

Advanced Product Quality Planning (APQP)



OSHKOSH™

Learning Outline

- What is APQP?
- APQP Deliverables during Product Development
- Oshkosh APQP (JNT001)
- APQP Supplier Expectations from Oshkosh
- Summary





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What are your expectations for today's training?

Advanced Product Quality Planning

1. What is APQP

Advanced Product Quality Planning (APQP)

Created by Automotive Industry Action Group (AIAG)

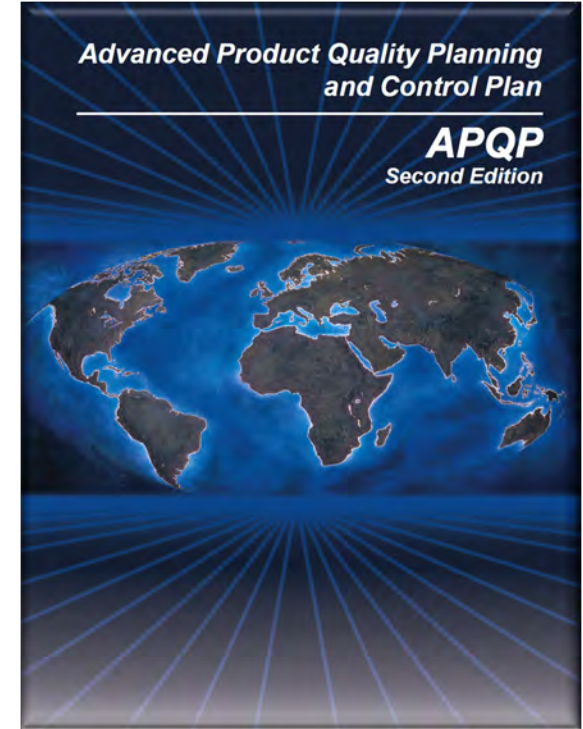
Structured method of defining and establishing the steps necessary to assure that a product meets customer specification and expectation

Identifies Critical to Quality sub-systems from the Voice of Customer

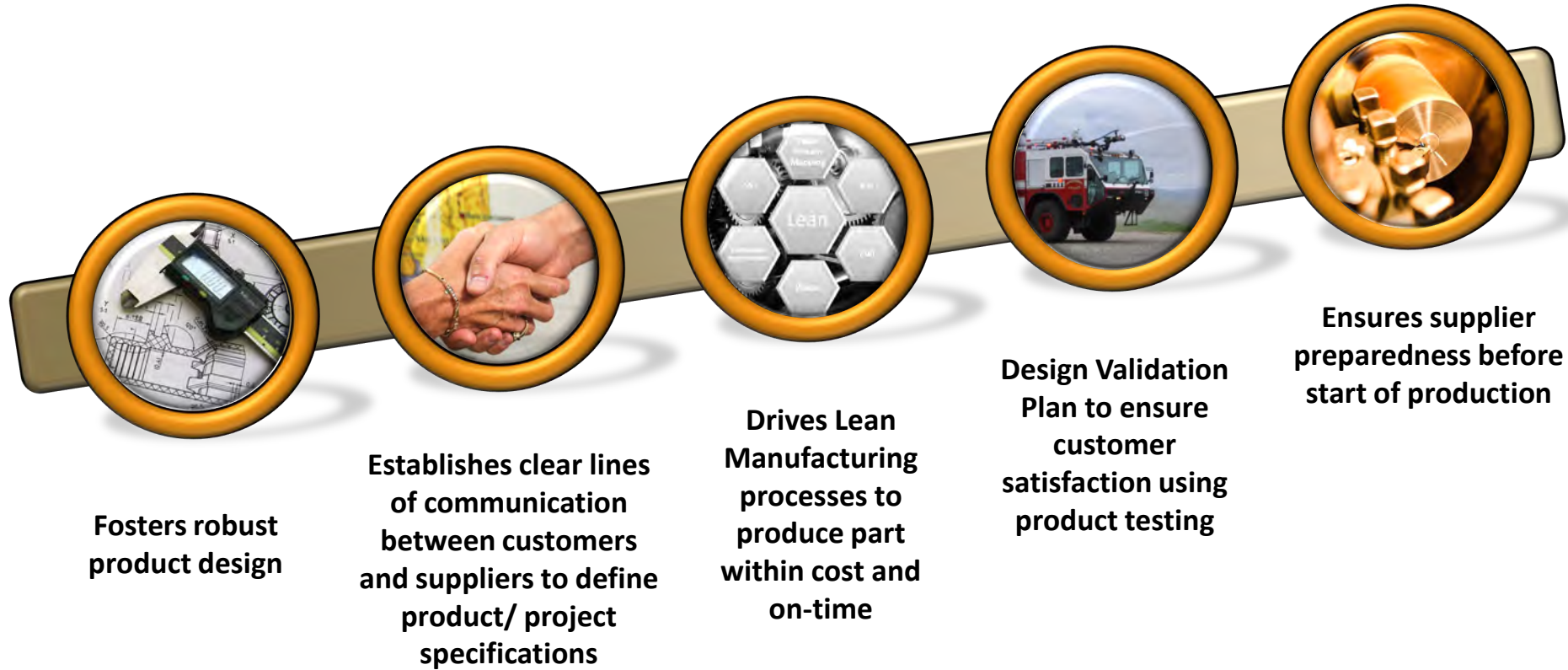
Details the implementation of appropriate quality tools at various phases in the product development cycle

Five common phases of APQP:

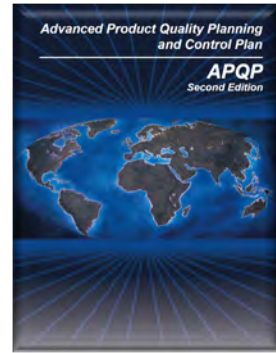
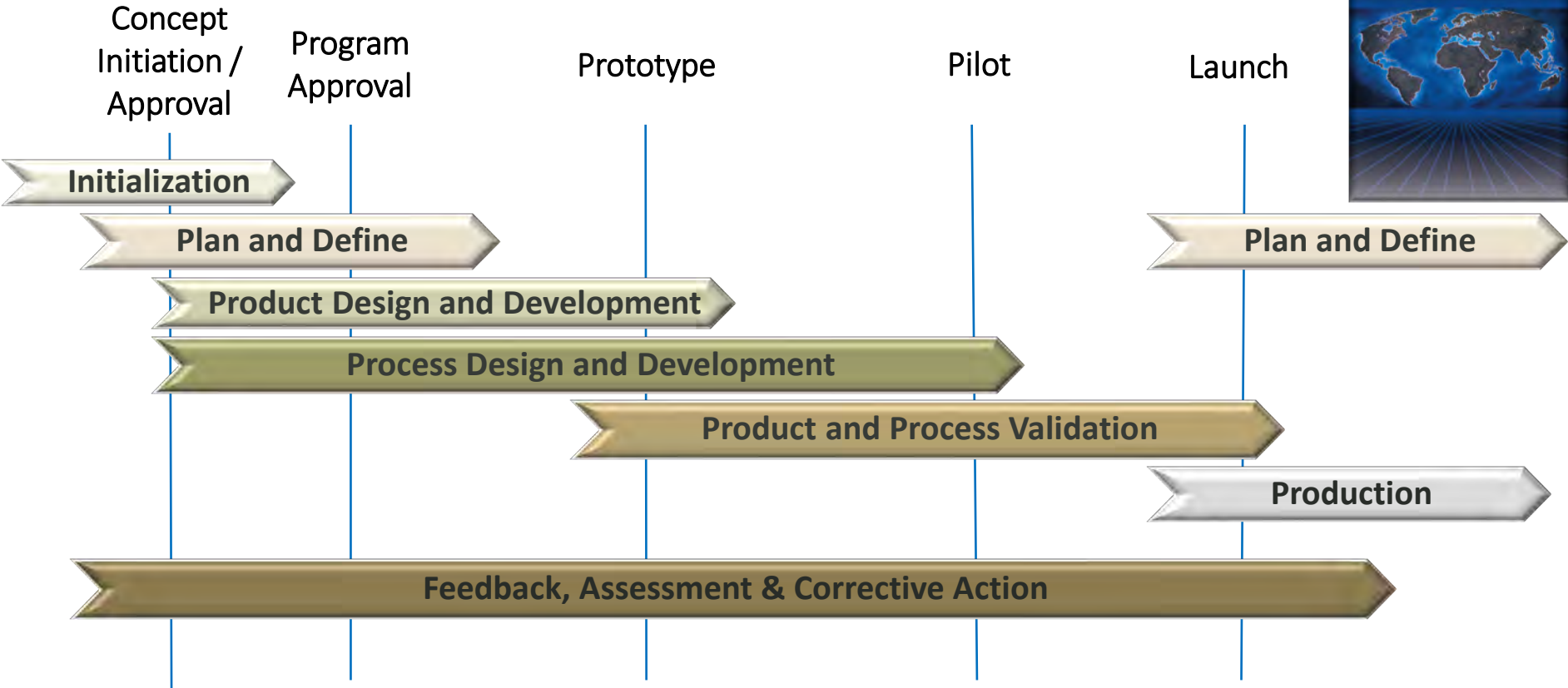
1. Plan and Define Program
2. Product Design and Development
3. Process Design and Development
4. Product and Process Validation
5. Feedback Assessment and Corrective Action



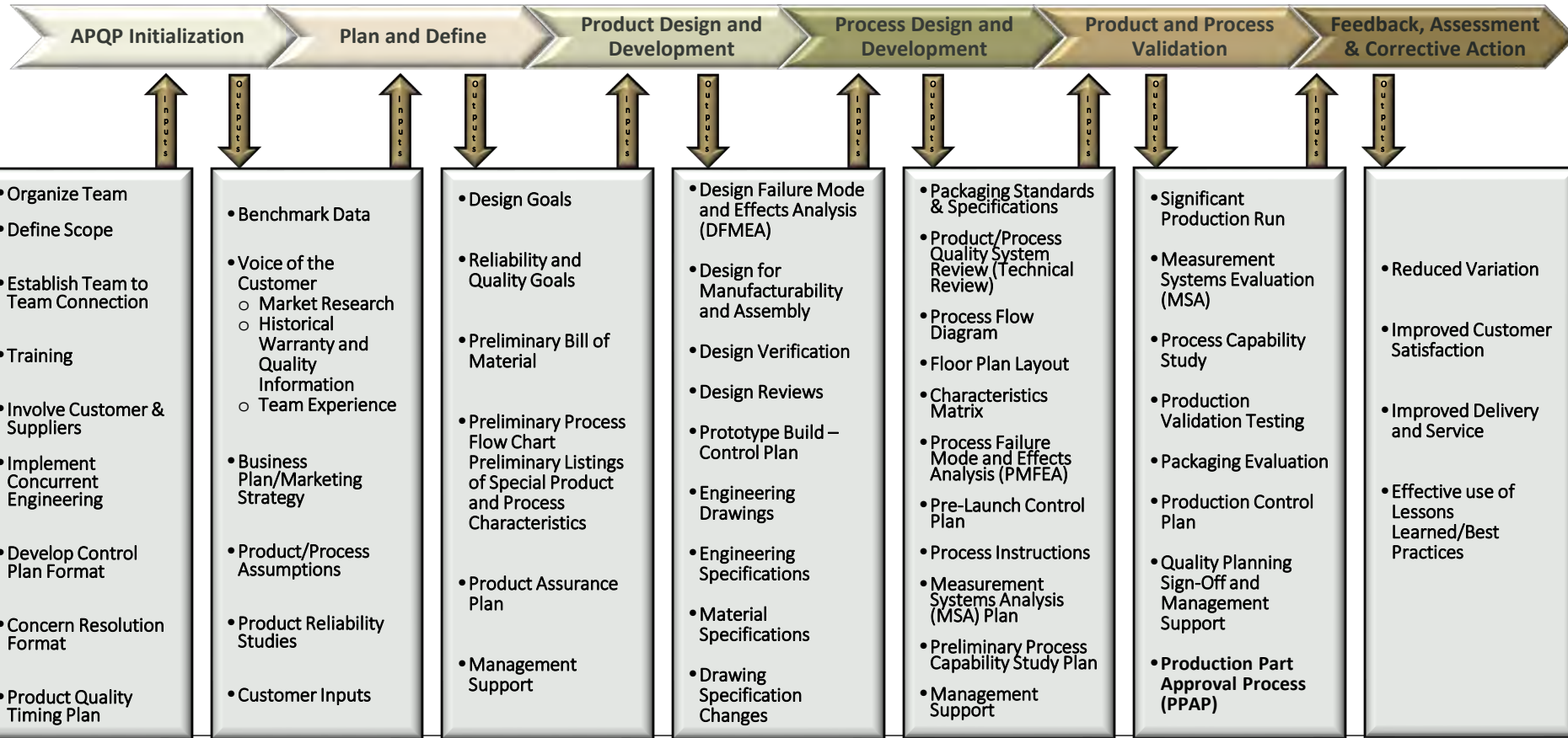
Why do we do APQP?



