Measurement System Analysis (MSA)

Measurement is a process that produces numbers used for making decisions. If the process lacks integrity the numbers will be incorrect which may result in decisions being made on a false premise. As a result product may be unusable or fail in service.

Basically MSA is a technique for assessing the capability of measurement systems to produce accurate and precise results repeatedly and predictably. A measurement system consists of the operations (measurement tasks and the environment in which they are performed), procedures, measurement devices and the personnel used to assign a quantity to the characteristics being measured. The technique has the following features:

- A measurement system must be in statistical control so that all variation is due to common cause and not special cause
- Variation in measurement systems arises dues to bias, repeatability, reproducibility, stability and linearity.
- It is only possible to supply parts with identical characteristics if the measurement system as well as the production processes are under statistical control (A state in which all variation is due to common cause)
- During product/process development a measurement plan is produced which is implemented during product/process validation
- Measurements are taken randomly to ensure random spread of results
- Each source of variation is studied using samples taken from pre-production
- The analysis is continued through production to reduce variation in the measurement system

The study seeks to establish

- Variations in observed values relative to a master reference (Bias or accuracy)
- Variance in appraisers where one appraiser is unable to reproduce the results of another appraiser measuring the same characteristic on the same part using the same instruments (Reproducibility)
- Variations in results when the same appraiser measures the same characteristics using the same instrument on the same part (Repeatability)
- Variations in results when the same characteristics are measured over an extended period of time using the same instruments (Stability)
- Variation in bias across the operating range of the measuring instrument (Linearity)

Typical problems that arise in the use of MSA are

- Frequently not understood
- Used before special cause variation has been eliminated thereby making the results invalid

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