Measurement Systems Analysis Course Outline

UNIT 1 ANALYZING MEASUREMENT SYSTEM VARIATION

Lesson 1 | Variation in Measurement Systems

- A review of sources of measurement system variation.
- An explanation of Type A and Type B evaluations of measurement uncertainty.
- Exploration of the effects of too much variation on measurements.

Lesson 2 | Measurement System Linearity

- How to measure gage/instrument linearity (both graphically and mathematically) to determine if a gage (or instrument) has linearity problems.
- Taking action to deal with linearity problems.

Lesson 3 | Measurement System Stability

- How to evaluate gage/instrument stability using a control chart. Taking action to deal with stability problems.

Lesson 4 | Repeatability & Reproducibility

- How to conduct a GR&R study.
- R&R analysis for non-destructive measurements.
- Use of ANOVA for GR&Rs.
- R&R analysis for destructive measurements.
- R&R analysis for attribute measurements.
- Graphical techniques to analyze R&R.

Lesson 5 | Improving Measurement Systems

- Using a problem-solving approach to find the root causes of repeatability and reproducibility problems.
- Using the GR&R data to help direct the problem-solving effort.
- A description of some basic causes to investigate if gage/instrument repeatability is high.
- A description of some basic causes to investigate if appraiser reproducibility is high.

Lesson 6 | MSA Software Considerations

- Suggested selection criteria for features of software programs for analyzing GR&R studies.
- An overview of some of the advanced measurement system analysis tools that a GR&R software package may have.

Unit 1 Challenge

- An assessment of the learner's progress in this Unit.

UNIT 2 MANAGING MEASUREMENT SYSTEMS

Lesson 1 | Formal Instruments Management

- Why a gage/instrument calibration program is so important and makes good business sense.
- Why a gage/instrument may not be accurate.
- The components of a gage/instrument management system.

Lesson 2 | Sources of Measurement Error

- Measurement errors due to gage/instrument calibration deficiencies.
- Measurement error related to gage/instrument usage or damage.

- Errors of judgment resulting in measurement errors.
- GR&R issues and measurement error.

Lesson 3 | Calibration Practices

- A discussion of common calibration practices.
- Key elements of a calibration system as defined by ISO 10012-1.
- Gage/instrument identification techniques.
- Sources for calibration procedures and independent calibration laboratories.
- Methods for determining intervals of calibration.

Lesson 4 | Calibration Standards & Tools

- Traceability of calibration standards from primary national standards to working standards.
- The role of transfer standards and working standards.
- Measurement uncertainty and the calibration system.

Lesson 5 | Calibration Pitfalls

- Common instrument management system pitfalls.
- Proactive techniques to steer your organization clear of these pitfalls.

Lesson 6 | Records & Audits

- Different types of records needed for a comprehensive instrument management system.
- The role of audits to ensure your instrument management system is working.

Lesson 7 | Calibration Software Considerations

- Benefits of using instrument management software.
- Suggested selection criteria of software features for an instrument management software program.

Unit 2 Challenge

- An assessment of the learner's progress in this Unit.