Process Failure Mode and Effect Analysis

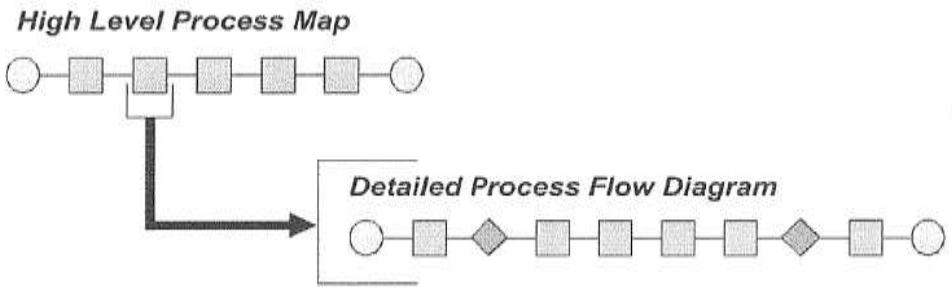
Team Approach:

The PFMEA is developed and maintained by a multi-disciplinary (or cross-functional) team typically led by the responsible engineer. During the initial development of the PFMEA, the responsible engineer/team leader is expected to directly and actively involve representatives from all affected areas. These areas should include but are not limited to design, assembly, manufacturing, materials, quality, service, and suppliers, as well as the area responsible for the next assembly. The PFMEA should be a catalyst to stimulate the interchange of ideas between the areas affected and thus promote a team approach.

Design Consideration:

The team should assume the product as designed will meet the design intent. During the development of a PFMEA, the team may identify design opportunities which, if implemented, would either eliminate or reduce the occurrence of a process failure mode. For example, adding a feature to a part and a matching feature to a fixture will eliminate the possibility of an operator placing a part in the wrong orientation. Such information must be provided to the responsible design engineer as well as the tooling/equipment/fixture design-responsible individual for consideration and possible implementation. The process-responsible engineer/team leader has at his or her disposal a number of documents that will be useful in preparing the PFMEA. The PFMEA begins by developing a list of what the process is expected to do and what it is expected not to do, i.e., the process intent. The PFMEA should begin with a flow chart of the general process. This flow chart should identify the product/process characteristics associated with each operation. Identification of product effects from the corresponding DFMEA should be included. Copies of the flow chart used in the PFMEA preparation should accompany it.

A process flow diagrams describes the flow of the product through the process — from incoming to outgoing. This should include each step in a manufacturing or assembly process as well as their related outputs (product characteristics, requirements, deliverables, etc.) and inputs (process characteristics, sources of variation, etc.). The detail of the process flow depends on the stage of process development discussion. The initial flow diagram is generally considered a high level process map. It needs more detailed analysis to identify the potential failure modes.



High level to Detailed Process Map

By Pretesh Biswas (APB Consultant)

The PFMEA should be consistent with the information in the process flow diagram. The scope of the process flow diagram should include all manufacturing operations from processing of individual components to assemblies including shipping, receiving, transportation of material, storage, conveyors, labeling, etc. A preliminary risk assessment using the process flow diagram may be performed to identify which of these operations or individual steps can have an impact on the product manufacturing and assembly and should be included in the PFMEA.

The PFMEA development continues by identifying the requirement(s) for each process/function. Requirements are the outputs of each operation/step and relate to the requirements for the product. The Requirements provide a description of what should be achieved at each operation/step. The Requirements provide the team with a basis to identify potential failure modes. In order to assure continuity, it is highly recommended that the same cross-functional team develop the Process Flow Diagram, PFMEA, and Control Plan.

Other sources of information that are useful in providing the team with ways to focus and capture discussions on the requirements of the process include:

- DFMEA
- Drawings and design records
- Bill of Process
- Interrelationship (Characteristic) matrix
- Internal and external (customer) nonconformance (i.e., known failure modes based on historical data)
- Quality and Reliability History

After establishing the scope of the analysis effort, the team should begin by reviewing historical information. The areas to review should include:

- Lessons that have been learned from previous product and process design implementation, and
- Any information available that establishes best practices including items such as guidelines and standards, standard part identification, or error-proofing methods.

