Severity, Occurrence, and Detection Criteria for Process FMEA

SEVERITY EVALUATION CRITERIA

This ranking results when a potential failure mode results in a final customer and/or a manufacturing/assembly plant defect. The final customer should always be considered first. If both occur, use the higher of the two severities.

Effect	Criteria: Severity of Effect on Product (Customer Effect)	Criteria: Severity of Effect on Process (Manufacturing/Assembly Effect)	Rank
Failure to Meet Safety and/or Regulatory Requirements	Potential failure mode affects safe vehicle operation and/or involves noncompliance with government regulation without warning	May endanger operator (machine or assembly) without warning	10
Failure to Meet Safety and/or Regulatory Requirements	Potential failure mode affects safe vehicle operation and/or involves noncompliance with government regulation with warning.	Or may endanger operator (machine or assembly) with warning.	9
Loss or Degradation of Primary Function (Major Disruption)	Loss of primary function (vehicle inoperable, does not affect safe vehicle operation).	100% of product may have to be scrapped. Line shutdown or stop ship.	8
Loss or Degradation of Primary Function (Moderate Disruption)	Degradation of primary function (vehicle operable, but at reduced level of performance).	A portion of the production run may have to be scrapped. Deviation from primary process including decreased line speed or added manpower.	7
Loss or degradation of Secondary Function (Moderate disruption)	Loss of secondary function (vehicle operable, but comfort/convenience functions inoperable).	100% of production run may have to be reworked off line and accepted.	6
Loss or degradation of Secondary Function (Moderate disruption)	Degradation of secondary function (vehicle operable, but comfort/convenience functions at reduced level of performance).	A portion of the production run may have to be reworked off line and accepted	5
Annoyance (Moderate disruption)	Appearance or Audible Noise, vehicle operable, item does not conform and noticed by most customers (> 75%).	100% of production run may have to be reworked in station before it is processed.	4
Annoyance (Moderate disruption)	Appearance or Audible Noise, vehicle operable, item does not conform and noticed by many customers (50%)	A portion of the production run may have to be reworked in-station before it is processed.	3
Annoyance (Minor disruption)	Appearance or Audible Noise, vehicle operable, item does not conform and noticed by discriminating customers (< 25%).	Slight inconvenience to process, operation, or operator.	2
No effect	No discernible effect.	No discernible effect	1

RPN THRESHOLD

There is no threshold value for RPNs. In other words, there is no value above which it is mandatory to take a Recommended Action or below which the team is automatically excused from an action.

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*Note: Zero (0) rankings for Severity, Occurrence or Detection are not allowed

SUGGESTED DETECTION EVALUATION CRITERIA

Opportunity for Detection	Criteria: Likelihood of Detection by Process Control	Rank	Likelihood Of 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 or in-station by operator through the 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	Failure Mode detection in-station by automated controls that will detect discrepant part and automatically lock part in station to prevent further processing	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; Error Prevention	Error (Cause) prevention as a result of fixture design, machine design or part design or part design. Discrepant parts cannot be made because item has been error-proofed by process/product design	1	Almost Certain

SUGGESTED OCCURRENCE EVALUATION CRITERIA

Likelihood of Failure	Criteria: Occurrence of Cause (Incidents per items/vehicles	PPK	Rank
Very High	≥100 per thousand pieces ≥ 1 in 10	<0.55	10
High	50 per thousand pieces 1 in 20	≥0.55	9
High	20 per thousand pieces 1 in 50	≥0.78	8
High	10 per thousand pieces 1 in 100	≥0.86	7
Moderate	2 per thousand pieces 1 in 500	≥0.94	6
Moderate	.5 per thousand pieces 1 in 2,000	≥1.00	5
Moderate	.1 per thousand pieces 1 in 10,000	≥1.10	4
Low	0.01 per thousand pieces 1 in 100,000	≥1.20	3
Low	0.001 per thousand pieces 1 in 1,000,000	≥1.30	2
Very Low	Failure is eliminated through preventative control	≥1.67	1

FMEA - Quick Reference Guide

ITEM:

