APQP & PPAP

Bocar Group

Customer Specific Requirements

Objectives

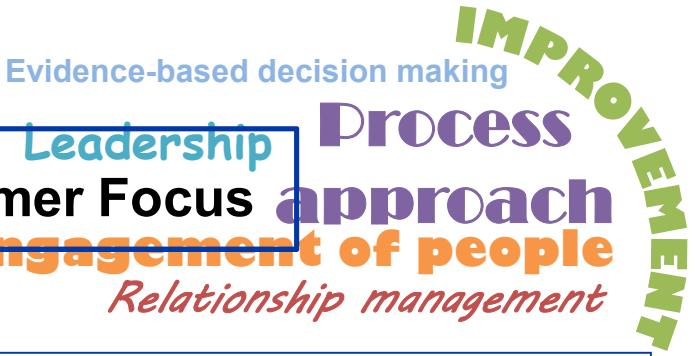
Identify BOCAR Group Customer Specific Requirements for the APQP/ PPAP process, in order to standardize the key inputs, outputs and deliverables.

APQP

Advanced Product Quality Planning is the key process for the prevention of defects and continuous improvement, therefore the supplier must demonstrate compliance in the following cases:

- During the development of new processes and products.
- Before making changes to processes and products.
- Prior to tooling transfer to new facilities.
- Before making changes to the process or product that affect vehicle safety or compliance with governmental regulations.

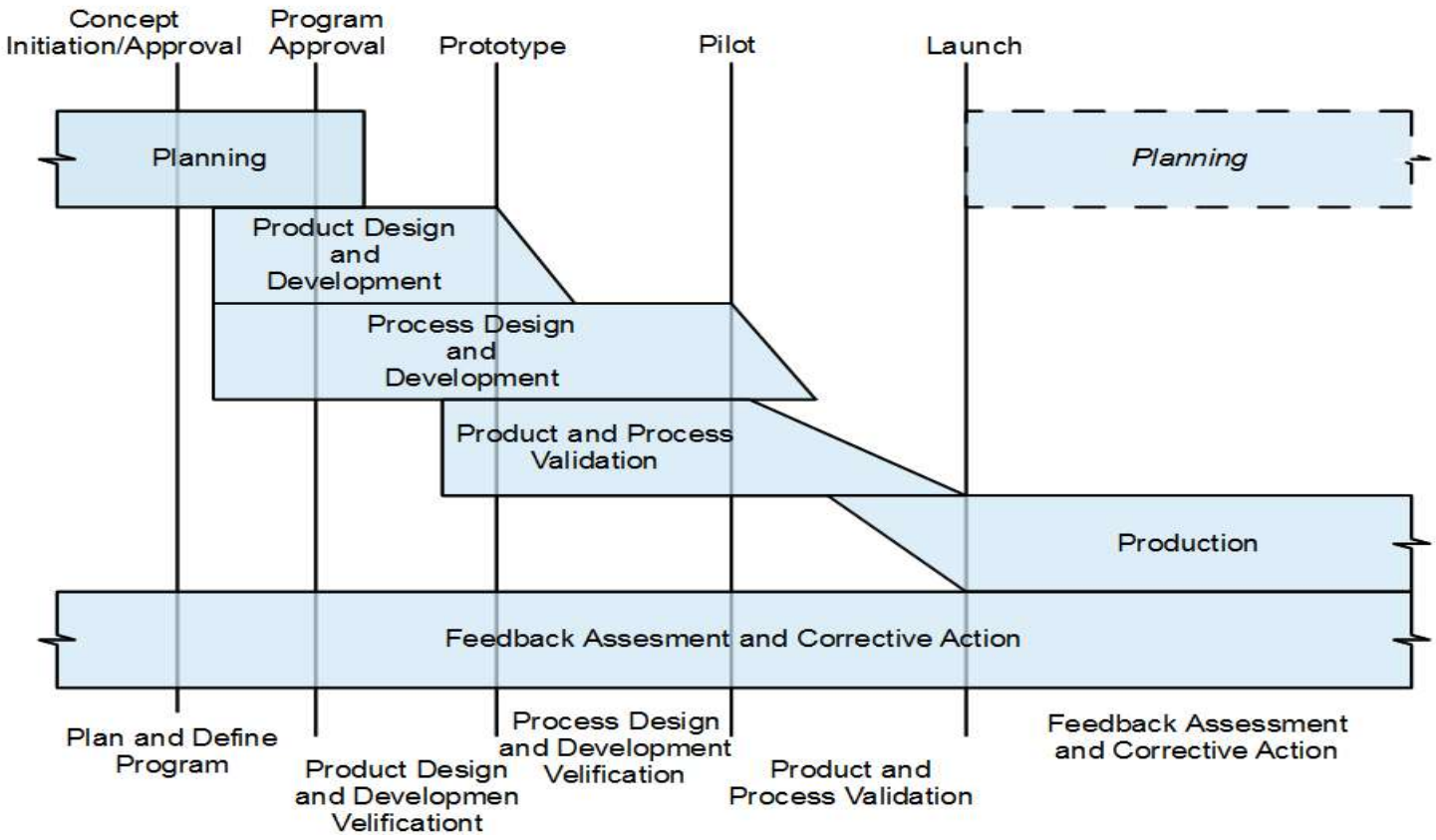
Advanced Product Quality Planning = Customer Focus



Which are the 7 Quality Management System Principles?

APQP

It is divided on 5 stages:

