Production Part Approval Process (PPAP) Training – SQE/SDE Department
### Agenda

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Learning Objectives

At the end of this training, participants will be able to:

• What is the **Purpose** of PPAP?
• When is PPAP **Required**?
• What are the **Elements** of the submission?
• How are the **Levels** of PPAP applied?
• Details on successful PPAP submission to **Polaris’** facilities
Document Purpose

• The sole purpose of this document is to provide additional information, training and guidance to Polaris’ supply base to ensure all PPAP documentation is provided in a manner consistent with expectations.

• This document is not intended to be all encompassing. PPAPs are to be created and submitted on the basis of AIAG standards.

Additional resources:

• **Automotive Industry Action Group (AIAG)**
  26200 Lahser Road, Suite 200
  Southfield, MI 48034
  Phone 248-358-3570
  www.aiag.org
  
  Training options available:
  • Courses at AIAG’s headquarters in Southfield, MI
  • Onsite training
  • Webcasts

• **Quality-One**
  Detroit, MI USA
  1333 Anderson Road
  Clawson, Michigan 48017
  Phone: 248-280-4800
  
  Online training courses available for purchase at [http://quality-one.com/online-training/](http://quality-one.com/online-training/)
  • Production Part Approval Process (PPAP)
  • Process and Design Failure Mode and Effects Analysis (PFMEA & DFMEA)
  • Measurement System Analysis (MSA)
  • Eight Disciplines of Problem Solving (8D)
  • Advanced Product Quality Planning (APQP)
  • Six Sigma Black, Green, White and Yellow Belt training

• It is the supplier’s responsibility to reach out to a Polaris representative if there are questions or concerns regarding PPAP preparation/submission. If you are unsure of anything, please ask.
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*Note: Hyperlinks only work in presentation mode*
What is PPAP?

**Production Part Approval Process**

– Rigorous and structured process for part qualification used to formally reduce risks prior to product or service release, in a team oriented manner using well established tools and techniques.

– Initially developed by AIAG (Auto Industry Action Group) in 1993 with input from the Big 3 - Ford, Chrysler, and GM.

– All AIAG forms are acceptable

Contact AIAG At:
Automotive Industry Action Group
26200 Lahser Road, Suite 200
Southfield, MI 48034
Phone 248-358-3570
www.aiag.org
Purpose of PPAP

- Provide evidence that all customer engineering design records and specification requirements are properly understood by the organization and achievable.
- To demonstrate that the manufacturing process has the potential to produce product that consistently meets all requirements during an *actual production run*, at the quoted production rate.
- All PPAP submission data/documentation shall be based on a *significant production run* as defined as any time period/quantity used to establish process capability, with all normal process variation accounted for.

PPAP manages change and ensures product conformance!
When is PPAP Required?

- PPAP submission required when:
  - New part released for production
  - Engineering change order (ECO)
  - Correction from previous submission discrepancy
  - Process Change Request (PCR) – any change to product or process. Note: Reference the *Polaris PCR Training Guide* for further details / guidance. Some examples:
    - Alternative construction or materials
    - Tooling or equipment refurbishment, replacement, transfer or additional
    - Production at new or additional location
    - Change of or at a subcontractor or material source change
    - Product or process changes to component

Note: At the discretion of Polaris, a PPAP submission may be requested at any time.

PPAP is required for *any* new or changed part/process!!
Benefits of PPAP Submission

- Forces formal part conformance and approval
- Ensures formal quality planning
- Helps to maintain design integrity
- Identifies issues early for resolution
- Reduces warranty charges and prevents costs of poor quality
- Assists with managing supplier changes
- Prevents use of unapproved and nonconforming parts
- Identifies suppliers that need more development
- Improves the overall quality of the product & customer satisfaction
Importance of Attention to Detail

- In the last three months an analysis was completed on rejected PPAP submissions.
  - The majority of the rejected submissions were easily preventable (not filling out forms properly and/or not following simple directions/requirements).

PQR Submittals

- 62% Approved
- 38% Rejected
  - Majority due to documentation missing or discrepancy

~ 70% of PPAP submission failures due to documentation
Top Documentation Related PQR Failures

- Missing Dimensions
  - Dimensions and KPCs missing on required documents
  - Balloon drawings not submitted
  - Variable data missing
  - Frequency: 27%

- Missing/Incorrect Question Answers
  - PSW missing responses or not pertaining to the question
  - Frequency: 43%

- Language
  - Documents not submitted in English
  - Frequency: 57%

- Print not PII Released
  - Frequency: 59%

- Missing Polaris PN/Rev
  - Frequency: 65%

- Outdated Revisions Submitted
  - Frequency: 70%

These are EASILY preventable!!
Submission requirements are called **Elements**

Any element not submitted **MUST** be retained

Which element is required is determined by the submission **Level**
1. Design Record
2. Authorized Engineering Change Documents, if any
3. Customer Engineering Approval, if required
4. Design FMEA
5. Process Flow Diagrams
6. Process FMEA
7. Control Plan
8. Measurement System Analysis Studies
9. Dimensional Results
10. Records of Material / Performance Test Results
11. Initial Process Studies
12. Qualified Laboratory Documentation
13. Appearance Approval Report, (AAR) if applicable
14. Sample Production Parts
15. Master Sample
16. Checking Aids
17. Customer–Specific Requirements
18. Part Submission Warrant (PSW)
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<td>4. Design FMEA</td>
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S = The organization shall submit to the customer and retain a copy of records or documentation items at appropriate locations (AIAG std. requirement)
R = The organization shall retain at appropriate locations and make available to the customer upon request (AIAG std. requirement)
* = The organization shall retain at the appropriate location and make available to the customer upon request (AIAG std. requirement)
*P = Polaris default submission level - subject to modification

NOTE: Level 5 PPAP may be reviewed at supplier's manufacturing location

**Level 4 is Polaris’ default and the most common level requested**
Submission Requirements (cont.)

- Polaris requests that all PPAPs be submitted electronically or scanned / uploaded into electronic PPAP system.
- Submissions must be in English.
- Submission must be received prior to the PPAP due date in order to allow for processing time at Polaris.
- Review and Approval Process:
  - Samples are received into PPAP request system when package is delivered to the designated Quality Lab.

