



المركز العالمي للتدريب والتطوير
International Centre For Training & Development



FE015

Piping Vibration Analysis & Practical Engineering Solutions



ACTVET
Abu Dhabi Centre for
Technical and Vocational
Education and Training
مركز أبوظبي
للتنظيم والتدريب
التقني والمهني

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Course Introduction:

This course provides a thorough review of a wide variety of causes of process plant piping vibration from the point of view of an engineer that must identify the cause of vibration, determine if vibration is excessive, and correct the problem if it is. It provides a background on fundamental causes of piping vibration and how to identify source of vibration, rules of thumb and simplified methods for evaluating vibration severity, and methods of treatment. A wide variety of causes of vibration are covered in order to enable the participant to properly evaluate the variety of piping vibration problems that can occur in piping systems.

The causes of vibration, where possible, are discussed with respect to very basic energy and momentum principles that enable the participant to understand what is happening within and to the piping system. Screening and simple vibration limits are provided. Many actual examples of typical plant piping vibration problems that the instructor has solved in the energy industry are reviewed to illustrate the concepts covered. In addition, participants are encouraged to bring examples of troublesome vibration problems they have experienced or are experiencing in their plants for class discussion.

Course Objectives:

This course focuses primarily on structural vibration, merging failure analysis, analytical and test solutions.

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Upon successful completion of this course, the delegates will be able to:

- ✓ Primary Objective: Provide an integral, analytical/test approach to solving field vibration problems with an emphasis on piping vibration issues
- ✓ Secondary Objective: Provide a common language that supports clear understanding for both the analyst and the test engineer of what each needs to solve vibration problems

Who Should Attend?

This course is directed towards engineers responsible for operating piping systems. However, designers of new piping systems will also find the broad coverage of potential vibration problems a time saving briefing on the variety of vibration problems that can occur in piping systems.

Course Outline:

Day 1:

Introduction

Course objectives and course overview; General vibration facts and plant vibration issues

Optimum Vibration Problem Resolution Strategy

Root cause determination approach; Integration of analysis and test

Day 2:

Basic Vibration Theory

Terminology: sine waves, amplitude, frequency, phase.

Single DOF Parameters: stiffness, damping, and mass, Governing EOM

Multi degree-of-freedom system characteristics: mode shape and frequency

Vibration Test Fundamentals

Test specifications: frequency range, measured parameters, sensor locations, sensor types

Instrumentation concerns: linearity, range, bandwidth, installation, uncertainty analysis

Data acquisition: digital vs. analog. Digital DAQ issues: amplitude resolution and aliasing.

Day 3:

Signal Processing

FFT, windowing, filtering, digital integration, averaging, overlap and order tracking

Data Analysis Techniques

Data analysis: time history, frequency spectrum; Data statistics: peak, peak-to-peak, RMS

Day 4:

Vibration Causes and Data Interpretation

Imbalance: static, dynamic; Misalignment: parallel and angular; Bent or bowed shaft

Resonance and Critical speed; Damaged bearings; Gear problems; Fluid induced vibration

Day 5:

Case Studies

Case studies are presented that illustrate application of the course information. In addition, students are encouraged to present current plant problems for the class to work on.

Course Certificate:

International Center for Training & Development (ICTD) will award an internationally recognized certificate(s) for each delegate on completion of training.

Course Methodology:

A variety of methodologies will be used during the course that includes:

- (30%) Based on Case Studies
- (30%) Techniques
- (30%) Role Play
- (10%) Concepts
- Pre-test and Post-test
- Variety of Learning Methods
- Lectures
- Case Studies and Self Questionnaires
- Group Work
- Discussion
- Presentation

Course Fees:

To be advised as per the course location. This rate includes participant's manual, hand-out, buffet lunch, coffee/tea on arrival, morning & afternoon of each day.

Course Timings:

Daily Course Timings:

08:00 - 08:20	Morning Coffee / Tea
08:20 - 10:00	First Session
10:00 - 10:20	Coffee / Tea / Snacks
10:20 - 12:20	Second Session
12:20 - 13:30	Lunch Break & Prayer Break
13:30 - 15:00	Last Session