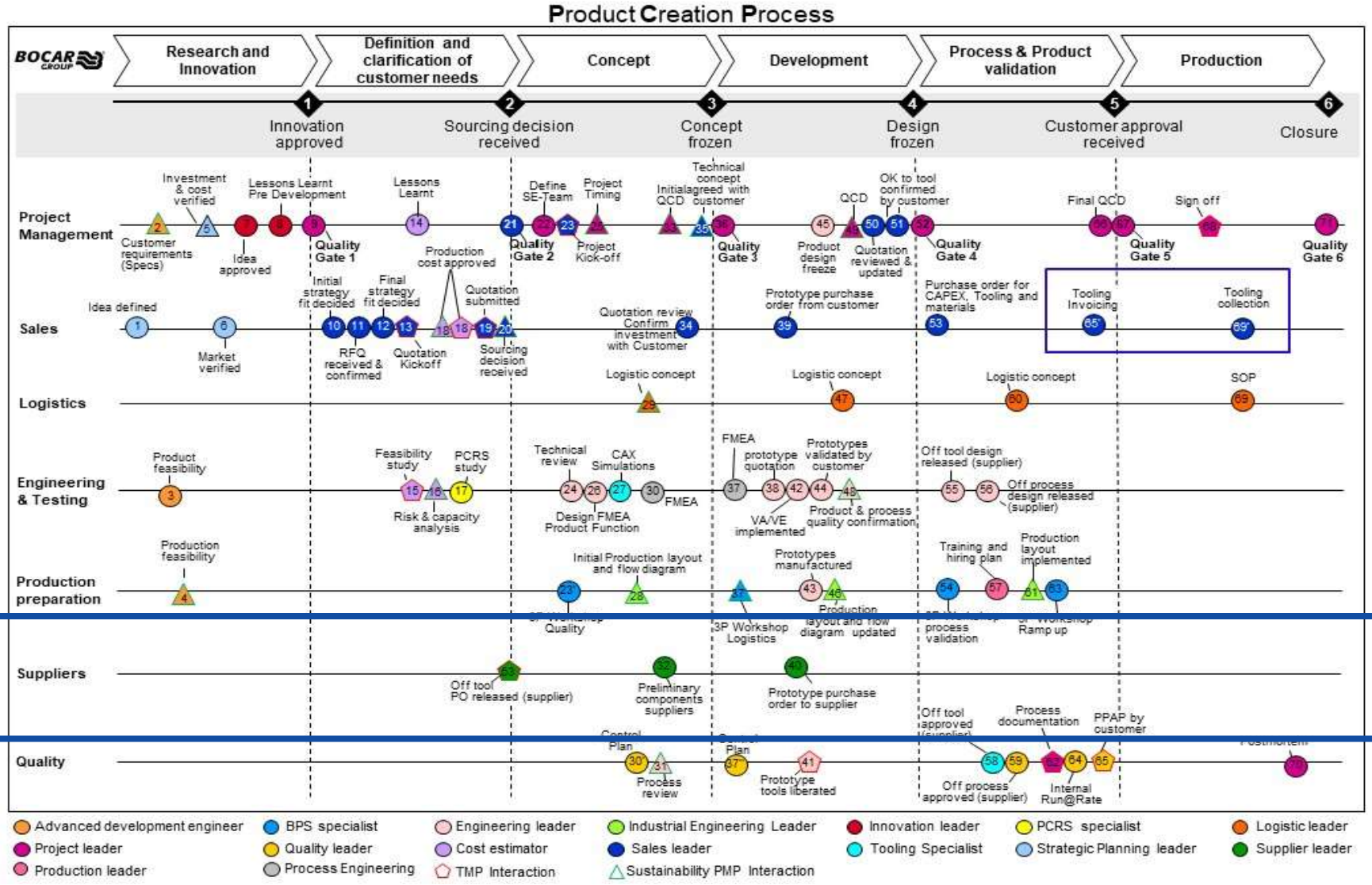


Who should participate on the APQP?

1. Define the owner for the APQP process.
2. Define a multifunctional team to ensure correct planning.
3. The main team must include representatives from:

SUPPLIER	BOCAR	CUSTOMER
• Engineering • Manufacture • Control of materials • Human Resources • Purchases • Quality • Sales • Field service • Suppliers and clients	• Quality • Purchasing • SQA • Engineering • Logistics • Project Leader	• When needed

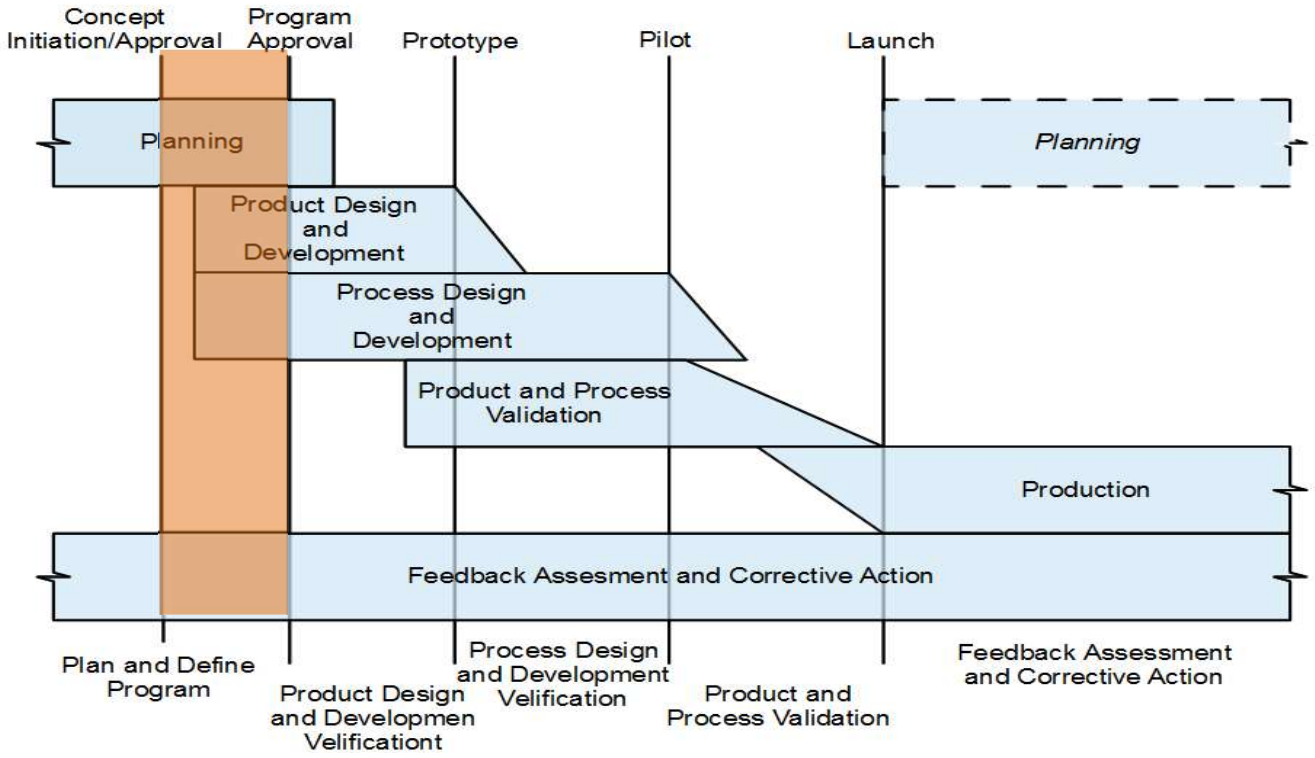
PCP – Bocar Group



Stage 1

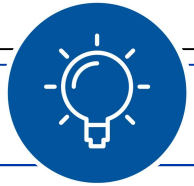
Plan and define program.

Describe and define how customers needs and expectations are linked to planning and defining a quality program (Project Timing)



Plan and define program.

Inputs	Outputs
• Voice of the Customer • Marked Research • Historical Warranty and Quality Information. • Team Experience. • Business Plan/Marketing Strategy. • Product/Process Benchmar Data. • Product/Process Benchmark Data. • Product/Process Assumptions. • Product Reliability Studies. • Customer Inputs.	

