This PPAP File Is Under Construction

Production Part Approval Process

- Provides proof of capability
- Made up of documents from APQP

PPAP Applies To:

- Parts taken from a significant run
- One hour to one shift
- 300 parts minimum, normally
  - Lesser quantities needs customer approval
- One part from each position for multiple cavity, die, mold, tool pattern to be measured

PPAP Purpose

- Ensure that customer design record and specification requirements are understood
- Ensure that the process has potential to produce product meeting these requirements

Formal Submission

- Always required
- Prior to first production shipment of a new part or product
- When a discrepancy is corrected on a previously submitted part
- In case of an engineering change to:
  - Design records
  - Specifications
  - Materials
- Use of optional construction or material
- Production uses new or modified tools, dies, molds, patterns, etc.
- Refurbishing or rearranging of existing tooling or equipment
- Changes in process or method of manufacture
- Tooling and equipment is transferred from/to a different location
- Change in subcontractor source for:
  - Parts
  - Materials
  - Services (heat treat, plating)
- Production resumes after being inactive for more than one year
- Customer requests shipments to be suspended due to a customer concern
- Customer may waiver or require partial submission (get in writing!)
- Applies to Tier 1 and Tier 2. Tier 3 ‘On the way’

Submission Waiver

- Waiver is for submission only, NOT entire PPAP activity
- Customer initiated
- PPAP file shall be reviewed and updated, including name of individual granting waiver and date

PPAP Submission

- Supplier must notify customer and customer will determine need for part submission
- Purpose is to identify changes that may affect direct customer or ultimate purchaser
- Suppliers are responsible for subcontracted materials and services

Part Submission Warrant

Appearance Approval Report (CFG-1002 5/95)

- Not applicable to all parts - Customer will specify
- Not all items must be completed - customer will specify
- Appearance evaluation
- Colour Evaluation - 1 for each colour

Samples

- Two sample parts - or as agreed to in the control plan
- Master samples retained by supplier for length of part approval
- Show customer approval date
- May be modified by customer

Customer and Supplier Design Records

- Must be maintained
- CAD/CAM math data
- Part(s) prints and latest revision levels
- Material specifications and latest revision levels
- Detail drawings
- Any authorized engineering changes incorporated in the part but not in the design record

Engineering Changes

- Any authorized engineering changes incorporated in the part but not in the design record

Dimensional Results

- Referenced to part drawing
- On a marked drawing
- Includes:
  - Cross-sections
  - Tracings from optical comparator
  - Sketches

Checking Aids

- Fixtures
- Models
- Templates
- Mylars
- Submission of checking aids
  - Specific to part being tested or inspected
  - May be waived by customer

Test Results Specified on Design Record

- Material tests
- Performance tests
- Durability tests

Process Flow Diagrams

- Updated after production trial run
- Need to indicate special characteristics generated at each step
- Generates characteristics matrix (optional)
- Completed during APQP

Design FMEA

- When the supplier has design control responsibility, a DFMEA must be submitted

Design FMEA Form

Process FMEA

- Must follow flow of process flow diagram
- Must include ALL process special characteristics (as a minimum)

Process FMEA Form

Control Plans

- Includes product and process special characteristics
- Includes SPC requirements
- Follows flow of process flow chart and PFMEA
- May be for a ‘family’ of parts if reviewed for commonality
- May require customer approval

Process Performance Evaluation

- Process potential studies for special characteristics and/or compliance characteristics
- Supporting studies
- Control charts
- Ppk ≥ 1.67
- Customer specific requirements
- Use the AIAG Fundamental SPC Manual

Measurement System Variation

- New or modified gages, measurement and test equipment
- Gage R&R studies for all special characteristics
- Follow AIAG Measurement System Analysis reference manual

Design Engineering Approval

- When required on customer's part drawing or specification

Submission Levels

- Identified by customer
- Factors which may determine submission level:
  - QS 9000 compliance
  - Recognition status
    - Chrysler’s quality excellence
    - Ford's Q1
    - GM’s supplier of the year
  - Part criticality
  - Experience with prior part submission
  - Supplier expertise with the commodity
  - Different suppliers may assign different submission levels to the same location

Level Requirements Chart

Forms

- Use forms referenced and documented in PPAP
- Exact facsimiles may be used
- Facsimiles must have customer approval prior to first submission