Note: Reference the Polaris PQR System Guide for further submission details / guidance.
Notification through PPAP request system
  – Must be Approved or have Interim Approval granted prior to shipping product

  • Full Approval
    – Meets requirements
    – May ship product

  • Interim Approval
    – Approved until specified date
    – Must meet condition by specified date
    – May ship product

  • Rejected
    – Submission does not meet specifications
    – Do not ship product

Production quantities may not be shipped without approval
The Design Record is what the supplier has contracted to provide per the Polaris Purchase Order (PO). Examples would include, but not limited to:

- **Polaris drawings (as defined by a unique Polaris part number) to the latest Engineering Change Level (ECL) or Rev Level as defined on the Purchase Order (PO).**
- **Engineering specifications**
- **Special notes added to the PO (i.e., paint it black or special packaging)**

The engineering drawing portion of the Design Record is often used to provide a ballooned drawing when submitting Element 9 – Dimensional Results.

Supplier drawings (if defined on the Polaris drawings or PO) would also be part of the Design Record.
Design Record – Ballooned Print Requirements

- Bubble print supports the dimensional report
  - Must have all notes and specifications circled and numbered
  - Must be clear and legible
  - Must include any reference dimensions
  - Ideally, start numbering in upper-left and continue clockwise (maintain a logical pattern)

- Any additional supporting information:
  - Reference prints
  - Sub-Assembly prints
  - Component prints with a different part number
  - Applicable material specifications
  - Applicable reference specifications
  - Customer specified workmanship standards

All submissions should have one copy of the Polaris print
Print balloon number must correspond to the “Item” number on the Dimensional Report
Reviewer’s Checklist

- Must be a Polaris print
- Ballooned drawing must be clean and legible
- Must be correct part number and revision
- Every requirement must have a separate balloon
  - Dimensions
  - Notes
  - Special Characteristics
  - Referenced specifications
- Verify that no other prints need to be submitted
  - Sub-assemblies
  - Component level detail

Attention to detail!!
Authorized Engineering Change Documents (if any) – Purpose

**Purpose:**
- To provide any pertinent change information for reference
- This is a placeholder for all authorized engineering change documents not yet recorded in the design record but incorporated in the product, part or tooling:
  - Engineering Change Orders (ECOs)
  - Approved deviations
  - Approved Process Change Requests (PCRs)
  - Specifications
  - Feasibility studies
  - Sub-assembly drawings
  - Life or reliability testing requirements

**Note:** PPAPs may be approved with approved engineering change documents.

This element is typically used when changes occur to the design documentation.
Reviewer’s Checklist

- ECOs must be approved, not pending
- Marked up prints are not acceptable for PPAP
- Feasibility studies included (if applicable)
- Life or reliability testing requirements included (if applicable)
- Submission must include copies of approved change requests
If required, customer Engineering Approvals are used to demonstrate pre-approval of a supplier’s design/testing by Polaris.
The interaction of these three elements is the **CORE** of PPAP!!
Failure Mode and Effects Analysis

- Industry accepted process to assess risk before completing design of product and processes.
  - *DFMEAs shall be complete before tooling PO is launched (ideal state)*
  - *PFMEAs shall start upon handoff of DFMEA driven KPCs*
  - *PFMEAs shall be completed in time to have a control plan in place before product ramp-up (run at rate or pulse order)*
  - *Control Plans shall be derived from KPC and other risks identified through the PFMEA*

- FMEAs are generated for:
  - *New designs, technology or processes*
  - *Modifications to existing design or process*
  - *New environment, location or application*
  - *Root cause analysis*

- FMEAs are generated by:
  - *Cross-functional team from Polaris and Supplier, consisting of Design Engineers, Process/Manufacturing Engineers, Project Leaders, etc.*

- Reference AIAG FMEA Manual and/or SAE J1749
• A 3 phase approach to proactively identify and prioritize potential risk and drive corrective actions before production launch.
  – *Design risk out* by implementing robust design solutions
  – *Process risk out* by implementing robust process solutions (i.e. mistake-proofing)
  – *Control risk* by developing a control plan to audit Design (KPC) and Process risk
• Reduce costly design changes by catching errors and oversights up-front before capital investments are launched.
• Improved safety
• One safe source for historical issues, lessons learned, warranty, etc.
# FMEA – Proactive Quality Tools/Process

## 3 phases of risk mitigation

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<th>V Build</th>
<th>PI Build</th>
<th>PB Build</th>
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<td>Proposed KPCs ID’d</td>
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<td>Process risk out</td>
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<td>Process Design Risk Reduction</td>
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<tr>
<td>Control risk</td>
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<td>Control Plan (with KPCs)</td>
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- PPAP Element #4: Product Design Risk Reduction
- PPAP Element #5: Process Flow
- PPAP Element #6: Process Design Risk Reduction
- PPAP Element #7: Control Plan (with KPCs)
DFMEA – Procedure

- Reference AIAG FMEA Manual for process and category definitions.
- DFMEA is only required if designed by the supplier.
- Must address all KPCs from previous designs with similar requirements. For new designs KPCs should be developed by the DFMEA.
- Document is reviewed by a team not a single engineer.
- Severity, Occurrence and Detection must be compliant with AIAG or Polaris guidelines.
- Must take the technical/physical limits of the manufacturing/assembly process into consideration.
- Use RPN or Severity vs. Occurrence (red, orange, yellow, green) to drive action to reduce risk.
PFMEA – Procedure

- Reference AIAG FMEA Manual for process and category definitions.
- Requirements, Effects of Failure, Severity and KPCs should be directly linked to the DFMEA. If DFMEA is not available, Polaris Product Engineering may develop these categories.
- Must address all KPCs from previous designs with similar requirements.
- Document is reviewed by a team not a single engineer.
- Severity, Occurrence and Detection must be compliant with AIAG or Polaris guidelines.
- Control Plan should be generated by PFMEA Risk.
- Use RPN or Severity vs. Occurrence (red, orange, yellow, green) to drive action to reduce risk.
• Forming the team is critical, the team should be comprised of design, test, quality, manufacturing engineers and subject matter experts. Make sure the right skillset of people are in the meeting to encourage brainstorming.

• Pre-work drives efficiency and accuracy. The first meeting should start by reviewing the pre-work prepared for the FMEA sessions. Process flow charts, boundary diagrams, parameter diagrams, warranty and supplier quality data are a few examples of pre-work that will assist in FMEA development.