Model Year/Vehicle (s):

Core Team: M. Moore, M. Weber, L. Dawson

Process Responsibility:

Key Date:

Potential
Failure Mode and Effects Analysis
(Process FMEA)

FMEA Number:
Page 1 of 1
Prepared by: Lee Dawson
FMEA Date (orig.):

Process / Function	Potential Failure Mode	Potential Effect(s) of Failure	Sev	Class	Potential Cause(s)/ Mechanism(s) Failure	Current Process Controls Prevention	Occur	Current Process Controls Detection	Detec	R.P.N.	Recommended Action(s)	Responsibility & Target Completion Date	Actions Taken	Action Results			
														Sev	Occ	Det	R.P.N.
OP#10 must assemble cross functional Team and Develop FMEA. •SAEJ 1739 Guidelines •APQP Specific Team Members Must provide an FMEA which determines process risk and addresses confirmed significant…	FMEA not adequately performed;	• Product liability • Customer dissatisfaction • Reduced performance of system or component • Potential risk of injury • Reduce level of analysis of…	10	CC ▽	Inadequate FMEA development • Cross functional team not assembled • Facilitation not used • FMEA expertise is limited…	• Mistake Proofing • Automatic Visual Systems • Proximity Switch	5	• APQP Checklist • FMEA Review Process • Management Review Process • Control Plan entries	5	250	Call an FMEA facilitator to reduce time required and improve quality of the…	Process engineer team leader or project manager; ASAP	FMEA performed under the supervision and leadership	10	1	2	20

• Verb-noun
• measurable is desirable
• objective
• subjective

Anti function for functional approach
• full
• partial
• intermittent
• excess function

Customer focus/experience
• end user
• assembler
• maker
• regulatory body

See Severity Chart on opposite side

Brainstorm causes
• man
• material
• method
• machine
• environment
Determine Root cause if CC

Prevent
• Reduce Occurrence
Detect
Planned Evaluation Method to/from
• Control Plan
• Tools
• Mistake Proofing
Note: must have written Instruction

See Occurrence Chart on opposite side

Actions should:
• eliminate failure mode SEV=9/10
• eliminate causes on CC
• reduce occurrence
• improve evaluation "detection reduction last option"

See Detection Chart on opposite side

• Name of team member to carry issue.
• Name of champion
• Date action desired completion

Brief action result description Date action taken

Recalculate RPN, after action has been taken
• occurrence
• detection
Note: severity will likely stay the same unless failure mode is eliminated
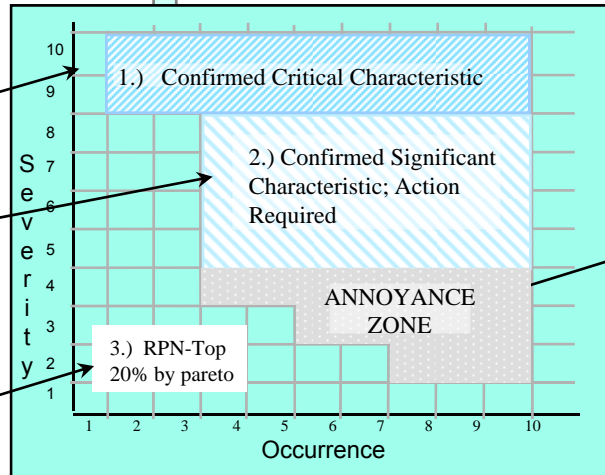
Actions are Required: (by Priority)

1.) Confirmed CC is a Critical Characteristic to be addressed on Control Plan)

2.) An SC is a confirmed Significant Characteristic to be addressed on Control Plan)

3.) For the top 20% Failure Modes / Causes (Pareto by RPN)

Critical & Significant Characteristics Action Guidelines

1.) Confirmed Critical Characteristic

2.) Confirmed Significant Characteristic; Action Required

ANNOYANCE ZONE

3.) RPN-Top 20% by pareto

Severity (vertical axis: 1–10)

Occurrence (horizontal axis: 1–10)

Top 20% of Failure Modes by RPN

R P N

Failure Modes