 3D animations and interactive simulations that make everything easy to understand.

If you are ready to be the senior vibration analyst, with the capability of handling all the common fault conditions and leading the Category I and II analysts, then this is the course for you.

The Category III course is intended for people who are confident with spectrum analysis but who wish to push on and learn more about signal processing, time waveform and phase analysis, cross-channel testing, machine dynamics, and fault correction. If you wish to truly advance in vibration analysis and be able to run a successful condition monitoring team, then you are ready for this course.

- You will learn to diagnose all of the common fault conditions with rolling element and sleeve bearing machines, utilizing spectra, high-frequency detection techniques, time waveforms, phase readings, and other techniques to diagnose faults.
- You will also learn machine dynamics (natural frequencies, resonance, etc.), how to perform resonance testing, and how to correct resonance problems. The course also covers single and cross-channel measurement capabilities of your analyzer.
- And after completing the CAT-III course, you will be able to set up and run a successful vibration program and mentor the junior analysts.

Once you complete the training, you can take the exam with confidence, and become certified to ISO 18436-2 Category III via the internationally respected Mobius Institute Board of Certification [MIBoC]. The MIBoC certification is accredited to ISO/IEC 17024 - there is no higher standard. You will join thousands of other Mobius certified analysts around the world.

VCAT-III CANDIDATE PROFILE

This course is intended for the vibration analyst who will:

- Have a minimum of 3 years of experience
- Have a senior role in the condition monitoring team
- Have others report to them to verify diagnoses
- Be responsible for the most complex fault conditions (with the possible exception of sleeve bearing, flexible rotor machines)
- Need to perform complex tests to validate fault conditions (e.g., resonance) and find a solution
- Want to be a leader of the vibration team or take a leading role in diagnosing faults and making repair recommendations
- Want to understand all data collector options, special test capabilities, all analysis tools and understand the widest range of fault conditions
- Seek to become certified to international standards (ISO-18436) by an accredited certification body
- Want to understand all condition monitoring technologies, how and when to apply them
- Want to understand machine dynamics (natural frequencies, resonance, ODS), how to perform resonance testing and how to correct resonance problems
- Use the training and certification as the next step in a rewarding career as a vibration analyst

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WHAT WILL YOU GAIN FROM TAKING THIS COURSE?

There is a great deal to learn, but it will help you to perform your role with confidence. The topics covered in this course include:

- Review of condition monitoring technologies and the ISO standards
- Signal processing and data acquisition
- Time waveform analysis
- Phase analysis
- Dynamics (natural frequencies and resonance)
- Testing for natural frequencies
- Operating Deflection Shape (ODS) analysis
- Modal analysis and intro to FEA
- Correcting resonances
- Rolling element bearing fault detection
- Journal bearing fault detection
- Electric motor testing
- Pumps, fans, and compressors
- Gearbox fault detection
- Corrective action
- Running a successful condition monitoring program
- Acceptance testing
- Review of ISO standards

The key is that with the VCAT-III course, you will transition from being a vibration analyst who should be supervised to a person who is capable of running the program, being a senior consultant, solving difficult problems, and taking a leadership role.

VCAT III FAST FACTS

Duration:

38 hours, typically over five days

Format:

- Live public course
- On-site course
- Virtual online course
- Video distance learning online courses and Life Long Learning (LLL)

Compliance:

- Training and certification: ISO 18436-2
- Certification: ISO 18436-1, ISO/IEC 17024
- Training: ISO 18436-3

Exam:

- Four hours
- 100 multiple-choice questions
- 70% passing grade
- Can be taken online or in-person at the course

Certification requirements:

- Training course completed
- 36-months of vibration analysis experience, verified by an independent person
- Have previsouly been certifed to VCAT-II by a MIBoC approved certification body
- Pass the exam
- Valid for 5 years

Pre-study:

- Access to the “Learning Zone” upon registration and payment
- Complete set of videos covering every topic
- An excellent way to be prepared and get the most from the course

Post-study:

- Continue to access the Learning Zone for 4-months after the course or upgrade your access for a lifetime with Life Long Learning (LLL).
- Continue learning, without charge, on MOBIUS CONNECT® via WWW.MOBIUSCONNECT.COM

TOPICS COVERED – SENIOR ANALYST CATEGORY III

Signal processing

- Filters: Low pass, band pass, high pass, band stop
- Sampling, aliasing, dynamic range
- Signal-to-noise ratio
- Resolution, Fmax, data collection time
- Averaging: linear, overlap, peak hold, time synchronous
- Windowing and leakage
- Order tracking
- Cross-channel measurements
- 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, and other conditions

Phase analysis

- Collecting data
- Bubble diagrams
- Diagnosing unbalance, misalignment, bent shaft, eccentricity, cocked bearing, resonance, looseness, and other conditions

Dynamics (natural frequencies and resonance)

- 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) analysis

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

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’ approach
- A ‘scientific’ approach
- Isolation
- Tuned absorbers and tuned mass dampers

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TOPICS COVERED – SENIOR ANALYST CATEGORY III

(continued)

- Rolling element bearing fault detection
  - Why do bearings fail?
  - Cocked bearing, sliding on the shaft or 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, Peak Vue, and other techniques
  - 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 with pre-load, unbalance, misalignment, 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
  - Unique fault conditions
  - Flow turbulence, recirculation, cavitation
- Gearbox fault detection
  - Spectrum analysis versus time waveform analysis
  - Wear particle analysis
  - Gearmesh, gear assembly phase frequency (and common factors)
  - Tooth load, broken teeth, gear eccentricity and misalignment, backlash and more
- 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
- Review of ISO standards