



AIAG – VDA Process FMEA:
Striving for a Complete &
Accurate Risk Analysis



Presentation Agenda

- Project Overview – Scott Gray
- Process FMEA Introduction – Dave Dalby



AIAG VDA FMEA - Project Objective



SAE International	SURFACE VEHICLE STANDARD	SAE	J1739 JAN2009
		Revised	1994-07 2004-04
		Superseding	J1739AUG2002
(R) Potential Failure Mode and Effects Analysis in Design (Design FMEA), Potential Failure Mode and Effects Analysis in Manufacturing and Assembly Processes (Process FMEA)			

RATIONALE
Widespread use of design and process FMEA is a benefit to consumers and manufacturers. The application of FMEA has been in place in the automotive industry since the late 1950s with emphasis on potential starting, braking and fuel systems in the early 1960s. The FMEA methodology has since been applied in the prevention and reduction of potential failure modes. However, a growing need developed for improved failure mode analysis and a desire to focus on safety when the use of the Risk Priority Number (RPN). The document relates current thinking on the subject and incorporates the use of an RPN based on the concept of failure mode or function criticality. It also includes a section on Design FMEA and Process FMEA. The document is intended to be used as a common starting point for the development of an effective FMEA and FMEA.

FORWORD
This SAE International Standard for Potential Failure Mode and Effects Analysis in Design (DFMEA) and Potential Failure Mode and Effects Analysis in Manufacturing and Assembly Processes (PFMEA) has been developed and approved by a consensus. The study committee members are listed in the front matter of this document and are available in the published version. This document was created by a consensus committee and represents current thoughts and practices in the industry from the perspective of OEM Original Equipment Manufacturers and their suppliers.

1. SCOPE
This FMEA Standard describes Potential Failure Mode and Effects Analysis in Design (DFMEA) and Potential Failure Mode and Effects Analysis in Manufacturing and Assembly Processes (PFMEA). It guides users in the identification and reduction of risk by providing systematic terms, requirements, testing checks, and worksheets. As a standard, this document provides a common language and methodology to be used by all users through the FMEA process. The FMEA process and methodology shall be used in accordance with the standard as well as the consensus group consensus. This document is intended to be used in conjunction with the customer's requirements for the product. Documented consensus and agreement with the customer is necessary for deviations in order to justify new work or changed methods during customer or third party reviews.

Provide consistent direction, guidance to all automotive suppliers

Update to include:

- Best Practices
- Improved Examples
- Functional Safety

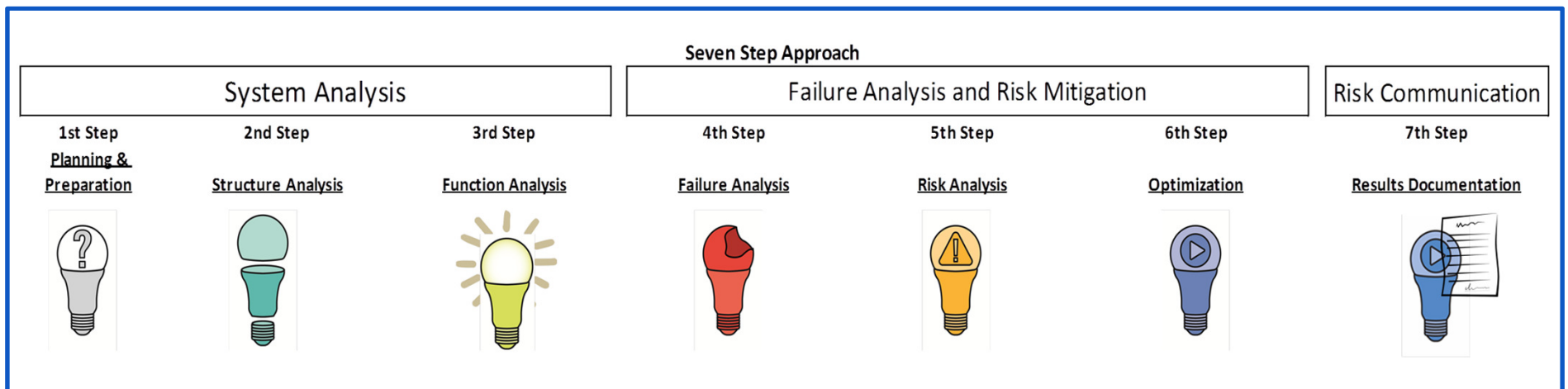


AIAG-VDA FMEA Project Team

	AIAG Work Group	VDA Work Group
OEMs	FCA US LLC, Ford, GM, Honda N.A., Daimler Truck NA	Daimler AG, Ford Europe, Volkswagen AG, Adam Opel AG
Suppliers	Nexteer, Bendix, ZF/TRW, ON Semiconductor	Robert Bosch GmbH, Continental, Schaeffler AG, Knorr-Bremse, ZF Friedrichshafen AG
Project Managers	Scott Gray	Jochen Pfeufer



AIAG-VDA FMEA 7 Step Approach



Supplemental FMEA - MSR

- FMEA MSR = Monitoring and System Response
 - Addresses Risk Analysis of Mechatronic Systems
 - Not previously addressed in AIAG 4th Edition FMEA
 - Describes linkages between Design FMEA and Functional Safety concepts and analyses
 - Unique Frequency (F) and Monitoring (M) Rating Tables



AIAG VDA FMEA Handbook

- The Team Work Continues
 - Final revisions and final reviews
 - Completion in March
- Approvals by AIAG and VDA
 - Both required to approve the document
 - Scheduled in April and May, respectively
- Release of Handbook, 1st Edition, 2019
 - Targeted for release in June
- Updated training
 - Expect global launches in Q3



1st Step: Planning and Preparation for Process FMEA

AIAG: “Define the Scope”

- Establishes Analysis Boundaries.
- Define what processes are to be included and excluded from the analysis.

AIAG - VDA - “1st Step – Planning and Preparation”

- * In addition to the above-
- * States the overall advantage of Planning and Preparation is to focus resources on processes with the **highest priority** i.e., **must processes** and **highest level want** processes.
- * Direction from a high level of management so **all processes** that can impact product quality are considered:
 - * Part receiving and delivery.
 - * On-line and off-line detection controls.
 - * Maintenance processes of critical equipment.