• Debating Severity, Occurrence and Detection ratings. In most cases there will be very little difference in rankings that are 1 point apart. To keep the FMEA moving it is a best practice to just take the higher of the 2 rankings if the team can not agree after a short period of time.

• A Recommended Action shall be defined for all items with a severity of 9/10 regardless of occurrence or detection and should be defined for all items with a high severity x occurrence or RPN

• Don’t set an RPN threshold. If RPN is used to prioritize work, the actions should be sorted and worked from highest to lowest.

• If possible, have many short sessions (1-1.5 hours) rather than one or two all day sessions.

• Before a design or process change occurs, the FMEA should be used to ensure no other risks are being introduced.
FMEA – Reviewer’s Checklist

Reviewer’s Checklist

✓ All KPCs have been addressed and labeled in the FMEA.
✓ Make sure action is being taken on high severity and higher RPN line items and the outlined action will actually have an impact.
✓ Make sure that high RPN process concerns and KPCs are carried over into the control plan.
✓ Make sure that all critical failure modes are addressed:
  □ Safety
  □ Form, fit, function
  □ Material concerns
✓ Severity, Occurrence and Detection must be compliant with AIAG guidelines and scored within reason.

Attention to detail!!
The interaction of these three elements is the **CORE** of PPAP!!
What is it?

• A visual diagram of the entire process from receiving through shipping, including outside processes and services.

Purpose:

• To help people “see” the real process

When to Use It:

• To understand how a process is done
• Prior to completing the PFMEA

Guidance – Process Flow Must Include:

• All manufacturing and key processes to be included
• All offline activities (such as measurement, inspection and handling)
• Identification of areas containing nonconforming material
• Scrap, defective and rework parts
• Process steps must match both the Control Plan and the PFMEA
• PFDs for ‘families’ of similar parts are acceptable if the new parts have been reviewed for commonality by the supplier and/or Polaris.
• Reference PFD Checklist (A-6 of the AIAG APQP Manual) for additional guidance
Benefits for Supplier:
- Provide a system overview allowing the study of an entire process at once
- Illustrates relationships between and dependencies of process steps
- Display all process inputs and outputs
-Expose process or system inefficiencies and problem areas. Document a process or system.
- Planning tool to aid in design of new products

Benefits for Polaris:
- Supplier identifies and resolves gaps in quality component of process
  - Higher quality parts
- Supplier identifies and eliminates areas of inefficiency
  - Lower cost parts
- Serves as formal documentation of the process
  - Decreases chance for variation
- Clearly displays all steps in process and provides consistent frame of reference
  - Improves communication

Conclusion:
- A Process Flow Diagram (PFD) provides a pictorial description of all the major steps in a process
- If used properly, it can result in a higher quality, lower cost part
This slide illustrates some of the most commonly used symbols in a flow chart. However, hundreds of symbols exist and companies can actually create their own symbols to meet their needs.
More process flow diagram examples

This process flow diagram utilizes these symbols to clearly identify each step in the process.
Reviewer’s Checklist

✓ Process Flow must identify each step in the process
✓ Match both PFMEA and Control Plan
✓ Should include abnormal handling processes
  □ Scrap
  □ Rework
  □ Extended Life Testing
✓ Process Flow must include all phases of the process
  □ Receiving of raw material
  □ Part manufacturing
  □ Offline inspections and checks
  □ Assembly
  □ Testing
  □ Shipping
  □ Transportation
The interaction of these three elements is the **CORE** of PPAP!!
What is it?

- A document that defines the operations, processes, materials, equipment, methodologies and special characteristics integral to the manufacturing process.

Purpose:

- To communicate the supplier’s decisions during the entire manufacturing process (materials purchase through final packaging).
  - *It does not replace the information contained in detailed operator instructions.*
- Reflects methods of monitoring, control, and the measurement system used.

Guidance:

- Identify Key Product Characteristics (KPCs) and their source of variations.
- Develop using a cross-functional team.
- Generate using the PFD, FMEA, design reviews, special characteristics, and knowledge of process.
- The Control Plan is a living document reflecting the current product and process designs, control methods, and measurement systems.
  - *As these change and/or improvements are made, the control plan needs to be updated.*
- Reference Control Plan Checklist (A-8 of the AIAG APQP Manual) for additional guidance
**Control Plan – Benefits**

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<td>Identify, monitor, &amp; control variation</td>
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<td>Reduce rejects and waste</td>
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<td>Provides a structured approach towards control methods</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>•</th>
<th>Customer Satisfaction</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Focuses on characteristics important to the customer</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>•</th>
<th>Cost Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Reduce scrap, rejects, and waste</td>
</tr>
</tbody>
</table>

|  • | Communication |
Control Plan – Form Details

<table>
<thead>
<tr>
<th>Element</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
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<th>7</th>
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<th>12</th>
<th>13</th>
<th>14</th>
<th>15</th>
<th>16</th>
<th>17</th>
<th>18</th>
</tr>
</thead>
</table>

### Control Plan

**Control Plan Number**
- 002

**Key Contact/Phone**
- T. Smith / 313-555-5555

**Date:**
- Rev.: 2/20/2010

**Part Number/Latest Change Level**
- 54321231 / D

**Core Team**
- Erin Hope, Alan Burt, Ken Light

**Customer Engineering Approval/Date (If Req'd.)**
- 2/20/2010

**Supplier/Plant Approval/Date**
- Erin Hope, Alan Burt, Ken Light

**Customer Quality Approval/Date (If Req'd.)**
- 2/20/2010

**Supervisor/Plant Code**
- 439412

**Other Approval/Date (If Req'd.)**
- 2/20/2010

### Part / Process Number

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Soldering Connections</td>
<td>Wave solder machine</td>
<td>Wave solder height</td>
<td>2.0 +/- .25 mb</td>
<td>Sensor continuity check</td>
<td>100% Continuous</td>
<td>Automated</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Flux concentration</td>
<td>Standard #302B</td>
<td>Test sampling lab environment</td>
<td>1 pc 4 hours</td>
<td>x-MR chart</td>
</tr>
</tbody>
</table>

3. Production – a comprehensive documentation of product/process characteristics, process controls, tests, and measurement systems that will occur during mass production.

