

MR11 - Practical Shaft Alignment and Dynamic Balancing

Scope

The scope of this course is to provide participants with the basic information and guidelines for the implementation of good shaft alignment, vibration analysis and dynamic balancing for standard rotating machinery.

Course Objectives:

Upon completion of this course participants will be able to:

- Understand the fundamentals of Vibration Theory;
- Discuss the time and frequency domains;
- Understand the value of phase analysis;
- Evaluate machinery condition from vibration data;
- Use vibration data collectors;
- Perform single and two plane balancing using vector calculations;
- Perform shaft alignment using the face and rim and reverse dial methods.

Who Should Attend:

This course is primarily designed for Maintenance Personnel, Engineers, Apprentice Engineers, Supervisors, Technicians and Operators involved in Rotating Machinery Operation and Maintenance and wish to obtain a broad knowledge in Rotor Balancing and Alignment of Rotating Machinery.

Training Methodology

The duration of the seminar is five days (40 hrs). In the first three days, the theory will be covered with lectures, animations and instructor led discussions. In the last two days participants, will have the opportunity to carry out dynamic balancing both single plane and two-plane on an actual small-scale rotating machinery model. Also, they will practice on shaft alignment using the two methods described above on a small-scale model.

Course instructor: Mr. George Loizou

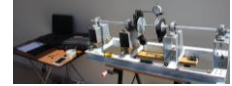
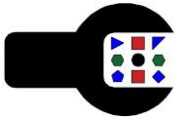
George is a Mechanical Engineer with more than 34 years of experience mainly in the Oil and Gas Industry. George holds an MSc Degree from The Pennsylvania State University. He is a member of SMRP and a Certified Maintenance and Reliability Professional (CMRP). He is also a member of the Cyprus Scientific and Technical Chamber and Associated member of the Institution of Mechanical Engineers of UK.

George worked as Head of Mechanical Maintenance at the Cyprus Petroleum Refinery Ltd, Engineering Manager and Terminal Manager at Cyprus Petroleum Storage Company Ltd.

He has a wide experience as a trainer, as since 2005 he has been delivering courses and seminars internationally.

Duration: 3 Days

Course Venue: TBA



Day 1

- Introduction
- Initial Assessment Exam
- Maintenance Principles
 - Types of Maintenance
 - Condition Based Maintenance
- Machine Characteristics
 - Driving, Driven and Transmission Equipment
 - Rotating Machinery Operating Principles
- Machinery Mounting
 - Foundations
 - Setting and Levelling
- Couplings
 - Standards
 - Types of Couplings
- Theory of Mechanical Vibrations
 - Mass Spring Free Vibration
 - The Concept of Phase
 - Damped Free Vibration
 - Damped Forced Vibration
 - Resonance
- Vibrations in Rotating Machinery
 - Vibration Transducers - Overview, Selection and mounting;
 - Measurement Locations;
 - Overview of Vibration Instruments;
 - Time-Waveform Plots
 - Spectrum Plots
 - Vibration waterfall (cascade) Bode and Polar Plots
 - Phase Angle Analysis
 - On-line Monitoring Systems
 - Vibration Standards and Severity Criteria
- Faults detected by Vibrations Analysis
 - Unbalance
 - Misalignment
 - Mechanical Looseness
 - Rolling Element Bearing Faults
 - Sleeve Bearing Faults
 - Bent Shaft

Day 2

- Shaft Alignment
 - Sources of Misalignment
 - Alignment Tools and Materials
 - Alignment basics
 - Relative Position of Shafts
 - Face and Rim Alignment Method
 - Reverse Dial Alignment Method
 - Laser Alignment
 - Effect of Temperature on Alignment
 - Effect of Bearings on Alignment
 - Sag Check
 - Soft Foot
 - Misalignment Tolerance
- Dynamic Balancing
 - Balancing Terms
 - Causes of Unbalance
 - Types of Unbalance
 - Principles of Balancing
 - Single Plane Balancing (With Phase and without Phase measurements)
 - Flexible and Rigid Rotors
 - Two Plane Balancing
 - Recommendations for Balancing
 - Problems affecting Balancing
 - Combining and Dividing Correction Weights
 - Tolerances for Balancing
 - Permissible Residual Unbalance
 - Balancing Quality Grades
 - Balancing Machines
 - In Situ Balancing

Day 3

- Demonstrations by Instructors
- Data Collection
- Phase Readings
- Training on Shaft Alignment (Reverse Dial Alignment, Face and Rim)
- Training on Single and Two Plane Balancing
- Final Assessment