1st Step: Planning and Preparation – Process FMEA

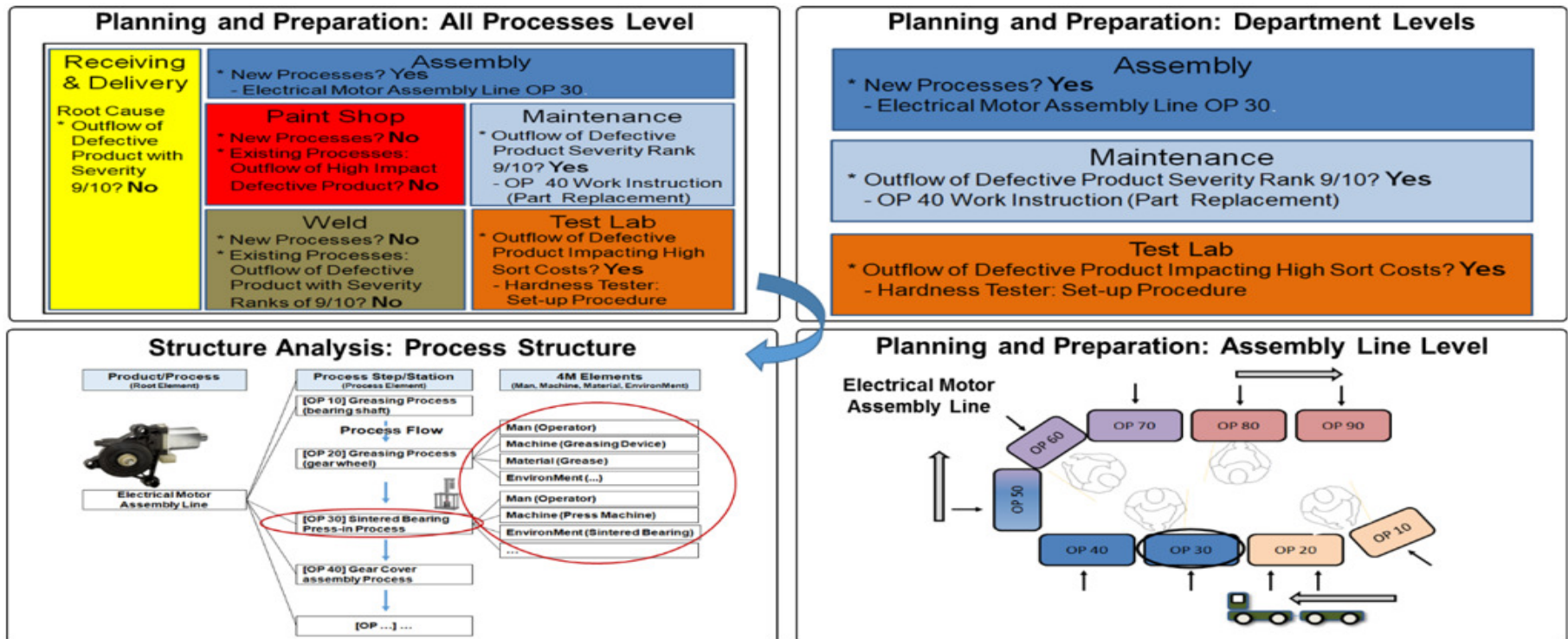


Figure only shows Assembly taken to Process Structure level

PFMEA Severity

- * AIAG Severity 9 & 10 - Are applied for safe operation and / or noncompliance of government regulation defects. The difference between the two rating are **With Warning (9)** and **Without Warning (10)**.
 - * With and Without Warning not defined in the manual.
 - * Each user could define what these terms meant.
- * AIAG - VDA Severity -
 - * Severity 10 – Applied to safe operation defects.
 - * Severity 9 – Applied to noncompliance of government regulations.



PFMEA Severity

- * AIAG – Considers two categories
 - * Effect on Manufacturing – Verbiage implies to your manufacturing plant
 - * Effect on Customer (End User)
- * AIAG - VDA – Considers three categories
 - * Impact to Manufacturing – Divided into two categories
 - * Impact to Your Plant
 - * Impact to the Ship-to-Plant (when known)
 - * Eliminate or reduce –
 - * Charge-back for customer containment activity.
 - * Manpower sent to support customer on-site sorts & repairs.
 - * 3rd party charges for sorts and repairs.
 - * Management involvement for high impact items to customer manufacturing.
 - * In automotive production – Number of units to repair / Line downtime
 - * Effect on Customer – End User



PFMEA Severity

Process General Evaluation Criteria Severity (S)					
Potential Failure Effects rated according to the criteria below.					Blank until filled in by user
S	Effect	Impact to Your Plant	Impact to Ship-to Plant (when known)	Impact to End User (when known)	Corporate or Product Line Examples
10	High	Failure may result in an acute health and/or safety risk for the manufacturing or assembly worker	Failure may result in an acute health and/or safety risk for the manufacturing or assembly worker	Affects safe operation of the vehicle and/or other vehicles, the health of driver or passenger(s) or road users or pedestrians.	
9		Failure may result in in-plant regulatory noncompliance	Failure may result in in-plant regulatory noncompliance	Noncompliance with regulations.	
8	Moderately high	100% of production run affected may have to be scrapped. Failure may result in in-plant regulatory noncompliance or may have a chronic health and/or safety risk for the manufacturing or assembly worker	Line shutdown greater than full production shift; stop shipment possible; field repair or replacement required (Assembly to End User) other than for regulatory noncompliance. Failure may result in in-plant regulatory noncompliance or may have a chronic health and/or safety risk for the manufacturing or assembly worker.	Loss of primary vehicle function necessary for normal driving during expected service life.	