Product Quality Planning Element Timing Chart



Product Quality Planning as Defined by APQP



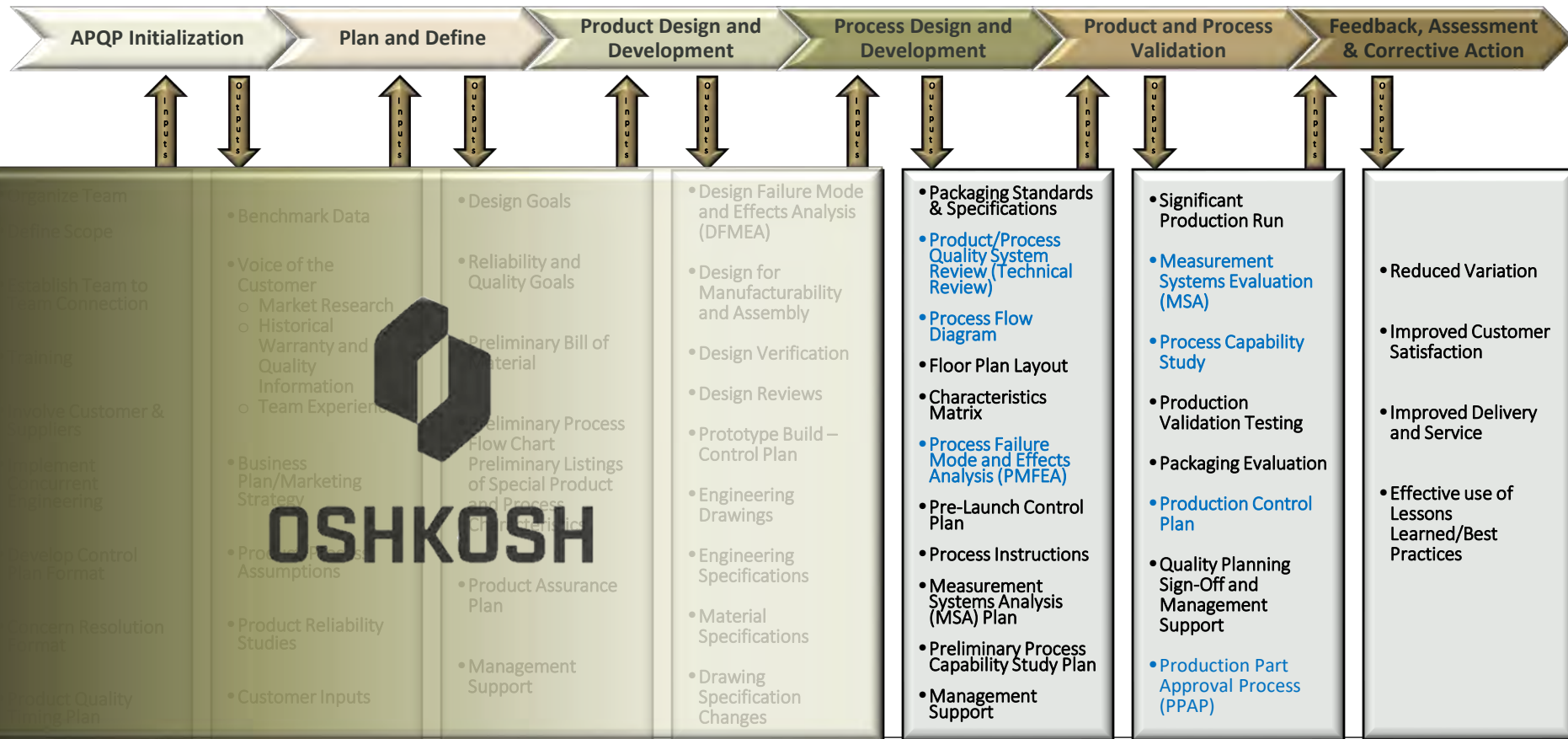
APQP – Contract Provider



Deliverable



Action



APQP – Deliverables

Process Design and Development

Product and Process Validation

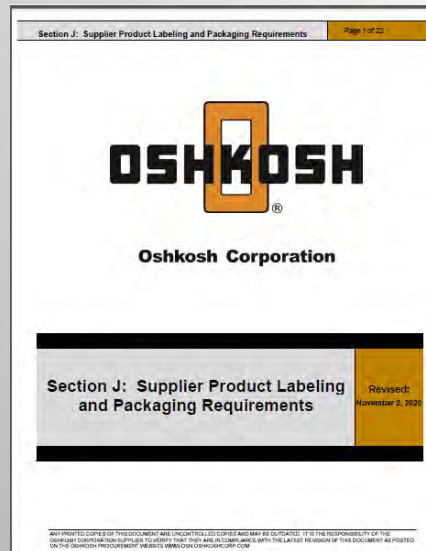
Information
Plan &
Define
OSHKOSH
Define

Product Design &
Development

Outputs

- **Packaging Standards & Specifications**
- **Product/Process Quality System Review (Technical Review)**
- **Process Flow Diagram**
- Floor Plan Layout
- Characteristics Matrix
- **Process Failure Mode and Effects Analysis (PMFEA)**
- Pre-Launch Control Plan
- Process Instructions
- Measurement Systems Analysis (MSA) Plan
- Preliminary Process Capability Study Plan
- Management Support

Packaging Standards & Specifications



- Significant Production Run
- **Measurement Systems Evaluation (MSA)**
- **Process Capability Study**
- Production Validation Testing
- Packaging Evaluation
- **Production Control Plan**
- Quality Planning Sign-Off and Management Support
- **Production Part Approval Process (PPAP)**

Packaging Strategy



Packaging Strategy

1. Do you know what the Oshkosh packaging strategy is?
2. What is Oshkosh's Packaging Standards and where do you find it?
3. How does packaging impact our supply chain?

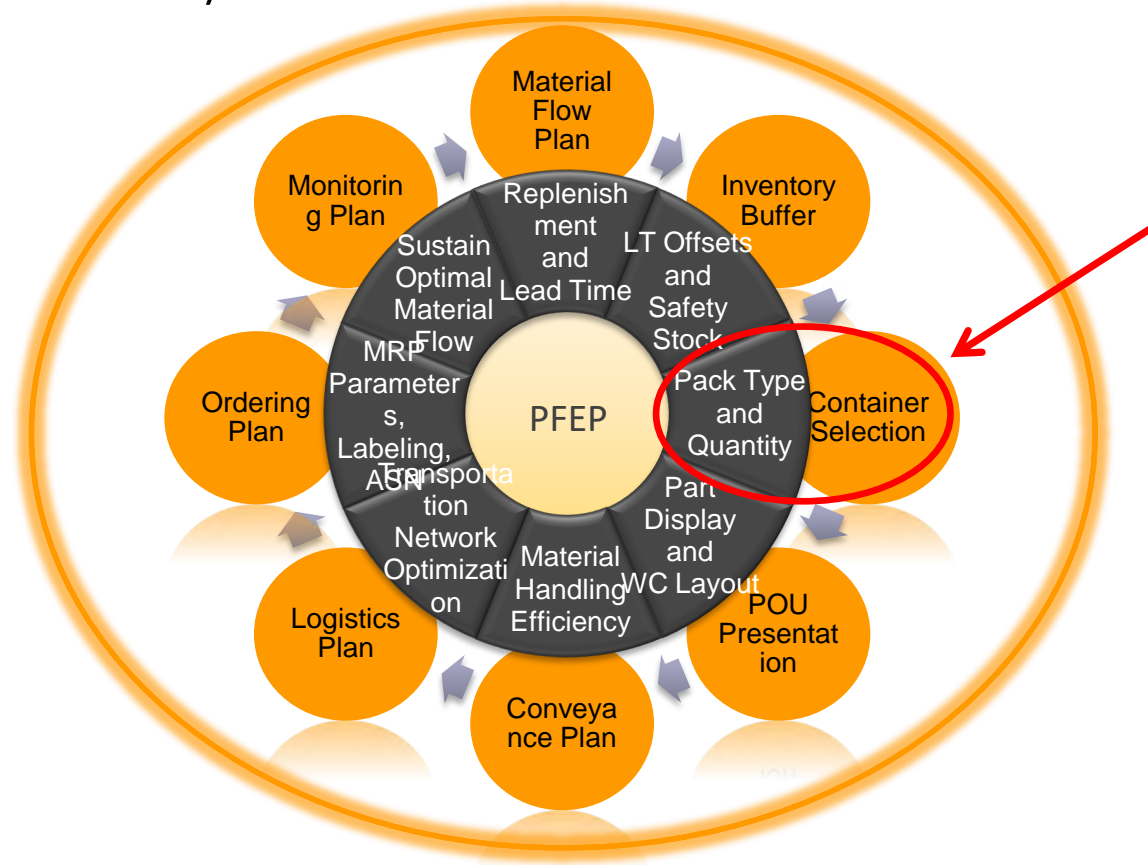


Class Discussion

Oshkosh Corporation's Packaging Objective

Oshkosh's Packaging Objective is to optimize our supply chain through Standardization, Education, and Cost & Waste Elimination.
We want to make our Supply Chain boring!

Packaging & Plan for Every Part



Why Have a Packaging Strategy



Material Handling

Sustainability

Consistency

Efficiency

Damage

Safety



Oshkosh Corporate Packaging Strategy

Standardize

- Packaging Guide defines standards
- Standard Containers and Quantities



Cost & Waste Elimination

- Standard & Custom Returnable Containers
- Strategic Packaging & Ordering Decisions
- Trailer Utilization Improvements

Benefits

- Supports Sustainability
 - Lean Material Handling
 - Ergonomics
 - Cost Savings



Packaging Strategies Support Lean Thinking

Packaging adds value

Parts

- Form
- Time
- Place



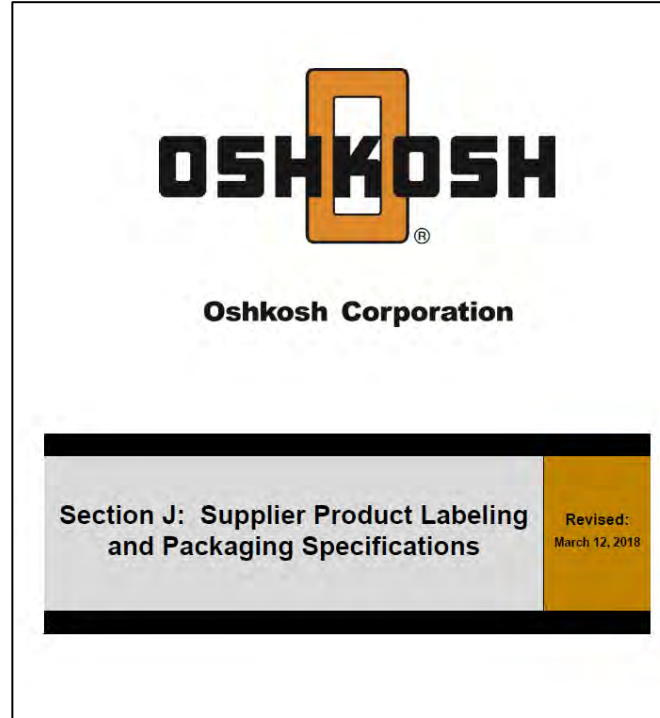
Optimized packaging allows Oshkosh to possess products, in the desired form, at the desired time, in the desired place

How Suppliers Support/Align to our Strategy

- Understand and comply with Oshkosh Corporation Packaging and Labeling Requirements (Section J)
- Understanding our container naming convention
- Knowing when/if to use returnable packaging
- Submit SCRIP ideas related to packaging
- Follow instructions for packaging placed on your P.O.

Oshkosh Product Labeling & Packaging Specifications

Provides guidelines for product, content, and company identification of parts and materials



Introduction

Important Instructions in Section J

- Our purchase order number shall appear on all packages, invoices, shipping papers, and correspondence.
- Packing lists shall accompany each shipment.
- Invoice line items shall reference Oshkosh Corporation part numbers to be paid.
- All shipments shall be identified with Oshkosh Corporation part and revision number.
- All shipments shall include the Oshkosh Standard Bar Code Label found in Section III, Figure 9.
- All new or modified packaging will require completion and submission of the Packaging Data Form.
- Supplier shall verify their part number matches part number and revision number specified on our drawing, if not, you shall contact buyer to modify Oshkosh Corporation drawing prior to shipping.