**Administrative Section**
- Identifies part number and description, supplier, required approval signatures, and dates.

**Note:** Must submit a Production Control Plan for PPAP approval

Reference Section 6 of AIAG’s APQP Manual for in-depth instruction
### Product Characteristics

Define the characteristics of the product. There may be several for each operation. Can be dimensional, performance or visual criteria.

### Specifications/Tolerance

Use this area to define upper/lower spec limits for each control element or a visual criteria not listed in the engineering documentation.

### Part/Process

Use this area to define part/process number and description.

### Machine/Tools

List the machine, device, jig, or tools that will be used in the manufacturing process.

### Process Parameters

Process parameters that are important. A process parameter is a setting made within a process that effects the variation within the operation.

- Temperature (molding, heat treat, etc.)
- Pressure
- Fixture settings
- Speed
- Torque

### Special Characteristic Classification

Use as required to designate “Critical”, “Key”, “Safety”, “Significant” classifications.
## Control Plan – Form Details (cont.)

<table>
<thead>
<tr>
<th>Element</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
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<th>13</th>
<th>14</th>
<th>15</th>
<th>16</th>
<th>17</th>
<th>18</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Part Number/Latest Change Level</strong></td>
<td>54321231/D</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Part Name/Description</strong></td>
<td>Electronic Circuit Board</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td><strong>Supplier/Plant Approval Date</strong></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td><strong>Other Approval Date (if req’d)</strong></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

### Sample Size
What is the size of the sample you should gather data from?

### Measurement Technique
How is the characteristic or parameter going to be measured? Examples include: caliper, visual, fixture, test equipment, etc.

### Frequency
Define number of parts and the frequency for which the measurement will be taken. Examples: Final testing, visual criteria
- 100%
- SPC, Audit,
- The sample size/frequency

### Control Method
Method that will be used to control the process. Examples:
- Xbar/R Chart
- Mistake proofing
- Pre-control Chart
- Lab report
- Log sheet
- NP Chart
- 1st piece inspection
- Checklist

### Reaction Plan
Actions to be taken if controls fail. What happens when the characteristic or parameter is found to be out of control.
Must include:
- Segregation of nonconforming product
- Correction method
May include (as appropriate):
- Sorting
- Rework/Repair
- Customer notification
Control Plan – Common Pitfalls

- One time document
  - Must be continuously reviewed and updated - what if the latest change or revision has a significant impact?
- Not consistent with process flow or PFMEA
- Reaction plan not specific enough to tell an operator or supervisor what to do
- Process characteristics not identified
- Evaluation measurement / detection tools not specifically identified
- Critical and/or special characteristics not identified
- Family based control plan is not all inclusive
- Inspection frequency/gaging not appropriate for inspected feature
Reviewer's Checklist

✓ Use PFD and PFMEA to build the control plan; keep them aligned
  ❑ “Process Number” should cross reference with PFMEA and PFD
✓ Keep it simple but robust. Controls should be effective.
  ❑ Such as SPC, Error Proofing, Inspection, Sampling Plan
  ❑ Cannot be excessively dependent on visual inspection
✓ Ensure that the control plan is in the document control system and matches the current design record revision.
✓ Good control plans address:
  ❑ All testing requirements - dimensional, material, and performance
  ❑ All product and process characteristics at every step throughout the process
  ❑ All rework loops
  ❑ All Special Characteristics as independent line items
✓ Control plans should reference other documentation
  ❑ Specifications, tooling, etc.
What is MSA?
• MSA is a method used to assess the quality of a measurement system, and make judgment of fitness for its intended use.

Purpose:
• Quantify the amount and sources of variability in the measurement system.
• Assess whether the measurement system is usable for its intended application.

When to use it:
• On critical inputs and outputs prior to collecting data for analysis.
• For any new or modified process in order to ensure the quality of the data.
• When KPCs are identified and an Initial Process Study (Element #11) is required.

Further Guidance:
• Providing detailed guidance on conducting and analyzing GR&R studies is beyond the scope of this document. For further information:
  • Refer to AIAG’s Measurement Systems Analysis manual
  • See an example at www.MoreSteam.com’s link: https://www.moresteam.com/toolbox/measurement-system-analysis.cfm
Repeatability: Variation in measurements obtained with one measuring instrument when used several times by an appraiser, while measuring the identical characteristic on the same part (this is often referred to as Equipment Variation, or EV).

Reproducibility: Variation in the average of the measurements made by different appraisers, using the same gage when measuring a characteristic on one part (this is often referred to as Appraiser Variation, or AV).

Gage Repeatability and Reproducibility (GR&R): The combined estimate of measurement system repeatability and reproducibility. GR&R is typically expressed as “% Tolerance” when the measurement process is used to judge compliance to specifications.

GR&R Study: A study where multiple parts are measured repeatedly by multiple appraisers. In a typical study, 5-10 parts are measured 2-3 times each by 3 appraisers (people that actually make these measurements).

Discrimination, Resolution: The smallest unit of output for a measurement instrument. 10 to 1 rule of thumb: there should be at least 10 units of measurement contained in the specifications, and in ±2 standard deviations of measurement.

Reference Value: Accepted value of a standard.

Bias: Difference between the observed average of measurements and the reference value.

Stability: A stable measurement process which is in statistical control.

Linearity: Change in bias over the normal operating range. A measurement process with good linearity will operate consistently across the range of values.
• Polaris requires an analysis of the capability of all measurement processes identified in the Control Plan required to assess KPCs.

• Minimum requirement for Polaris suppliers are:
  – *Gage R&R study using total tolerance on each measurement tool used to assess a KPC.*
  – *Percentage of R&R should strive to be less than 10%.*
  – *Gage R&R results between 10% and 30% are considered marginal, meaning the supplier has to take or suggest action to improve.*
  – *If greater than 10%, an explanation of why the measurement tool is used shall be included.*

• Every effort shall be made to include samples that represent the full range of process variation.
Reviewer's Checklist

- If the gage/inspection measures a KPC or other important feature, then conduct a Gage R&R. The gage used must be the same gage specified in the Control Plan.
- Make sure the study is recent - less than 1 year
- Gage R&R results must follow the approval %
  - Gages >30% cannot be used on Polaris product
  - Gages between 10% and 30% require highlighted actions
- Make sure discrimination vs. tolerance makes sense
  - Rule = 1 level MORE than the tolerance (i.e. tolerance = .01, gage should measure to .001)
- Does Study provide data on the %GRR, %EV, %AV?
What is It?

