
Applied Quality Engineering: SPC, Process Capability and FMEA Training Course

1 – 5 November 2026
Zoom





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Programme Summary

Applied quality engineering with SPC, process capability and FMEA is the subject of this one-week training course for quality managers and engineers at intermediate level, culminating in a quality engineering control plan for one product or process line. Many plants inspect heavily yet still ship defects because measurement error and unstable processes go unnoticed. The approach moves from cost of quality and statistics to measurement, control, capability, prevention and reliability. Mars Training Centre UK delivers this programme in quality engineering.

The Business Case

Inspection and rework consume budget without making a process better, and a capable process cannot be confirmed with a gauge that cannot see the variation. Quality engineering methods move effort from detecting defects to preventing them, so decisions about adjusting, accepting or redesigning a process rest on data rather than opinion and the cost of poor quality falls over time.

- Cost of Poor Quality: Falls as scrap, rework and returns are traced to their sources.
- Process Capability: Improves as special causes are removed and processes are centred.
- Customer Complaints and Escapes: Decrease as high-risk failure modes are controlled before release.

Principles and Evidence Base

- ISO 7870 Series and Shewhart Control Charts: Variables and attributes charts structure Session 3.
- ISO 22514 Series: Capability and performance indices Cp, Cpk, Pp and Ppk frame the capability studies in Session 3.
- IEC 60812: Failure mode and effects analysis guides the risk work in Session 4.
- ISO 2859-1: Attribute sampling plans inform the acceptance decisions examined in Session 2.

Intended Participants

- Managers responsible for the quality performance of a plant, line or product family.
- Engineers who analyse process data and recommend corrective actions.
- Heads of production who decide whether to adjust, stop or release a process.
- Specialists who own inspection and supplier quality.

The programme serves manufacturing, oil, gas and petrochemicals, food and pharmaceutical processing and engineering services.



Learning Outcomes

1. Participants will be able to estimate the cost of quality by category.
2. Participants will be able to evaluate a measurement system using gauge repeatability and reproducibility results.
3. Participants will be able to construct and interpret control charts for variables and attributes data.
4. Participants will be able to calculate capability indices and judge whether a process meets specification.
5. Participants will be able to prioritise failure modes with FMEA and select preventive controls.
6. Participants will be able to design a factorial experiment and apply reliability measures.

Programme Structure

Day 1: Quality Engineering Foundations and Statistics

What does poor quality cost, and how is variation described?

- Quality Engineering Role in a Quality Management System
- Cost of Quality: Prevention, Appraisal, Internal and External Failure
- Descriptive Statistics, Histograms and the Normal Distribution
- Common Cause and Special Cause Variation
- Sampling, Data Collection Plans and Stratification

Day 2: Measurement Systems Analysis and Acceptance Sampling

Can the data be trusted, and when should a batch be accepted?

- Measurement System Accuracy, Bias, Linearity and Stability
- Gauge Repeatability and Reproducibility Study Design
- Attribute Agreement Analysis for Visual Inspection
- Acceptance Sampling Plans and Operating Characteristic Curves
- ISO 2859-1 Inspection Levels and Switching Rules

Day 3: Statistical Process Control and Process Capability

Is the process stable, and can it meet the specification?

- X-Bar and R, and Individuals Control Charts
- p, np, c and u Charts for Attributes Data
- Out-of-Control Rules and Reaction Plans
- Capability Indices Cp, Cpk, Pp and Ppk
- Capability Study Conditions and Non-Normal Data



Day 4: FMEA, Design of Experiments and Reliability

How are failures prevented and processes improved before defects occur?

- Process and Design FMEA Under IEC 60812
- Severity, Occurrence and Detection Rating and Action Priority
- Full and Fractional Factorial Experiments
- Reliability Measures: Failure Rate, MTBF and the Bathtub Curve
- Weibull Analysis Basics for Life Data

Day 5: Applying Quality Engineering to a Process Line

Is the control plan complete and ready for the shop floor?

- Linking Day 4 FMEA Actions to Process Controls
- Setting Day 3 Chart Types and Sampling Frequency
- Measurement Plan Built From Day 2 Gauge Studies
- Cost of Quality Tracking Against the Day 1 Baseline
- Quality Engineering Control Plan Completion

Methodology

The programme relies on data workshops. Participants analyse real-format data sets from machining, filling and chemical processes using spreadsheet tools, run a gauge study and a small paper-helicopter or catapult experiment, then apply each method to data from their own operation where available, comparing results with colleagues from other industries.

- Suggested activity: Running a gauge repeatability and reproducibility study on a supplied measurement data set.
- Suggested activity: Building control charts and capability indices for a filling line.
- Suggested activity: Scoring and ranking failure modes for a process step.

Capstone Output

Each participant completes a quality engineering control plan for one product or process line. It lists critical characteristics, gauge study results, chart types, reaction plans, capability targets, FMEA-driven controls and cost of quality measures. It is used to brief production teams and audit process control.



Frequently Asked Questions

Is the applied quality engineering programme suitable for quality managers without a statistics background?

Yes. It is set at intermediate level, introduces the statistics it needs and assumes basic spreadsheet skills and production or quality experience.

Which standards does the quality engineering, SPC and FMEA course rest on?

It rests on the ISO 7870 control chart series, the ISO 22514 capability series, IEC 60812 for FMEA and ISO 2859-1 for attribute acceptance sampling.

How is the control plan from quality engineering training used at work?

You can use it to set charting and measurement routines on a line, brief operators on reaction plans and track the cost of quality.

How does quality engineering training differ from a course on quality management systems?

Quality management systems training covers policies, documentation and audits. Quality engineering covers the statistical tools that measure, control and improve processes.