THE WORD "SHALL" INDICATES A REQUIREMENT AND THE WORD "SHOULD" INDICATES A RECOMMENDATION

Key Information in Section J

Boxes & Totes

Wooden Pallets

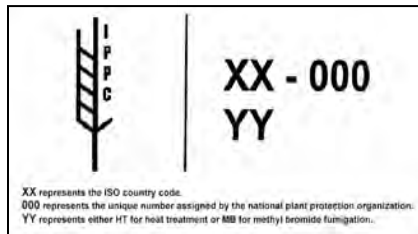
Requirements

Labeling

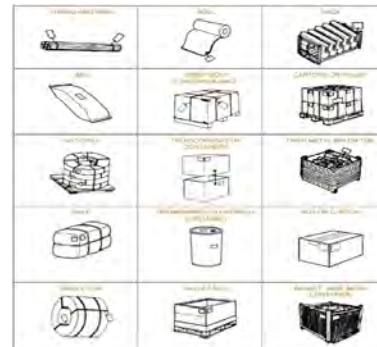
OSHKOSH STANDARD CORRUGATED BOXES

Oshkosh Standard Corrugated Box Sizes				
Description	E0001	E0002	E0003	E0004
	Small	Medium Shallow	Large Shallow	Large
Inside Length (in)	12	12	24	48
Inside Top Width (in)	7	15	15	15
Height (in)	5	7	7	7
Handheld Corrugated Boxes (RSC) 35 lbs. weight limit				

Oshkosh Corporation Preferred				
Small-lot Bins Maximum Weight: 35 lbs.				
Description	C0001 Chep120705	C0002 Chep121507	C0003 Chep241507	C0004 HHT 481507
Inside Length (in)	9.4	13	21.4	45.4
Inside Top Width (in)	5.5	9.4	13	13
Height (in)	4.5	8.3	8.3	8.3



Pallet Number (P) 123456		Country Origin USA Revision: A Container Code C0001
Quantity (Q) 12	Pallet Size (S) 34880	
Karabin ID (K) AA1000	Location (L) 711	
Please Save This Space On The Labels For a Future Oshkosh Initiative		
Supplier Name City/State/Zip		OSH Location Name City/State/Zip



Labeling



Label Protection

- Label protection against moisture, weather, abrasion, etc.
 - Shall be required where needed.
- Acceptable Examples include:
 - Laminates / Sprays / Window Envelopes / Clear Plastic Holders

Protection should not impair the ability to read or access labels

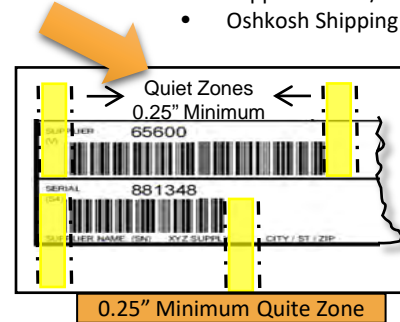
Required Data Fields:

Barcoded Fields

- Part Number
- PO Number
- Quantity
- Location (JLG ONLY)
- Kanban ID (JLG ONLY)

Text Fields

- Country of Origin
- Revision (If applicable)
- Container Code (If assigned)
- Supplier Name/Address
- Oshkosh Shipping Address

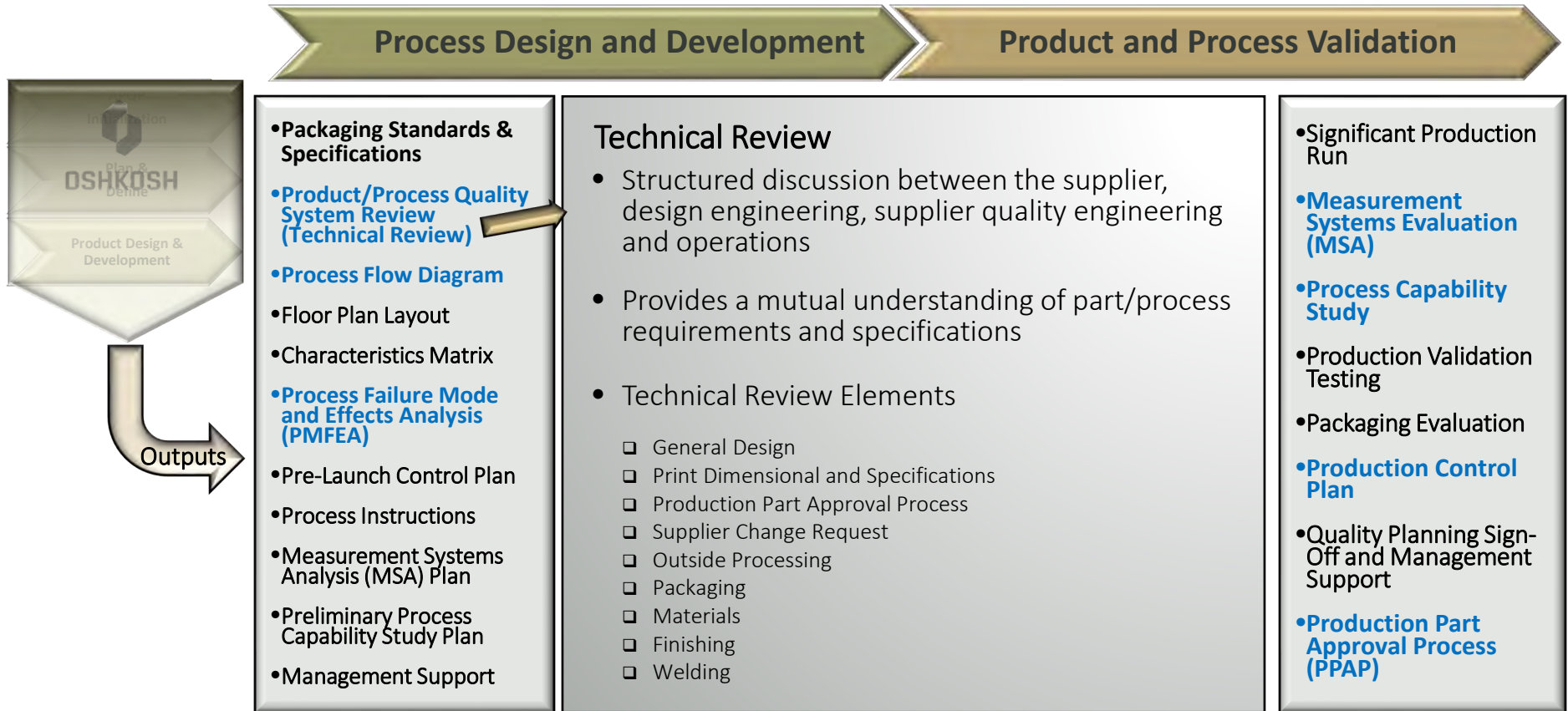


Packaging Requirements can be found on the OSN

Info1	Additional Info2	Standard Pack	Primary Container Code	Description
			C0001	CHEP 12X7X5
		40	C0006	CHEP 32X30X25
		1		
		4	C0006	CHEP 32X30X25

[illegible]

APQP – Deliverables



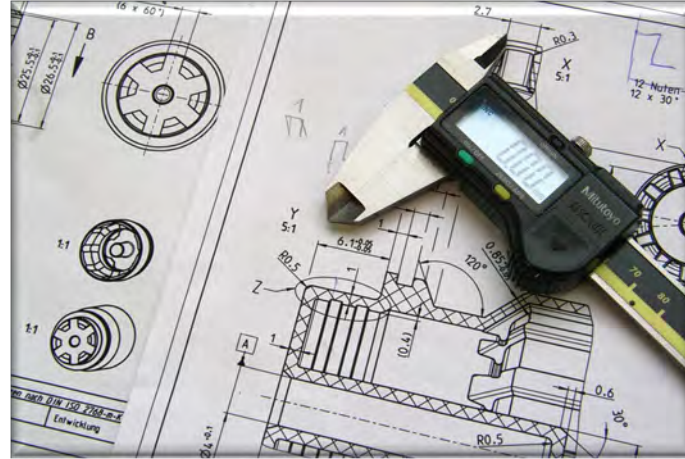
Technical Review



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Learning Outline

- What is a Technical Review?
- Why use Technical Review?
- Technical Review Location
- Technical Review Form
- Technical Review Questions



Technical Reviews – Who Should Be Involved?

Oshkosh

- Purchasing (*Global Commodity Managers, Segment Commodity Managers, NPD Buyers, PFP Buyers, Tactical Purchasing*) – **Technical Review Process Owner**
- Design Engineering
- Supplier Quality Engineering
- Manufacturing
- Others as Required (Service/Aftermarket, Supplier Development, Sales, Logistics, Program Management, Cost Management, Marketing, PFEP)

Supplier

- Supplier Leadership
- Engineering
- Manufacturing (Manufacturing Engineers, Tooling, Operations, etc.)
- Quality

Why Technical Review's

- Creates open lines of communication between the Supplier and Oshkosh purchasing, engineering and quality
- Mutual understanding of Print Dimensions, Specifications, Notes and Materials
- Communicate Lessons Learned from the manufacturing history of the part or similar parts to the Supplier
- Expedite any necessary design changes
- Full understanding of how a part will be manufactured and measured
- Ensure cost quoted is accurate and sustainable
- Identify changes to engineering documents based on the Supplier's processes and capabilities for Value Add/Value Engineering (VA/VE)
 - ❑ Eliminate issues that would prevent the Supplier from being able to manufacture or inspect
 - ❑ Reduce cost
 - ❑ Improve the performance

Technical Review Documents Location

Available on the Oshkosh Supplier Network (OSN):

- Technical Review Checklist
- Procedure
- Training

Oshkosh Supplier Network
Vision: Making a difference through supply chain excellence

Global Supplier Quality Manual

Revision Date: 02/22/2017

04/01/2019

This section contains information and requirements for Defense suppliers such as: Surface preparation, painting and finishing; Part marking, identification and traceability; Casting radiography; and Welding procedure.

Training Materials

Revision Date: 04/08/2013

OSK-T3000

16 - 17

02/15/2016

OSK-T2000

7 - 14

09/19/2019

OSK-T1000

15

11/01/2012

OSK-T3100

17 - 18

09/26/2016

OSK-T2100

08/15/2016

CFAT JLTV, E002 Plan Form

08/01/2018

CFAT JLTV, E003 Report

03/08/2017

Measurement Systems Analysis (MSA) Instruction Guide

Procedures

Revision Date: 04/08/2013

OSK-P3000

16 - 17

05/04/2018

OSK-P2000

13

06/13/2018

OSK-P1000

15

11/01/2012

OSK-P3100

17 - 18

09/27/2013

OSK-P2100

Forms

Revision Date: 04/08/2013

OSK-F3000

16 - 17

04/08/2019

OSK-F2000

7 - 14

06/16/2018

OSK-F1000

15

11/01/2012

OSK-F3100

17 - 18

09/26/2016

OSK-F2100

08/27/2012

QC-899

22

Supplier Technical Review Checklist: Supplier Questionnaire REV: A

Objective: To assess the suppliers understanding of the design requirements, document any supplier concerns or exceptions, and verify the manufacturing feasibility.