• Provides evidence that dimensional verifications required by the design record and the control plan have been completed and results indicate compliance with specified requirements.

Purpose:

• To show conformance to the customer part print on dimensions and all other noted requirements.

When to Use It:

• For each unique manufacturing process
  – Each cell, production line and all cavities, molds, patterns and dies require a Dimensional Result submission.
Dimensional Results – Requirements

Dimensional Results Report Must Include:
• Date of the design record
• Change level
• Authorized engineering change documents

Sample Production Part (see Element 14):
• Supplier must send the part measured (and specified as such) in the Dimensional Results Form.
• Send to Polaris Quality Assurance Representative (as designated in the PPAP request).
• Must be clearly labeled as the sample part with the Polaris part number.

Additional Guidance:
• All dimensions (except reference dimensions), characteristics, specifications, material types, all notes, and any corresponding color or length dash codes should be listed in a convenient format, with actual variable results recorded.
• Nonconforming Measurements:
  – *If any dimensions / characteristics do not meet the specifications, interim approval may be granted if additional documentation is submitted and approved prior to the PPAP submission* (i.e. approved deviation or drawing change request).
  – *Must be identified on PSW*

The dimensional report is evidence of conformance to print
### Dimensional Results – Example

#### ACME Anvils

**INITIAL SAMPLE INSPECTION REPORT**

<table>
<thead>
<tr>
<th>Description</th>
<th>Part Number</th>
<th>Drawing NO.</th>
<th>Issue Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gear, Large</td>
<td>27256542</td>
<td>27256542</td>
<td>14/03/2016</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Customer</th>
<th>Customer’s Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Polaris Industries</td>
<td>27256542</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Norms:</th>
<th>Kind of Delivery</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purchase Order</td>
<td></td>
</tr>
<tr>
<td>NO</td>
<td>Prototypes</td>
</tr>
<tr>
<td>PO0001476</td>
<td>Production lot/batch</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>REASON FOR SUBMISSION</th>
</tr>
</thead>
<tbody>
<tr>
<td>NEW PART</td>
</tr>
<tr>
<td>INSPECTION COMMENTS REQUEST</td>
</tr>
<tr>
<td>GEROGATION REQUEST</td>
</tr>
<tr>
<td>SYSTEMATIC INSPECTION</td>
</tr>
<tr>
<td>PERIODICAL INSPECTION</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>NEW TOOLING</th>
<th>START OF PRODUCTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>DESIGN</td>
<td>TOOLING</td>
</tr>
<tr>
<td>PRODUCTION CYCLE</td>
<td>MATERIAL</td>
</tr>
<tr>
<td>TREATMENT</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Description</th>
<th>Characteristic</th>
<th>(min e max)</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Resulted From Control</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Length of 382 mm</td>
<td>382 mm ± 1.2</td>
<td>381.19 / 381.31</td>
<td>5</td>
</tr>
<tr>
<td>Wheelbase of 276 mm</td>
<td>276 mm ± 1.2</td>
<td>276.04 / 276.05</td>
<td>5</td>
</tr>
<tr>
<td>Length of 382 mm</td>
<td>382 mm ± 1.2</td>
<td>382.89 / 382.90</td>
<td>5</td>
</tr>
<tr>
<td>Wheelbase of 276 mm</td>
<td>276 mm ± 1.2</td>
<td>276.49 / 276.47</td>
<td>5</td>
</tr>
<tr>
<td>Diameter of 390 mm</td>
<td>390 mm ± 1.2</td>
<td>390.89 / 390.97</td>
<td>5</td>
</tr>
<tr>
<td>Holes of 08 mm</td>
<td>8 mm ± 0.5</td>
<td>7.85 / 7.86</td>
<td>5</td>
</tr>
<tr>
<td>Height of 78.7 mm</td>
<td>78.7 mm ± 0.8</td>
<td>78.51 / 78.71</td>
<td>5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Measurement on the Samples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample Number</td>
</tr>
<tr>
<td>--------------</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>3</td>
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<td>4</td>
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<tr>
<td>5</td>
</tr>
<tr>
<td>6</td>
</tr>
<tr>
<td>7</td>
</tr>
</tbody>
</table>
Dimensional Results – Reviewer’s Checklist

Reviewer’s Checklist

✓ Make sure the dimensional report addresses all print requirements.
✓ Ensure “Method” is noted for every measurement and it makes sense for the dimension.
✓ If requested, the agreed upon number of parts from the production run must be shipped to Polaris for verification of form, fit and function.
✓ The same parts will be used to verify both critical and non-critical dimensions.
✓ Supplier must send the part measured (and specified as such) in the Dimensional Results Form.
✓ Supplier should make every effort to ship parts that represent the normal process variation.

Attention to detail!!
Definition:
• The supplier shall have records of material and/or performance test results for tests specified on the Design Record or Control Plan.

Purpose:
• The test reports shall include:
  − Design record revision and the specifications to which the part was tested
  − Any authorized engineering change documents
  − Date the tests were performed
  − Indication of pass or fail
  − The actual results of each test
    • Material test result examples:
      • Chemical
      • Physical
      • Metallurgical
    • Performance test result examples:
      • Fuel pump flow and pressure
      • Regulator voltage or current capacity
      • Seat bun dynamic fatigue test
Records of Material / Performance Test Results – Reviewer’s Checklist

Reviewer’s Checklist

✓ Performance test documents should include confirmation of:
  - Any formal specification referenced
  - Any formal life testing
  - Any specific functional test

✓ Sometimes performance is not directly addressed via the part print but it may be:
  - Referenced through a specification or a drawing note
  - Implied through a requirement

✓ Always ask about the need to demonstrate performance if it is not listed on the print.

✓ Material results should be compared against a known standard. Do not assume the test specification is correct.
  - Verify the correct specification (i.e. ASTM D2000 Rev 2015)
  - Verify the composition breakdown

✓ Verifying composition is NOT just for PPAP, it should be a periodic check that is identified in the Control Plan.
### Initial Process Studies – Definition/Purpose

#### What is it?
- Statistical tools are applied to data from a production run to provide an early assessment of process stability and capability.