Process Requirements

- Supplementary layout results sheets
- Sketches
- Tracings (e.g.. Optical comparator)
- Cross-sections
- CMM inspection point results
- Geometric dimensioning and tolerance sheets
- Other auxiliary drawings used with part drawing
- Copies must accompany dimensional results
- Each document must contain
  - part number
  - Change level
  - Drawing date
  - Supplier's name
- Tracing shall be included when optical comparator is necessary for inspection

Part-Specific Inspection or Test Device

- If product, whole or in part, requires a specific device for inspection and/or test, it shall be submitted upon customer request
- Certify that all aspects of the device agree with part dimensional requirements
- All engineering change levels up to submission must be incorporated in the device
- Suppliers are responsible for device maintenance for the life of the device
- Gage R&R per customer requirements must be conducted (see the AIAG MSA reference manual)

Customer Identified Special Characteristics

- Customer safety
- Compliance with regulations
- Function
- Fit
- Appearance

Preliminary Process Capability Studies

- Performance evaluation
- Acceptable level determined for special characteristic prior to submission
- Evaluated using variables data
- Determine if process is likely to produce product that will meet customer requirements
- Other methods for evaluation can be used with customer approval
- Studies are short term - Ppk

Length

- Will not measure long-term (Cpk) variation in:
  - Materials
  - Methods
  - Equipment
  - Measurement system
  - Environment

Data

- Collect and analyze the data in the order produced and use control charts
- Collect and record all process information for each study:
  - Speeds
  - Feeds
  - Material
  - Hardness
  - Temperature
  - pressure
  - Etc.

Measurement System Analysis

- Do gage R&R prior to study on new gages and equipment
- Collect 25 or more sub-groups
- 100 individual readings, minimum
- Sampling plan can influence appearance of stability

Analysis

- Analyze control chart for instability
- if unstable, take corrective action
- Contact customer if stability cannot be achieved
- For stable processes calculate Pp and Ppk
- Preliminary data can be replaced by long term data with customer approval
- For certain processes, other analytical tools, such as individual and moving range charts, are appropriate
- Pp and Ppk must be ≥ 1.67
- When 1.33 ≤ Ppk ≤ 1.67 process may not meet customer requirements. After part approval, begin production with additional attention to characteristic until ongoing Cpk > 1.33 achieved.
- Ppk < 1.33
  - Process is substandard for meeting customer requirements. if given interim approval, process improvement must be given high priority and documented in corrective action plan. Increased inspection and/or testing until Cpk ≥ 1.33 is demonstrated. Revised control plan for interim actions must be reviewed and approved by the customer.

Unstable Processes

- C_{pk} data is useless data for unstable processes
- Process may not meet customer requirements
- Special causes should be identified, evaluated and eliminated where possible
- Use 100%inspection and increased SPC sampling until a C_{pk} of > 1.33 is demonstrated or until customer is satisfied
- Process improvement is a high priority and must be documented in a corrective action plan
- Revise control plan for customer approval

Stability Not Achieved by Submission Date?

- Corrective action plan required
- Interim revised control plan (100% inspection)
- Control plan must be approved by customer

Appearance Approval Requirements

- A separate Appearance Approval Report (AAR) for each part or series of parts when designated an ‘Appearance Item’
- After completion of required criteria, record required data
- Certain customers may not require entries in all spaces
- Completed AAR and representative parts submitted
- Receive parts disposition from customer
- AARs and part disposition must accompany warrant at final submission (see Appendix A for instructions)

Dimensional Evaluation

- On all parts and product materials with dimensional requirements
- Third party inspection services
  - Results must be submitted on their letterhead
  - Must be ‘certified’ lab
- Checked print must be used
- Indicate date on which Measurements took place
- Indicate date of the design record change level and any authorized engineering change document not yet incorporated in the design record but incorporated in the part
- If design record is math data, a hard copy must be submitted and marked to show where Measurements took place
- One of the parts must be identified and maintained as a ‘Master Sample’ (see PPAP page 14)
- Parts outside the specification should not be submitted without prior customer approval. Customer must be notified. Plan must be developed to address the problem.

