

## Vibration Analysis Training: ISO Category II + ASNT Level II

### Quick facts

*This four day course, with an additional day for review and the exam, is intended for people who have mastered the basics, but who need to be able to take good data (and decide how the data collector should be set up); analyze a range of fault conditions; and understand balancing and alignment.*

*The course exceeds the ISO 18436-2 Category II standard and meets the ASNT Level II Recommended Practice.*

*The certification exam can be taken after the course.*

### Course description

#### Duration:

*4 days + review and exam on fifth day*

#### Description:

*Do you already have an understanding of vibration fundamentals and want to become more confident and accurate in your diagnoses? Then you will enjoy this course!*

*As a Category II analyst you are expected to know how to test machines correctly, how to diagnose faults accurately (and perform additional tests to verify your diagnosis), how to set vibration alarm limits, and how to correct certain types of faults. Now it is time to understand what those analyzer settings mean so that you can take the best measurements. Now it is time to understand why the vibration patterns change the way they do – and how to use time waveform analysis and phase analysis to verify the fault condition.*

*We are offering you the opportunity to not only learn these topics, but to truly understand the analyzer and machine so that you feel confident in the decisions you make.*

#### Language:

Training delivered in Arabic and/or English based on the participants preference.

Training material is in English.

## **Aim:**

*You will come away from the course with a solid understanding of:*

- 1. How a well designed program, and the reliability centered maintenance approach (with precision balancing, alignment, lubrication and resonance control), will improve the OEE and therefore the bottom line.*
- 2. The condition monitoring technologies: acoustic emission, infrared analysis (thermography), oil analysis, wear particle analysis, motor testing – via supplementary training*
- 3. How machines work – via supplementary self-study via the “Equipment Knowledge” section*
- 4. How to select the correct measurement location and axis, and collect good, repeatable measurements*
- 5. What the Fmax, resolution, averaging and other analyzer settings mean, and how to select the optimum settings for a wide variety of machine types*
- 6. How to analyze vibration spectra, time waveforms, envelope (demodulation), and phase measurements*
- 7. How to diagnose a wide range of fault conditions: unbalance, eccentricity, misalignment, bent shaft, cocked bearing, looseness, rolling element bearings faults, journal bearing faults, gearbox faults, resonance, and other conditions*
- 8. How to set alarm limits manually and with statistics*
- 9. How to balance and align a machine, and correct a resonance condition*

## **Who should attend?**

*If you have been performing vibration analysis for more than six months, and feel that you have a good understanding of the fundamentals, then you are ready to step up to the Category II course. (Note that you require 18 months experience to be certified.) Anyone who wants to be confident and capable of diagnosing a wide range of fault conditions, correct certain conditions, and taking accurate measurements needs to take this course. Many plant sites require contractors to be certified, and many employers require employees to be certified. The Mobius Institute course and certification program follows the ISO 18436-2 standard and the ASNT Recommended Practice SNT-TC-1A.*

## What is unique about this course?

*Mobius makes it 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!*

*Addition benefits which are unique to Mobius Institute courses:*

*Classroom activities:*

- *Sitting and watching an instructor can be boring... When the instructor is using modern slides, 3D animations, and incredible simulators, there is no way that you will be bored, however there is nothing like hands-on participation.*
- *Hands-on participation accelerates learning and enjoyment (depends on venue)*
- *In the Mobius Institute courses you can use the simulators, and you can collect readings and study real vibration patterns. There is no doubt that the simulators make it easier to understand the topics we cover – but when you can use them yourself, the learning is further accelerated.*
- *Workbooks provide feedback – do you really understand?*
- *We also provide quiz questions that help you check if you really did understand the topics, and that you will be able to make the right decisions in the field (and in the exam). Every morning we have a lively discussion as we go through the questions.*
- *Take away more than just knowledge*
- *We don't just deliver an excellent course. We provide you with resources that you can use before, during and after the course.*
- *Get started before the course even starts*
- *Before you even start the course you can visit our Learning Zone Web site to take the self-paced iLearnVibration lessons (and read through the manual). These lessons will help prepare you for the course – you will learn so much more if you go into the course with this knowledge.*
- *Excellent materials that you will treasure forever*
- *During the course you receive a pocket reference guide (a very handy booklet); a mouse pad that is covered with classic spectra representing common fault conditions; the famous Mobius pen that has a pull-out sheet of common fault conditions, an activity book of sample questions and answers, and our new 500+ page Category II manual. This new manual is easy to read, is filled with illustrations, follows the course slides exactly, contains an excellent "Equipment Knowledge" appendix, and can be used as a reference in the future.*
- *Don't stop learning just because the course ends*
- *For six months after the course (or longer for a small fee), you can continue to access the iLearnVibration self-paced material on the Web site. If you forget something that you were taught, or you just want a refresher, then just jump on to the site and go through the fully narrated lessons.*

## Topics:

### Review of maintenance practices

### Review of condition monitoring technologies

### Principles of vibration

- *Complete review of basics*
- *Waveform, spectrum (FFT), phase and orbits*
- *Understanding signals: modulation, beating, sum/difference*

### Data acquisition

- *Transducer types: Non-contact displacement proximity probes, velocity sensors, and accelerometers*
- *Transducer selection*
- *Transducer mounting and natural frequency*
- *Measurement point selection*
- *Following routes, and test planning*
- *Common measurement errors*

### Signal processing

- *Filters: Low pass, band pass, high pass, band stop*
- *Sampling, aliasing, dynamic range*
- *Resolution, Fmax, data collection time*
- *Averaging: linear, overlap, peak hold, time synchronous*
- *Windowing and leakage*

### Vibration analysis

- *Spectrum analysis*
- *Harmonics, sidebands, and the analysis methodology*
- *Time waveform analysis (introduction)*
- *Orbit analysis (introduction)*
- *Phase analysis: bubble diagrams and ODS*
- *Enveloping (demodulation), shock pulse, spike energy, Peak Vue*

## **Fault analysis**

- *Natural frequencies and resonances*
- *Imbalance, eccentricity and bent shaft*
- *Misalignment, cocked bearing and soft foot*
- *Mechanical looseness*
- *Rolling element bearing analysis*
- *Analysis of induction motors*
- *Analysis of gears*
- *Analysis of belt driven machines*
- *Analysis of pumps, compressors and fans*
- *Lots of case studies and exercises for participants*

## **Equipment testing and diagnostics**

- *Impact testing (bump tests)*
- *Phase analysis*

## **Corrective action**

- *General maintenance repair activities*
- *Review of the balancing process*
- *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**