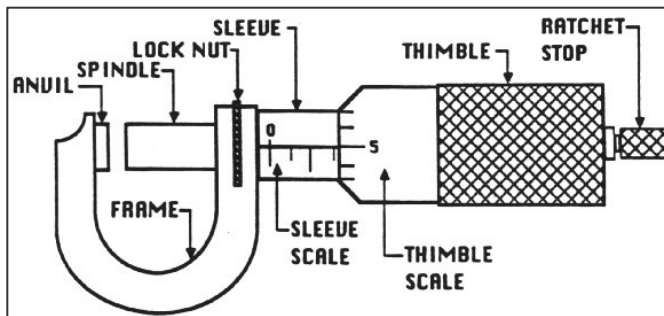




## MECH-101: Precision Maintenance Skills

### Abstract

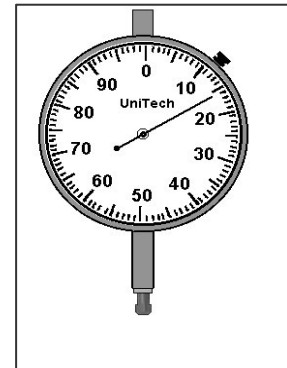
Today's world of rapidly evolving technology poses a wealth of challenges...just to remain abreast of the "latest and greatest;" *but what about the basics?* More and more companies are realizing the need to emphasize a precision mentality and re-focus on the fundamental skills required to achieve "precision."



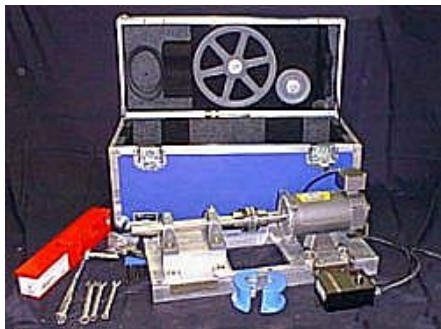
This course addresses those fundamentals skills, including proper use of precision measuring instruments such as dial indicators and micrometers, proper fastening and torquing procedures, precision fits, precision assembly techniques, and proper installation of couplings, gears, belt and chain drive components, bearings, and seals.

Throughout this seminar, instructor demonstrations reveal the impact of course content on machinery reliability, vibration levels, bearing life, etc. Crafts people will leave this seminar with a *refreshed understanding* of maintenance principles and procedures they had forgotten, never used, or never learned.

This seminar provides practical, easy-to-implement techniques for ensuring maintenance tasks are performed *confidently right the first time*. Root Cause Failure determination processes consistently demonstrate that human error in basic mechanical skills is too often the source of the problem.



Preventive procedures, problem-solving techniques and activities include:



- ❑ Measurement Tool Selection, Use, & Precautions
- ❑ Machinery Component Inspection Procedures
- ❑ Handling, Installation & Fit Procedures
- ❑ Fastening, Torquing & Tensioning Procedures
- ❑ Precision Assembly Techniques
- ❑ Good Lubrication Practices
- ❑ Precision Shaft Alignment Overview
- ❑ Bearing Fundamentals and Failure
- ❑ Prevention Overview



Copyright © 2001-2005 by Universal Technologies, Inc.

25797 Conifer Road #C210 Aspen Park, CO 80433 USA Tel: 303-838-3447 Fax: 303-838-3437 [www.unitechinc.com](http://www.unitechinc.com)

## **Seminar Duration**

The duration of this seminar is 40 hours.

## **Who should attend?**

This seminar is designed primarily for maintenance, engineering, technical support and management personnel whose job functions involve rotating machinery repair. The scope of content is appropriate for technicians who change bearings and seals, repair and restore plant machinery, and those who provide support for such tasks.



