IIGDT Training

Level 4
"Measurement Systems Analysis"
Course Outline

Objective:

To provide fundamental to advanced information in applications and analysis of measurement equipment used to determine compliance to mechanical engineering drawings per the ASME Y14.5M-1994 Standard.

Course Length:

2 days

Course Content:

Precision Hand Tools and Hard Gaging
- Micrometers, calipers, indicators, pin & ring gages and thread gaging

Bench Top Measurement Instruments
- Height gages, bore gages, fixture gages and laser micrometers

Surface and Form Instruments
- Profilometers, contour measurement, roundness and cylindricity systems

Optical Measurement Systems
- Optical comparators, toolmaker's microscopes, viewing systems and video measurement systems

Contact Coordinate Measuring Machines
- Manual & automatic CMMs, single point touch sensors & scanning sensors and measuring arms

Multi sensor and Hybrid Coordinate Measuring Machines
- Video sensors, laser sensors, white light interferometers and micro probes

Methods for Analyzing and Interpreting Data Results (2D & 3D)
- SmartProfile, PC-DMIS, Measure-X, MeasureMind, VMS

Measurement Uncertainty/Traceability
- Gage repeatability & reproducibility
  - Corrected and uncorrected error sources
- GR&R versus measurement uncertainty
  - Error categories
- Length standards
  - Gage blocks, laser, chrome on glass line standards
- Traceability (NIST, U_{95})

In each subject group an overview of the tools is followed by a demonstration of best application practices and a discussion of calibration issues and measurement uncertainty factors. Each subject session is concluded with a hands-on lab activity.

Various parts will be utilized during this seminar to provide the greatest understanding of measurement technology applicable to multiple industries. Students are encouraged to bring a part (with CAD modal and drawing) that represents their measurement challenges (non-confidential).

Prerequisites:

Precision GD&T: Introduction & Fundamental Principles or equivalent knowledge.

Who should attend?

This course is for those who require a greater understanding of the state of technology in measurement systems used for the measurement of components and assemblies dimensioned and toleranced per the ASME Y14.5 standards from an advanced applications and analysis perspective. Specifiers of engineering requirements as well as specifiers of manufacturing processes and measurement applications will greatly benefit. Machinists, toolmakers, designers, senior inspectors, senior technicians and engineers (all levels).

Due to the direct hands-on training in this course we limit each session of this seminar to 20 participants. Limiting the number of participants allows us to maximize the amount of time each student will be able to have hands-on utilization of each measurement instrument.