#### Purpose:
- To determine if the production process is likely to produce product that will meet Polaris requirements.

#### When to use them:
- In the development process, initial process studies are conducted for all KPCs (and other characteristics as identified by Polaris), based on a significant production run.

**Initial Process Studies: Section 2.2.11 in AIAG’s PPAP, Fourth Edition**
For each KPC and/or identified dimension:

- Perform measurement system analysis (MSA) to understand how measurement variability affects the study measurements.

1. **Gather** data for the study.
2. **Analyze** the data in the order produced using control charts.
3. **Calculate** the appropriate quality indices and create a histogram from the data.
4. **Apply** acceptance criteria and determine next steps.
Polaris requires at least 30 observations gathered from the production process for initial process studies.

- Although the PPAP manual calls for a minimum of 25 subgroups containing at least 100 readings, we have reduced this because of our lower volumes versus the automotive industry.

- Data should be gathered and recorded in the order of production.
- The intent of initial process studies is to identify the amount and sources of variation present in the production process. The data requirements may be replaced by longer-term historical data from the same or similar processes, with Polaris concurrence, if it is judged that the longer-term historical data will better achieve that intent.
• Data should be plotted in the order produced, preferably using control charts.
  – *With small data sets, we cannot make conclusions about long-term process stability (effects of time and variations in people, materials, methods and environment), but we can understand whether the process is stable over the short time involved, and possibly identify key sources of variation for control and improvement.*

• Look for signals of instability (special causes of variation)
  – *With small data sets, we cannot make conclusions about long-term process stability (effects of time and variations in people, materials, methods and environment).*

• If there are signs of instability, the supplier shall identify, evaluate and wherever possible, eliminate special causes of variation prior to PPAP submission.

For details about process control charts, see AIAG’s SPC manual, Chapter I-Section G through Chapter II
The capability index for a stable process

- \( C_{pk} \) is a measure of process capability based on process variation within each subgroup of a set of data.
- It does not include the effect of process variability between subgroups.
- It provides a prediction of what the process might deliver if the process is in statistical control.

The performance index

- \( P_{pk} \) is an indicator of process performance based on process variation throughout the full set of data.
- It does include all sources of process variability in the data set, and provides a summary of what the process has done during generation of the data.
- If a process is in statistical control \( C_{pk} \) and \( P_{pk} \) will have similar values.

The quality indices are designed to provide a numerical indication of how the process performs compared to specifications. However, a histogram of the data, with specification limits indicated, should accompany the indices to provide a visual sense of how the data in the study relate to the specification limits.

For details about quality indices, see AIAG’s SPC manual, Chapter IV
C\textsubscript{pk} or P\textsubscript{pk} will be chosen as the Index, as appropriate.

<table>
<thead>
<tr>
<th>Results</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Index &gt; 1.67</td>
<td>The process currently meets the acceptance criteria.</td>
</tr>
<tr>
<td>1.33 \leq \text{Index} \leq 1.67</td>
<td>The process may be acceptable. Contact the authorized Polaris representative for a review of the study results.</td>
</tr>
<tr>
<td>Index &lt; 1.33</td>
<td>The process does not currently meet the acceptance criteria. Contact the authorized Polaris representative for a review or the study results.</td>
</tr>
</tbody>
</table>
Initial Process Studies – Miscellaneous

- Unstable (out of statistical control) processes may not meet Polaris requirements. The supplier shall notify the authorized Polaris representative of an unstable process and submit a corrective action plan prior to submission.

- Action to be taken when acceptance criteria are not satisfied:
  - The supplier shall contact the authorized Polaris representative if acceptance criteria cannot be attained by the required PPAP submission date.
  - The organization shall submit to the authorized Polaris representative for approval a corrective action plan and a modified Control Plan normally providing for 100% inspection.
  - Variation reduction efforts shall continue until the acceptance criteria are met, or until customer approval is received.

- The quality indices are designed to provide a numerical indication of how the process performs compared to specifications. However, a histogram of the data, with specification limits indicated, should accompany the indices to provide a visual sense of how the data in the study relate to the specification limits.
Reviewer’s Checklist

✓ Ensure the supplier has evaluated measurement processes and they are adequate.
✓ Review control charts to assess statistical process control.
✓ Review histogram to evaluate distribution of the data.
  ❑ Is the measure centered in the specification? (Note: This isn’t absolutely necessary, but if the process is not centered, have a conversation with the supplier about why it isn’t centered and whether they intentionally run the process centered at the location indicated by the data.)
  ❑ Does it show a coherent distribution (i.e. are there multiple modes or clear “flyers” that raise questions about using the data to represent the ongoing process)?
✓ Review reported quality indices to ensure they meet requirements.
Purpose:

• Inspection and testing for PPAP shall be performed by a qualified laboratory as defined by Polaris requirements (i.e. an accredited laboratory).

• The qualified laboratory (internal or external to the supplier) shall have a laboratory scope and documentation showing that the laboratory is qualified / accredited for the type of measurements or tests conducted.
  – When an external laboratory is used, the supplier shall submit the test results on the laboratory letterhead or the normal laboratory report format.
  – The name of the laboratory that performed the tests, the date(s) of the tests, and the standards used to run the tests shall be identified.

Internal / External Recommendations:

• Recommendation for performing testing or measurement (INTERNAL)
  – Record/Scope that identifies the testing to be done and it must include a list of all test equipment, methods and standards used to calibrate the equipment.

• If you are sending out for measurement and testing (EXTERNAL)
  – Provide a copy of the company’s THIRD PARTY accreditation
  – Results must be on company letterhead and include:
    • The name of the Lab
    • Date of testing
    • Standards used for testing are identified
Reviewer's Checklist

✓ Third party labs that measure parts for performance, material or dimensional must be accredited.
✓ If any testing is performed to measure or monitor part quality the test organization must have:
  - Lab scope
  - Evidence of calibration (in-process)
✓ Lab Scope: Make sure internal labs have a “system” defining what can be measured, method, training, etc.

