

E-643

▲ Who should attend?

Supervisory and technical staff involved in inspection and maintenance of rotating equipment.

The practical approach, based on case studies, workshops, in situ exercises and demonstrations on actual machines, makes the course suitable both for full-time vibration specialists and for any person working in rotating machinery maintenance.

▲ Duration

5 days

▲ Dates & Location

May be organised for a single company

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▲ Course Coordinator

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Ref. **MTM / DIAVIB-E**

PRACTICAL APPROACH TO MACHINERY VIBRATION SIGNATURE ANALYSIS

OBJECTIVES

To provide participants with the tools allowing to **identify and evaluate most of the machinery defects during operation**. To give the necessary knowledge and methods in view of organizing and practicing an **efficient predictive maintenance**.

On completion of the course, the participants:

- know the capacity and **limits of different types of equipment**: sensors, analysers, softwares, ...
- are able to recognise **typical signatures** of the more common mechanical defects
- can decide **the kind of signal treatments** to apply in order to give evidence of a specific defect and evaluate its severity
- have discussed how to promote a **maintenance program for each machine**, according to the type of machine and its criticality in the production process.

COURSE CONTENT

BASIC DEFINITIONS - OVERALL MEASUREMENTS

0.75 day

Frequency and amplitude

Displacement, velocity, acceleration

Different types of vibration: periodic, random, shocks

Overall measurements: their limitations, severity charts, high frequency techniques for anti-friction bearings, practical recommendations

RESONANCE

0.50 day

Simple system behavior: amplitude and phase

Actual rotor and bearings systems

Critical speeds

Using phase to study resonance

Identifying and solving problems

TOOLS FOR DIAGNOSIS

0.50 day

FFT analyzers: Fourier transforms and actual plots

Accelerometers, fixation methods

Selecting analysis parameters: scales, units, windows

Using special functions: zoom, cepstrum, envelope detection

Using non-contacting probes for monitoring large machinery running on plain or tilt-pad bearings

MACHINERY DEFECTS AND VIBRATION SIGNATURE

3 days

Unbalance

Vibration due to unbalance, unbalance due to assembly errors, unbalance tolerance and precision balancing

Shaft and coupling misalignment

Examining amplitude, phase and frequencies, most usual symptoms, usual misalignment errors. Precision alignment, soft foot correction

Antifriction bearings

Frequencies generated by faulty bearings, high frequency resonances, envelope detection and specific signature of different defects

Oil whirl of plain or tilt pad bearings

Description and causes of the whirl process. Symptoms. Remedies

Mechanical looseness, shaft cracks, friction between rotor and stationary part

Analysing the harmonics content of the signal. Typical plots. Experiments

Defective gears

Amplitude and phase modulations, worn teeth, gear excentricity, clearance errors. Typical plots

Electromagnetic defects of induction electric motors

Air-gap variation (static or dynamic), winding faults (turns or coils in short circuit), broken rotor bars, typical spectra

Drive belt vibration

Effect of faulty tension, uneven tension of multiple V belts, resonant belt, misalignment of grooves

GUIDE FOR MACHINERY VIBRATION MONITORING

0.25 day

Vibration control policy: machinery improvement program

Different policies according to the type of machinery and its criticality

"Ordinary machines" monitoring (motor-pump assemblies, fans, blowers, ...). Guidelines

Developing an effective program: cooperation between specialists, mechanics and operators