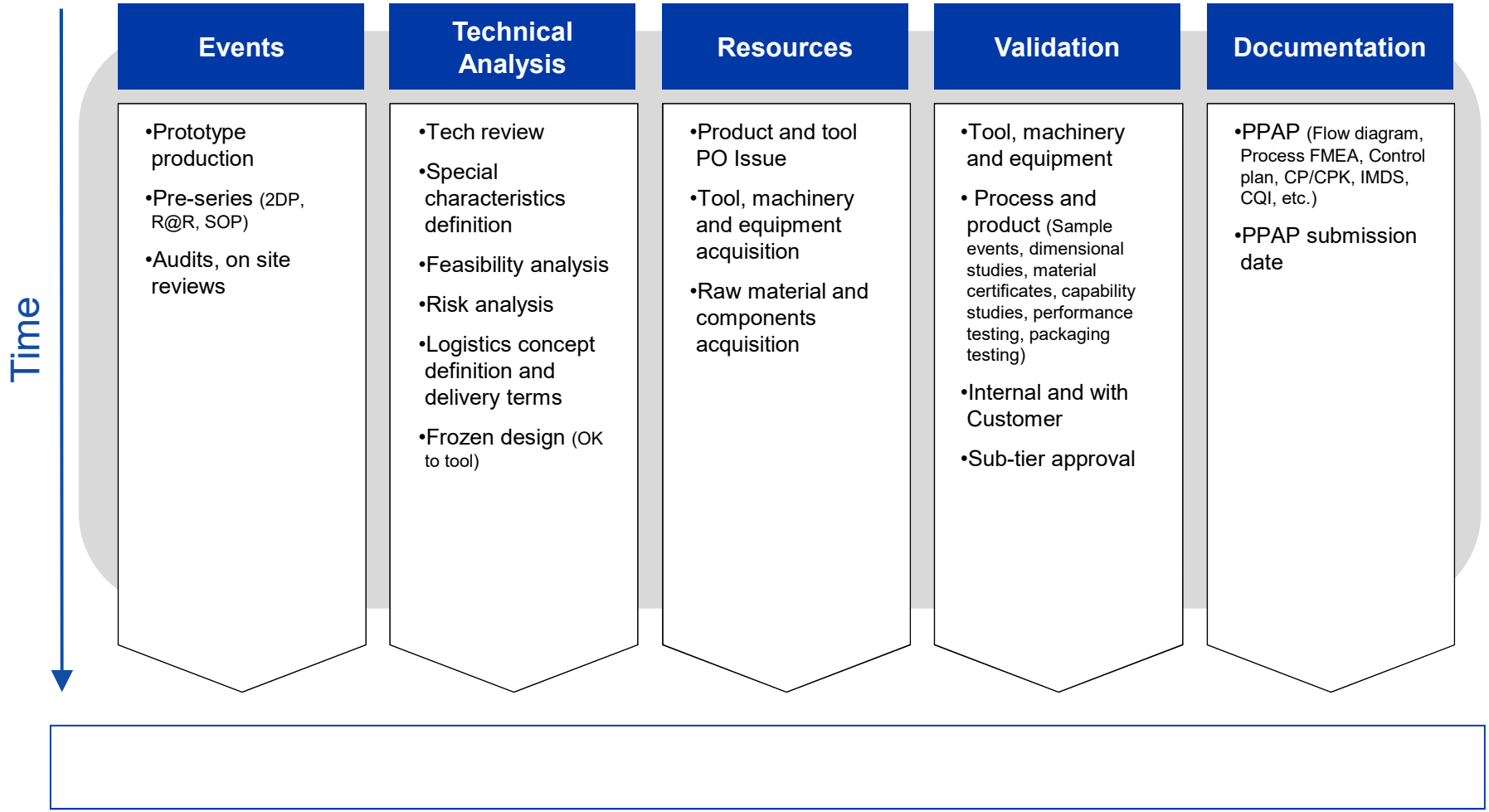


State at least 3 outputs at this APQP Stage

Plan and define program.

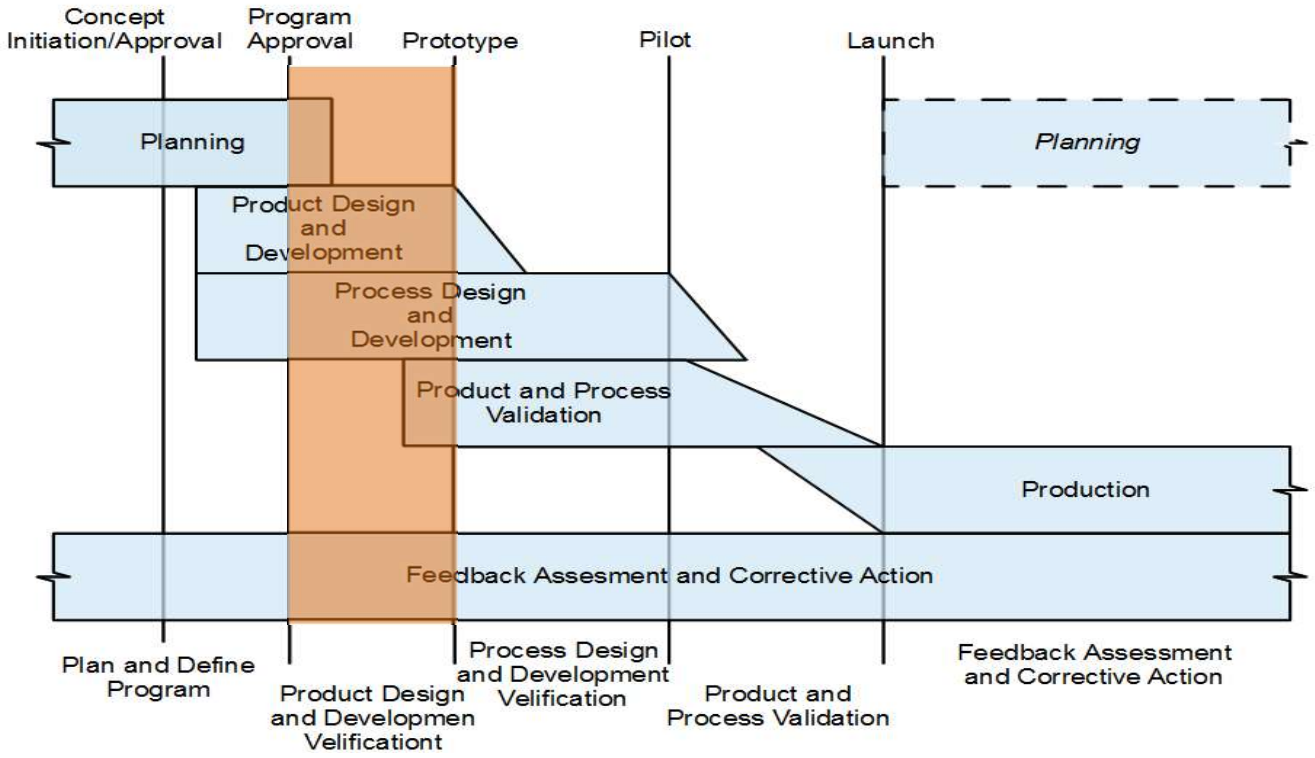
Inputs	Outputs
• Voice of the Customer • Marked Research • Historical Warranty and Quality Information. • Team Experience. • Business Plan/Marketing Strategy. • Product/Process Benchmar Data. • Product/Process Benchmark Data. • Product/Process Assumptions. • Product Reliability Studies. • Customer Inputs.	• Design Goals • Reliability and Quality Goals • Preliminary Bill of Material • Preliminary Process Flow Chart • Preliminary Listing of Special Product and Process Characteristics • Product Assurance Plan • Management Support

Project Timing Content



Product Design and Development

It is designed to ensure a comprehensive and critical review of engineering requirements and other related technical information.



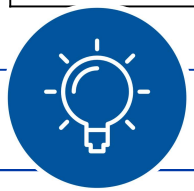
Product Design and Development

Inputs	Outputs
• Design Goals • Reliability and Quality Goals • Preliminary Bill of Material • Preliminary Process Flow Chart • Preliminary Listing of Special Product and Process Characteristics • Product Assurance Plan • Management Support	• Design Failure Mode and Effects Analysis (DFMEA) • Design for Manufacturability and Assembly • Design Verification • Design Reviews • Prototype Build - Control Plan • Engineering Drawings (Including Math Data) • Engineering Specifications • Material Specifications • Drawing and Specification Changes

Design Outputs

APQP Outputs

- New Equipment, tooling and facilities requirements
- Special product and Process requirements
- Gages/testing, equipment requirements
- Team feasibility commitment and management support



Which are the APQP outputs at this stage?