Checklist Completion Date:	1/1/2000	Technical Review Meeting Date:	1/15/2000	Part Number:	pre-filled	Revision Level:	pre-filled
Q#	Question	STATUS	Evidence, Explanations, Questions, Issues and Clarifications	Indicate status of items	Action Tracker #		
General Design Requirements							
1)	Does the supplier have all the purchased level, component and sub component level drawings at the revision shown on "Sheet 2 - Part Numbers" tab? If NO: Please list the drawings and revision you are missing.	<input type="checkbox"/> YES <input type="checkbox"/> NO					
2)	Does the supplier possess the correct revision of industry, military and/or OSK/JLG Specification? (i.e., OSK, MIL, ASTM, CQR, QAC, GB, etc.)? If NO: Please list the Specs and revision you are missing.	<input type="checkbox"/> YES <input type="checkbox"/> NO	The latest JLG specs should be sent along with this Tech Review Checklist. If you don't see them or if the JLG spec at your possession is an order Rev, please mark NO				
3)	Does the supplier require any CAD data? If YES: Please list part number(s) and needed file format (DXF, STEP, etc.)	<input type="checkbox"/> YES <input type="checkbox"/> NO					
4)	Has the function and the end-use of the part been clearly defined to the supplier?	<input type="checkbox"/> YES <input type="checkbox"/> NO					
5)	Has the supplier manufactured similar types of parts for OSK/JLG? If YES and if these parts had DMR in the past 6 months: Please list DMR numbers, root cause of DMR and corrective action taken.	<input type="checkbox"/> YES <input type="checkbox"/> NO					
6)	Are there any SCRs (pending or closed) of this part OR engineering changes if the supplier designs the part? If YES, please list part number and status of SCRs to the right.	<input type="checkbox"/> YES <input type="checkbox"/> NO	Please be noted that all approved SCRs need to be included in the package when submitting PPAPs				
General Design Requirements PPAP & SCR Requirements Material Requirements Print Dimensional and Spec Req. Manufacturability and Tooling Welding Re...							
<p>1) YES: What is the... 2) YES: What is the... 3) YES: What is the... 4) YES: What is the... 5) YES: What is the... 6) YES: What is the... 7) YES: What is the... 8) YES: What is the... 9) YES: What is the... 10) YES: What is the... 11) YES: What is the... 12) YES: What is the... 13) YES: What is the... 14) YES: What is the... 15) YES: What is the... 16) YES: What is the... 17) YES: What is the... 18) YES: What is the... 19) YES: What is the... 20) YES: What is the... 21) YES: What is the... 22) YES: What is the... 23) YES: What is the... 24) YES: What is the... 25) YES: What is the... 26) YES: What is the... 27) YES: What is the... 28) YES: What is the... 29) YES: What is the... 30) YES: What is the... 31) YES: What is the... 32) YES: What is the... 33) YES: What is the... 34) YES: What is the... 35) YES: What is the... 36) YES: What is the... 37) YES: What is the... 38) YES: What is the... 39) YES: What is the... 40) YES: What is the... 41) YES: What is the... 42) YES: What is the... 43) YES: What is the... 44) YES: What is the... 45) YES: What is the... 46) YES: What is the... 47) YES: What is the... 48) YES: What is the... 49) YES: What is the... 50) YES: What is the... 51) YES: What is the... 52) YES: What is the... 53) YES: What is the... 54) YES: What is the... 55) YES: What is the... 56) YES: What is the... 57) YES: What is the... 58) YES: What is the... 59) YES: What is the... 60) YES: What is the... 61) YES: What is the... 62) YES: What is the... 63) YES: What is the... 64) YES: What is the... 65) YES: What is the... 66) YES: What is the... 67) YES: What is the... 68) YES: What is the... 69) YES: What is the... 70) YES: What is the... 71) YES: What is the... 72) YES: What is the... 73) YES: What is the... 74) YES: What is the... 75) YES: What is the... 76) YES: What is the... 77) YES: What is the... 78) YES: What is the... 79) YES: What is the... 80) YES: What is the... 81) YES: What is the... 82) YES: What is the... 83) YES: What is the... 84) YES: What is the... 85) YES: What is the... 86) YES: What is the... 87) YES: What is the... 88) YES: What is the... 89) YES: What is the... 90) YES: What is the... 91) YES: What is the... 92) YES: What is the... 93) YES: What is the... 94) YES: What is the... 95) YES: What is the... 96) YES: What is the... 97) YES: What is the... 98) YES: What is the... 99) YES: What is the... 100) YES: What is the...</p>							

Technical Review Format

- 40 Questions over 9 requirement tabs

- ☐ General Design Requirements
- ☐ PPAP & SCR Requirements
- ☐ Material Requirements
- ☐ Print Dimensional and Spec Requirements
- ☐ Manufacturability and Tooling
- ☐ Weld Requirements
- ☐ Finishing Requirements
- ☐ Outside Processing
- ☐ Packaging Requirements

- Additional Tabs

- ☐ Instructions
- ☐ Preparer Identification
- ☐ Part Numbers
- ☐ Action Tracker

Supplier Technical Review Checklist: Supplier Questionnaire						REV: A	
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						R	G
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<div> <div>...</div> <div>General Design Requirements</div> <div>PPAP & SCR Requirements</div> <div>Material Requirements</div> <div>Print Dimensional and Spec Req.</div> <div>Manufacturability and Tooling</div> <div>Welding Re ...</div> <div>+</div> </div>							

Technical Review - Example Questions

Supplier Technical Review Checklist: Supplier Questionnaire										REV: A				
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								Revision Level:		pre-filled				
Q#	Question						STATUS		Evidence, Explanations, Questions, Issues and Clarifications			Indicate status of items		
										R	G	B	Action Tracker #	
<u>General Design Requirements</u>														
1)	Does the supplier have all the purchased level, component and sub component level drawings at the revision shown on "Sheet 2 - Part Numbers" tab?						<input type="checkbox"/>	<input type="checkbox"/>						
	If NO: Please list the drawings and revision you are missing.						YES	NO						
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							YES	NO						
5)	Has the supplier manufactured similar types of parts for OSK/JLG?						<input type="checkbox"/>	<input type="checkbox"/>						
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Technical Review Example Questions

				R	G	B	Action Tracker #
<u>General Design Requirements</u>							
1)	Does the supplier have all the purchased level, component and sub component level drawings at the revision shown on "Sheet 2 - Part Numbers" tab?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	TRUE			1
	If NO: Please list the drawings and revision you are missing.	YES	NO				
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	If NO: Please list the Specs and revision you are missing.	YES	NO				
3)	Does the supplier require any CAD data?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	TRUE			3
	If YES: Please list part number(s) and needed file format (DXF, STEP, etc.)	YES	NO				
4)	Has the function and the end-use of the part been clearly defined to the supplier?	<input checked="" type="checkbox"/>	<input type="checkbox"/>		TRUE		
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	If YES, please list part number and status of SCRs to the right.	YES	NO				
<div> Instructions-READ ME FIRST Tech Rev Checklist Prepared By. Supplier Acknowledgement Part Numbers General Design Requirements PPAP & SCR Requirements </div>							

Depending on answers, additional pop boxes may appear with additional information or instructions

Technical Review Process

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- 1) Checkboxes for the reviewer to indicate status, either yes or no
- 2) A field for the reviewer to record evidence, explanations, questions, issues and clarifications
- 3) Red, Yellow, and Green fields to indicate high priority action items. (Type a "1" in the appropriate box for it to change colors.)
 - A. **Red** – Indicates a risk exists and/or action is required
 - B. **Blue** – Indicates that risk may or may not exist. Follow up questions will be required during the technical review meeting
 - C. **Green** – Indicates low risk and no actions are needed

Technical Review Questions

Supplier Technical Review Checklist: Supplier Questionnaire							REV: A	
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4)	Has the function and the end-use of the part been clearly defined to the supplier?	<input type="checkbox"/> YES	<input type="checkbox"/> NO					
5)	Has the supplier manufactured similar types of parts for OSK/JLG? If YES and if these parts had DMR in the past 6 months: Please list DMR numbers, root cause of DMR and corrective action taken.	<input type="checkbox"/> YES	<input type="checkbox"/> NO					
6)	Are there any SCRs (pending or closed) of this part OR engineering changes if the supplier designs the part? If YES, please list part number and status of SCRs to the right.	<input type="checkbox"/> YES	<input type="checkbox"/> NO	Please be noted that all approved SCRs need to be included in the package when submitting PPAPs				

General Design Requirements
PPAP & SCR Requirements
Material Requirements
Print Dimensional and Spec Req.
Manufacturability and Tooling
Welding Re ...

Follow Up

- The Action Tracker can be used to track follow-up.
- Continue with follow-up until
 - ☐ All major risks have been addressed
 - ☐ All improvement opportunities have been pursued
- Primary goal is to reduce risks
- Review potential impact to the part's cost drivers
- Prioritize and address important items.

DSHKOSH		Technical Review Action Tracker						
		REV. A						
#	Question Number	Risk Category	Issue Category	Action Item Description and Action to be Taken	Responsible Person (Lead)	Required Completion Date	Actual Completion Date	Status
1		High/ Medium/ Low	Design/ RFQ/ Manufacturability/ Inspection capability/ Others					
2								
3								
4								
5								
6								
7								
8								
9								

Conclusion

After completing the Supplier Technical Review process, don't forget to document Lessons Learned.

Items that should be included:

- Recommendations to improve the Technical Review form, training, or procedure
- Important or unexpected outcomes of the Technical Review process
- Things to watch out for



APQP – Deliverables

Process Design and Development

Product and Process Validation



•Packaging Standards & Specifications

•Product/Process Quality System Review (Technical Review)

•Process Flow Diagram

•Floor Plan Layout

•Characteristics Matrix

•Process Failure Mode and Effects Analysis (PMFEA)

•Pre-Launch Control Plan

•Process Instructions

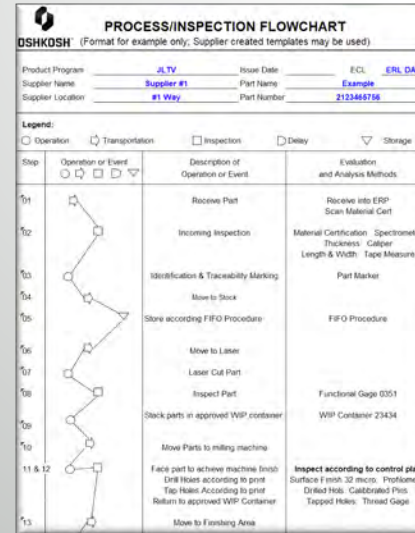
•Measurement Systems Analysis (MSA) Plan

•Preliminary Process Capability Study Plan

•Management Support

Process Flow Diagram

- Visual tool that maps the processing steps for a product
- Diagram provides the scope for Process Failure Mode and Effects Analysis (PFMEA)
- Identifies where potential issues might arise



•Significant Production Run

•Measurement Systems Evaluation (MSA)

•Process Capability Study

•Production Validation Testing

•Packaging Evaluation

•Production Control Plan

•Quality Planning Sign-Off and Management Support

•Production Part Approval Process (PPAP)

APQP – Deliverables

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Floor Plan Layout & Standard Work



- **Significant Production Run**
- **Measurement Systems Evaluation (MSA)**
- **Process Capability Study**
- Production Validation Testing
- Packaging Evaluation
- **Production Control Plan**
- Quality Planning Sign-Off and Management Support
- **Production Part Approval Process (PPAP)**

Standard Work



What is Standard Work?

A documented description of the:

- Safest
- Highest quality
- Most efficient way to perform a task

The only acceptable way to perform the work

Expected to be continually improved

Specifies:

- Work content
- Sequence
- Timing
- Expected outcome



Key Information Included in Standard Work

How do you complete this work?

How do you know you are doing this work correctly?

How do you know the outcome is free of defects?

What do you do if there is a problem?



Why is Standard Work Important?

Without a standard, there can be no continual improvement

Sustain improvement

To provide a safe work environment

To sustain high quality

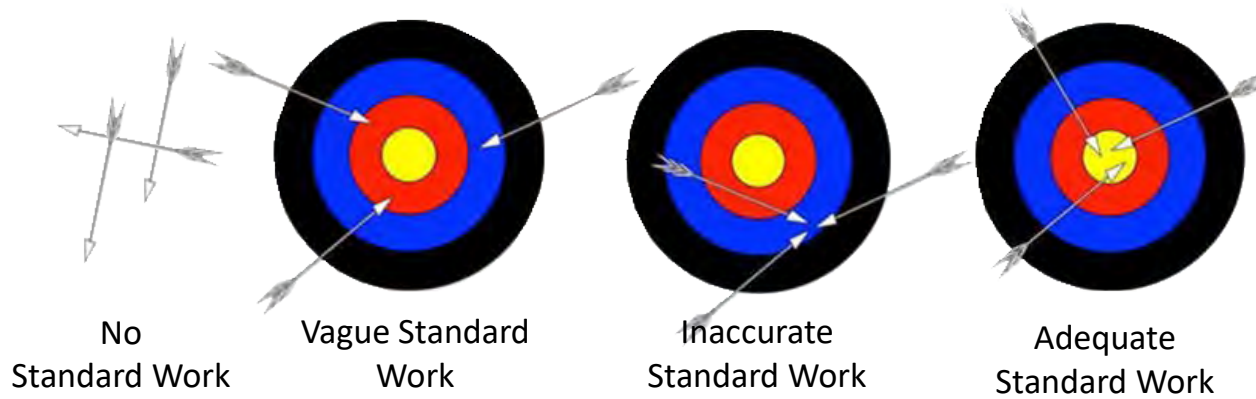
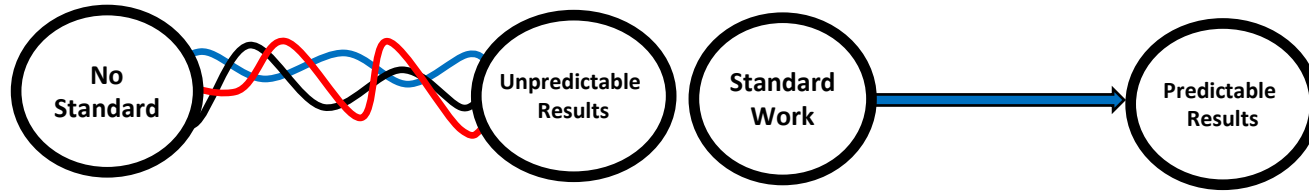
To provide a visual management tool to see normal vs. abnormal

