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