Feasibility Analysis

Product

- Process capability 1.67 (initial), 1.33 (series production)
- The product can be manufactured according to design requirements:
  - Material
  - Specification and tolerances
  - Testing and performance requirements
- Packaging requirements

Process

- Labor, equipment, facilities, machinery, tooling
- Efficient manufacturing process (Cost, Quality, Scrap index and Customer Satisfaction)

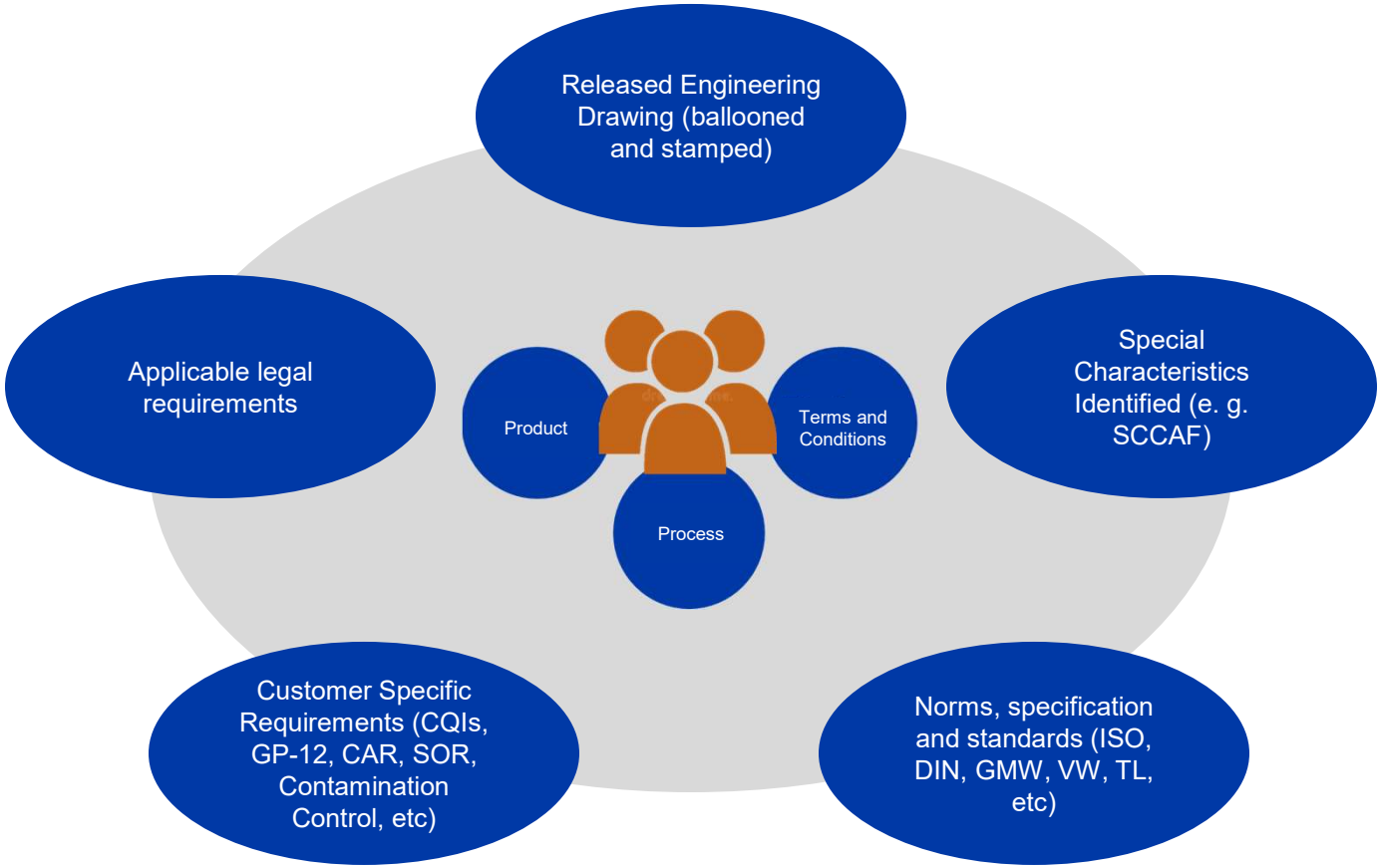
Terms & Conditions

- Bocar Group Supplier Quality Management System Manual acceptance
- Commercial terms and conditions acceptance

- Applicable to new projects and changes to the product and process.
- Any non-feasible element must be justified.

Tech Review

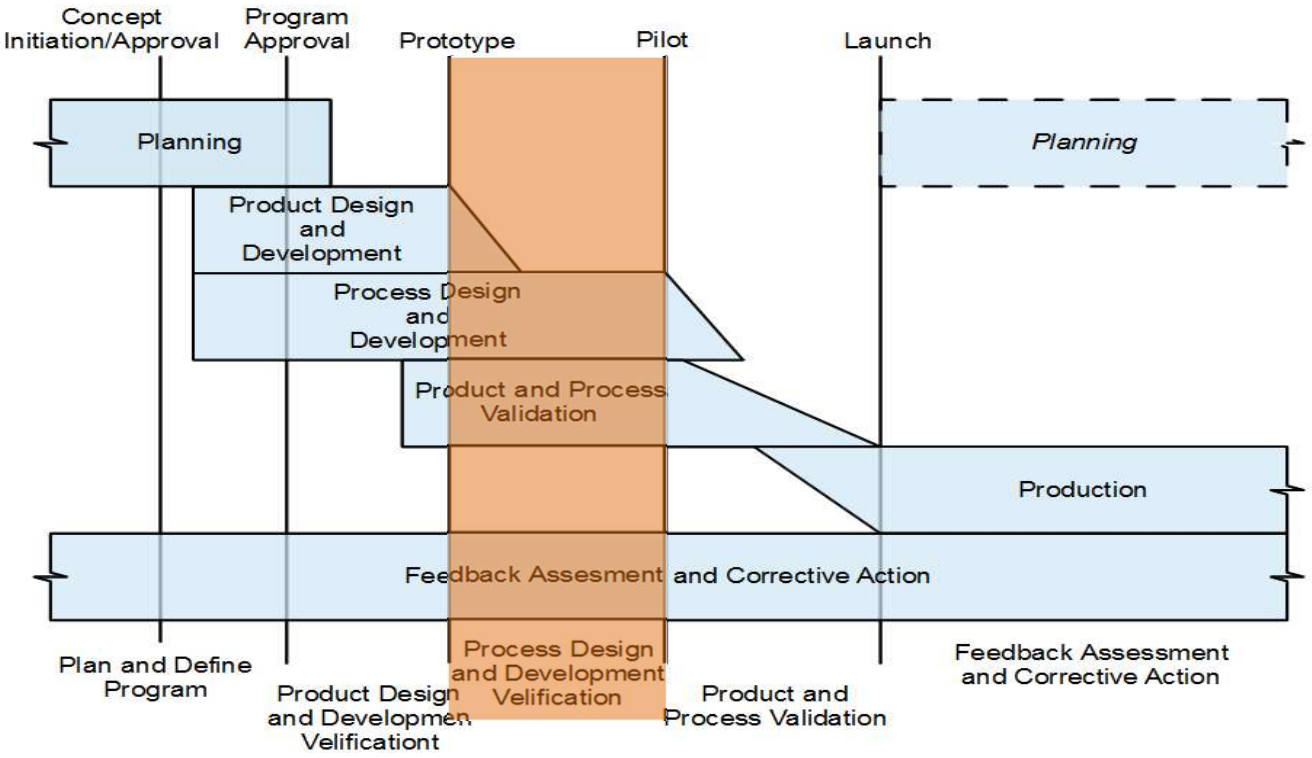
Meeting organized by BOCAR GROUP commodity buyer including Supplier, Bocar and/ or Customer (OEM) representatives



Stage 3

Process Design and Development.