PFMEA Occurrence & Detection

AIAG Occurrence vs AIAG - VDA Occurrence

- * AIAG Occurrence - Based on **defects per thousand**, set for automotive production rates.
- * AIAG - VDA Occurrence - Based on **robustness** of Prevention Controls.
 - * Can be applied to any production rate.

AIAG Detection vs AIAG - VDA Detection

- * AIAG Detection - Based on:
 - * “Opportunity for Detection” (4 ~ 5 word summary)
 - * “Likelihood of Detection” by Process Control (overview of controls and where applied)
- * AIAG - VDA Detection – Based on:
 - * **Maturity** of Detection Method (experience with controls)
 - * Opportunity of Detection (overview of controls and where applied)
- Rating of 3 & 4 made more stringent – Requires control of rejected product...**by robust system to prevent outflow.**



Risk Priority Number (RPN) and Action Priority (AP)

* AIAG RPN Based on:

* Severity x Opportunity x Detection = RPN

* S, O and D weighted equally.

* AIAG - VDA Action Priority Table Based on:

* S, O and D considered at the same time while weighting Severity highest, then Occurrence, then Detection, to determine priority of action.

* High, Medium, or Low.

Action Priority (AP) for DFMEA and PFMEA							
Action Priority is based on combinations of Severity, Occurrence, and Detection ratings in order to prioritize actions for risk reduction.							Blank until filled in by user
Effect	S	Prediction of Failure Cause Occurring	O	Ability to Detect	D	ACTION PRIORITY (AP)	Comments
Product or Plant Effect Very high	9-10	Very high	8-10	Low - Very low	7-10	H	
				Moderate	5-6	H	
				High	2-4	H	
				Very high	1	H	
		High	6-7	Low - Very low	7-10	H	
				Moderate	5-6	H	
				High	2-4	H	
				Very high	1	H	
		Moderate	4-5	Low - Very low	7-10	H	
				Moderate	5-6	H	



Risk Priority Number (RPN) and Action Priority (AP)

	Actual Sev.	AP Sev	Actual Occ.	AP Occ	Actual Det.	AP Det	Action Priority
1	9	9 ~ 10	8	8 ~ 10	5	5 ~ 6	H
2	9	9 ~ 10	6	6 ~ 7	5	5 ~ 6	H
3	9	9 ~ 10	4	4 ~ 5	5	5 ~ 6	H
4	9	9 ~ 10	3	2 ~ 3	5	5 ~ 6	M
5	9	9 ~ 10	3	2 ~ 3	4	2 ~ 4	L

↓	↓	↓
70	2	3
	1	3
		2
		1

Structure Analysis (Step 2) – Process FMEA

- * AIAG - VDA Failure Cause Identification: Add 4M Categories

- * To aid the users to identify Failure Causes, the 4M approach has been added in this step.

- * For each Failure Mode, the users are asked to consider the 4M Categories as a source for a Failure Cause.

- * 4M Categories;

- * Man

- * Machine

- * Material (indirect)

- * Milieu

- * Milieu is a term coined in mid-18th century France meaning: “A person’s social environment”

- * As in - “He grew up in a very strict milieu”

- * Word was adopted by the English and used to represent - Background, Backdrop, Setting, Context, Scene, Atmosphere. and Environment.

- * Milieu (EnvironMent)



Rollout of AIAG – VDA FMEA Handbook

- * Potential rollout path and timing -
 - * AIAG - VDA FMEA Handbook to be published by end of Q2 2019
 - * 2 -3 months for training to be developed.
 - * 6 ~ 9 months for training to be completed by supplier / company.
 - * Recommend to apply at start of next “major model” development cycle, i.e., business awarded for new drawings.
 - * Discretion of company/supplier to retroactively apply to existing processes.



Any Questions?