Quality performance information available from similar, previous product and process designs, including items such as process yield, first time capability (both end of line and at each operation), Pans per Million (PPM), process capability indices (C_{pk} and P_{pk}), and warranty metrics. The information can be useful input for determination of severity, occurrence and detection rankings.

Example of Process Failure Mode and Effect Analysis

FAILURE MODE AND EFFECTS ANALYSIS
(PROCESS FMEA)

FMEA Number A
Page _____ of _____
Item: B
Process Responsibility C
Prepared By: H
Model Year(s)/Program(s) D
Key Date E
FMEA Date (Orig.) F
Core Team G

Process Step / Function	Requirement	Potential Failure Mode	Potential Effect(s) of Failure	Severity	Classification	Potential Cause(s) of Failure	Current Process: Controls Prevention	Occurrence	Current Process: Controls Detection	Detection	RPN	Recommended Action	Responsibility & Target Completion Date	Action Results: Actions Taken / Completion Date	Severity	Occurrence	Detection	RPN
Op 70; Manual application of wax inside door panel	Cover inner door, lower surfaces with wax to specification thickness	Insufficient wax coverage over specified surface	Allows integrity breech of inner door panel Corroded interior lower door panels Deteriorated life of door leading to: • Unsatisfactory appearance due to rust through paint over time. • Impaired function of interior door hardware	7		Manually inserted spray head not inserted far enough	None	8	Variables check for film thickness Visual check for coverage.	5	280	Add positive depth stop to sprayer	Mfg Engineering by 0X 10 15	Stop added, sprayer checked online	7	2	5	70
												Automate spraying	Mfg Engineering by 0X 12 15	Rejected due to complexity of different doors on the same line				
						Spray head clogged - Viscosity too high - Temperature too low - Pressure too low	Test spray at start-up and after idle periods and preventative maintenance program to clean heads	5	Variables check for film thickness Visual check for coverage.	5	175	Use Design of experiments (DOE) on viscosity vs. temperature vs. pressure	Mfg Engineering by 0X 10 01	Temp and Press Limits were determined and limit controls have been installed- Control charts show process is in control Cpk=1.65	7	1	5	35
						Spray head deformed due to impact	Preventative maintenance programs to maintain heads	2	Variables check for film thickness Visual check for coverage.	5	70	None						
						Spray time sufficient	None	5	Operator instructions Lot sampling (visual) check coverage of critical areas	7	245	Install Spray timer.	Maintenance XX/XX/XX	Automatic spray timer installed- operator starts spray, timer controls shut-off control charts show process is in control – Cpk=2.05	7	1	7	49
		Excessive wax coverage over specified surface																
a1	a2	b	c	d	e	f	h	g	h	i	j	k	l	m	----n----			

Sample PFMEA Form with Minimal Information Elements & Example Entries

FMEA Number (A)

Enter an alphanumeric string which is used to identify the FMEA document. This is used for document control.

System, Subsystem, or Component Name and Number (B).

Enter the name and number of the system, subsystem, or component which is being analyzed.

By Pretesh Biswas (APB Consultant)

Process Responsibility (C)

Enter the OEM, organization, and department or group who is Process design responsible. Also enter the supply organization name, if applicable.

Model Year(s)/Program(s) (D)

Enter the intended model year(s) and program(s) that will use or be affected by the Process being analyzed (if known).

Key Date (E).

Enter the initial PFMEA due date, which should not exceed the scheduled start of production date. In case of a supply organization, this date should not exceed the customer required Production Part Approval Process (PPAP) submission date.

FMEA Dates (F)

Enter the date the original PFMEA was completed and the latest revision date.

Core Team (G)

Enter the team members responsible for developing the PFMEA. Contact information (e.g., name, organization, telephone number, and email) may be included in a referenced supplemental document.