This chapter discusses the major features of developing a manufacturing system and its related control plans to achieve quality products.

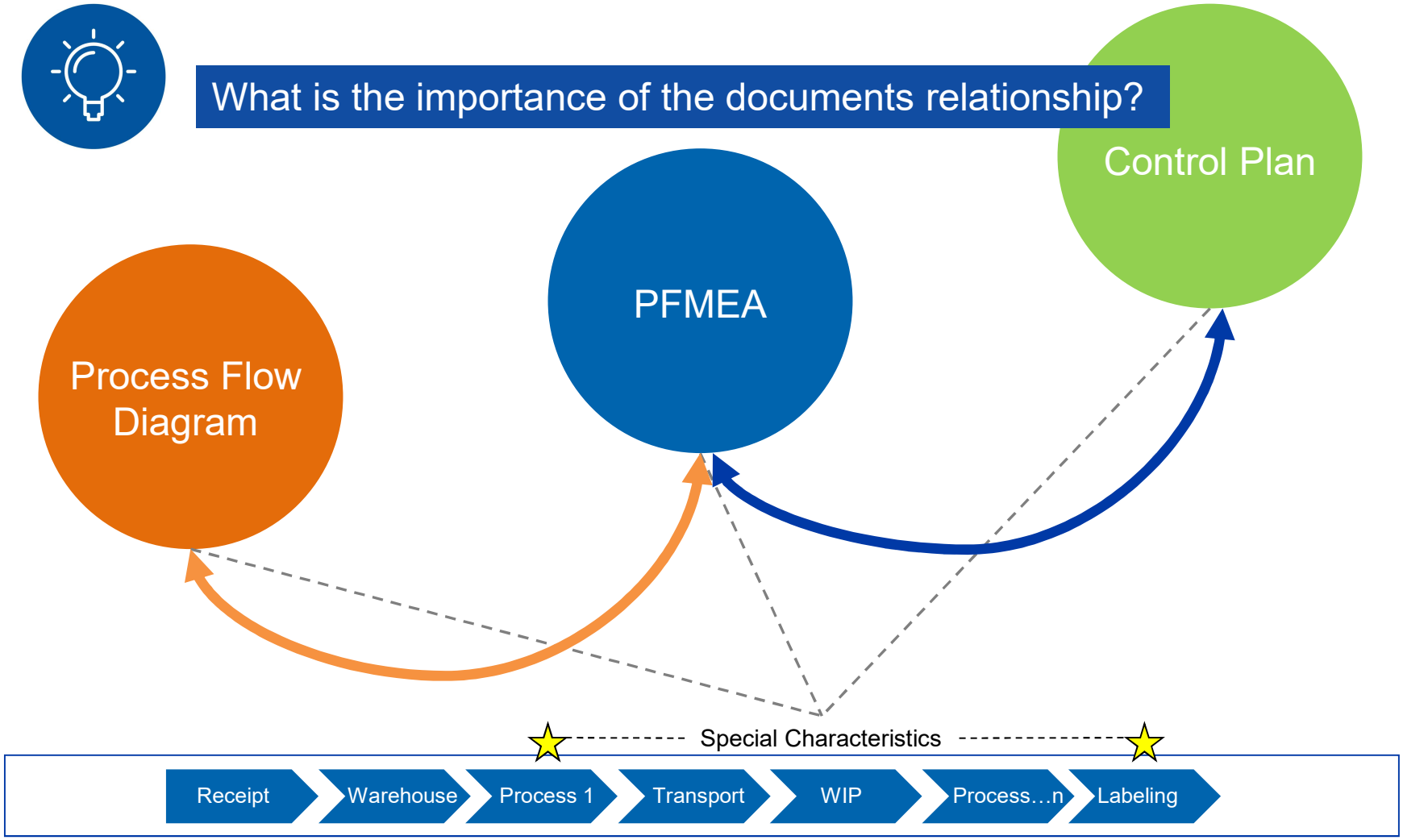


Process Design and Development.

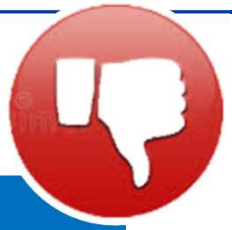
Inputs	Outputs
• Design Failure Mode and Effects Analysis (DFMEA) • Design for Manufacturability and Assembly • Design Verification • Design Reviews • Prototype Build - Control Plan • Engineering Drawings (Including Math Data) • Engineering Specifications. • Material Specifications • Drawing and Specification Changes • New Equipment, Tooling and Facilities Requirements • Special Product and Process Characteristics • Gages/Testing Equipment Requirements • Team Feasibility Commitment and Management Support	• Packaging Standards & Specifications • Product/Process Quality System Review • Process Flow Chart • Floor Plan Layout • Characteristics Matrix • Process Failure Mode and Effects Analysis (PFMEA) • Pre-Launch Control Plan (including Error-Proofing Devices) • Process Instructions • Measurement Systems Analysis Plan • Preliminary Process Capability Study Plan • Management Support (including operator staffing and training plan)

Process FMEA Highlights

All the manufacturing operation and processes in plant should be analyzed



Process FMEA Highlights



Reactive Method

A) Update PFMEA for Customer and Internal concerns (Required as part of the Problem Solving Process)

