

The background of the cover features a blurred, high-speed image of a tunnel or a road with blue lighting, creating a sense of motion and depth. The text is overlaid on a white horizontal band.

# AIAG & VDA FMEA Handbook

April 4, 2019

# Agenda

- Current Development Status
- Project Objective
- Leveraging the new FMEA Handbook
- Examples of major changes and their benefits
- Q & A

# Current Development Status

- Final Draft in Approval Process
  - AIAG QSC: April 2, 2019
  - VDA QMA: May 8, 2019
  - Both approvals required to release the document
- Release of Handbook – June 2019
  - Launch events in Germany and U.S.
- Availability of Training – Q3 2019
  - Each Association updating training courses

# AIAG VDA FMEA - Project Objective



SAE International	SURFACE VEHICLE STANDARD	SAE	J1739 JAN2009
		Revised	1994-07 2009-01
		Superseding	J1739 AUG2002
(R) Potential Failure Mode and Effects Analysis in Design (Design FMEA), Potential Failure Mode and Effects Analysis in Manufacturing and Assembly Processes (Process FMEA)			
<p>RATIONALE</p> <p>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 safety, vehicle and engine fires. In the early 1990s, the FMEA methodology has become "best practice" in the prevention and reduction of potential safety critical failures. However, as growing trend developments for safety and failure mode reduction in cars and trucks in the world, the use of the Risk Priority Number (RPN). The document contains updated rating scale and it incorporates the use of an RPN Based on the current focus in determining prevention or detection effectiveness. It also includes a Functional Design and Process Risk Analysis (FDPA) as an add-on tool to be used. The intent for Potential Failure Mode and Effects Analysis for Surface Vehicles (PFMEA) is to focus on Design FMEA and has been limited. Therefore, PFMEA is a type of Design FMEA in appearance. From the numerous trends, reference manuals and ongoing references on the subject of FMEA, this document serves as a common starting point for the development of an effective DESIGN FMEA.</p> <p>FOREWORD</p> <p>The Vehicle Recommended Practices 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 revised and expanded. As a Standard, it includes functional requirements and recommendations for effective use of DFMEA and PFMEA, as well as related tasks and activities. This document was created by interested parties and members of the SAE Standards and Practices Committee. The document is the result of SAE's ongoing efforts to improve standards and practices in the field of FMEA.</p> <p>1. SCOPE</p> <p>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 applies only to the identification and mitigation of risk by providing systematic, formal, repeatable, verified, clear, and verifiable. As a Standard, this document includes requirements, "how-to" and recommendations, "should" or "shall" for use. The FMEA Standard. The FMEA Standard and documentation must comply with the Standard as well as any corporate policy governing this Standard. Documentation obtained and agreement with the customer is necessary. The document is in order to justify the work in changed events, development or final product review.</p>			

Update to include:

- Best Practices
- Improved Examples
- Functional Safety

Provide consistent direction, guidance to all automotive suppliers

# Importance of New Methods and Tools

- Effective FMEA risk identification - never been more critical
  - Rapid growth in component/system interactions
  - Increasingly specialized technologies
  - No change in legal obligations of producers
- Effective FMEA includes:
  - Cross-functional team contributions
  - Carefully identified system boundaries
  - Thorough documentation of risks and actions

# Leveraging the AIAG & VDA FMEA Handbook

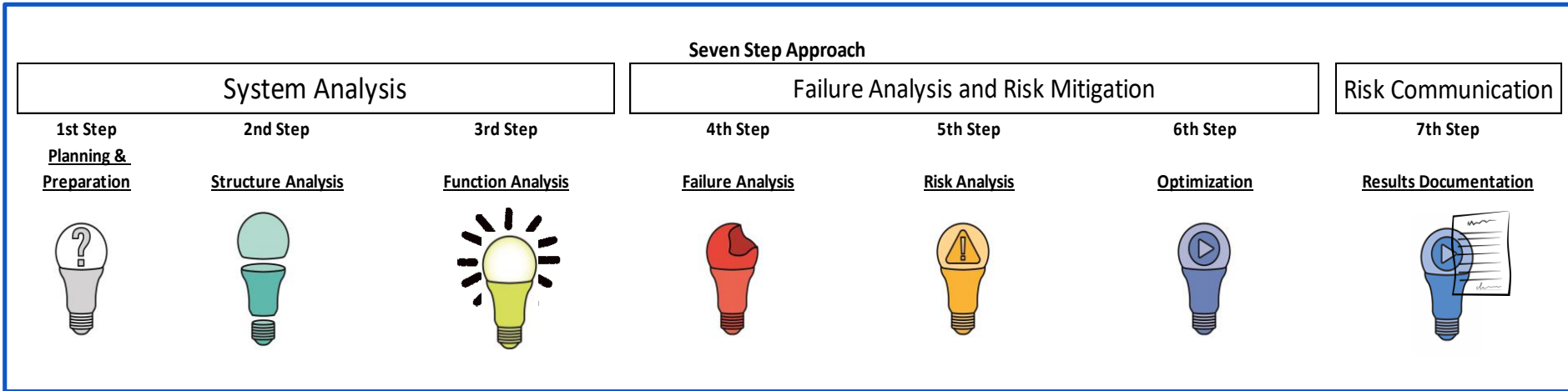
- The Essential Link Between COQ and FMEA
  - You will need FMEA to make sure COQ / COPQ improvement targets are met;
  - You will need COQ / COPQ actual performance on similar products and processes to make sure the FMEA risk evaluation of the new product and/or process is realistic;
  - Not acceptable reduction in Cost of Poor Quality (COPQ) means FMEA was not effective