Prepared By (H)

Enter the name and contact information including the organization (company) of the engineer responsible for preparing the PFMEA.

Body of DFMEA Form (Fields a-n)

The body of the PFMEA contains the analysis of risks related to the potential failures, and improvement action being taken.

Process steps / Process Function /Requirements (a)

Process Step/Function can be separated into two (or more) columns or combined into a single, bridged column which encompasses these elements. Process Steps may be listed in the Process Step/Function column or additional column(s) may be added containing the functions or requirements of that process step. “Process Step”, “Function”, and “Requirements” are described below:

Process Step (a1)

Enter the identification of the process step or operation being analyzed, based on the numbering process and terminology. For example, enter the number and identifier (e.g., name). Process numbering scheme, sequencing, and terminology used should be consistent with those used in the process flow diagram to ensure traceability and relationships to other documents (Control Plans, operator instructions, etc). Repair and rework operations should also be included.

Process Function (a1)

List the process function that corresponds to each process step or operation being analyzed. The process function describes the purpose or intent of the operation. A risk analysis is recommended in order to limit the number of steps to be included to only those that add value or otherwise are seen as likely to have a negative impact on the product. If there are multiple process functions being analyzed with respect to a given operation, each should be aligned on the form with its respective "Requirements" to aid in the development of the associated failure modes. Process Function becomes a2 if Process Step and Process Function are split.

Requirements (a2)

List the requirements for each process function of the process step or operation being analyzed. Requirements are the inputs to the process specified to meet design intent and other customer requirements. If there are multiple requirements with respect to a given function, each should be aligned on the form with the respective associated failure modes in order to facilitate the analysis.

Potential Failure Mode (b)

Potential failure mode is defined as the manner in which the process could potentially fail to meet the process requirements (including the design intent). In preparing the FMEA, assume that the incoming part(s)/material(s) are correct. Exceptions can be made by the FMEA team where historical data indicate deficiencies in incoming part quality. The team should also assume that the basic design of the product is correct; however, if there are design issues which result in process concerns, those issues should be communicated to the design team for resolution. List the potential failure mode(s) for the particular operation in terms of the process requirement(s) (e.g., as documented in the process flow diagram.) Assume that the failure could occur but may not necessarily occur. Potential failure modes should be described in technical terms, not as a symptom noticeable by the customer. If the requirements have been well defined, then the potential failure mode is readily identifiable by determining the condition when a specific requirement is not met. Each requirement may have multiple failure modes. A large number of failure modes identified for a single requirement usually indicates that the requirement is not well defined. The assumption is made that the failure could occur but may not necessarily occur - consequently the use of the word "potential". Verification of completeness of the potential failure modes can be made through a review of past things-gone-wrong, concerns, reject or scrap reports, and group brainstorming. Sources for this should also include a comparison of similar processes and a review of customer (End User and subsequent operation) claims relating to similar components.

Process step/function	Requirement	Potential failure Mode
Attach seat cushion to track using a torque gun	Four Screws	Fewer than four screws
	Specified Screws	Wrong screw used
	Assembly Sequence: First screw in the Right Front hole	Screw placed in any other hole
	Screw fully seated	Screw not fully seated
	Screw torqued to dynamic torque specification	Screw torque too high
		Screw torque too low

Example of Process step/function, Requirement & Potential failure mode Column

Potential Effect(s) of Failure (c)

Potential effects of failure are defined as the effects of the failure mode as perceived by the customer(s). The effects of the failure should be described in terms of what the customer might notice or experience, remembering that the customer may be an internal customer as well as the ultimate End User. The customer(s) in this context could be the next operation, subsequent operations or locations, the dealer, and/or the vehicle owner. Each must be considered when assessing the potential effect of a failure. The product effects in the PFMEA should be consistent with those in the corresponding DFMEA. If the failure mode could impact safety or cause noncompliance to regulations, this should be clearly identified in the PFMEA. For the End User, the effects should be stated in terms of product or system performance. If the customer is the next operation or subsequent operation(s) / location(s), the effects should be stated in terms of process / operation performance.

