



## **STATISTICAL PROCESS CONTROL (2 Day Program)**

### **OVERVIEW**

Statistical Process Control (SPC) is a method of continuous quality control that employs statistical tools to evaluate, monitor and control a process, and enables prevention of defects rather than detection after production. Process and product related data is collected to ensure that the process is capable and produces product within specification. Application of SPC detects changes in the process before they lead to defective product.

Measurement System Analysis (MSA) forms part of the Statistical Process Control to ensure that the organization's inspection, measuring and test equipment provide reliable measurement data to make correct decisions regarding the product and process, without which good parts may be rejected or non-conforming parts may be accepted. It determines how much the variation within the measurement process contributes to overall process variability. Having accurate and precise measurements improves process capability and ensures that improvement efforts are focused in the right direction.

This program supports Clause 9.1.1.1 of IATF 16949 that requires organizations to utilise appropriate statistical tools and Clause 7.1.5.1.1 on "Measurement System Analysis".

## OBJECTIVE

- To train the participants on the principles of Statistical Process Control (SPC) to enable them to implement and/or effectively conduct an Internal Audit on Statistical Process Control within the organization.

## LEARNING OUTCOMES

- Upon completion of this program, participants should be able to:
  1. Understand how to implement Statistical Process Control (SPC) effectively for proper control and monitoring.
  2. Be aware of the suitability of different types of Control Charts.
  3. Conduct Measurement System Analysis to identify and quantify the sources of measurement variation from the Measurement System with respect to the overall process variability;
  4. Ask relevant and challenging open-ended questions about the Statistical Process Control to identify strengths, gaps and opportunities relating to Statistical Process Control implementation in the company.

## WHO SHOULD ATTEND

Managers, senior engineers, engineers, technicians, supervisors, team leaders, audit teams and other executives who require an understanding of the principles of Statistical Process Control and the usage of Control Charts in the organisation and/or are responsible to ensure the accuracy of data used for analysis and who require an understanding of the implications of measurement error for decisions made about a product or process.

## METHODOLOGY

This workshop utilises a combination of lectures, practical exercises and group discussions to enable a solid understanding of the subject matter. It is an experiential learning program.

# COURSE OUTLINE

## Day 1

9:00 am – 10:00 am - Module 1: Introduction to SPC

- Principles of SPC
  - Population vs. Sampling Data
- Benefits of SPC
- IATF 16949:2016 CLAUSE 9.1.1.1
- The Ideal Process
- Process Measures
- Types of Data
  - Variable
  - Attribute

10:00 am – 11:30 am - Module 2: Basic Statistics

- Accuracy and Precision
- Mean, Mode and Median
- Measures of Variation
- Histograms and Distribution Curves
- Central Limit Theorem
- Types of Limits

11:30 am – 1:00 pm - Module 3: Process Control Charts

- Where to use Control Charts
- How to use Control Charts
- Types of Variation
  - Common Causes
  - Special Causes
- Interpreting Control Charts
- SPC Implementation
  - Sampling Plan
  - Sample Size
  - Sampling Frequency
  - Calculation of Control Limits
    - Mean
    - Variation – Standard Deviation, Range
  - Reaction Plan

1:00 pm – 2:00 pm - LUNCH Break

2:00 pm – 3:30 pm - Module 4: Types of Process Control Charts

- Variable Charts
  - Xbar-R, Xbar-s, Individual Moving Range charts
- Attribute Charts
  - p, np, c, u charts

3:30 pm – 5:00 pm - Module 5: Process Capability

- Process Capability vs. Process Control
- Short Term – Cp, Cpk
- Long Term – Pp, Ppk
- Improving Process Capability

**Day 2**

9:00 am – 9:30 am - RECAP

9:30 am – 10:30 am - Module 6: Measurement System Analysis (MSA)

- Objective of Measurement System Analysis
- What is a Measurement System
- When to Conduct Measurement System Analysis

10:30 am – 1:00 pm - Module 7: Terms used in MSA

- Accuracy, Bias, Calibration and Traceability
- Variation and Precision
- Variation in a Measurement System
  - Repeatability
  - Reproducibility
  - Stability, Linearity, Uniformity
  - Resolution/Discrimination, Sensitivity
  - Uncertainty
  - Measurement Error

1:00 pm – 2:00 pm - LUNCH

2:00 pm – 4:30 pm - Module 8: MSA Studies

- Stability
- Bias
- Linearity
- Variable Gage R&R
- Attribute Gage R&R
- Improving measurement capability
- Relationship between Process Capability and Measurement Capability

4:30 pm – 5:00 pm - REVIEW

- Questions to Ask during Internal Audit