

# " Vibration analysis As a tool for early fault diagnosis of Rotating machinery"

## Training Program

(English Material)

**Course Length:** 20 Hours @ 5 days (condensed training program)

**Course Length:** 40 Hours @ 10 days (detailed training program)

### Part 1

#### Basics of vibration analysis :

- Sources of rotating machine vibrations
- Forced vibrations encountered in rotating equipment
- Response of Multi degrees of freedom systems(case of rotating machine systems)
- Frequency and time domain analysis.
- Resonance analysis and Critical speed analysis
- Torsional vibration and its effects on rotating parts

### Part 2

#### Vibration measuring instruments , its specifications, and selection

##### a Sensors

- Contactless- transducer
  - Applications
  - Consideration and operation- limitations
- Velocity pickups.
  - Applications
  - Consideration and operation- limitations
- Accelerometers
  - Applications
  - Consideration and operation- limitations
  - Installations and specifications

##### b Measuring amplifiers

##### c Filters

- d Phase angle meters
- e FFT analyzers
- f Balancing Equipments

### Part 3

#### **Predictive maintenance and machine Health monitoring**

- Predictive and its techniques by monitoring and analysis of vibration characteristics and spectra data
- Cost analysis for each type

#### **diagnosis of Mechanical and electrical fault of rotating machines**

- **Unbalance**
  - Causes of unbalance
  - Static and dynamic unbalance
  - Spectral analysis for unbalance
  - Preventing unbalance due to assembly errors
  - Methods of determination and Correction of unbalance
- **Misalignment**
  - Types of misalignment: parallel, angular
  - Misalignment vibration symptoms
  - Correction of misalignment and its considerations
  - Instruments used for shaft alignment

### Part 4

- **Loose shaft, loose bearing and machine structures looseness on foundations**
- **Resonance problems**
  - What is the resonance and its types
  - Factors that affect natural frequency
  - Methods used for the determination of natural and resonance frequency
  - Determining whether it is due to support structure or vibration source
  - On line Diagnosis of resonance
  - Methods of resonance corrections
- **Bearing failures**
  - Types of bearings

- Causes of bearing failures
- Diagnosis of bearing failures during the failure stages
- Prevention of bearing failures
  
- **Gears**
  - Causes of gear and gear boxes failures
  - Early detection and diagnosis of gear failures
  - Prevention of gear failures
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- **Electric motor**
  - Early detection and diagnosis of motor failures

## **Part 5**

**Presentation of Practical Cases covering the use of vibration analysis in machinery faults diagnosis.**

**Field and practical measurements and analysis**