Requirement	Failure Mode	Effect
Four Screw	Fewer than four screw	End user: Loose seat cushion and noise. Manufacturing and Assembly: Stop shipment and additional sort and rework due to affected portion.
Specified Screw	Wrong screw used	Manufacturing and Assembly: Unable to install screw in station.
Assembly sequence: First screw in right front hole	Screw placed in any other hole	Manufacturing and assembly: Difficult to install remaining screws in station.
Screw fully seated	Screw not fully seated	End User: Loose seat cushion and noise. Manufacturing and Assembly: Sort and rework due to affected portion.
Screw torqued to dynamic torque specification	Screw torque too high	End User: Loose seat cushion due to subsequent fracture of screw and noise. Manufacturing and Assembly: Sort and rework due to affected portion.
	Screw torque too low	End User: Loose seat cushion due to gradual loosening of screw and noise. Manufacturing and Assembly: Sort and rework due to affected portion.

Example of Effects

Severity (d):

Severity is the value associated with the most serious effect for a given failure mode. Severity is a relative ranking within the scope of the individual FMEA. The team should agree on evaluation criteria and a ranking system and apply them consistently, even if modified for individual process analysis. It is not recommended to modify criteria ranking values of 9 and10. Failure modes with a rank of severity 1 should not be analyzed further.

Effect	Criteria Severity of Effect on Product (Manufacturing Effect)	Rank
Failure to Meet Safety and/or Regulatory Requirements	May endanger operator (machine or assembly) without warning.	10
	May endanger operator (machine or assembly) with warning.	9
Major Disruption	100% of product may have to be scrapped. Line shutdown or stop ship.	8
	A portion of the production run may have to be scrapped. Deviation from primary process including decreased line speed or added manpower.	7
Significant Disruption	100% of production run may have to be reworked off line and accepted.	6
	A portion of the production run may have to be reworked off line and accepted.	5
Moderate Disruption	100% of production run may have to be reworked in station before ¡t is processed.	4
	A portion of the production run may have to be reworked in-station before it is processed.	3
Minor Disruption	Slight inconvenience to process, operation, or operator.	2
	No discernible effect.	1

Example of PFMEA Severity Evaluation criteria

Classification (e)

This column may be used to highlight high priority failure modes or causes that may require additional engineering assessments. This column may also be used to classify any special product. Or process characteristics (e.g., critical, key, major, significant) for components, subsystems, or systems that may require additional process controls. Customer specific requirements may identify special product or process characteristic symbols and their usage. Where a special characteristics identified with a severity of 9 or 10 in the PFMEA, the design responsible engineer should be notified since this may affect the engineering documents.

Potential Cause(s)/Mechanism(s) of Failure Mode (f)

Potential cause of failure is defined as an indication of how the failure could occur, and is described in terms of something that can be corrected or can be controlled. Potential cause of failure may be an indication of a design or process weakness, the consequence of which is the failure mode. To the extent possible, identify and document every potential cause for each failure mode. The cause should be detailed as concisely and completely as possible. Separating the causes will result in a focused analysis for each and may yield different measurement, controls, and action plans. There may be one or more causes that can result in the failure mode being analyzed. In preparing the PFMEA, the team should assume that the incoming part(s)/material(s) are correct. Exceptions can be made at the team's discretion where historical data indicate deficiencies in incoming part quality. Only specific errors or malfunctions (e.g., seal not installed or seal installed inverted) should be listed. Ambiguous phrases (e.g., operator error) should not be used.

