PD515
Dimensioning and Tolerancing Principles for Gages and Fixtures

Day One

- Introduction to the Y14.43 standard on Dimensioning and Tolerancing Principles for Gages and Fixtures

- Attribute versus Variables Data collection and analysis

- Basic principles for the design, dimensioning and tolerancing of GO gages, NOGO gages and Functional Gages

- Absolute, Practical Absolute, Tolerant and Optimistic gage tolerancing policies

- Risk involved in the various gage tolerancing policies (accepting out-of-tolerance parts vs. rejecting in-tolerance parts)

- Use of material condition symbols after geometric tolerances on gages to achieve an Absolute Gage.

- Converting from LMC to MMC modifiers on gaging elements while maintaining an Absolute gage

- Comparison of gages that use LMC/ LMB vs. MMC/ MMB vs. RFS/ RMB modifiers referenced after geometric tolerances and datum features

- Step by step gage design, including: gaging element configurations, gaging element datum feature selection, determining datum feature simulator sizes and how to display sizes and calculate geometric tolerance for all gage elements to fit a chosen gage tolerancing policy

- Percentages of part tolerance used on gages
    - How to calculate part tolerance
    - How to calculate gage tolerance
    - How to apply gage tolerance and wear allowance

- Separate gaging requirements versus simultaneous gaging requirements.

- Differences and similarities between gages and fixtures

- Measurement force rules, restraint versus free state checks and how to choose clamping types and sequence

Day Two

- Environmental conditions-humidity, temperature, coefficient of expansion formula, etc.

- Certification and Calibration

- Production line gages versus inspection lab gages vs. referee gages

- Principle of gage alignment, usage and handling

- Variables data collection and analysis
  - Gage capabilities and weaknesses
  - Coordinate machine capabilities and weaknesses
  - Tolerance zone versus virtual condition boundary verifications

- Push Pin gages versus Fixed Pin gages
  - Types of Push Pin gages (type 1 vs. type 2)

- Projected tolerance zone applications for push pin gages.

- Fits between the gage base and the push pin gages.

- Gages capable of being completely disassembled
  - Design, fits and how to calculate tolerances

- Gaging a threaded hole's position.

- Gages for hoses, pipes and tubing. Positional Boundaries generated by profile and position together and separately.

- Gaging oddly configured features of all shapes
  - Advantages of gages versus other measurement techniques on amorphous configurations.

Day Three

- Composite tolerancing versus two or three single segment tolerancing. Meanings and differences, advantages, capabilities and variables data collection versus gaging

- Composite tolerancing gage design, dimensioning and tolerancing

- Gage simulators for datum feature patterns

- Datum feature simulators to generate center planes

- Regardless of feature size (RFS) and regardless of material boundary (RMB) datum feature simulators

- Measuring symmetry and concentricity

- Measuring and gaging positional symmetry

- Measuring and gaging coaxiality relationships for position

- Meaning and measurement of runout and total runout

- Probes and variables data collection for RFS and RMB simulations

- Measurement, datum feature simulation and gaging of new types of datum features allowed by ASME Y14.5-2009