Part Weight

- Determine part weight without packaging or shipping material
- Report weight in kilograms to 3 decimal places
- Weight Determination
  - Weigh 10 parts randomly selected and report the average weight
  - For parts less than 0.100 kilogram, weigh 10 parts together and report the average weight

Material Tests

- Chemical
- Physical
- Metallurgical
- Must perform tests required by material specifications and control plans
- If required, outside services must be performed by a ‘qualified’ source or customer’s qualified laboratory by special arrangement
- Third party laboratory services
  - Results must be submitted on their letterhead or normal report format
  - Name of laboratory that performed tests must be indicated

Required Tests

- All tests required in design records and related specifications are to be listed in a convenient format with quantity tested and actual results of each test, indicating:
  - Design record change level
  - Specific designation number, date and change level of the test specification
  - Testing date
  - Material supplier name
  - Subcontractor name for services
  - When required by customer, code number for material from customer's approved source list

General

- Supplier is responsible for meeting all applicable specifications
- Do not submit parts and documentation results if they are outside specification
- Take corrective action to meet all design record requirements
- Contact customer if unable to meet all requirements
- Comply with customer developed material specifications and/or approved source list
- See AIAG PPAP reference manual Appendix A

Performance Tests

- Reporting
  - Indicate design record change level
  - Indicate number, date and change level of specifications
  - Indicate date that testing took place
- Supplier's responsibility
  - Meet all applicable specifications
  - Do not submit if results are outside specification
  - Take corrective action required to meet all design record requirements
  - Contact customer if unable to meet all requirements

Parts Submission Warrant

- Upon satisfactory completion of all required Measurements and tests, enter all required information on the warrant (See AIAG PPAP reference manual Appendix A)
- A separate warrant is required for each part number
- Certain customers will not require entries in all spaces
- Responsible supplier official verifies:
  - Measurements and tests conform to customer requirements
  - Required documentation is available for proper submission level
  - Signs warrant and provides date, title and telephone number

Engineering Changes

- Inspection and testing requirements are determined by the extent of the changes
- If certain dimensions are changed, the dimensional evaluation may be limited to those areas affected by the change
- For guidance, contact the customer's part approval activity

Multiple Cavity Molds, Tools, Dies and Patterns

- Complete dimensional layer required from one part from each cavity as a minimum
- Supplier must identify by specific cavity for each part submitted

Master Sample and Record Retention

- Supplier must retain a complete record of findings and master sample(s) for each submission, including SPC results and, where applicable, appearance approval.
- Record should show conformance to all test specifications, including:
  - Dimensional
  - Chemical
  - Metallurgical
  - Physical
  - Other
- SPC results
- Appearance approval, if applicable
- Inspection results
- Laboratory test results
- Preliminary process capability results
- Preliminary process performance results
- Measurement System Analysis results
- Process flow diagrams
- Process FMEA
- Design FMEA (where applicable)
- Control plans
- Subcontractor warrants
- Subcontractor supporting documentation
- Subcontractor appearance approval (where applicable)
- Subcontractor master sample(s)

General

- Suppliers are required to complete and retail copies of all documentation identified in “requirements for Approval” regardless of submission level
- records of PPAP are to be maintained for the life of the part plus one calendar year
- Master samples retained
  - Same as PPAP, or
  - Until a new master sample is produced for the purpose of a customer approval
- Master sample must be identified by
  - Part number
  - Drawing level or revision level
  - Customer approval date
- Sample storage
  - Customer can modify retention for large parts
  - May be waived (must be in writing)

Part Submission Status

- NEVER ship production quantities before receiving customer approval (‘should’ be in writing)
- Supplier ‘may’ be notified of disposition
- Supplier must ensure that future production continues to meet all customer requirements
- “Self Certifying” suppliers send approved documentation unless customer advises otherwise
- No production parts can be shipped until approval is received

Approval Options

- Approval for Production
  - meets all customer specifications and requirements
  - Supplier authorized to ship production quantities to customer releases
- Interim approval
  - Permits shipment on a limited time or piece quantity basis
  - Granted when supplier has:
    - Clearly defined root cause of nonconformance
    - Prepared an interim action plan agreed to by the customer
    - Resubmission is required unless customer revises drawings or specifications to agree with part
  - Must meet agreed upon action plan by expiration date or be rejected
  - No additional shipments authorized except by extension of interim approval
- Rejection
  - Submission, parts and/or accompanying documentation do not meet customer requirements
  - Product and documentation must be corrected
  - New submission required
  - No part shipments until approval