Occurrence (g)

Occurrence is the likelihood that a specific cause/mechanism will occur resulting in the failure mode within the design life. The likelihood of occurrence ranking number has a relative meaning rather than an absolute value. A consistent occurrence ranking system should be used to ensure continuity. Estimate the likelihood of occurrence of a potential cause of failure on a 1 to 10 scale. A consistent occurrence ranking system should be used to ensure continuity. The occurrence ranking number is a relative ranking within the scope of the FMEA

and may not reflect the actual likelihood of occurrence. The "Incident per items/vehicles" is used to indicate the number of failures that are anticipated during the process execution. If statistical data are available from a similar process, the data should be used to determine the occurrence ranking. In other cases, a subjective assessment can be made by using the word descriptions in the left hand column of the table, along with input from the appropriate process knowledge source to estimate the ranking. The team should agree on evaluation criteria and a ranking system and apply them consistently, even if modified for individual process analysis. Occurrence should be estimated using a 1 to 10 scale.

Likelihood of Failure	Criteria: Occurrence of Cause DFMEA (Incidents per Items/vehicles)	Rank
Very High	100 per thousand 1 in 10	**10**
High	50 per thousand 1 in 20	**9**
	20 per thousand 1 in 50	**8**
	10 per thousand 1 in 100	**7**
Moderate	2 per thousand 1 in 500	**6**
	0.5 per thousand 1 in 2,000	**5**
	0.1 per thousand 1 in 10,000	**4**
Low	0.01 per thousand 1 in 1,00,000	**3**
	0.OO1 per thousand 1 in 1,000,000	**2**
Very Low	Failure is estimated through Preventive controls.	**1**

Example of PFMEA Occurrence Evaluation Criteria

Current Process Controls (h)

Current Process Controls are descriptions of the controls that can either prevent to the extent possible, the cause of failure from occurring or detect the failure mode or cause of failure should it occur.

There are two types of Process Controls to consider:

Prevention:

Eliminate (prevent) the cause of the failure or the failure mode from occurring, or reduce its rate of occurrence.

Detection:

Identify (detect) the cause of failure or the failure mode, leading to the development of associated corrective action(s) or counter- measures.

The preferred approach is to first use prevention controls, if possible. The initial occurrence rankings will be affected by the prevention controls provided they are integrated as part of the process. The initial detection rankings will be based on process controls that either detect the cause of failure, or detect the failure mode.

Example of Process Failure Mode and Effect Analysis

Requirement	Failure Mode	Cause	Prevention Control	Detection Control
Screws torqued until fully seated	Screw not fully seated	Nut runner not held perpendicular to work surface by operator	Operator training	Angle sensor included in nut runner to detect cross-threading not allowing part to be removed from fixture until value is satisfied
Screws torqued to dynamic torque specification	Screw torqued too high	Torque setting set too high by non-set-up personnel	Password protected control panel (only set-up personnel have access)	Torque validation box included in set-up procedure to validate setting prior to running
		Torque setting set too high by set-up personnel	Training of set-up personnel	Torque validation box included in set-up procedure to validate setting prior to running
			Settings added to set-up instructions	
	Screw torqued too low	Torque setting set too low by non-set-up personnel	Password protected control panel (only set-up personnel have access)	Torque validation box included in set-up procedure to validate setting prior to running
		Torque setting set too low by set-up personnel	Training of set-up personnel	Torque validation box included in set-up procedure to validate setting prior to running
			Settings added to set-up instructions	

Examples of Causes and Controls

Detection (i)

Detection is the rank associated with the best detection control listed in the Detection Controls column. Detection is a relative ranking within the scope of the individual FMEA. In order to achieve a lower ranking, generally the planned detection control has to be improved. When more than one control is identified, it is recommended that the detection ranking of each control be included as part of the description of the control. Record the lowest ranking value in the Detection column. Assume the failure has occurred and then assess the capabilities of all "Current Process Controls" to prevent shipment of the part having this failure mode. Do not automatically presume that the detection ranking is low because the occurrence is low, but do assess the ability of the process controls to detect low frequency failure modes or prevent them from going further in the process. Random quality checks are unlikely to detect the existence of an isolated problem and should not influence the detection ranking. The team should agree on evaluation criteria and a ranking system and apply them consistently, even if modified for individual product analysis. The ranking value of one (1) is reserved for failure prevention through proven process design solutions.

