

# PRINCIPLES OF BEARINGS and LUBRICATION with SHAFT ALIGNMENT

*If your machinery is misaligned by only a few thousandths of an inch, your plant energy bill may be significantly higher than necessary.*

Did you know that 50% of all motor failures are due to improper lubrication? Proper alignment and lubrication of rotating machinery can not only help cut your energy costs, it can increase the “in-production” time of your equipment, lower your maintenance costs and increase bearing life.

Learn to create specifications to purchase, install, maintain and repair bearing based systems. Learn how to align any type of machinery which will result in a significant reduction in both operating and energy costs. Gain the skill set to extend the life of rotating equipment.

## CLASS FORMAT:

Lab + classroom

The participant is able to “learn-by-doing” in the course; this knowledge can be transferred to the workplace.

## STANDARD CLASS SIZE:

NTT recommends a class of 12 participants for the best results.

## NTT PROVIDES:

- 2-day classroom (16 contact hours) on Bearings and Lubrication
- 2-day lab (16 contact hours) in Shaft Alignment
- Textbooks and lab manuals
- Classroom consumables
- Completion certificates
- Shipping and instructor travel logistics

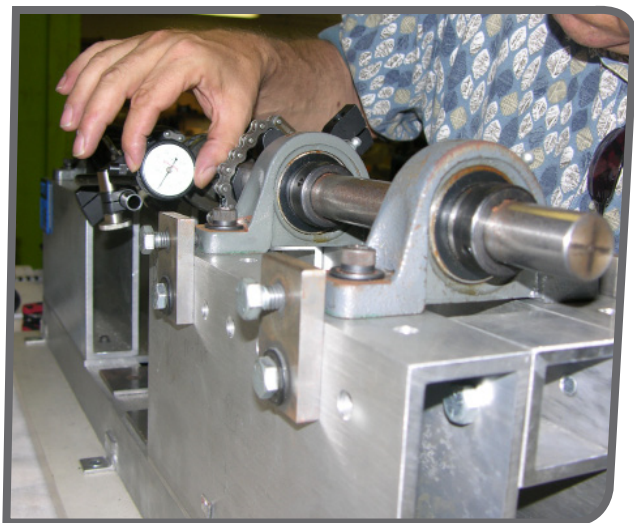
## CLIENT PROVIDES:

- Classroom, with easy access, of 750 square feet or greater
- Projection screen, white board and/or flip charts
- A dock facility or a forklift to unload the training equipment
- A pallet jack to move the crates around after they have been unloaded may also be needed
- Please place this equipment in the training room for the NTT instructor to test and setup prior to the start of class

## SHIPPING:

3 crates at 2,100 lbs.

- 2 @ 49" x 35" x 40" (800 lbs. each)
- 1 @ 29" x 55" x 43" (500 lbs.)



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## BEARINGS & LUBRICATION COURSE AGENDA | 2-Day Classroom

### POWER-TRANSMISSION PHYSICS

- Basic concepts
- The relationship between power, speed and torque
- Calculate the linear velocity of a rotating component
- Calculate speed ratio
- Efficiency and service factors

### BEARINGS

- Types and terms
- Installation and maintenance of bearings
- Troubleshoot bearing failures
- Select bearings
- Shaft and housing fits
- Bearing materials of construction
- Types and installation of precision ball bearings
- Tapered roller bearings

### LUBRICATION

- Select the right lubricant
- The right lubrication method
- Terminology
- Properties
- How to determine the required amount of lubricant
- Test procedures
- Flash and fire points
- Bearing operating environment
- Method to apply fluid lubricants

### COUPLINGS AND ALIGNMENT

- Selecting a coupling
- Energy savings
- Shaft centerlines
- Shaft alignment process and its importance
- Different types of soft foot
- Shaft versus coupling alignment
- Different types of flexible couplings
- Coupling installation and interference fit
- Comparison of couplings

### POWER-TRANSMISSION FORMULAS

### CONVERSIONS

## SHAFT ALIGNMENT COURSE AGENDA | 2-Day Lab

### THE IMPORTANCE OF ALIGNMENT

- Align two pieces of rotating machinery
- Correct soft foot
- Check run out
- Symptoms of misaligned rotating machinery
- Recognize and correct piping induced stress problems
- Tools and techniques to control lateral movement of machinery
- Alignment accuracy
- Measure misalignment
- Measure alignment with different coupling types
- Checking alignment
- Measure alignment
- Advantages and disadvantages of alignment systems on the market
  - Laser
  - LVDT
  - Electromechanical
  - CCD Sensors
- Computer software programs

### LAB EXERCISES

- Measure of run out
- Measure and correct soft foot problems
- Perform three common shaft position measurements
  - Face peripheral
  - Reverse indicator
  - Shaft to coupling spool
- Measure bracket sag and adjust shaft position measurements