

**Description:** The course covers all aspects related to the critical job of alignment of machinery shafts to reduce vibration and extend bearing life. The theory of alignment: bearing alignment, coupling alignment, and sheave alignment is discussed including how to align equipment using taper gauge and caliper, dial indication (both face and hub as well as reverse dial), sheave alignment, and precision laser alignment. The attendee performs alignment using supplied tooling and equipment. A pre-test is used to assess skill level at the beginning of the course and post-test is used to document the level of improvement of the attendee. The attendee should be able to perform alignment on small to medium industrial equipment after completing the course.

### A SHORT HISTORY OF ALIGNMENT AND WHY IT NEEDS TO BE DONE

- Eli Whitney and interchangeable parts
- Bearing failures caused by misalignment
- Early alignment methods—Straight edge, feeler gauge and calipers
- Dial indication methods- face and hub, reverse dial
- Laser alignment-wired and wireless
- Alignment tolerances

### BEARING ALIGNMENT INSIDE OF THE MACHINE

- Shaft shoulders and unmounted bearings
- Testing using feeler gauges
- Alignment of pillow block bearings

### COUPLING ALIGNMENT (SHAFT ALIGNMENT)

- Use of precision shims and micrometer
- Testing for soft foot and piping strain
- Use of side alignment tools
- Checking for indicator sag
- The 4-step method—using dial indicators on the face and hub
- Practicing face and hub on the bench top models
- Practicing face and hub on a pump and motor
- The reverse dial indication method-using dial indicators and indicator brackets
- Calculation of reverse dial indication on graph paper
- Mathematical calculation for reverse dial indication
- Practicing reverse dial on bench top models followed by pump and motor

### LASER ALIGNMENT

- Geometric centering and use of the wireless (BlueTooth) laser
- Checking for soft foot and correcting for coupling backlash
- Checking for thermal growth

### V-BELT and CHAIN ALIGNMENT

- Using the straight edge and string methods
- V-belt tensioning using the force deflection method
- V-belt tensioning using the percent elongation method
- V-belt groove to groove alignment using a laser alignment tool
- Sprocket and chain alignment—building a chain checking tool

### HANDS-ON ACTIVITIES

More than 50% of the course will be "hands-on" and each student will receive work books and supervised instruction as well as individual one-on-one assistance to make sure they can accomplish the tasks assigned. It is expected that an attendee will leave the class with the basic knowledge and skill to perform precision alignment on small to medium equipment. Class books can be used on the job site in the future to assist with alignment steps and refresh the tasks that need to be done.

### DURATION AND ATTENDANCE

Three day duration (8 hours each day) and up to 12 students may attend. Minimum of 6 students.