Allows for cross training

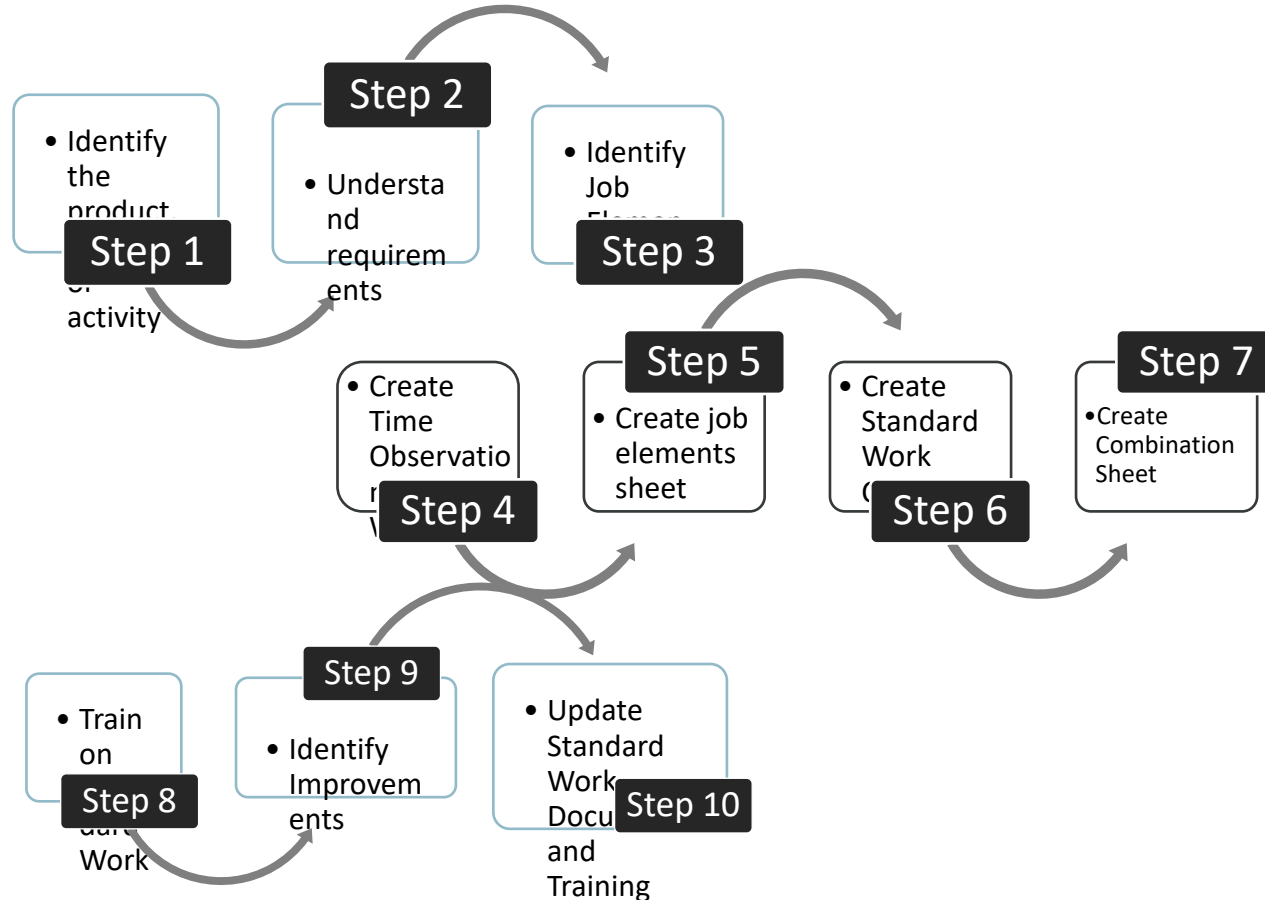
To make process results predictable



Predictable Results

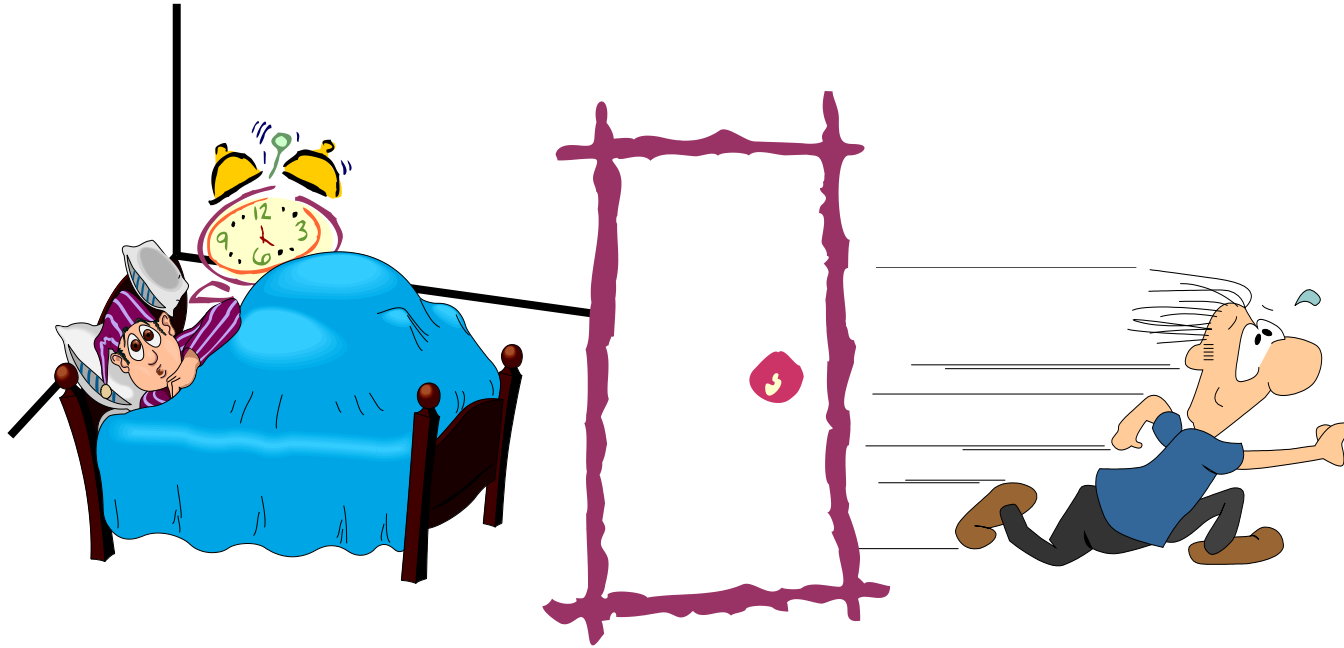


Establishing Standard Work

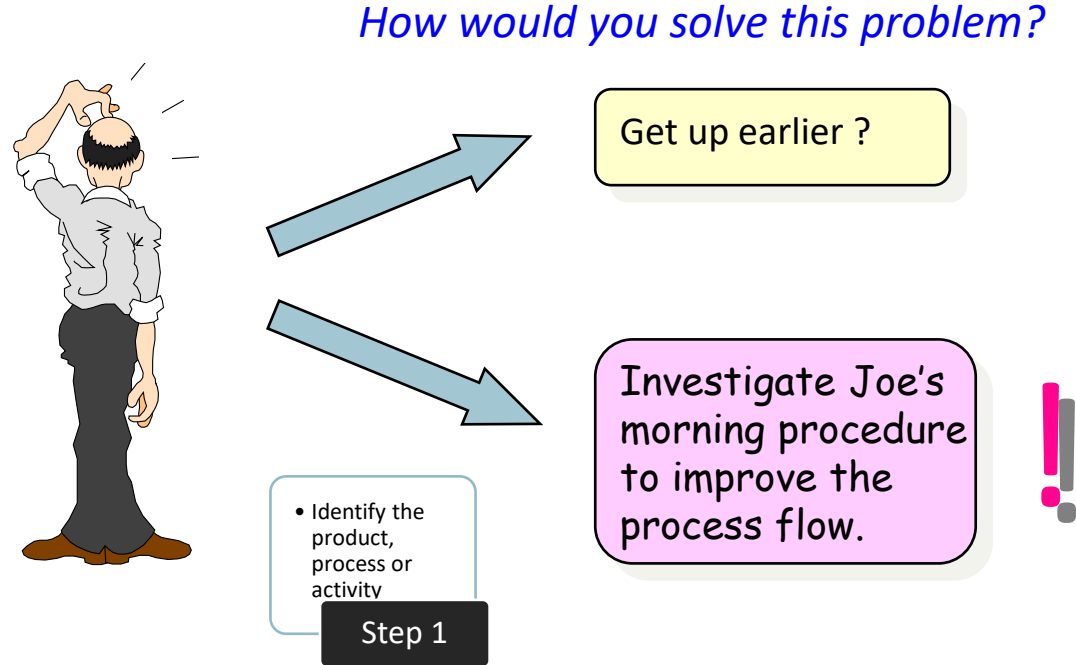


Standard Work - Example

Joe always arrives late for work



Identify Activity - Example



But First, we need to understand the process....

Understand Requirements - Example

Joe is always late by
about **2 minutes**



Just the facts

Joe currently gets out of bed at **5:00 am**

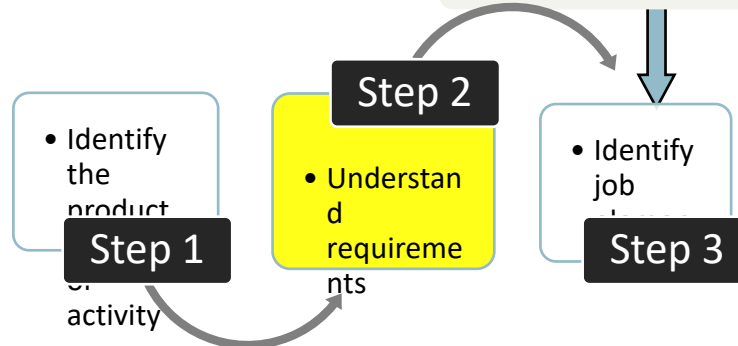
In order to be on time, Joe needs to leave the house by **5:14 am**

14 min X 60sec

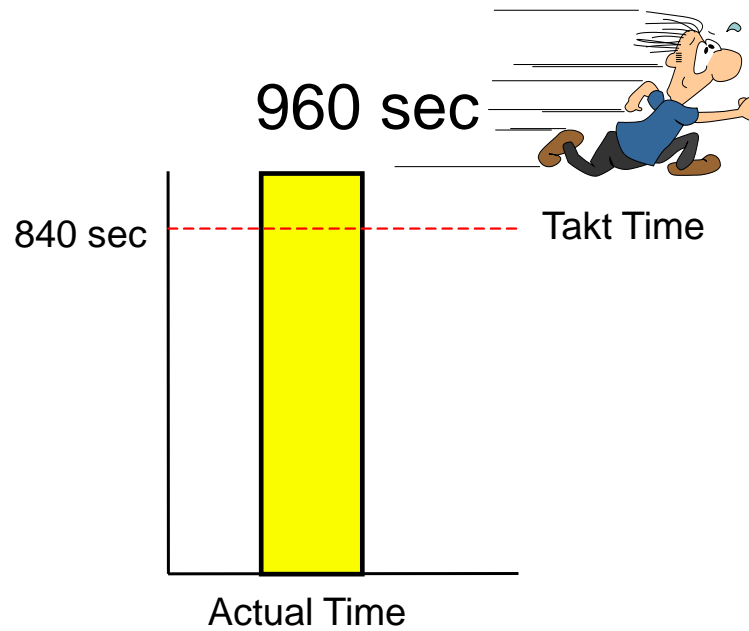
Takt (T.T.) = **840 sec**



Sequence to grasp the process information:



Joe's Takt time Vs. Actual



Job Elements

Job Element

A job element contains ONLY **working time** (cyclic)

- Assembly time
- Data Entry
- Pick up or load parts
- Pick up tools for manual work