B) Annual review with out a Systemic focus, and clear objectives

Proactive Method

A) Reverse PFMEA and monthly risk reduction

B) New potential failure mode identification

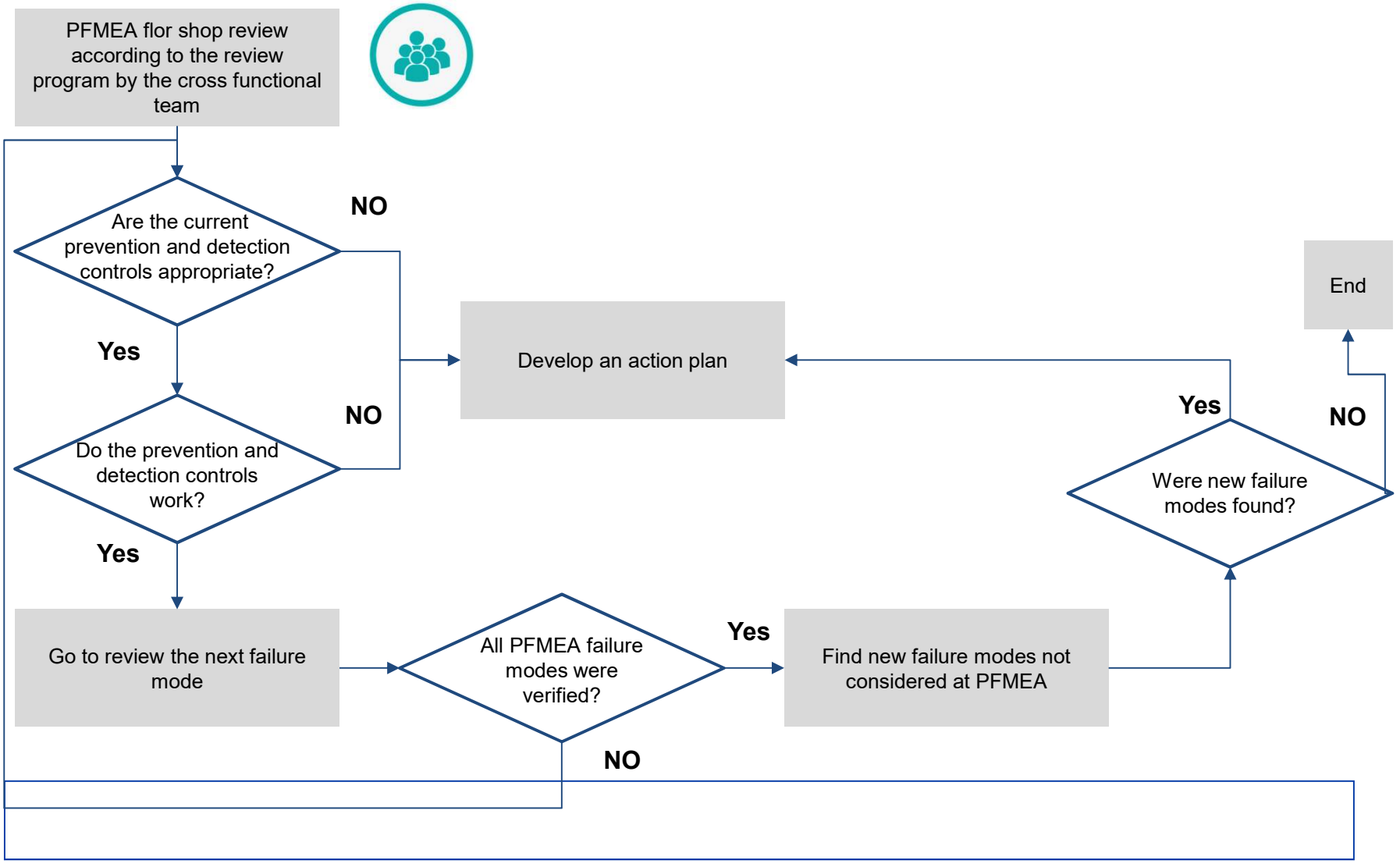
C) Current control testing (prevention/ detection)

D) Update detection and occurrence rating with real data

E) Failure effect review considering impact to: internal processes, Customer/ subsequent processes, OEM, final user and legal requirements

2021 New product developments must be submitted withVDA-AIAG PFMEA

Process FMEA Highlights



Process FMEA Highlights

Example

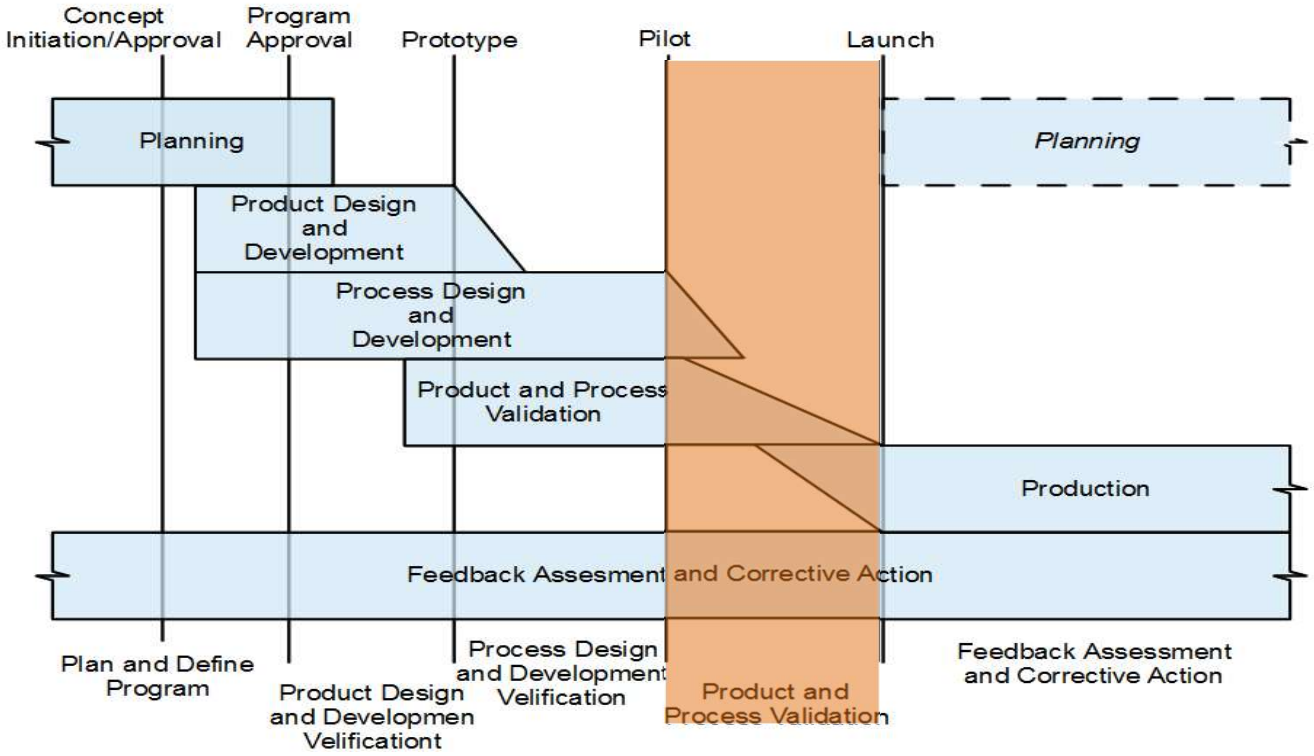
Process Step/ Function	Requirement	Failure Mode	Effect
Op. 20 / Attach seat cushion to track using a torque gun / Select four screws	Four screws	Fewer than four screws	**End User:** Loose seat cushion and noise **(9)** **Manufacturing and Assembly:** Stop shipment and additional sort and rework due to affected portion **(7)** **OEM:** Moderate disruption **(5)** **Government Regulations:** N/A
	Specified screws	Wrong screw used (larger diameter)	**End User:** Degradation of primary function **(7)** **Manufacturing and Assembly:** Unable to install screw in station **OEM:** Moderate disruption **(5)** **Government Regulations:** N/A
Op. 20 / Attach seat cushion to track using a torque gun / Beginning with right front hole, otrque each screw to the required torque	Assembly sequence (First screw in right front hole)	Screw placed in any other hole	**End User:** Audible noise, vehicle operable, item does not conform and noticed by many customers **(4)** **Manufacturing and Assembly:** Difficult to instal remaining screws in station **(5)** **OEM:** Moderate disruption **(5)** **Government Regulations:** N/A
	Screws fully seated	Screw not fully seated	**End User:** Loose seat cushion and noise **(9)** **Manufacturing and Assembly:** Sort and rework due to affected portion **(7)** **OEM:** Moderate disruption **(5)** **Government Regulations:** N/A
	Screws torqued to dynamic torque specification	Screw torqued to high	**End User:** Loose seat cushion due to subsequent fracture of screw and noise **(9)** **Manufacturing and Assembly:** Sort and rework due to affected portion **(7)** **OEM:** Major disruption **(8)** **Government Regulations:** FMVSS XXXX **(10)**
		Screw forqued to low	**End User:** Loose seat cushion due to gradual loosening of screw and noise **(9)** **Manufacturing and Assembly:** Sort and rework due to affected portion **(7)** **OEM:** Major disruption **(8)** **Government Regulations:** FMVSS XXXX **(10)**

Does your Company follow a reactive or proactive FMEA approach?

