



Alignment Methods & Application



Introduction:

One of the most common causes of damaging vibration in rotating equipment is shaft misalignment. This comprehensive course trains the student in the need for precision shaft alignment and instructs in the popular methods to achieve it. Classroom and actual field alignments are performed using dial indicators.

Who Should Attend?

The training program is designed and targeted to inspection & technical support engineers & supervisors and technicians who are dealing with the operation and maintenance of rotating equipment and who are running alignment and wish to improve their knowledge and skills

Methodology:

This interactive Training will be highly interactive, with opportunities to advance your opinions and ideas and will include;

- Lectures
- Workshop & Work Presentation
- Case Studies and Practical Exercise
- Videos and General Discussions

Certificate:

BTS attendance certificate will be issued to all attendees completing minimum of 80% of the total course duration.

Course Objectives:

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

- Apply and gain a comprehensive understanding of alignment
- Identify the importance of proper shaft alignment and identify the symptoms of misalignment
- Discuss the foundations, baseplate and piping effects and enumerate various types of couplings, flexible and rigid couplings
- Identify alignment and coupling tolerances and perform the preliminary alignment checks
- Enumerate the different alignment methods(dial indicator and laser) and state the advantages of each alignment method .
- Apply alignment procedures, analyze mathematical relationships and perform alignment calculations and graphic.
- Carry out adjustments for thermal growth, "hot" alignment vs "cold" alignment and moving machinery in the field
- Evaluate alignment considerations for specific equipment such as; electric motors, pumps, gear boxes, compressors, cooling towers, blowers & fans & internal combustion engines
- Prevent misalignment severity and vibrations caused by misalignment

Course Outline:

Day 1

1- Introduction

- What's Alignment?
- The alignment Process
- Pre-shutdown preparation
- Prior to Misalignment Measurement
- Base preparation
- Coupling Run out
- Soft Foot
- Piping Strain

2- Alignment Calculation

- Balance Dial Indicator
- Converting sweep readings
- Formulas for determining Horizontal and Vertical Moves.

Day 2

3- Rim and Face Shaft Alignment

- Types of Misalignment
- Couplings
- Seals
- Bearings
- Vibration
- Downtime

- Alignment Accuracies
- Pre-Alignment Procedures and checks,
- Rim and Face Machine Shaft Alignment
- Rough Alignment
- Precision Alignment
- Rough Horizontal Alignment
- Precise Horizontal Alignment
- Presentation for Final Readings

4- Double Radial Method.

- Basic Mathematical Equations for the Double Radial Method .
- Modeling the Double Radial Method .

Day 3

5- Reverse/Cross Dial Alignment Method.

- Cross dial method
- Rim Dial reading
- Cross Dialing Alignment Graphical Method
- How to construct the cross dial Graph,
- Steps in Drawing the Graph
- Horizontal Cross Dial Graph Example.
- Graph Method of Cross Dialing in the Horizontal Plane.
- Cross Dial Measurement Method
- Corrective Moves on MTBM
- Misalignment Limits.
- Angular Error Check.
- Offset Error Check.
- Alignment Error Limitations.

- Cross Dialing Horizontal Plane Alignment Using Formulae
- Comparing Cross Dialing to Reverse Dialing.

6-Shaft to Coupling Spool Method .

- Basic Mathematical Equations for the Shaft to Coupling Spool Method .
- Modeling the Shaft to Coupling Spool Method .

Day 4

7- Laser Shaft Alignment.

- Laser Safety
- Rim and Face Alignment
- How accurate is the dial indicator readings
- Laser Alignment
- Key Laser Components
- Laser Emitter
- Receiver,
- Safety and Operating Guide lines for Laser Units.
- Laser Bore Alignment methods & Application

8- Advanced Alignment

- Safety
- Drive Shaft Coupling Alignment.
- Thermal Growth
- Practical Example
- Example of thermal Growth problem
- Electric Motor Thermal Growth
- Combination Misalignment and thermal Growth Correction.

- Hot Alignment Methods.
- Characteristics of Online Monitoring,
- Multi-Machine Shaft Alignment.

Day 5

9-Aligning V-Belt Drives.

- Belt Drive Systems—Advantages and Disadvantages . .
- V-Belt Standards Information .
- Sheave Information .
- V-Belt Recommendations and Rules of Thumb .
- Sheave and Belt Wear .
- Adjusting Belt Tension .
- Preliminary Alignment Checks for V-Belts and Sheaves
- Types of Sheave Misalignment Conditions
- Using a Straightedge to Measure Misalignment .
- Measuring the Misalignment at the Sheaves
- V-Belt Machine Measurements .
- Modeling V-Belt Alignment Problems .
- V-Belt Alignment Modeling Sample Problem .

10- Vibration Symptoms and vibration Diagnostics in case of Misalignment

- Vibration Basic Plot diagrams.
- Vibration diagnostics.
- Misalignment Symptoms.