Group job elements to facilitate timing

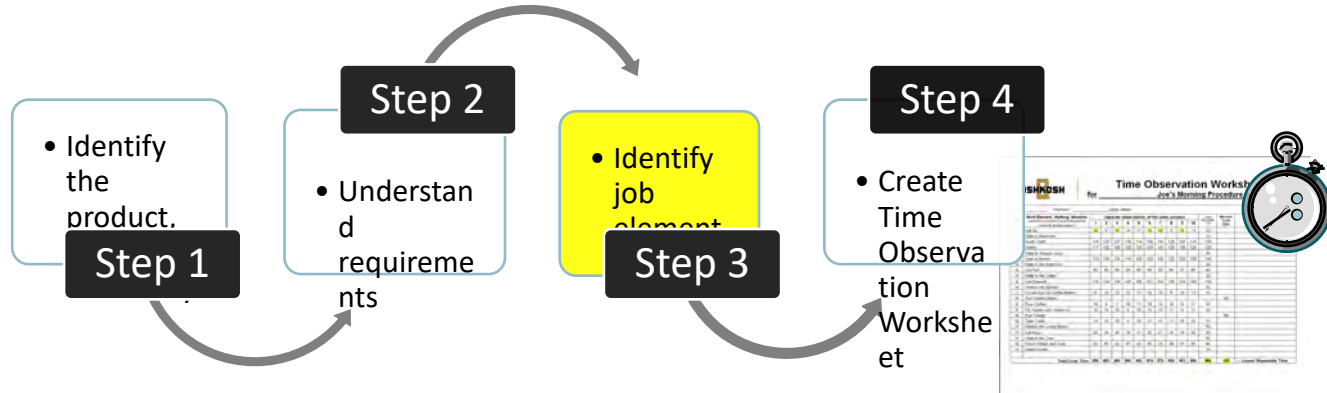
- Group in the smallest increment of work that could be moved to another person
- Walking, hand-offs, and tool changes will typically separate job elements

Identify Job Elements - Example

Job Elements for Joe

Process name: **Get Ready for Work**

1. Get up
2. Brush teeth
3. Shave
4. Take a shower
5. Dry hair
6. Get dressed
7. Make coffee
8. Drink coffee
9. Make toast
10. Eat toast
11. Get car keys
12. Put on shoes and coat



Create Time Observation Worksheet



Fill in the work
Elements, Walking,
and Machine Time
1 step = 0.5 sec

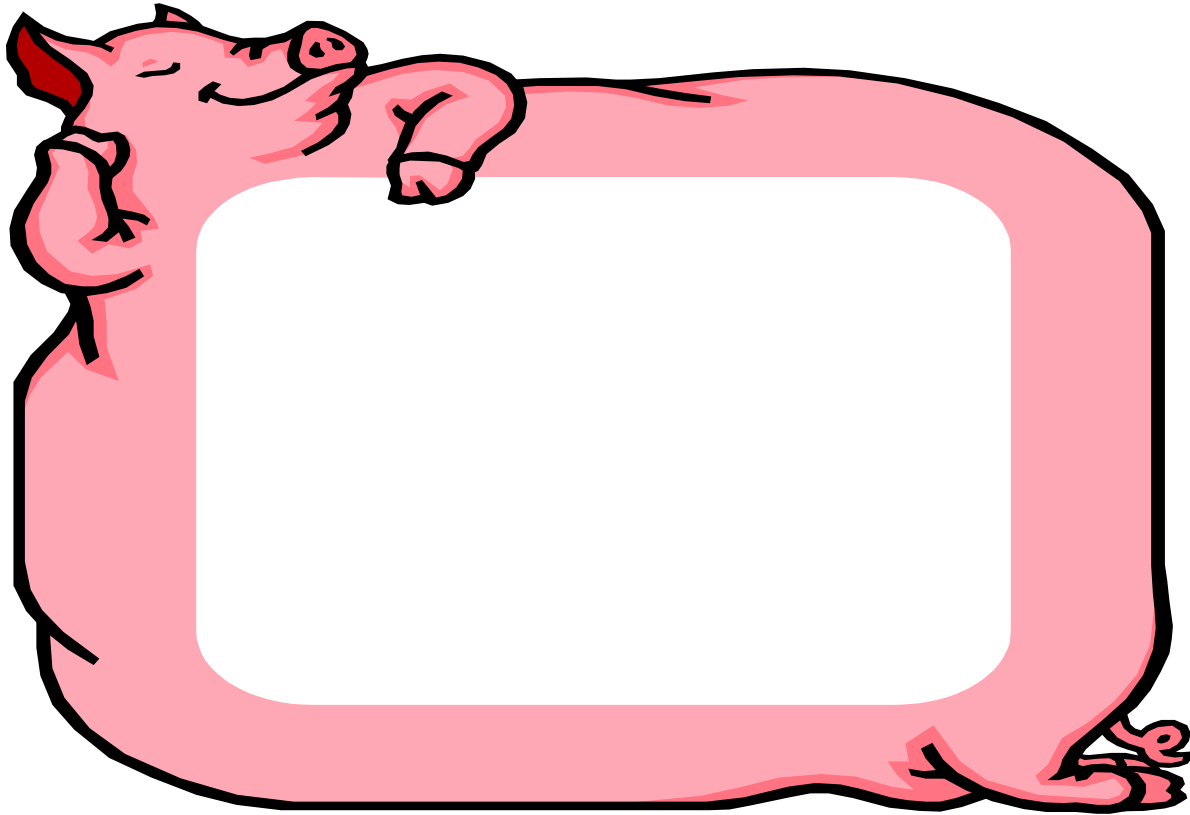
Time Observation Worksheet Joe's Morning Procedure

Date: _____ Observer: _____ Other details: _____

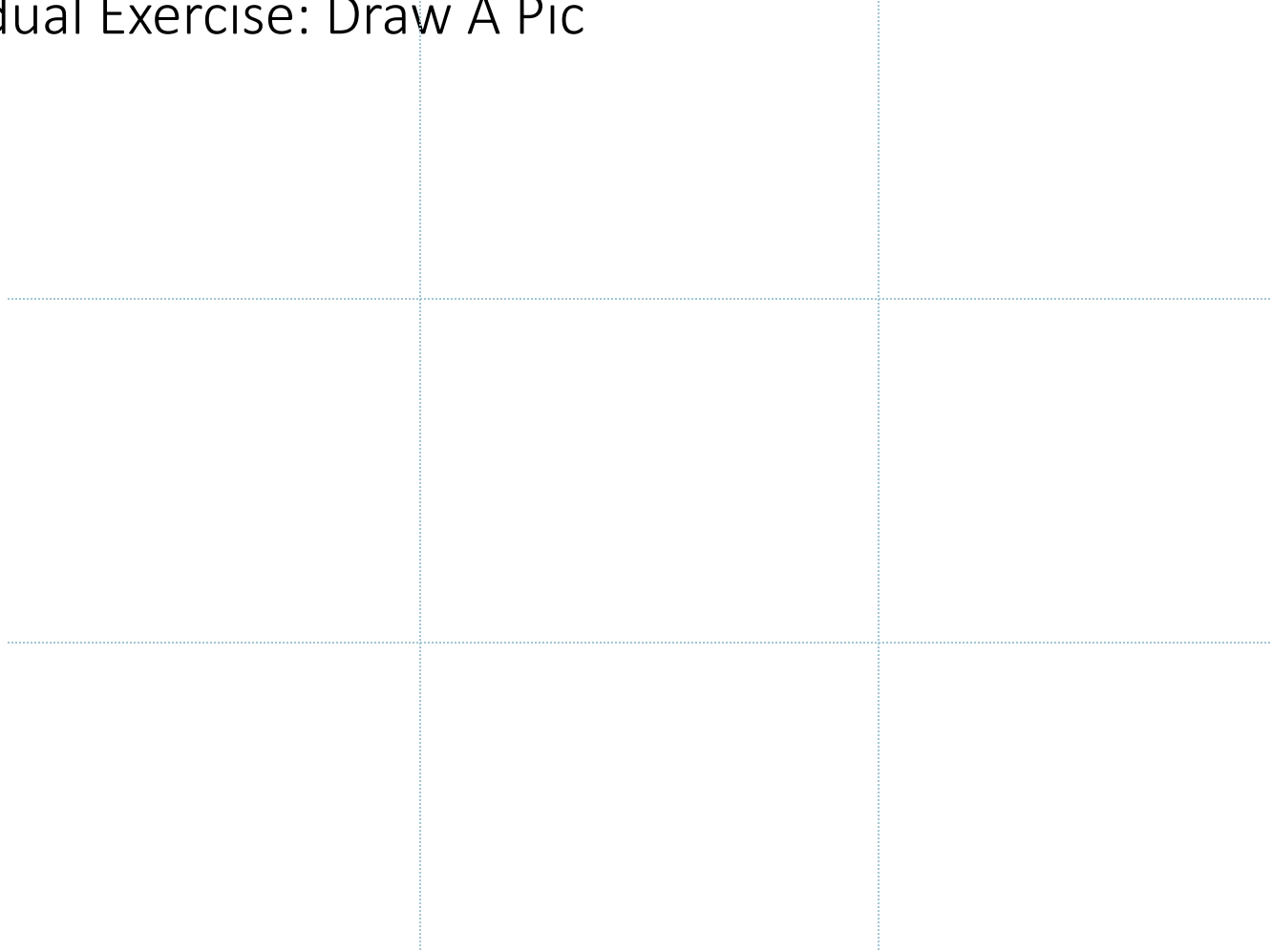
Seq #W,M	Work Element, Walking, Machine (smallest increment of work that could be moved to another person)	Separate observations of the same process										Lowest Repeatable Time	Machine Cycle Time	Notes
		1	2	3	4	5	6	7	8	9	10			
1	Get Up	10	8	10	14	11	10	10	9	10	13	10		
W	Walk to Bathroom											10		
2	Brush Teeth	110	126	127	130	114	120	126	128	120	118	120		
3	Shave	117	122	120	120	120	124	120	123	136	120	120		
W	Walk to Shower room											20		
4	Take a Shower	123	123	123	113	123	123	128	130	120	120	120		
W	Walk to the Bathroom											20		
5	Dry Hair	62						63	60	57	60	60		
W	Walk to the Closet											20		
6	Get Dressed	140	144	144	140	140	141	140	150	140	140	140		
W	Walk to the Kitchen											20		
7	Fill and turn on Coffee Maker	8	10	12	12	11	10	10	9	10	13	10		
M	Run Coffee Maker												60	
8	Pour Coffee	10	9	7	10	11	12	10	10	10	11	10		
9	Fill Toaster and Switch on	10	10	10	9	10	11	10	11	10	11	10		
M	Run Toaster												60	
10	Take Toast	10	10	10	9	10	11	10	11	10	10	10		
W	Walk to the Living Room											30		
11	Get Keys	10	10	10	10	11	9	11	10	12	10	10		
W	Walk to the Door											30		
12	Put on Shoes and Coat	60	60	62	61	54	60	58	68	51	60	60		
W	Leave House											10		
Total Cycle Time		850	863	860	860	852	874	870	895	861	866	840	120	← Lowest Repeatable Time

