9145 - ADVANCED PRODUCT QUALITY PLANNING (APQP) AND PRODUCT PART APPROVAL PROCESS (PPAP) AVIATION SPACE AND DEFENSE INDUSTRIES

BERLIN SUPPLIER FORUM
18 OCTOBER 2019

PRODUCT & SUPPLY CHAIN IMPROVEMENT
SUPPLY CHAIN MANAGEMENT HANDBOOK (SCMH)

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The IAQG is a legally incorporated international not for profit association (INPA) with membership from the Americas, Europe and the Asia Pacific Region (Rev. 08-2015)
9145 APQP & PPAP

The purpose of this presentation is to:

• Introduce key concepts of APQP and PPAP and the benefits of application

• Implementation – First steps

• Guidance material and training
Introduction to 9145
What is 9145?

**A** Advanced
**P** Product
**Q** Quality
**P** Planning

Quality refers to Good, effective Enterprize-wide Planning
What is 9145?

9145 applies Advanced Product Quality Planning (APQP) and Production Part Approval Process (PPAP) to Product Development in the Aviation Space And Defense (AS&D) industry

5-Phase Product Development Process

1. Planning
2. Product Design and Development
3. Process Design and Development
4. Product and Process Validation
5. On-Going Production, Use, and Post-Delivery Service

Success Drivers

- Management commitment
- Integrated cross-functional teams
- Effective project management
- Defined deliverables & outputs for each phase

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Why 9145?

Improve Quality and Reduce Cost

• Prevention tools for risk reduction
• Early achievement of product maturity
• Reduced overall life-cycle costs
• Provides foundation for successful work transfers
Why 9145?

Improve Quality and Reduce Cost by eliminating:

• **Visible Costs:**
  • Non Conformances
  • Rework / Repairs
  • Penalties

• **Hidden Costs:**
  • Design changes
  • Warranty costs
  • Loss of productivity
  • Field service costs
• The list goes on…

Deliver quality products that satisfy customer expectations

The iceberg effect…
9145 Benefits from Proactive Approach

- Reactive to proactive approach
- Improved product quality
- Reduce failure costs through prevention
- Increased Customer satisfaction

Upfront costs are offset by reduction in failure and inspection cost

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9145 Benefits from Proactive Approach

Non-conformances reduced through PPAP  
(Actual AS&D example)

New Product introduction

Program to program comparison

First benefits of APQP can be achieved through PPAP deployment

Work Transfers

Across programs

First benefits of APQP can be achieved through PPAP deployment

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APQP Overview
What is Advanced Product Quality Planning?

APQP is a structured phased Product Development methodology that assures Customer satisfaction by:

- Ensuring that all activities are completed on-time and on-quality
- Facilitating effective communication
- Providing timely escalation and resolution of delays and risks
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**APQP Principles**

- **Customer Satisfaction**
  - On-Time, On-Quality, Shorter lead times

- **Pillars of success**
  - Organizational Commitment & Management Support
  - Cross Functional Team
  - Effective Project Planning

**APQP PRINCIPLES**
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Pillars of success

Customer Satisfaction
On-Time, On-Quality, Shorter lead times

Top Management demonstrates commitment by...

- Completing APQP training
- Allocating and training resources
- Leading reviews
- Standardizing APQP practices
- Removing roadblocks

Management engagement & commitment from launch to closure is key!

APQP Principles

Organizational Commitment & Management Support

Cross Functional Team

Effective Project Planning

APQP PRINCIPLES

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Pillars of success

APQP Principles

Customer Satisfaction
On-Time, On-Quality, Shorter lead times

Cross functional teams enable effective communications and faster product development

Teams should consist of...
- Engineering
- Procurement
- Manufacturing
- Quality
- Sales
- Suppliers
- Customers
- Customer Support

APQP PRINCIPLES

Organizational Commitment & Management Support

Cross Functional Team

Effective Project Planning
Effective project planning and management...

- Schedule tasks, assign responsibility and drive on-time completion
- Continually monitor plan, communicate risks and remove roadblocks
- The APQP plan cascades program key targets through the value stream

Commitment to a firm APQP plan is a critical success factor!

Pillars of success

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APQP has 5 phases starting with product concepts and extending through the product life cycle.
PPAP Overview
PPAP Overview

PPAP is an aerospace APQP element finalizing “Product and Process Validation”

1. Planning
2 – Product Design and Development
3 – Process Design and Development
4 – Product and Process Validation
5 – On-going Production, Use and Post-delivery Service

PPAP combines First Article Inspection and Process qualification

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What is Production Part Approval Process?

