VIBRATION ANALYSIS & CONDITION MONITORING

TRAINIT ACADEMY

COURSE TITLE

VIBRATION ANALYSIS & CONDITION MONITORING

COURSE DATE/VENUE

13 - 17 July, 2020

London, UK

COURSE REFERENCE

MUE288

COURSE DURATION

05 Days

DISCIPLINE

Mechanical & Utility Engineering

COURSE INTRODUCTION

This course provides a detailed examination of the detection, location and diagnosis of faults in rotating and reciprocating machinery using vibration analysis. The basics and underlying physics of vibration signals are first examined. The acquisition and processing of signals is then reviewed followed by a discussion of machinery fault diagnosis using vibration analysis. The course is concluded by a review of the other techniques of predictive maintenance such as oil and particle analysis, ultrasound and infrared thermography with an introduction to automated machine condition monitoring.

COURSE OBJECTIVE

Upon completing this course, participants will be able to:

• Understand the basics of vibration measurement

• Demonstrate the basics of signal analysis

- Understand measurement and the characteristics of vibration signals

- Understand how to use Data Acquisition Equipment for vibration signals

- Apply vibration analysis for different machinery faults

- Apply specific techniques for pumps, compressors, engines, turbines and motors

- Apply vibration based fault detection and diagnostic techniques

- Diagnose machinery related problems with vibration analysis techniques

- Apply advanced signal processing techniques and tools to Vibration analysis

- Detect, locate and diagnose faults in rotating and reciprocating machinery using vibration analysis techniques

- Identify conditions of resonance and be able to rectify these problems

- Understand the basic advantages of allied predictive techniques such as oil analysis, thermography, ultrasonics and performance evaluation

COURSE AUDIENCE

Engineers, engineering supervisors and managers responsible for designing or qualifying mechanical components, equipment, piping and structures subjected to dynamic forces; those responsible for auditing, reviewing, or approving shock and vibration analysis tasks. Those with a few years of experience in vibration analysis as well as those who are new to the area will benefit.

COURSE CONTENT
Introduction

- Definition of Machinery Monitoring, Fault Diagnostics and Failure
- Maintenance Strategies and their application (pros and cons)
- Principles of Predictive Maintenance (including specific tasks)

- Periodic Monitoring versus Continuous Monitoring
- Various Techniques of Predictive Maintenance
- Vibration Analysis as a Key Technique

Part 1 THEORY: INTRODUCTION TO VIBRATION ANALYSIS

Chapter 1 introduction

Chapter 2 vibration analysis applications

Chapter 3 vibration analysis overview

Theoretical vibration profiles

Actual vibration profiles

Time domain

Vibration measuring equipment

Transducer

Portable vibration analyzer

Chapter 4

Vibration sources

Rotating machinery

Rotor imbalance

Flow instability and operating conditions

Mechanical motion and forces

Reciprocating and/or linear-motion machinery

Sources of vibration

Chapter 5

Vibration theory

Periodic motion

Harmonic motion

Measurable parameters

Frequency

Amplitude

Maximum Vibration Measurement

Displacement

Velocity

Acceleration

Measurement Classifications

Broadband or Overall
        Narrowband

Component

Common Elements of Curves

Peak-to- Peak

Zero-to-Peak

Root-Mean-Square

VIBRATION DATA TYPES AND FORMATS

ANALYSIS TECHNIQUES
        TRENDING

Broadband

Narrowband

Industrial Reference Data

Vibration monitoring overview

MACHINE-TRAIN MONITORING PARAMETERS

TRENDING ANALYSIS

Part 2 Machine vibration

Machine history

Machine characteristics

Data acquisition

Vibration amplitude versus frequency analysis

Importance of tri-axial reading

The machine sketch

Machinery vibration signature

Supporting information

Obtaining amplitude versus frequency data

Waterfall diagram

Amplitude/phase versus machine rpm

Data interpretation

Identifying the type of rotor unbalance

Determining machinery condition

Controlling normal vibration

Controlling radiated noise

Special techniques for monitoring bearing condition

Vibration due to plane (journal) bearings

Oil whirl

Dry whirl

Vibration due to resonance

Turbomachinery problems

Friction induced (hysteresis) whirl

Aerodynamic cross coupling

Surging

Choking (stone-walling)

Vibration problems with specific machinery types

Centrifugal pumps

Hydraulic forces

Cavitation

Re-circulation

Vibration of reciprocating machines

Part 3 Non-Vibration Based Techniques
- Costs versus Benefits
- Visual Monitoring
- Performance Monitoring
- Oil Quality Analysis
- Wear Particle Analysis
- Acoustic Emission
- Thermography (thermal imaging)

COURSE CERTIFICATE

TRAINIT ACADEMY will award an internationally recognized certificate(s) for each delegate on completion of training.

COURSE FEES

$6,150 per Delegate. This rate includes participant's manual, Hand-Outs, buffet lunch, coffee/tea on arrival, morning & afternoon of each day.

COURSE METHODOLOGY

The training course will be highly participatory and the course leader will present, guide and facilitate learning, using a range of methods including formal presentation, discussions, sector-specific case studies and exercises. Above all, the course leader will

make extensive use of real-life case examples in which he has been personally involved. You will also be encouraged to raise your own questions and to share in the development of the right answers using your own analysis and experiences. Tests of multiple-choice type will be made available on daily basis to examine the effectiveness of delivering the course.

- 30% Lectures
- 30% Workshops and work presentation
- 20% Case studies & Practical Exercises
- 10% Role Play
- 10% Videos, Software or Simulators (as applicable) & General Discussions