Operational Quality Masterclass: Core Tools Integration with Real Production Data

1.0 Introduction

The accelerating complexity of today's manufacturing environment demands a systematic, data-driven, and highly coordinated quality management approach. As industries move toward tighter tolerances, global supply chain expectations, and stringent customer-specific requirements—particularly in automotive and high-precision sectors—the ability to deploy the IATF 16949 Core Tools effectively has become an essential capability for engineers, quality practitioners, and production teams. This four-day masterclass is designed to strengthen that capability by integrating the application of APQP, SPC, MSA, and PPAP into one coherent and practical learning experience.

This program goes beyond classroom theory. Participants will engage in real, on-site production-floor activities to experience how each Core Tool operates within the actual manufacturing workflow. From translating the Voice of Customer into process requirements, constructing PFMEA and Control Plans, validating measurement systems through Gage R&R, to generating real-time SPC charts and assembling a complete PPAP submission—learners will gain end-to-end competency in managing process risk, ensuring product conformity, and demonstrating compliance to customers. By connecting statistical methods, engineering controls, and process validation techniques, this training provides a holistic and practical pathway to build a robust, stable, and audit-ready quality system.

2.0 Training Objective

The program seeks to enable participants to:

- Understand the purpose and integration of APQP, SPC, MSA, and PPAP within IATF 16949.
- Translate customer requirements into Process Flow, PFMEA, and Control Plan.
- Apply SPC tools ($\bar{X}$–R, $\bar{X}$–S, X–MR) to assess process stability and capability (C_p , C_{pk}, and ppm).
- Perform MSA studies including Variable Gage R&R and Attribute Agreement Analysis.
- Develop a complete PPAP documentation package aligned with customer-specific requirements.

- Conduct on-site practical activities to collect real production data and validate process controls.
- Strengthen problem-solving and decision-making using real-time data and manufacturing conditions.

3.0 Training Outcome

By the end of the training, participants will be able to:

- Demonstrate a practical understanding of how APQP, SPC, MSA, and PPAP work together as an integrated quality system.
- Develop Process Flow Diagrams, PFMEAs, and Control Plans that reflect real manufacturing conditions.
- Construct and interpret SPC charts ($\bar{X}$–R, $\bar{X}$–S, X–MR) using actual production data.
- Evaluate process capability using C_p , C_{pk}, and ppm, and identify improvement actions.
- Conduct and interpret Variable Gage R&R and Attribute MSA results to verify measurement reliability.
- Prepare and organize a complete PPAP Level 3 submission package.
- Apply Core Tools directly on the production floor to solve problems, validate controls, and support continuous improvement.
- Communicate findings and recommendations with confidence using data-driven evidence.

4.0 Target Audience

This program is intended for quality engineers, QA/QC personnel, process and manufacturing engineers, production supervisors, technicians, internal auditors, and members of R&D or NPI teams who are directly involved in APQP, SPC, MSA, or PPAP activities. It is also suitable for individuals seeking to strengthen their understanding of the IATF 16949 Core Tools and enhance their capability to apply these tools effectively within real manufacturing environments.

5.0 Prerequisites

Participants should possess a basic understanding of manufacturing processes and have some familiarity with common measurement instruments such as callipers or micrometers. Prior exposure to ISO 9001 or IATF 16949 concepts is helpful but not mandatory. No advanced statistical background is required, as all essential statistical and analytical concepts will be introduced and explained during the training.

6.0 Methodology

The training combines instructor-led sessions, hands-on exercises, and live production-floor practical. Participants will apply APQP, SPC, MSA, and PPAP tools using real data, supported by case studies, templates, and guided coaching for immediate workplace application.