Example of Process Failure Mode and Effect Analysis

Opportunity for Detection	Criteria: Likelihood of Detection by Design Control	Rank	Likelihood for Detection
No detection opportunity	No current Process control; Cannot detect or is not analyzed.	10	Almost Impossible
Not likely to detect at any stage	Failure Mode and/or Error (Cause) is not easily detected (e.g., random audits).	9	Very Remote
Problem Detection Post Processing	Failure Mode detection post-processing by operator through visual/tactile/audible means.	8	Remote
Problem Detection at source	Failure Mode detection in-station by operator through Visual/ tactile/audible means or post-processing through use of attribute gauging (go/no-go, manual torque check/clicker wrench, etc.)	7	Very low
Problem Detection Post Processing	Failure Mode detection post-processing by operator through use of variable gauging r in-station by operator through use of attribute gauging (go/no-go, manual torque check/clicker wrench, etc).	6	low
Problem Detection at source	Failure Mode or Error (Cause) detection in-station by operator through use of variable gauging or by automated controls in-station that will detect discrepant part and notify operator (light, buzzer, etc.). Gauging performed on setup and first-piece check (for set-up causes only).	5	Moderate
Problem Detection Post Processing	Failure Mode detection post-processing by automated controls that will detect discrepant part and lock part to prevent further processing.	4	Moderately high
Problem Detection at source	Error (Cause) detection in-station by automated controls that will detect error and prevent discrepant part from being made.	3	High
Error Detection and/or Problem Prevention	Error (Cause) detection in-station by automated controls that will detect error and prevent discrepant part from being made.	2	Very High
Detection not applicable; Problem Prevention	Error (Cause) prevention as a result of fixture design, machine design or part design. Discrepant parts cannot be made because item has been error-proofed by process/product design.	1	Almost Certain

Suggested PFMEA Prevention/Detection Evaluation Criteria

Determining Action Priorities

Once the team has completed the initial identification of failure modes and effects, causes and controls, including rankings for severity, occurrence, and detection, they must decide if further efforts are needed to reduce the risk. Due to the inherent limitations on resources, time, technology, and other factors, they must choose how to best prioritize these efforts. The initial focus of the team should be oriented towards failure modes with the highest severity rankings. When the severity is 9 or 10, it is imperative that the team must ensure that the risk is addressed through existing design controls or recommended actions. For failure modes with severities 8 or below the team should consider causes having highest occurrence or detection rankings. It is the team's responsibility to look at the information identified, decide upon an approach, and determine how to best prioritize the risk reduction efforts that best serve their organization and customers.

Risk Priority Number or RPM (i)

One approach to assist in action prioritization has been to use the Risk Priority Number:

RPN = Severity (S) x Occurrence (O) x Detection (D)

Within the scope of the individual FMEA, this value can range between 1 and 1000.

The use of an RPN threshold is NOT a recommended practice for determining the need for actions. Applying thresholds assumes that RPNS are a measure of relative risk (which they often are not) and that continuous improvement is not required (which it is). For example, if the customer applied an arbitrary threshold of 100 to the following, the supplier would be required to take action on the characteristic B with the RPN of 112.

Item	Severity	Occurrence	Detection	RPN
A	9	2	5	90
B	7	4	4	112

In this example, the RPN is higher for characteristic B, but the priority should be to work on A with the higher severity of 9, although the RPN is 90 which is lower and below the threshold. Another concern with using the threshold approach is that there is no specific RPN value that requires mandatory action. Unfortunately, establishing such thresholds may promote the wrong behavior causing team members to spend time trying to justify a lower occurrence or detection ranking value to reduce RPN. This type of behavior avoids addressing the real problem that underlies the cause of the failure mode and merely keeps the RPN below the threshold. It is important to recognize that while determining "acceptable" risk at a particular program milestone (e.g., vehicle launch) is desirable, it should be based on an analysis of severity, occurrence and detection and not through the application of RPN thresholds. Use of the RPN index in the discussions of the team can be a useful tool. The limitations of the use of RPN need to be understood. However, the use of RPN 'thresholds to determine action priority is not recommended.

