CONCEPT

Quality Engineering: APQP, FMEA, Control Plans, MSA and PPAP for New Part Launch

21 November – 2 December 2027
Dammam - Eastern Province five-star



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Introduction:

Quality engineering failures on new parts usually surface at launch: characteristics missed in the design review, process FMEAs disconnected from the control plan, gauges never studied and supplier submissions approved on incomplete evidence. The result is containment, sorting and customer complaints in the first production months. This Core Concept course trains quality, manufacturing and supplier quality engineers to run advanced product quality planning APQP from customer requirements through FMEA, control plans, measurement studies and PPAP. Participants build an APQP pack with PFMEA, control plan and PPAP checklist for a case part.

Course Objectives:

- Plan a product launch through the five APQP phases with gateway deliverables, timing and cross-functional team responsibilities
- Build design and process FMEAs with the seven-step approach and action priority, and flow special characteristics to drawings and controls
- Link process flow diagrams, PFMEA and control plans so that every characteristic has a method, sample size, frequency and reaction plan
- Qualify gauges and processes through measurement system studies, initial process studies and capability indices before part approval
- Select attribute and variables acceptance sampling plans and prepare PPAP submissions at the level a customer requests
- Manage supplier part approval, 8D problem solving, error-proofing and engineering changes through to requalification

Target Audience:

- Quality engineers who own launch quality planning, FMEAs and control plans for new parts
- Manufacturing and process engineers who design production operations, fixtures and in-process checks
- Supplier quality engineers who approve purchased parts and review supplier PPAP submissions
- Product and design engineers who contribute design FMEAs and define special characteristics
- Metrology and inspection engineers responsible for gauges, checking aids and dimensional layouts

Course Outline:

Day 1: The Quality Engineer's Role and Customer Requirements

- Quality Engineer Responsibilities from Concept Through Series Production
- Voice of the Customer Capture with the Kano Model
- Quality Function Deployment Matrix for Product and Process Characteristics
- Customer-Specific Requirements Register and Team Feasibility Review
- Cross-Functional Product Quality Planning Team Charter and Timing Chart

Day 2: APQP Phases, Gateways and Deliverables

- APQP Phase 1: Plan and Define Programme Inputs and Outputs
- APQP Phase 2: Product Design and Development Verification Outputs
- APQP Phase 3: Process Design and Development Verification Outputs
- APQP Phases 4 and 5: Product and Process Validation, Launch and Feedback
- APQP Status Reporting with Red-Amber-Green Gateway Checklists

Day 3: Design FMEA and Special Characteristics

- Seven-Step FMEA Structure: Planning and Preparation to Results Documentation
- DFMEA Structure and Function Analysis with Boundary Diagrams and P-Diagrams
- DFMEA Failure Chains Linking Failure Mode, Effect and Cause
- Severity, Occurrence and Detection Rating Tables with Action Priority Logic
- Special Characteristic Designation and Flow-Down to Drawings

Day 4: Process Flow Diagrams, Process FMEA and Control Plans

- Process Flow Diagram with Operation Numbering and Characteristic Mapping
- PFMEA Structure Analysis of 4M Work Elements per Operation
- PFMEA Prevention and Detection Controls Ranked by Action Priority
- Control Plan Columns: Specification, Evaluation Method, Sample Size, Frequency and Reaction Plan
- Prototype, Pre-Launch and Production Control Plan Stages

Day 5: Week-One Case: Planning Pack for a Machined Housing

- Case Part Data Pack: Drawing, Customer Requirements and Launch Timing
- Case DFMEA Extract for Sealing and Mounting Functions
- Case Process Flow Diagram and PFMEA Build
- Case Pre-Launch Control Plan Linked to PFMEA Controls
- Linkage Audit of Flow Diagram, PFMEA and Control Plan Consistency

Day 6: Measurement System Analysis for Launch Gauges

- MSA Study Planning: Gauge Selection, Resolution and Ten-to-One Rule
- Variable Gage R&R: Average and Range Versus ANOVA Method
- Bias, Linearity and Stability Studies on Case Gauges
- Attribute Agreement Analysis with Kappa for Visual and Go/No-Go Checks
- Percent GRR and Distinct Categories Acceptance Decisions and Gauge Improvement

Day 7: Initial Process Studies, Capability and Acceptance Sampling

- Initial Process Study Plan: Significant Production Run and Run-at-Rate Trial
- Preliminary Ppk Versus Ongoing Cpk Acceptance Criteria
- Capability Results Feeding Control Plan Sample Size and Charting Frequency
- Attribute Sampling Plans to ISO 2859-1: AQL, Inspection Levels and Switching Rules
- Variables Sampling to ISO 3951 and Operating Characteristic Curves

Day 8: PPAP Elements, Submission Levels and Part Approval

- PPAP Triggers: New Part, Engineering Change, Tooling Transfer and Source Change
- Eighteen PPAP Elements from Design Records to Checking Aids
- Dimensional Results, Material and Performance Test Records Preparation
- Appearance Approval Report, Master Sample and Qualified Laboratory Documentation
- Part Submission Warrant and Submission Level 1 to 5 Selection

Day 9: Supplier Quality, Problem Solving and Change Requalification

- Supplier Selection Assessment and Sub-Tier APQP Flow-Down
- Supplier PPAP Review Checklist and Interim Approval Decisions
- 8D Problem Solving: Containment, Root Cause and Escape Point Analysis
- Error-Proofing Devices: Contact, Fixed-Value and Motion-Step Methods
- Engineering Change Requests, Requalification Testing and Launch Quality Cost Tracking

Day 10: Capstone: APQP Pack for a Case Part

- Capstone Case Brief: Supplier-Made Bracket with a Pending Design Change
- Capstone PFMEA Update and Action Priority Review
- Capstone Control Plan with MSA and Capability Evidence
- Capstone PPAP Checklist and Draft Part Submission Warrant
- APQP Pack Presentation, Launch Readiness Review and Improvement Backlog

Skills You Will Gain:

- Product Quality Planning
- Failure Chain Analysis
- Control Plan Development
- Gauge Study Evaluation
- Acceptance Sampling Design
- PPAP Package Preparation
- Supplier Part Approval
- Error-Proofing Design

Why Attend This Course:

- Leave with an APQP pack for a case part: PFMEA, control plan and PPAP checklist ready to adapt to a live launch
- Cut launch surprises by aligning FMEA, flow diagram and control plan before tooling is released
- Judge whether a supplier submission can be approved, approved on interim or rejected, using documented evidence
- Compare launch practice with engineers from automotive, aerospace, electrical equipment and industrial machinery suppliers

Conclusion:

Quality engineering on a new part succeeds when planning, risk analysis, measurement and approval evidence form one connected record. Week one moves from the quality engineer's role and customer requirements through the APQP phases, design and process FMEA and control plans, closing with a guided planning case. Week two adds measurement system analysis, initial process studies, acceptance sampling, PPAP elements and submission levels, supplier approval, 8D, error-proofing and change requalification. The final day assembles an APQP pack with PFMEA, control plan and PPAP checklist for a case part.