Use the lowest
repeatable time

Standard Work Activity Part 1



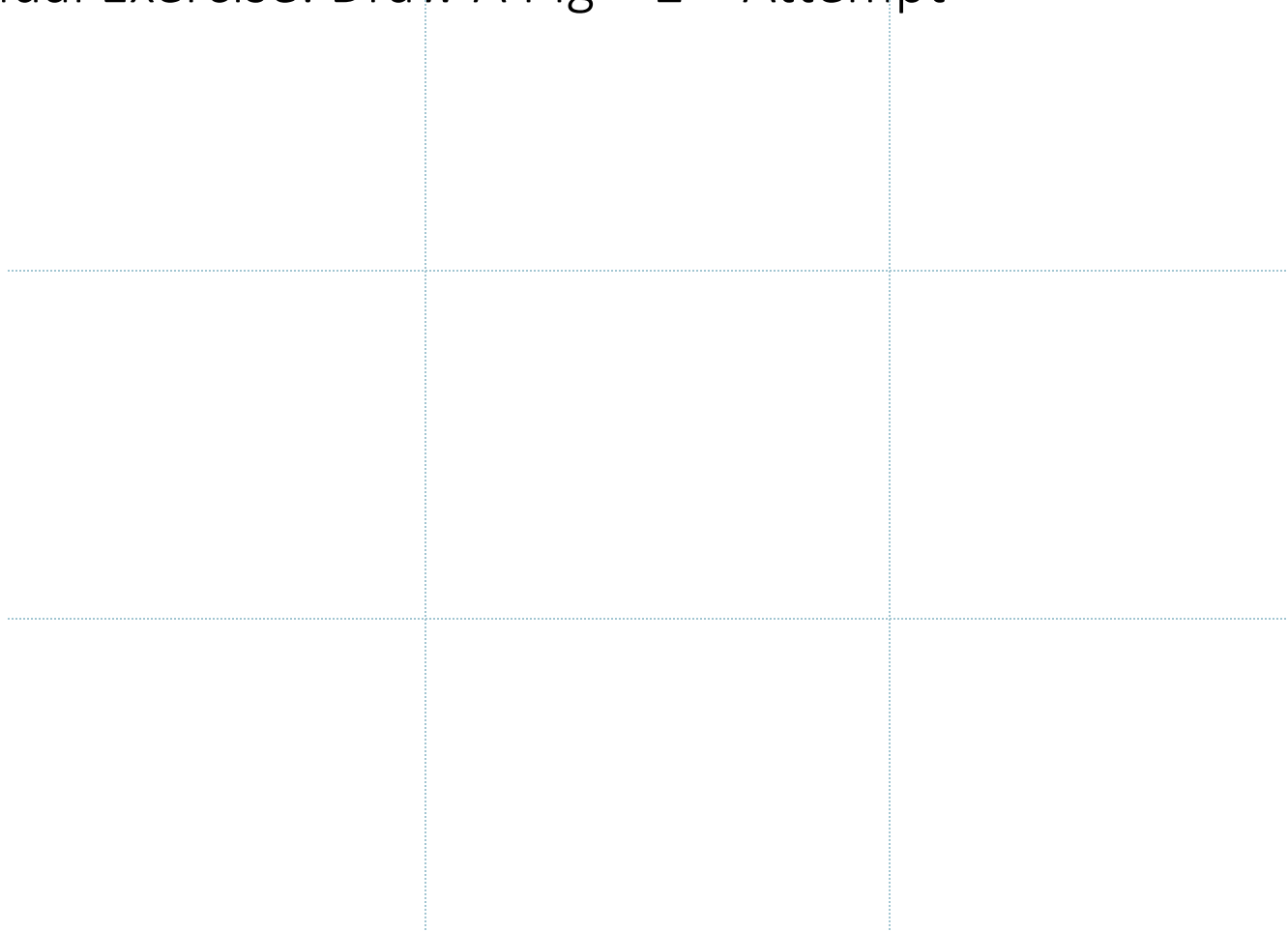
Individual Exercise: Draw A Pic



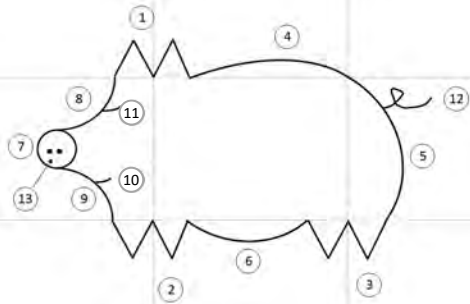
Standard Work Activity Part 2

Task	Description	Sub-Task	Instructions
1	Draw a letter M at the top left intersection.	1.1	Bottom center of M touches intersection
2	Draw letter W at bottom left intersection	2.1	Top center of W touches intersection
3	Draw letter W at bottom right intersection	3.1	Top center of W touches intersection
4	Draw arc from letter M to top right intersection		
5	Draw another arc from top right intersection to bottom right W		
6	Draw an arc between the two bottom Ws		
7	Draw the letter O in center left box		
8	Draw arc from letter M to tangent of the circle		
9	Draw arc from left W to tangent of the circle		
10	Draw an arc for the mouth	10.1	Half way between the W and circle
		10.2	Must be a happy pig
11	Draw an arc for the eyes	11.1	Half way between the M and circle
12	Draw cursive letter e near top of arc on right		
13	Draw two dots in middle of circle for pigs' nose.		

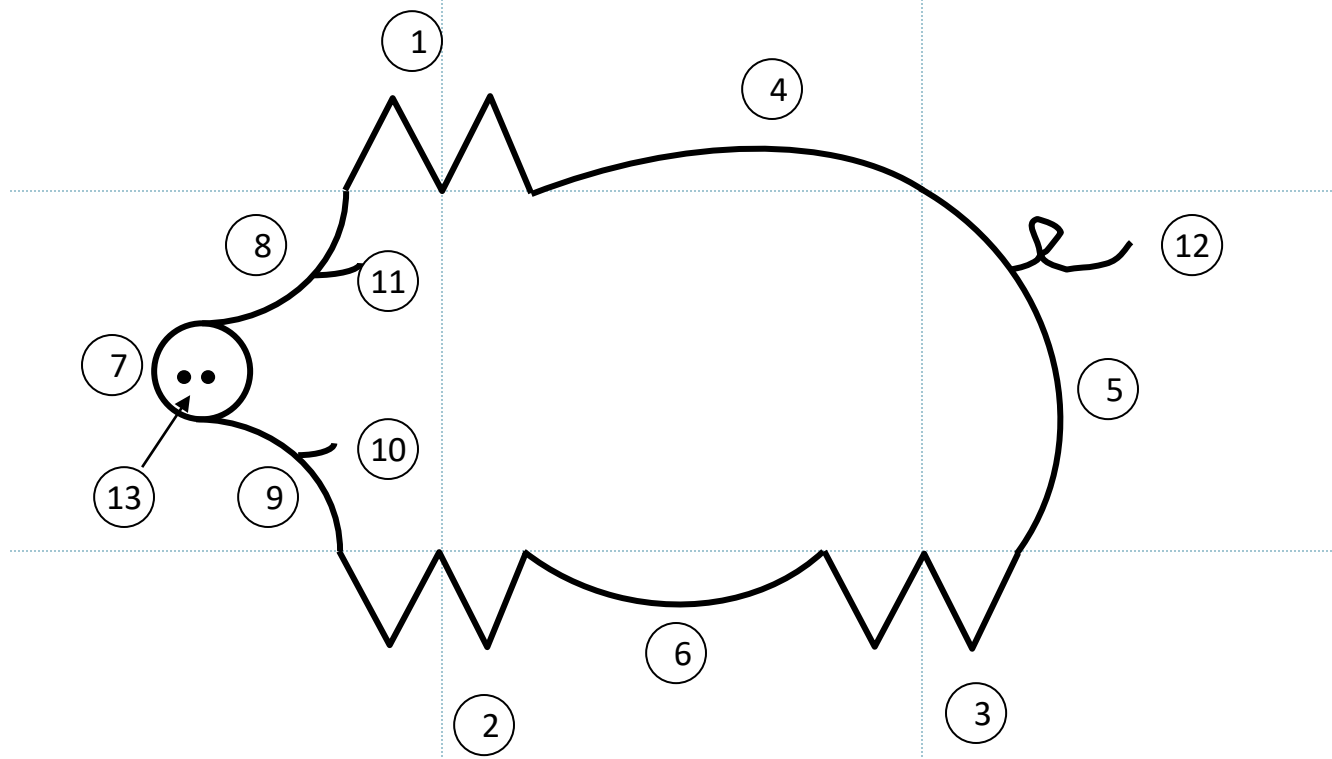
Individual Exercise: Draw A Pig – 2nd Attempt



Standard Work Activity Part 3

Task	Description	Sub-Task	Instructions
1	Draw a letter M at the top left intersection.	1.1	Bottom center of M touches intersection
2	Draw letter W at bottom left intersection	2.1	Top center of W touches intersection
3	Draw letter W at bottom right intersection	3.1	Top center of W touches intersection
4	Draw arc from letter M to top right intersection		
5	Draw another arc from top right intersection to bottom right W		
6	Draw an arc between the two bottom Ws		
7	Draw the letter O in center left box		
8	Draw arc from letter M to tangent of the circle		
9	Draw arc from left W to tangent of the circle		
10	Draw an arc for the mouth	10.1	Half way between the W and circle
		10.2	Must be a happy pig
11	Draw an arc for the eyes	11.1	Half way between the M and circle
12	Draw cursive letter e near top of arc on right		
13	Draw two dots in middle of circle for pigs' nose.		

Standard Work Activity



13. Draw two dots in the middle of the circle for the pig's nose

Common challenges

“Standardization ruins creativity”

Operators performing other work (tool retrieval, material handling, etc.) that is not outlined in the Standard Work sequence

Standard Work documentation not updated to reflect changes

Operators not trained to properly perform their work sequence

Supervisor allows deviation to Standard Work

Standard Work not used as a visual control



Summary

If a process is not documented, there is no process

Consistency = predictable cost, safety, quality, and delivery

Without a standard, there can be no continual improvement

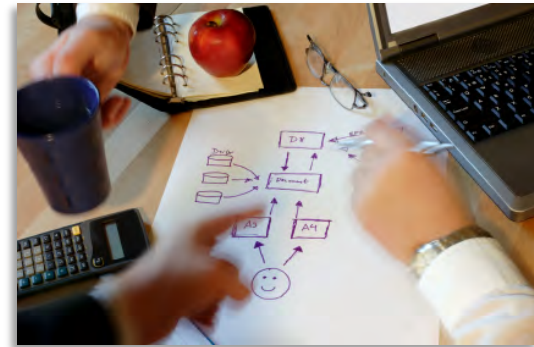
Standard work must be simple and created by the people that do the work, so it is meaningful

Standard Work is a process management tool

Standard Work is dynamic, not stagnant

If Standard Work is >30 days old, ask questions

- Has demand changed?
- Have improvements been made?



APQP – Deliverables

Process Design and Development

Product and Process Validation



- **Packaging Standards & Specifications**
- **Product/Process Quality System Review (Technical Review)**
- **Process Flow Diagram**
- Floor Plan Layout
- Characteristics Matrix
- **Process Failure Mode and Effects Analysis (PMFEA)**
- Pre-Launch Control Plan
- Process Instructions
- Measurement Systems Analysis (MSA) Plan
- Preliminary Process Capability Study Plan
- Management Support

Process Failure Mode and Effects Analysis (PFMEA)

- Analytical method to ensure potential problems are considered, prioritized and addressed throughout the product and process development
- Integral part of risk management and supporting continual improvement
- Helps guide teams in developing product and process designs that meet expectations
- Not a single event or to be done by one individual
- Retention of past learning should be included in FMEA for continual improvement



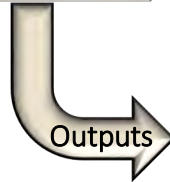
The image shows a sample PFMEA table. The table has multiple columns, including 'Failure Mode', 'Effects', 'Severity', 'Occurrence', 'Detection', 'Risk Priority Number (RPN)', and 'Actions'. The table is filled with data, including various failure modes and their corresponding effects and actions.

- Significant Production Run
- **Measurement Systems Evaluation (MSA)**
- **Process Capability Study**
- Production Validation Testing
- Packaging Evaluation
- **Production Control Plan**
- Quality Planning Sign-Off and Management Support
- **Production Part Approval Process (PPAP)**

APQP – Deliverables

Product and Process Validation

Feedback, Assessment & Corrective Action



- Significant Production Run
- **Measurement Systems Evaluation (MSA)**
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Measurement System Analysis (MSA)

- Thorough assessment of the test method, measuring instruments, and process of obtaining measurements to ensure the integrity of data used for analysis
- MSA considers the following:
 - ❑ Selecting the correct measurement and approach
 - ❑ Assessing the measuring device
 - ❑ Assessing procedures and operators
 - ❑ Assessing any measurement interactions
 - ❑ Calculating the measurement uncertainty of individual measurement devices and/or measurement systems
- Required for all Critical and Significant Characteristics

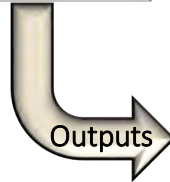


- Reduced Variation
- Improved Customer Satisfaction
- Improved Delivery and Service
- Effective use of Lessons Learned/Best Practices

APQP – Deliverables

Product and Process Validation

Feedback, Assessment & Corrective Action



- Significant Production Run
- **Measurement Systems Evaluation (MSA)**
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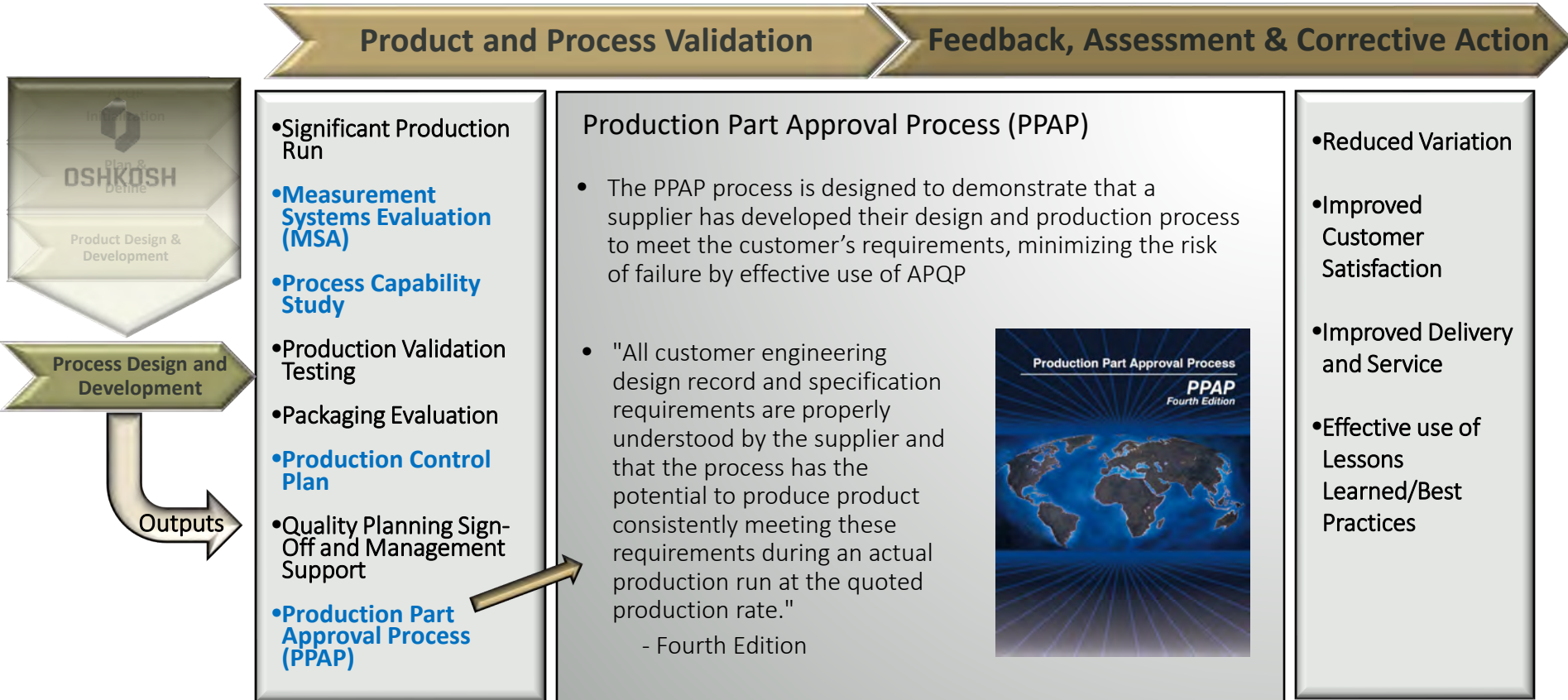
Process Capability Study