Recommended Action (k)

In general, prevention actions (i.e., reducing the occurrence) are preferable to detection actions. An example of this is the use of process design error proofing 'rather than random quality checks or associated inspection. The intent of any recommended action is to reduce rankings in the following order: severity, occurrence, and detection. Example approaches to reduce these are explained below:

- **To Reduce Severity (S) Ranking:**

Only a design or process revision can bring about a reduction in the severity ranking. A product/process design change, in and of itself, does not imply that the severity will be reduced. Any product/process design change should be reviewed by the team to determine the effect on the product functionality and process. For maximum effectiveness and efficiency of this approach, changes to the product and process design should be implemented early in the development process. For example, process technology needs to be considered very early in the process development if severity is to be reduced.

- **To Reduce Occurrence (0) Ranking:**

To reduce occurrence, process and design revisions may be required. A reduction in the occurrence ranking can be effected by removing or controlling one or more of the causes of the failure mode through a product or process design revision. Studies to understand the sources of variation of the process using statistical methods may be implemented. These studies may result in actions that reduce occurrence. Further, the knowledge gained may assist in the identification of suitable controls including ongoing feedback of information to the appropriate operations for continuous improvement and problem prevention.

- **To Reduce Detection (D) Ranking:**

The preferred method is the use of error/mistake proofing. A redesign of the detection methodology may result in a reduction of the detection ranking. In some cases, a design change to a process step may be required to increase the likelihood of detection (i.e., reduce the detection ranking.) Generally, improving detection controls requires the knowledge and understanding of the dominant causes of process variation and any special causes. Increasing the frequency of inspection is usually not an effective action and should only be used as a temporary measure to collect additional information on the process so that permanent preventive/corrective action can be implemented.

Process Step/Function	Requirement	Failure Mode	Cause	Prevention Controls	Detection Controls	Recommended Actions
Op. 20 (attach seat cushion to track using a torque gun) Select four screws	Four screws	Fewer than four screws	Too few screws inadvertently installed	Visual aids illustrating correct quantity Operator training	Visual Inspection in station	In-station torque monitoring; Line lockout if fewer than four
	Specified screws	Wrong screw used (larger dia.)	Similar screws available at station	Visual aids illustrating correct screw Operator training	Visual inspection in station	In-station torque angle monitoring; Line lockout if angle not met Error proof by design: use one type screw for station/product
Op. 20 (attach seat cushion to track using a torque gun) Beginning with right front hole, torque each screw to the required torque	Assembly sequence: First screw in right front hole	Screw placed in any other hole	More than one hole available to operator	Visual aids identifying location of first screw Operator training	Visual inspection in station	Add position sensor to nut runner not allowing tool to operate unless runner is aligned with correct hole

Examples of Causes, Controls and Recommended Actions

Responsibility & Target Completion Date (I)

Enter the name of the individual and organization responsible for completing each recommended action including the target completion date. The Process-responsible engineer/team leader is responsible for ensuring that all actions recommended have been implemented or adequately addressed.

Action Results (m-n)

This section identifies the results of any completed actions and their effect on S, O, D rankings and RPN

Action(s) Taken and Completion Date (m)

After the action has been implemented, enter a brief description of the action taken and actual completion date.

Severity, Occurrence, Detection and RPN (n)

After the preventive/corrective action has been completed, determine and record the resulting severity, occurrence, and detection rankings. Calculate and record the resulting action (risk) priority indicator (RPN). All revised rankings should be reviewed. Actions alone do not guarantee that the problem was solved (i.e., cause addressed), thus an appropriate analysis or test should be completed as verification. If further action is considered necessary, repeat the analysis. The focus should always be on continuous improvement.