Mobius Institute

Vibration Analysis Distance Learning

ISO Cat III & ASNT Level III Vibration Analysis

Mobius Institute offers distance learning courses for vibration analysis at the Category I, II and III level, identical to the instructor-led courses we teach globally. You can learn at your own pace, with assistance from an instructor, and optionally take a certification examination at the end of the course.

This 40 hour course is intended for people who are confident with spectrum analysis but wish to push on and learn more about signal processing; time waveform and phase analysis; cross-channel testing; machine dynamics; fault correction; and more. If you wish to truly master vibration analysis and be able to run a successful condition monitoring team, then you are ready for this course.

You will have four months to view the course materials. ISO 18436-2 recommends 40 hours of training for a course at this level and 110 hours of cumulative vibration training throughout your career. You may view the materials as many times as you like for the duration of the course. In order to become certified you will need 36 months of experience and you will need to pass the 100 question exam.

As a Category III Vibration Analyst you are expected to be able to diagnose all of the common faults conditions with rolling element bearing machines; have a good understanding of fault conditions associated with sleeve bearing machines; utilize time waveforms, phase readings and enveloping/PeakVue etc. readings to diagnose faults; and understand all condition monitoring technologies, how and when to apply them, and how to combine technologies to get the best results.

You must also understand machine dynamics (natural frequencies, resonance, etc.); how to perform resonance testing; and how to correct resonance problems. You must also understand balancing, alignment, and isolation. You are also, therefore, required to understand all of the single and cross-channel measurement capabilities of your analyzer. And finally, you are also expected to be able to set up the program, run a successful program, and mentor the junior analysts.

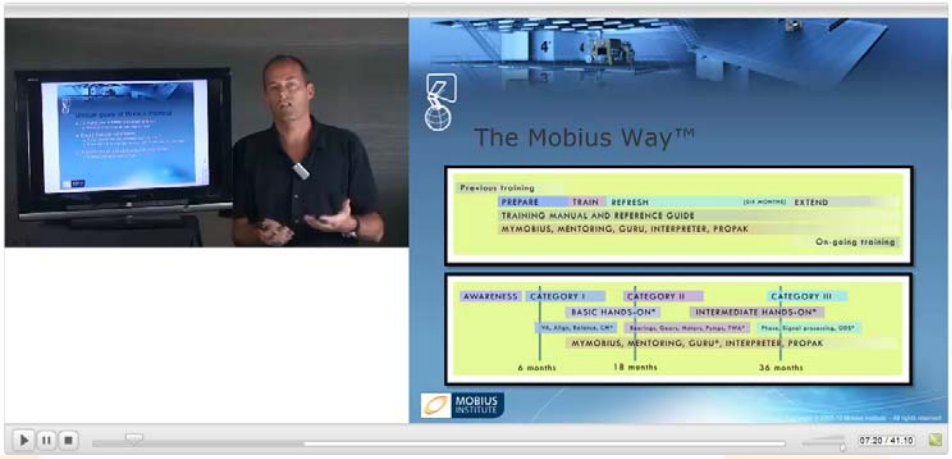
Distance Learning benefits

If the high cost of travel and accommodation and the time away from your family and work has stopped you from receiving the training that you need, then you should consider our distance learning courses.

At the time and pace that works best for you, you can take our lessons and learn in a very similar way to attendees of our classroom courses. This approximately four day course is available for three months online from the time your register.

Video lessons

Each video has been carefully created and edited so that you receive the full benefit exactly as you would in a live class – without the distractions. You will see the instructor talking and see the presentations, animations and simulators being used in high resolution. You can pause, replay or forward the video so that you can review any topic as many times as you need. All you need is a good Internet connection and monitor (1024x768 or better) and you will be ready to start learning.



Mobius makes learning about vibration analysis unique. We use 3D animations, Flash simulations, and numerous software simulators that completely demystify vibration analysis. While vibration training courses have traditionally been very theoretical, difficult to understand, (and boring), you will be captivated by the Mobius Training methods, and you will enjoy our practical approach. You will take away skills that you can immediately apply to your job, and you will truly understand what you are doing. When senior vibration analysts attend our classes they often say "if only I could have learned this way when I got started" – well, now you can!

In addition to the lessons, we present hands-on videos that show a variety of vibration analyzers being used to perform a range of tests. The tests include demonstrations of averaging (linear, rms, and peak hold), bump tests, run up and coast down tests, simple ODS tests, bearing fault detection tests, phase analysis, live spectrum analysis, time waveform analysis, and more.

You will also perform activities defined by the instructor, and take quizzes that will be reviewed by the instructor. Questions for the instructor may be submitted and will be answered electronically.

Certification

The course exceeds ISO 1836-2 and meets ASNT SNT-TC-1A Recommended Practice for training and certification of vibration analysts.

This course includes a Course Manual, Quick Reference Guide, Mobius mouse pad with fault diagnostic reminders and pen. Examinations for certification are offered as an option at the end of the course.

All Mobius certified analysts receive personalized logos with their certification number and name for their own professional use. Mobius Institute also maintains a listing of all certified analysts on mobiusinstitute.com and provides each analyst with a personal webpage.

Who Should Attend?

If you are Category II (or Level II) certified and are ready to take your career and responsibilities to the next step, and you wish to truly master vibration analysis, diagnosis and correction, then this course is ideal for you. You should have over 30 months of experience and a good understanding of fault diagnosis and spectrum analysis. (Note that 36 months experience is required to be certified.)

The Mobius Institute course and certification program follows the ISO 18436-2 standard and the ASNT Recommended Practice SNT-TC-1A.

Course Description

Duration: 4 months online to complete 40 hour of Cat III & Level III instruction; Optional Certification Examination: 100 questions, 70% Passing Grade, Invigilator required. Only the ISO Category III examination is given. (The ASNT Level III examination may only be given by ASNT.)

The Vibration Specialist Advanced course is intended for personnel who have at least two years vibration analysis experience and Category II or Level II certification by a recognized certification body. 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.

The Category III Vibration Analyst is expected to be able to diagnose all of the common faults conditions with rolling element bearing machines; have a good understanding of fault conditions associated with sleeve bearing machines; utilize time waveforms, phase readings and enveloping/PeakVue type readings to diagnose faults. He/she needs to understand all condition monitoring technologies, how and when to apply them, and how to combine technologies to get the best results.

The Category III Vibration Analyst must also understand machine dynamics (natural frequencies, resonance, ODS), how to perform resonance testing and how to correct

resonance problems. He/she must also understand balancing, alignment, and isolation and is also therefore required to understand all of the single and cross-channel measurement capabilities of the analyzer. Finally, he/she is also expected to be able to set up the program, run a successful program, and mentor junior analysts. Topics covered include:

Review of condition monitoring technologies and the ISO standards

Signal processing and data acquisition

- Filters: Low pass, band pass, high pass, band stop
- Signal to noise ratio
- Analog and digital integration
- Testing low speed machines
- Sampling, aliasing, dynamic range
- Resolution, Fmax, data collection time
- 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, bend 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
- Analysis of induction motors

Operating Deflection Shape (ODS) analysis

- 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 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

Rolling element bearing fault detection

- Why do bearings fail?
- Cocked bearing, sliding on shaft or inside 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

- 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

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