7.0 Course Outline

DAY 1 — APQP & Foundational Concepts	
9.00am – 10.15am	**Introduction to the Integrated Framework** • Why APQP, SPC, MSA, PPAP must operate as a single system • IATF 16949 linkages to the 5 Core Tools • Customer-Specific Requirements (CSR)
10.15am – 10.30am	**Morning Break**
10.30am – 12.30pm	**APQP Phase 1 & 2 (Plan / Product Design)** • Voice of Customer (VOC) • Customer requirements → CTQ (Critical to Quality) • Product design considerations • DFMEA overview and link to PFMEA
12.30pm – 1.30pm	**Lunch Break**
1.30pm – 3.15pm	**APQP Phase 3 (Process Design)** • Process Flow Diagram (PFD) • Process FMEA fundamentals • Control Plan fundamentals • Identifying characteristics for SPC and MSA
3.15pm – 3.30pm	**Afternoon Break**
3.30pm – 5.00pm	**LIVE PRACTICAL — Production Floor Walk** **Objective:** Identify CTQs, special characteristics, process steps, and data collection points. Activities: • Walk through actual workstation • Map process steps • Identify measurement points & risks • Identify potential PFMEA issues

DAY 2 — SPC Fundamentals + Applied Shop-Floor Practical	
9.00am – 10.15am	**Statistics for SPC** • Variation, Normal Distribution • Standard Deviation & formula • Central Limit Theorem (CLT) • Subgrouping logic
10.15am – 10.30am	**Morning Break**
10.30am – 12.30pm	**SPC Tools (Variable Data)** • X̄–R Chart • X̄–S Chart • Individuals–Moving Range (XMR) • Control limits, rules for out-of-control • Process Capability (C_p , C_{pk}) • PPM calculations
12.30pm – 1.30pm	**Lunch Break**
1.30pm – 3.15pm	**Practical SPC Calculations** • Manual calculation + software output comparison • Real sample data from shop floor • Identify process stability & capability
3.15pm – 3.30pm	**Afternoon Break**
3.30pm – 5.00pm	**LIVE PRACTICAL — SPC on Production Floor** Activities: • Collect real-time measurement samples • Construct control charts (manual + software) • Discuss process signals • Decide if corrective actions required
DAY 3 — MSA (Gage Studies) + PFMEA Alignment	
9.00am – 10.15am	**Introduction to MSA** • Measurement error concepts • Precision, bias, linearity, stability • Repeatability & Reproducibility (Gage R&R)
10.15am – 10.30am	**Morning Break**
10.30am – 12.30pm	**Variable Gage R&R (Crossed Method)** • Sample selection • Operator selection • Trial structure

	• Acceptance criteria (AIAG)
12.30pm – 1.30pm	**Lunch Break**
1.30pm – 3.15pm	**Attribute Agreement Analysis** • Kappa study • Correct/incorrect classification • Appraiser vs standard • Linking results to PFMEA severity/occurrence/detection
3.15pm – 3.30pm	**Afternoon Break**
3.30pm – 5.00pm	**LIVE PRACTICAL — Gage R&R on Production Floor** Activities: • Operators measure selected specimen • Collect repeated readings • Software / manual analysis • Interpret %EV, %AV, %GRR, ndc **Outcome:** Participants understand whether the measurement system is reliable for SPC and PPAP.
DAY 4 — PPAP Submission + Integrated Case Study + Final Audit	
9.00am – 10.15am	**PPAP Overview** • Elements of PPAP Level 1–5 • Customer-specific submission requirements • PFMEA → Control Plan → MSA → SPC → PPAP linkage
10.15am – 10.30am	**Morning Break**
10.30am – 12.30pm	**APQP Finalization & Control Plan Completion** • Aligning SPC characteristics, MSA results, PFMEA controls • Risk-based thinking • Finalizing Control Plan for PPAP
12.30pm – 1.30pm	**Lunch Break**
1.30pm – 3.15pm	**LIVE PRACTICAL — Integrated Case Study** Using actual production data collected from Days 1–3: • Build a PFMEA section • Complete a control plan

	• Attach SPC charts, MSA results • Structure a PPAP submission package
3.15pm – 3.30pm	**Afternoon Break**
3.30pm – 5.00pm	**Final Assessment + Presentation** • Team presentation of PPAP report • Trainer evaluation • Q&A, corrective actions, continuous improvement plan

8.0 Duration

4 days 9.00am to 5.00pm

9.0 Trainer

Dr. Yong WK