- Focuses on prevention rather than detection
- Used to understand variation in a process and then works to control it
- Some tools include
 - ❑ Statistical Process Control (SPC)
 - ❑ Control Charts
 - ❑ Process Capability
 - Cp
 - Cpk




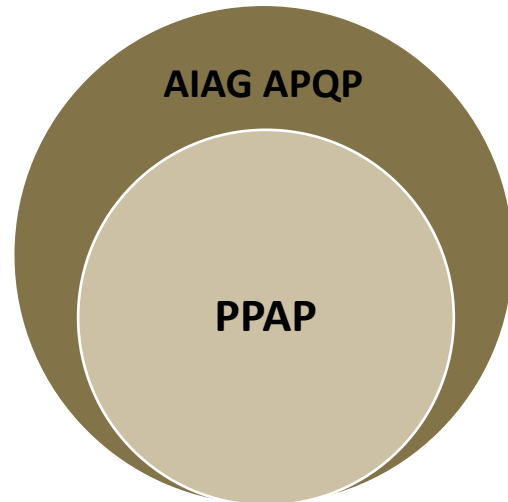
- Reduced Variation
- Improved Customer Satisfaction
- Improved Delivery and Service
- Effective use of Lessons Learned/Best Practices

APQP – Deliverables



Production Part Approval Process (PPAP)

 OSHKOSH™		Oshkosh Corporation PPAP Part Submission Requirements				
Part Number:	PART NUMBER	Purchase Order No.	ALL PPAP CRITERIA MUST CONFORM TO Oshkosh Corporation Customer Specifics defined in the Global Supplier Quality Manual			
Revision Level:	ERL DATE	Part Description:				PART NAME
Supplier Name:	SUPPLIER NAME	Reason for Request:				
Supplier Number:	101112	OSK Program:				MODEL / VEHICLE
Date Issued:		Submission Due Date:				
UNLESS OTHERWISE SPECIFIED IN WRITING BY OSHKOSH CORPORATION:						
Default PPAP Submission Level 2 - Unless Otherwise Specified by Oshkosh Corporation (Segment Specific Requirements may vary) S = Supplier Must Send Items to Oshkosh Corporation for Approval * = Applicable material info required (material certification, Certificate of Compliance, or catalog page) with PSW N/R= Documents are not required for development or submission						
		Submission Level				
PPAP Submission Requirements and Detail Description		1	2	3	4	
1.) Part Submission Warrant (PSW)		S	S	S	S	
2.) Dimensional Results		N/R	S	S	S	
3.) Design Records (Bubble Print)		N/R	S	S	S	
4.) PPAP Samples - <i>first production order / upon request prior to production order</i>		N/R	S	S	S	
5.) Print Notes: (Attach copy of Raw Material Certification / Performance Test Report / Surface Finish, Paint Process, Welding Documentation such as WPS/PQRs/Welder Certs)		*	S	S	*	
6.) Supplier Change Request (OSK-F1000) - <i>if applicable</i>		S	S	S	S	
7.) Design Failure Modes effects Analysis (DFMEA) - <i>if supplier is design responsible</i>		N/R	N/R	S	N/R	
8.) Process Flow Diagram (PFD)		N/R	N/R	S	N/R	
9.) Process Failure Modes Effects Analysis (PFMEA)		N/R	N/R	S	N/R	
10.) Initial Process Capability - <i>for major / critical characteristics - if applicable</i>		N/R	N/R	S	N/R	
11.) Measurement System Analysis (MSA) - <i>for major / critical characteristics - if applicable</i>		N/R	N/R	S	N/R	
12.) Process Control Plan		N/R	N/R	S	N/R	
13.) Appearance Approval Report (AAR) - <i>if applicable</i>		N/R	N/R	S	N/R	
14.) Checking Aids (Fixture, gage, template, etc) - <i>if applicable</i>		N/R	N/R	S	N/R	
15.) Records of Compliance with Customer Specific Requirements - <i>if applicable</i>		N/R	N/R	S	N/R	
16.) Photo Documentation (Master Sample of PPAP parts & Section J-Labeling)		S	S	S	N/R	
17.) Tooling Photo Documentation - <i>if applicable</i>		N/R	S	S	N/R	
18.) QC-112 PPAP Check List		N/R	N/R	S	N/R	
Additional Submission Instructions below:						



What are Our Expectations of Oshkosh Suppliers Regarding APQP?

Oshkosh Global Supplier Quality Audit - APQP Section						Supplier:	Audit Date:		
Element 1 - Pre-quote Feasibility Review	ISO 9001:2015 Clause 8.2.3.1					Supplier Comments	Auditor Comments		
	List Document Numbers, Names and Revisions								
	Objective Evidence	Review a completed feasibility review. Record the PART NUMBER (or other identifying number).							
	Review	(CR) A) Is there evidence that pre-quote feasibility reviews are conducted?	B) Is there a signoff / approval for the feasibility review?	C) Is there a documented checklist or equivalent?	(CR) D) Is there evidence of a review of customer requirements?			E) Is there evidence of a review of quality requirements?	
		F) Is there evidence of a review for manufacturability?	G) Is there evidence of a cross functional drawing review process?	H) Is there evidence of a supplier source review?					
	Interview	I) Is there a cross functional review meeting?	J) Is the outcome of reviews communicated back to customer?	(CR) K) Do the feasibility reviews include a manufacturing capacity review?					
MAX POINTS:	11	POINTS SCORED:	0	FAILED CRITICAL:	3				

What are Our Expectations of Oshkosh Suppliers Regarding APQP?

Oshkosh Global Supplier Quality Audit - APQP Section

Oshkosh Global Supplier Quality Audit - APQP Section							Supplier Comments	Auditor Comments
Element 2 - APQP/Product Realization	ISO 9001:2015 Clause 8.6 & IATF 16949:2015 Clauses 8.6.1 & 8.6.4							
	List Document Numbers, Names and Revisions							
	Objective Evidence	Review a completed project (for the Audit Sample Part Number, if possible). Record the PART NUMBER (or other identifying number).						
	Interview	(CR) A) Does the supplier have a product realization/APQP process to launch new parts?	(CR) B) Does the supplier use the process for all major projects?	C) Does the supplier use the process for all new parts?	D) Does the supplier have regular meetings to manage the project schedule?	E) Does the supplier track action items from the project meeting?		
			I	II				
		F) Does the process include creation of packaging plans?						
	Review	G) Is the APQP/Product Realization process documented?	H) Does the product realization/APQP documented process contain all critical steps for the supplier?	I) Does the process have a checklist or equivalent that includes multiple phases?	J) Is there evidence that the product realization/APQP process is being followed correctly?	K) Is there evidence of project planning (i.e. Gantt charts, electronic checklist, etc)?		
MAX POINTS:	11	POINTS SCORED:	0	FAILED CRITICAL:	2			

What are Our Expectations of Oshkosh Suppliers Regarding APQP

Oshkosh Global Supplier Quality Audit - APQP Section									
Element 3 - Customer Engineering Specifications	IATF 16949:2015 Clause 8.5.6.1					Supplier Comments		Auditor Comments	
	List Document Numbers, Names and Revisions								
	Objective Evidence	Review a part number that has recently changed. Record the PART NUMBER and REVISION.							
	Review	(CR) A) Is there a documented process to review customer document changes? (i.e., drawing changes, etc.)	(CR) B) Is a document (Change Notice, etc.) used to track and implement the changes?	C) Does the process include verification of changes (PPAP, etc.)?	(CR) D) Did you see evidence that the process is being followed?				
	Interview	E) Is there a cross-functional review process for changes?	G) Does the supplier have a process to purge obsolete	G) Does the supplier have a process to acknowledge changes?					
MAX POINTS:	7	POINTS SCORED:	0	FAILED CRITICAL:	3				

What are Our Expectations of Oshkosh Suppliers Regarding APQP?

Oshkosh Global Supplier Quality Audit - APQP Section										Supplier Comments	Auditor Comments		
Element 5 - Process Failure Modes and Effects Analysis (PFMEA)	IATF 16949:2015 Clause 8.3.2.1												
	Objective Evidence	Review a Process Failure Modes and Analysis (PFMEA) for the Audit Sample Key Process. Record the PART NUMBER (or other identifying number) and REVISION DATE.											
	Review	(CR) A) Does the supplier have Process Failure Mode and Effects Analysis (PFMEA)?	(CR) B) Do the PFMEA process steps match the PFD steps?	C) Is there evidence that actions are taken to reduce high RPN on PFMEAs?	D) Are there overdue items in the action plan for PFMEA? (No=1, Yes=0)	E) Is there evidence that the PFMEAs are updated when changes to the process occur?							
		F) Is there evidence that PFMEAs are updated based on nonconformance data and/or Corrective Actions?	G) Did the PFMEA include any Significant or Critical Characteristics (SC/CC)?	H) Is there evidence that PFMEAs are regularly reviewed and updated?									
	Interview	I) Does the supplier create a PFMEA for all key product families and/or key processes? (i.e., not only at customer request)	J) Is the PFMEA reviewed for high RPN?										
MAX POINTS:	10	POINTS SCORED:	0	FAILED CRITICAL:	2								

What are Our Expectations of Oshkosh Suppliers Regarding APQP?

Oshkosh Global Supplier Quality Audit - APQP Section							Supplier Comments	Auditor Comments
Element 6 - Control Plans	IATF 16949:2015 Clause 8.5.1.1							
	Objective Evidence	Review a Control Plan for the Audit Sample Key Process. Record the PART NUMBER (or other identifying number) and REVISION DATE.						
	Review	(CR) A) Does the supplier have Control Plans?	(CR) B) Does the Control Plan match the process controls in the PFMEA?	(CR) C) Does the Control Plan match the production documents you viewed on the production floor (i.e., traveler, inspection plan, etc.)?	D) Does the Control Plan provide specific inspection requirements (feature, method, frequency)?	E) Is there evidence that the Control Plans are updated when changes to the process occur?		
		F) Did the Control Plan include any Significant or Critical Characteristics (SC/CC)?						
	Interview	G) Does the supplier create general Control Plans for all key product families and/or key processes? (i.e., not only at customer request)	H) Does the supplier create Control Plans for all high volume part numbers?	(CR) I) Does the supplier use SPC, process capability studies, or 100% inspection for all Significant and Critical Characteristics?				
MAX POINTS:		9	POINTS SCORED:		0	FAILED CRITICAL:	4	

What are Our Expectations of Oshkosh Suppliers Regarding APQP?

Oshkosh Global Supplier Quality Audit - APQP Section						Supplier Comments	Auditor Comments
Element 7 - Production Part Approval Process (PPAP)	IATF 16949:2015 Clause 8.3.4.4						
	Objective Evidence	Review a submitted PPAP. Record the PART NUMBER and SUBMISSION DATE.					
	Interview	A) Does the supplier have experience with PPAP?	B) Does the supplier have experience with Oshkosh PPAP (for any segment)?				
	Review	C) Is there evidence of a customer approved L2 PPAP?	D) Is there evidence of a customer approved L3 PPAP?				
		I	II				
MAX POINTS:	4	POINTS SCORED:	0	FAILED CRITICAL:	0		

Appendix



OSHKOSH™