## Associated Task(s)

1. When given assigned maintenance tasks, perform the tasks in a manner that demonstrates proficient knowledge and skills with the fundamentals of precision maintenance, including:
  - A. A precision mentality
  - B. Effects of precision maintenance on vibration
  - C. Proper interpretation of dimensions and tolerances
  - D. Proper fitting practices
  - E. Proper use of precision measurement tools
  - F. Proper use of fasteners, torquing, and tensioning
  - G. Precision assembly techniques
  - H. Fundamental shaft alignment techniques
  - I. Precision maintenance of belt drive systems
  - J. Attention to fundamental bearing concepts

## Seminar Objectives

Upon successful completion of the seminar, the student will be able to:

1. Explain the benefits of precision maintenance and key components of a precision mentality.
2. Explain and demonstrate how to interpret and apply dimensions, tolerances and fit information provided by manufacturers or facility-specific literature.
3. Properly use the following instruments to obtain measurements with an accuracy of +/- the instrument's smallest graduation:
  - A. Outside Micrometers
  - B. Dial Indicators
  - C. Precision Levels
4. When given maintenance tasks that include use of fasteners, properly perform each of the following:
  - A. Select the proper fasteners
  - B. Determine the fastener torque
  - C. Determine and use the proper torquing procedure and sequence.
5. Explain how vibration detection and analysis are used to enhance machinery reliability, including use of amplitude and frequency data.
6. When given various installation and assembly tasks, explain and demonstrate how to properly perform the given task, including:
  - A. Proper use of keys, length, fits, & positioning
  - B. Proper use of set screws, length, & assembly
  - C. Minimizing eccentricity during assembly
  - D. Minimizing axial runout during assembly
7. When given alignment tasks that include direct-coupled machines, properly perform each of the following:



- A. Determine the purpose/type of alignment task.
  - B. Select an alignment method.
  - C. Perform all pre-alignment checks.
  - D. Perform a rough-in and precision soft foot check and correction procedure.
  - E. Briefly explain methods and procedures used for precision alignment.
  - F. Briefly explain alignment precautions for special or advanced alignment conditions.
8. When given maintenance tasks that include use of a belt drive system, properly perform each of the following:
- A. Install sheaves and belts
  - B. Properly align belt drive components
  - C. Properly tension belt(s)
  - D. Properly inspect and troubleshoot belt drive systems and components
9. Explain the following fundamental rolling element bearing concepts:
- A. Bearing life and load criteria
  - B. Major types of rolling element bearings and loads supported
  - C. Fundamental bearing specification terminology
  - D. Categories of bearing failures
  - E. Good bearing lubrication practices

## Typical Seminar Outline

1. Introduction
2. Maximizing Machinery Reliability Overview
  - 2.1. Machinery Reliability Concepts
  - 2.2. How Machines fail
  - 2.3. Precision maintenance Introduction
3. Condition Monitoring and Vibration Fundamentals Introduction
  - 3.1. Condition Monitoring Overview
  - 3.2. Vibration Detection and Analysis Overview
  - 3.3. Sources of Machinery Failures
4. Dimensions, Tolerances, and Fits
5. Precision Measurement Techniques
6. Fastening, Torquing, and Tensioning Techniques
7. Unbalance, and Precision Assembly Techniques
  - 7.1. Unbalance and Balance Overview
  - 7.2. Precision assembly techniques
8. Introduction to shaft alignment
  - 8.1. Alignment terminology
  - 8.2. Alignment Process over view
9. Pre-Alignment Procedures
  - 9.1. Pre-Alignment Procedures
  - 9.2. Rough in Alignment
  - 9.3. Precision soft foot checks
10. Precision Shaft Alignment Overview
  - 10.1. Rim-Face method
  - 10.2. Reverse Rim Method
  - 10.3. Laser systems overview
11. Belt Drive System Maintenance
  - 11.1. Belt drives overview
  - 11.2. Belt Drive Maintenance procedures
  - 11.3. Belt Drive Troubleshooting and inspection
12. Bearing Fundamentals
  - 12.1. Introduction to bearings
  - 12.2. Bearing terminology
13. Types of Bearings
14. Bearing Specification Concepts
15. Conclusions