Stage 4

Product and Process Validation

This stage discusses the major features of validating the manufacturing process through an evaluation of a significant production run.

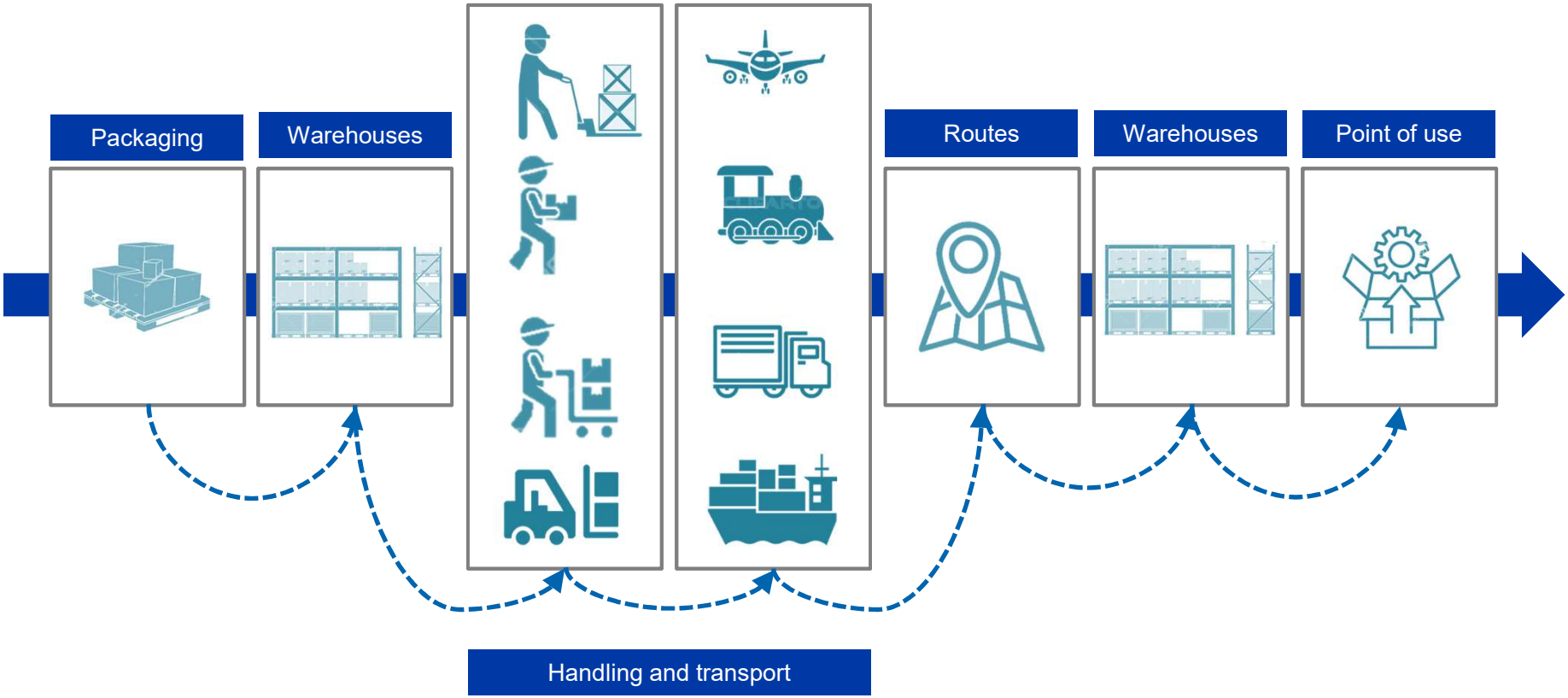


Product and Process Validation

Inputs	Outputs
• Packaging Standards & Specifications • Product/Process Quality System Review • Process Flow Chart • Floor Plan Layout • Characteristics Matrix • Process Failure Mode and Effects Analysis (PFMEA) • Pre-Launch Control Plan • Process Instructions • Measurement Systems Ailalysis Plan • Preliminary Process Capability Study Plan • Management Support	• Significant Production Run • Measurement Systems Evaluation • Preliminary Process Capability Study • Production Part Approval • Production Validation Testing • Packaging Evaluation • Production Control Plan • Quality Planning Sign-Off and Management Support

Packaging Standard

Packaging proposal and approval with BOCAR PCL (if necessary the OEM should be taken into account), this should happen prior the PPAP submission.

