Measurement Systems Analysis – Level 1

Course Description

Measurement Systems Analysis – Level 1 is a two-day course that teaches standard Gage R&R methods that are required to determine measurement system capability. Course content is based on the first three chapters of the *Measurement Systems Analysis* (3rd ed.) reference manual, and addresses QS-9000 and ISO/TS 16949:2002 requirements. We begin with a review of the fundamental concepts that allow us to understand and trust the measurements systems we use. We focus on data collection and analysis methods to determine appropriate actions.

Course Objectives

By the end of this course, participants will be able to:

- ✓ Correctly Use Common MSA Terms
- ✓ Define Measurement System Elements
- ✓ Evaluate Effective Resolution
- ✓ Select Appropriate Sample Sizes
- ✓ Assess Measurement System Stability
- ✓ Assess Measurement System Bias
- ✓ Assess Measurement System Linearity
- ✓ Quantify Measurement Uncertainty
- ✓ Quantify Gage Repeatability
- ✓ Quantify Gage Reproducibility
- ✓ Identify Extreme Sources of Variation
- ✓ Assess Attribute Measurement Systems

Course Materials

Each participant will receive a set of course notes, a copy of the MSA Reference Manual, and Microsoft Excel based software that performs the mathematics of the methods used. Calculators will be provided for classroom workshop experiences to reinforce the course content.

Course Outline

Review of Quality Statistics
- Understanding Variation
- Statistical Process Control
- Process Potential and Capability
- Impact of Measurement Variation

Fundamental MSA Concepts
- Definition of Purpose
- Common Use of Terms
- Standards and Traceability
- The Measurement Process
- The Measurement Ensemble
- Measurement Strategy and Planning
- Measurement System Development
- Measurement System Figures of Merit
- Measurement System Uncertainty

Preparation for MSA Studies
- Statement of Purpose for the Study
- Development of Test Procedures
- Definition of the MSA Study
- Analysis of MSA Results

Mathematics of MSA Studies
- Methods to Assess Stability
- Methods to Assess Bias from an Independent Sample
- Methods to Assess Bias from Control Charts
- Methods to Assess Linearity
- Range Method to Assess Repeatability and Reproducibility
- Average and Range Method to Assess Repeatability and Reproducibility
- Analysis of Variance (ANOVA) Method to Assess Sources of Variation
- Attribute Measurement System Study

Evaluation of MSA Studies
- Analysis of Stability
- Analysis of Bias Results
- Analysis of Linearity Results
- Analysis of Repeatability and Reproducibility Results
- Analysis of Attribute Measurement System Results
- Problem Solving in Measurement Systems