PPAP confirms...

that the production process has demonstrated the potential to produce products.....

that consistently fulfill all requirements.....

while operating at the *customer demand rate*
Production Part Approval Process (PPAP)

Key aspects PPAP

• Follows successful completion of the first 4 phases APQP
• Defines the standard deliverables for production part approval
• First Article Inspection (FAI) is the first milestone of Production Validation
• PPAP elements are updated as process and/or product changes occur

Products used for PPAP are from initial production run(s)
PPAP Elements & Phase Alignment

PPAP elements are the output and evidence of APQP execution

<table>
<thead>
<tr>
<th>PPAP ELEMENT</th>
<th>APQP PHASE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Design Records*</td>
<td>2</td>
</tr>
<tr>
<td>2. Design Risk Analysis*</td>
<td>2</td>
</tr>
<tr>
<td>3. Process Flow Diagram</td>
<td>3</td>
</tr>
<tr>
<td>4. PFMEA</td>
<td>3</td>
</tr>
<tr>
<td>5. Control Plan</td>
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<tr>
<td>6. MSA</td>
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<tr>
<td>7. Initial Process Capability Studies</td>
<td>4</td>
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<tr>
<td>8. Packing, Preservation and Labeling Approvals</td>
<td>3</td>
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<tr>
<td>9. FAIR</td>
<td>4</td>
</tr>
<tr>
<td>10. Customer Specific Requirements</td>
<td>4</td>
</tr>
<tr>
<td>11. PPAP Approval Form (or equivalent)</td>
<td>4</td>
</tr>
</tbody>
</table>

* Responsibility of design responsible organization
Production Part Approval Process (PPAP)

Compile the PPAP Package → Submit to Customer → Disposition PPAP Submission

- Approved
- Interim Approval
- Rejected

Maintain the PPAP file throughout product lifecycle

PPAP Approval Form - 9145 Appendix D
Aviation Space And Defense APQP & PPAP

Summary

• 9145 is the internationally harmonized Aerospace standard for APQP and PPAP
• APQP Principles are keys to success
• APQP has defined deliverables aligned to each of the 5 phases
• PPAP approval is the output of APQP
• APQP and PPAP apply throughout the life of the product
Implementation
Implementation Strategy

• Benchmark other companies

• Perform Self-Assessment (Maturity Assessment from SCMH)
  – Identify strengths and weaknesses

• Training
  – Determine what training is needed based off Maturity Matrix
  – Develop a plan to address training needs

• Incorporate 9145 into the Product Development Process
  – Align infrastructure to support 9145
  – Understand and incorporate customer requirements
  – Develop/update internal procedures
  – Establish conformance to the 9145 & customer requirements
Guidance Material & Training
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Aerospace APQP SCMH Section 7.2

Phase Checklists

Maturity Assessment

Tools & Templates

SCMH 7.2.2

Webinars are located here

SCMH 7.2.3

APQP Manual

SCMH 7.2.4-7.2.8

SCMH 7.2.14

7.2.9 Process Flow Diagram
7.2.10 DFMEA
7.2.11 PFMEA
7.2.12 Element Applicability
7.2.13 Control Plan

Standard Published Nov 2016

Introduction Presentation

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Self Assessment – Maturity Assessment

What is It?
- A tools used to visually represent an organizations strengths and weaknesses within APQP

Objective or Purpose
To evaluate and assess the maturity of an organizations Advanced Product Quality Planning philosophy
- Management awareness/commitment
- Organizational alignment and effective communication
- Project/risk management
- Use of tools
- Readiness of external suppliers

When to Use It
- Prior to deployment within your organization
- Prior to deployment of your external suppliers
- As needed to monitor and develop continuous improvement
APQP and PPAP Webinar Series

Topics
- Design Risk Analysis
- Process Flow Diagram & Process FMEA
- Advanced Product Quality Planning Overview
- Control Plan
- Measuremnt Systems Analysis
- PPAP
- Process Capability & Control

Objectives
- Provide high level understanding
- Introduce APQP and PPAP tools and show their relation to 9145
- Share benefits & best practices
- Provide sources for additional information
APQP Relationship Webinar Series

1. Planning
2. Product Design & Development
3. Process Design & Development
4. Product & Process Validation
5. On-going Production & Post Delivery

- Project Inputs
- Design Risk Analysis
- Key Product Characteristics
- Process Flow Diagram
- PFMEA
- Control Plan
- Process Capability & Control
- Measurement Systems Analysis
- PPAP

*Reference 9145 Table 2 – Production part approval process file contents*

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<table>
<thead>
<tr>
<th>Webinar Topic</th>
<th>Date &amp; Time</th>
<th>Who Should Attend</th>
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<tbody>
<tr>
<td>Advanced Product Quality Planning (APQP) Overview</td>
<td>Sept 17th 2019 2:00 PM GMT</td>
<td>Top leadership and leaders of all function engaged in product development process</td>
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<tr>
<td>Design Risk Analysis – Critical Items</td>
<td>Oct 8th 2019 2:00 PM GMT</td>
<td>Systems, Design, Manufacturing and Quality Engineers</td>
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<td>Control Plan</td>
<td>Nov 12th 2019 2:00 PM GMT</td>
<td>Design, Manufacturing and Quality Engineers, Operations Management</td>
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<tr>
<td>Measurement Systems Analysis MSA</td>
<td>Dec 3rd 2019 2:00 PM GMT</td>
<td>Design, Manufacturing and Quality Engineers, Calibration Management</td>
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<tr>
<td>Process Capability &amp; Control (Variation Management)</td>
<td>Jan 7th 2020 2:00 PM GMT</td>
<td>Manufacturing and Quality Engineers, Operations Management</td>
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<td>Production Part Approval Process (PPAP)</td>
<td>Jan 21st 2020 2:00 PM GMT</td>
<td>Manufacturing and Quality Engineers</td>
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2:00 PM GMT = 9:00AM EST = 11:00 PM KST(+9GMT)
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