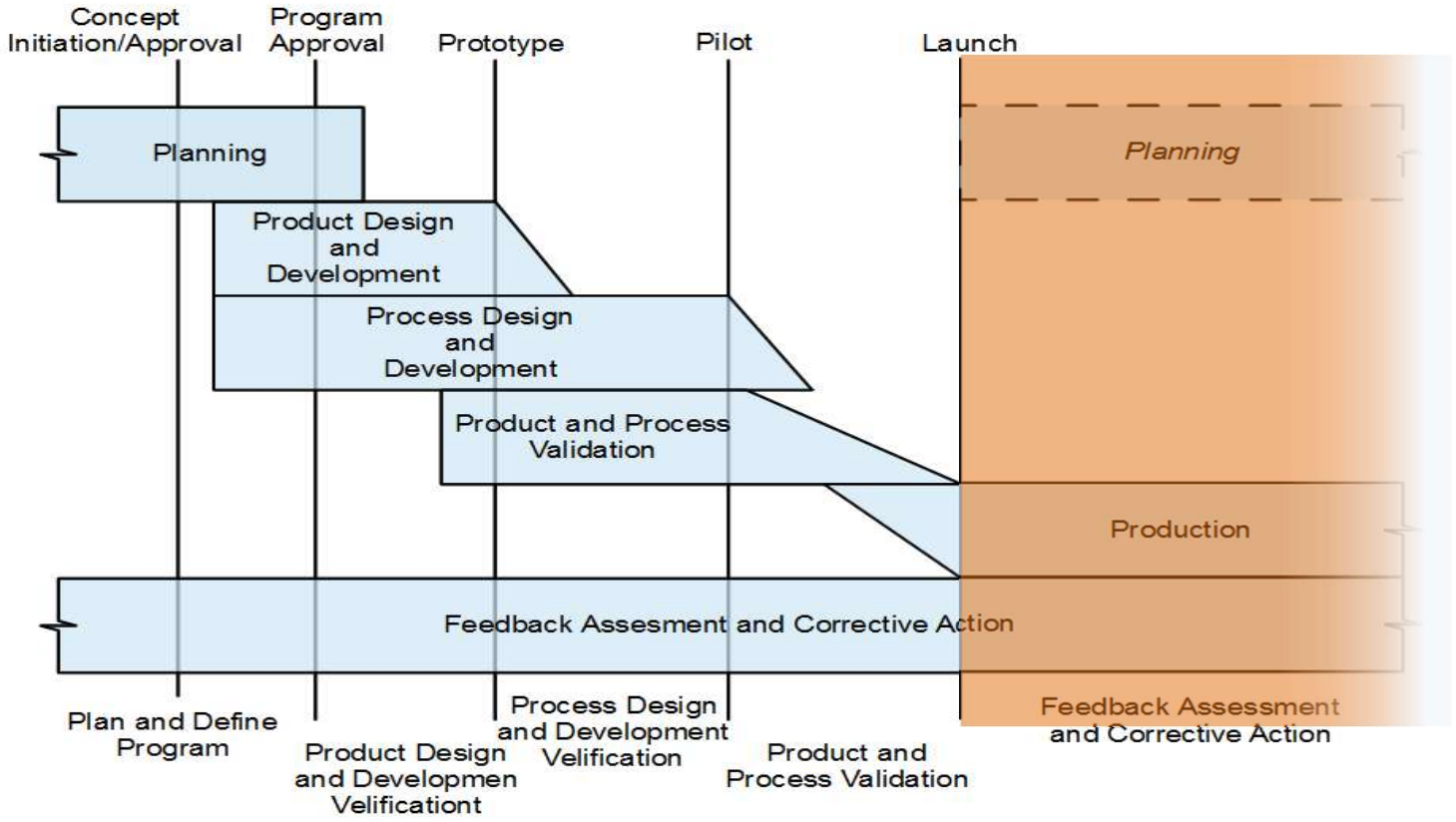


Customer property identification should be identified as applicable

Stage 5

Feedback, Assessment and Corrective Action.

Quality planning does not end with process validation and installation. It is the component manufacturing stage where output can be evaluated when all special and common causes of variation are present.

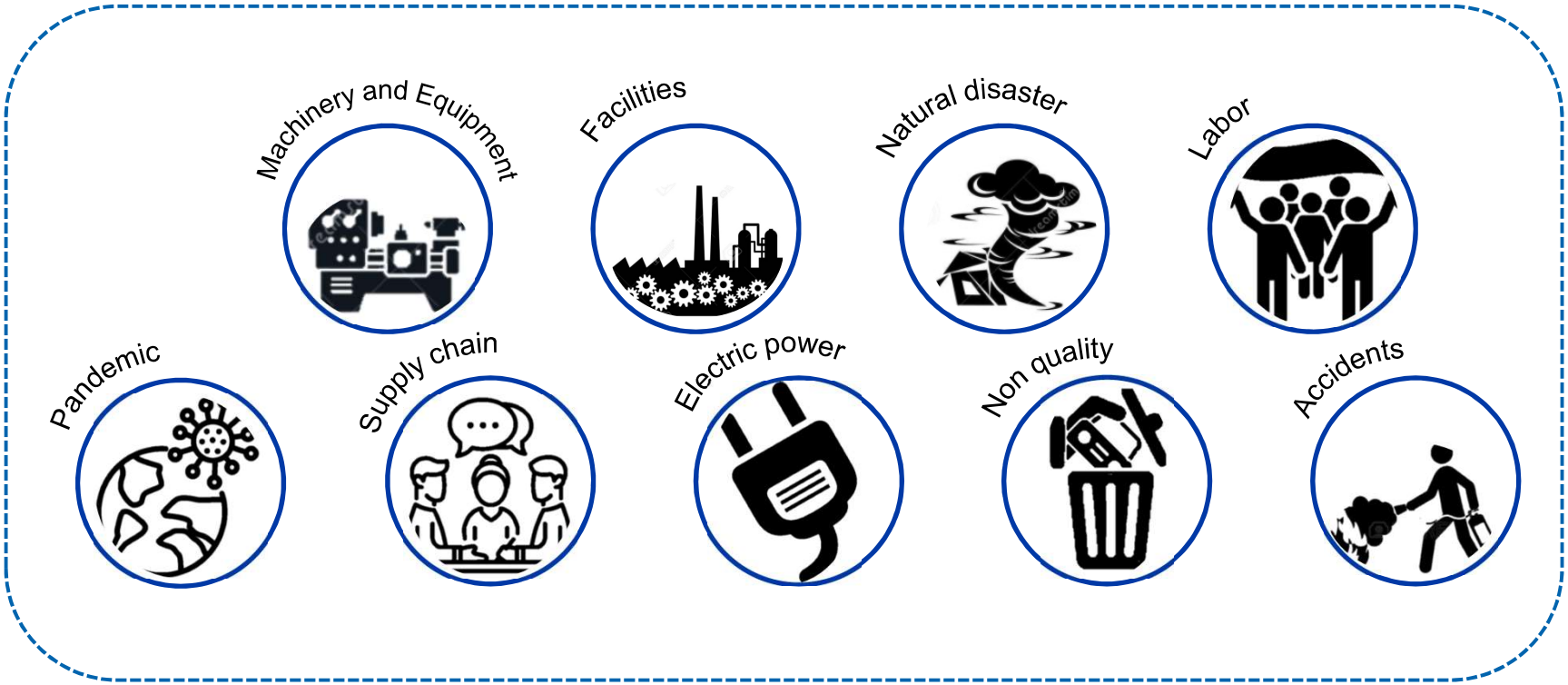


Feedback, Assessment and Corrective Action.

Inputs	Outputs
• Significant Production Run • Measurement Systems Evaluation • Preliminary Process Capability Study • Production Part Approval • Production Validation Testing • Packaging Evaluation • Production Control Plan • Quality Planning Sign-Off and Management Support	• Reduced Variation • Improved Customer Satisfaction • Improved Delivery and Service • Effective use of Lessons Learned/Best Practices

Contingency Plan

The suppliers should submit within PPAP documentation their contingency plans in order to assure the capacity to deliver material as per Bocar Group Requirements, considering but not limited to:



PPAP Requirements

New Product

- Product, raw material or component not supplied before (initial release)

Product Change

- Product, raw material or component modified with regards to its Engineering requirements, design, specifications or materials
- Correction of a discrepancy previously approved

Process Change

- New tool
- Location change
- Manufacturing lines change
- Supply change (sub-tier)
- Inactivity
- Testing/ inspection methods

Notify at least 90 days prior to the change implementation to Commodity Buyer
Initial documentation: Feasibility and risk analysis, Gantt, Change Request format

PPAP Level 3 Requirements

1. Ballooned, released drawings stamped by Bocar Engineering Area
5. Process flow diagram
6. Process FMEA
7. Control Plan
8. MSA, take into account applicable Customer Specific Requirement e. g. FORD PPAP Requirements
9. Dimensional results
10. Material and performance test results
11. Initial Process studies, should be reported with Minitab Six Pack Capability Report
12. Internal/ External qualified laboratory documentation
13. Appearance approval report
14. Sample production parts for functional approval
15. Master pieces (e. g. Painted parts for acceptance criteria definition)
16. Visual aids
17. Bocar Specific Requirements
    - IMDS
    - Signed feasibility analysis, Risk analysis
    - Approved packaging standard
    - CMRT (Conflict Mineral Report Template)
    - Run at rate, take into account applicable Customer Specific Requirement e. g. CAR
    - Contingency plan
    - Applicable CQI audit
18. PSW

BOCAR SQA will define applicable documentation when PPAP Level 4 is required (Change Management)

Thanks for your participation !!!