Attention to detail!!
**Appearance Approval Report (AAR) – Definition/Purpose**

<table>
<thead>
<tr>
<th>Element</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>What is It?</td>
</tr>
<tr>
<td>2</td>
<td>A Polaris supplied form: OPS-FORM-0151, completed by the supplier containing appearance and performance criteria.</td>
</tr>
<tr>
<td>3</td>
<td>Purpose:</td>
</tr>
<tr>
<td>4</td>
<td>To demonstrate that the part has met the coating cosmetic and performance requirements in the design record.</td>
</tr>
<tr>
<td>5</td>
<td>When to Use It:</td>
</tr>
<tr>
<td>6</td>
<td>Testing completed on production level parts.</td>
</tr>
<tr>
<td>7</td>
<td>AARs only required for cosmetic parts.</td>
</tr>
<tr>
<td>8</td>
<td>Note:</td>
</tr>
<tr>
<td>9</td>
<td>Typically only applies for parts with color, grain, or surface appearance requirements. The use of limit samples help to distinguish acceptable vs. unacceptable parts.</td>
</tr>
</tbody>
</table>
Form Breakdown:

• **Pretreatment Process Information**
  – *Defines the cleaning and preparation process including details of the process type, chemical composition and product identification.*

• **Coating Specifications**
  – *Provides the coating brand and details as well as the substrate conditions. Substrate conditions are identified by Polaris and are to be found in the design record.*

• **Performance Tests**
  – *Location for documenting all test results pertaining to coating performance, broken down into chrome and paint.*
  – *Performance requirements will come from the appropriate Polaris standard as found in the design record.*
  – *Examples: adhesion, hardness, and corrosion testing are a few of the results reported here.*

• **Cosmetic Surface Criteria**
  – *Cosmetic sections are broken down into Liquid Paint, Powder Paint, Colored Plastic, and Chrome.*
  – *Documents pass/fail for the supplied part on defects such as blisters, scratches, fibers, waviness, etc.*
AAR - Instructions

Instructions for completing the Polaris AAR Form

1. Please fill out this form as completely as possible. All light green areas must be completed before submission.
2. Drop down boxes are used throughout the form. If a test or surface defect is not applicable, select "N/A".
3. If the coating and specification used are not listed, select "OTHER" and manually enter the coating and specification below the drop down box.
4. If more than one surface designation is present on a part, use the Overflow tabs to enter data for each surface designation.
5. This form is intended to be used as a vehicle to report results and not intended to determine requirements.

*This form is not all encompassing. Refer to the design record (print, standards, PO) for all requirements not contained in this document and provide results accordingly.

* Note on POLARIS SOPC-814-1050-6
When using Polaris approved paint (as defined in the design record) the following tests/sections are required as described by each of the sections including frequency: Tests 4-9 & 14:
If unapproved paint (formally approved by Polaris) is used all 23 of the tests/sections must be completed and submitted in the AAR

Reminder: The process/materials used to achieve AAR approval cannot be changed without an approved Polaris PCR (Process Change Request) and subsequent PPAP request.

Supplier MUST understand the cosmetic expectations & provide specifications or standards for inspection.
Reviewer’s Checklist

- Are all green areas on the form populated as outlined in the AAR procedure?
- Is the information provided on the Appearance Approval Report directly tied to the design record?
  - All testing is complete per the Polaris standard referenced on the print.
  - Testing results are acceptable and passing according to the Polaris standard.

Attention to detail!!
Sample Production Parts – Definition/Purpose

What is it?

- Product sent by the supplier as defined by the customer on the submission request.

Purpose:

- Sample of Process Output
  - Sample parts should be representative of a process and taken from a significant production run (as discussed elsewhere in this document).
- Needs to be the same part measured when creating the dimensional report submitted in response to PPAP request.
- Verify inspection techniques.

Sample parts to be selected at random from the production run
Address the following when submitting Sample:

- Sample sizes for PPAP reporting purposes should be of at least 5 parts.
- Samples provided for Polaris approval can be a minimum of 1 part.
- Ship sample part(s) to the attention of the responsible Polaris quality assurance representative and to the location noted in the PPAP Request.
- Include method of shipment (i.e. UPS, FedEx, etc.) and the shipper’s tracking number in the PPAP Request.
- Sample parts are to be shipped shortly after the electronic data is submitted to the Polaris quality assurance representative.
- The Sample Part Label (found in the Polaris Supplier Quality Assurance Manual and shown here) must be affixed to the OUTSIDE of shipping containers…not enclosed inside.
- Samples are to be shipped free of charge – DO NOT send sample parts with inventory/production shipments – samples must be separate.
- Do not ship the sample(s) against any purchase order.
- The bill of lading, invoice or packing slip must clearly state the parts are “sample” at no cost to Polaris.
- If samples are shipped against a purchase order they will be received into inventory and will not be considered as PPAP samples – subject to an RMO.
Reviewer’s Checklist

✓ Sample Parts should be received with every PPAP submission and examined and must be the same part measured and documented in the Dimensional Results paperwork.
✓ Shipment method and tracking information must be referenced in PPAP submittal.
✓ Sample parts must be properly tagged, if they are not, they may be \textit{REJECTED}!!
Master Sample – Definition/Guidance

**Definition:**
- A sample of the material retained by the supplier from the *significant production run* which is representative of the yield of the process.

**Guidance:**
- The Master Sample is retained at the supplier’s facility, NOT AT POLARIS.
  - *Material must be retained by the supplier until such a time a new PPAP is submitted OR a change is made to the material.*
  - *In some cases, suppliers maybe required to retain parts for seven years after the end of the build. This condition usually relates to critical operation parts (brakes, drive system, vehicle safety systems, etc.).*
- The Master Sample may be used to:
  - *Confirm fit up and dimensional conformity*
  - *Confirm acceptance to cosmetic criteria*
  - *Used for development of gaging and creation of inspection criteria*
  - *Used for assembly and inspection training*
  - *Verification of production tooling*
Three types of Master Samples:

- **Physical sample** - A part or sample taken from the initial pre-production run and kept in a secure area.

- **Analytical Sample Record** - For materials that breakdown over time (plastics, rubber compounds, chemicals, etc.), a master analysis (test records) along with the test protocol, are kept on file. These records are for baseline comparison in the event the current material fails to perform.

- **Manufacturing Sample Record** - Test records from bulk material produced in the pre-production run (paint, welding shield gases, chemicals).
  
  In some applications, bulk materials are supplied which may contain several different lots of material. To create a master sample:
  
  - Record quantity of product produced
  - The important performance results
  - The raw materials utilized (including lot numbers used)
  - Critical equipment used to produce bulk material
  - An analytical sample record
  - Batch ticket used to make bulk material
Master Sample Requirements

- The supplier maintains a minimum of one part or applicable records
  
  - *Exception:* If a supplier is unable to safely retain samples due to size or storage constraints, the customer may grant a waiver to the entire master sample requirement.
  
  - A sample from each tool, mold, cavity, etc. must be retained.
  
  - Any differences in the process require sample parts be maintained for future comparison (*i.e.* injection molding barrel temperature).

- Each part labeled with the customer part number and PPAP approval date.

- Parts storage
  
  - Parts are organized so they are easily locatable.
  
  - Parts are protected from elements that may cause damage (*rain, wind, sunlight, etc.*), to preserve original production condition.
Reviewer’s Checklist

- Ensure there is a system for properly maintaining and periodically reviewing master samples.
  - Certain materials may deteriorate over time depending on storage conditions (i.e. rust, harden, discolor, warp, etc.).
  - Ensure contingency plans are established to protect samples from loss.
- A sample from each tool, mold, cavity, etc. are retained.
Definition:
• Fixtures, templates or special gages where used to measure dimensions or functional integrity of parts.

Guidelines:
• Supplier may be asked to provide gage with PPAP submission.
• Supplier will be responsible for maintenance, calibration and gage R&R.
Reviewer’s Checklist

✓ If a fixture is referenced in the control plan and used to check physical print dimensions either in-process or offline, then it is a checking aid and subject to this review.

✓ Checking aids must have evidence of:
  - Conformance to a provided print (if requested)
  - Repeatability
  - GRR
  - Preventive maintenance plan
Definition:

- Records of compliance to all applicable Polaris-specific requirements as listed below:
  - Packaging Approval form
  - Pre-Delivery Inspection (PDI) checklist (when applicable)
  - Others as defined
- These requirements would be defined by an authorized Polaris quality assurance representative as required.
What is it?
- It is an industry-standard document required for all newly-tooled or revised products in which the supplier confirms that inspections and tests on production parts show conformance to Polaris requirements.

Purpose:
- Used to:
  - Document part approval
  - Provide key information
  - Declare that the parts meet specification

When to Use It:
- Whenever PPAP submission is required
- Prior to shipping production parts

PSW submission is **MINIMUM** requirement for **ALL** PPAP levels
Elements of the Part Submission Warrant

- Part information
- Supplier Manufacturing Information
- Submission Information
- Reason For Submission
- Requested Submission Level
- Submission results
- Declaration
- Documentation for any non-conformance, deviation or open engineering change requests
- For Customer Use Only (not used – PPAP approval is the acceptance method)
Reviewers Checklist

✓ Must be completely filled out
✓ Must be signed by the supplier
✓ Part number must match the PO
✓ Product family submissions allowed
✓ Submitted at the correct revision level
✓ Submitted at the correct submission level
✓ Specify the reason for submission
✓ Ensure any deviations and/or change requests are documented
The Production Part Approval Process is an extensive approval process for *new or changed* designs or processes.
It is very formalized, so it inevitably causes some administrative work.
It can be used in both manufacturing and service industries.
AIAG PPAP expects the supplier to do all design and validation activities, regardless of PPAP level request.
Later changes to the product or process can be expensive and time-consuming!

**Standard Response to PPAP Charges**

Dear Supplier,

Polaris does not pay one-time PPAP charges because it expects the activities that make up APQP and PPAP will not be one-time activities. Process design elements such as FMEAs and Control Plans should be living documents and updated regularly. Process validation activities such as MSAs, Process Capability Studies and part inspections should also be done regularly to monitor and improve processes. Combined, these activities will help suppliers drive continuous process improvement and achieve necessary cost targets.

Please review the Polaris Supplier Quality Assurance Manual (SQAM) and the current AIAG APQP and PPAP manuals to ensure a complete understanding of Polaris’ expectations.

Regards,
PPAP – Reviewer’s Checklist

Reviewer’s Checklist

✓ Ensure all required elements have been submitted.
✓ Ensure any non-conformances or concerns have been noted.
✓ Must verify approval status of any sub-assemblies.
✓ Thoroughly review all element details prior to submitting/approving.
References / Resources

- Where are the training, references / resources located?
  - Refer to the Polaris Supplier Quality Assurance Manual (SQAM).

- Support/Subject Matter Expert (SME)
  - Contact your Polaris quality representative for questions or additional guidance.
Learning Objectives Recap

At the end of this training, participants will be able to:

✓ Understand Polaris’ expectations regarding the overall process of PPAP preparation, compilation and submittal.

✓ What is the Purpose of PPAP?

✓ When is PPAP Required?

✓ What are the Elements of the submission?

✓ How are the Levels of PPAP applied?

✓ Details on successful PPAP submission to Polaris’ facilities
FAQs

Why will Polaris not accept hard copies of submission data in lieu of electronic data?
• Hard copies cannot be entered into our system and thus viewed by the many people who need access to the data.
• Electronic submissions can also be traced verifying date of submission.

Why does the data need to be submitted in .pdf or .tif format?
• Data must be submitted in acceptable formats which Polaris can open conveniently.

What if multiple revisions exist in the PPAP submission system for the same part number?
• Previous revision requirements can be moved forward to the latest PPAP Submission Request upon supplier request (this is not done automatically and subject to certain conditions).

What if the due date on the PPAP request cannot be met?
• DO NOT ignore the date – your metrics will be negatively affected.
• Notify the Polaris representative PRIOR to the due date and provide a reason.
What happens to submitted samples after auditing at Polaris?

- Samples are scrapped after approval.
- Sometimes samples may be used for destructive testing and could be destroyed in the process.

Why must the submitted data be against a RELEASED Polaris drawing?

- Polaris Purchasing Agents and Engineers provide suppliers with pre-released drawings for quoting purposes or early discussion.
- Preliminary, pre-release or WIP drawings can change at any time with no notice and are exempt from the Polaris release cycle.
- The released drawing is a contractual agreement as noted on the PO.
- PPAP submission requests are automatically generated after a print is released.
- Only production POs and production drawings can be PPAP’d.
Questions?