# Examples of Major Changes and Benefits

- 7 Step Approach
- Supplemental FMEA – MSR
- New Severity, Occurrence, Detection Tables
- PFMEA Failure Analysis
- Action Priority (AP) Tables

More Structured Approach – Leverages Lessons Learned – Prevention Driven

# AIAG & VDA FMEA - 7 Step Approach



Applies to DFMEA, Supplemental FMEA – MSR, and PFMEA



# Supplemental FMEA - MSR

- FMEA MSR = Monitoring and System Response
  - Supplemental approach for Design FMEA
  - Addresses Risk Analysis of “Mechatronic Systems”
    - Not previously addressed in AIAG 4<sup>th</sup> Edition FMEA
  - Describes linkages between Design FMEA and Functional Safety (ISO 26262) concepts and analyses
  - Unique Frequency (F) and Monitoring (M) Rating Tables

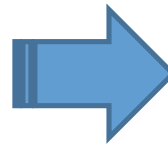
# New PFMEA Severity Table

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

## AIAG 4<sup>th</sup> Edition

Issue with Severity 10/9

“Without warning” – “with warning”



## AIAG & VDA FMEA Handbook

10 – Safe operation defects

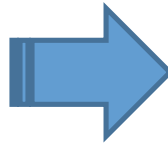
9 – Noncompliance with regulations

# New PFMEA Occurrence Table

Occurrence Potential (O) for the Process				
<p>Potential Failure Causes rated according to the criteria below. Consider Prevention Controls when determining the best Occurrence estimate. Occurrence is a predictive qualitative rating made at the time of evaluation and may not reflect the actual occurrence. The occurrence rating number is a relative rating within the scope of the FMEA (process being evaluated). For Prevention Controls with multiple Occurrence Ratings, use the rating that best reflects the robustness of the control.</p>				Blank until filled in by user
O	Prediction of Failure Cause Occurring	Type of Control	Prevention Controls	Corporate or Product Line Examples

## AIAG 4<sup>th</sup> Edition

Rating based on defects/thousand, set for high volume production rates



## AIAG & VDA FMEA Handbook

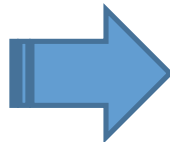
Rating based on robustness of prevention controls, can be applied to any production rate

# New PFMEA Detection Table

Detection Potential (D) for the Validation of the Process Design				
Detection Controls rated according to the Detection Method Maturity and Opportunity for Detection.				Blank until filled in by user
D	Ability to Detect	Detection Method Maturity	Opportunity for Detection	Corporate or Product Line Examples

## AIAG 4<sup>th</sup> Edition

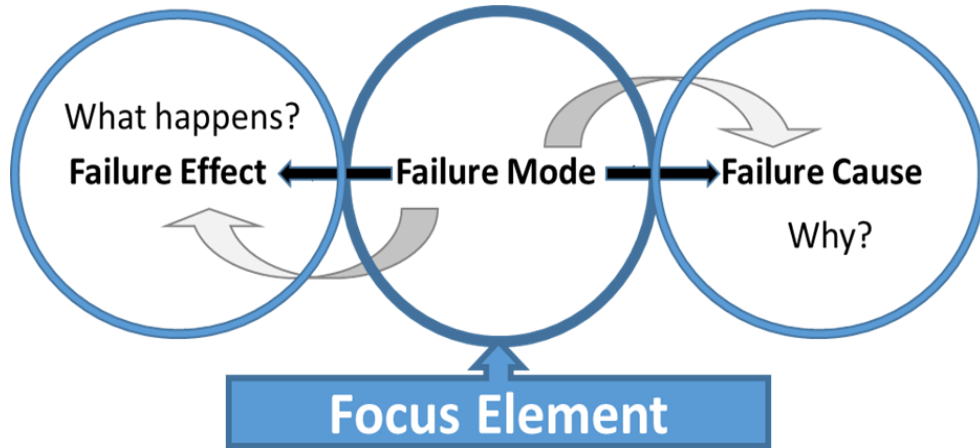
Rating based on “Opportunity for Detection” and “Likelihood of Detection” by Process Controls



## AIAG & VDA FMEA Handbook

Rating based on “Maturity of Detection Method” and “Opportunity of Detection”  
More stringent ratings, requires control of rejected product to prevent outflow

# Failure Analysis (Step 4) – Process FMEA



Failure Chain Model

## Addition of 4M

- For each Failure Mode (FM) consider these categories as sources of Failure Cause (FC)
  - Man
  - Machine
  - Material
  - EnvironMent

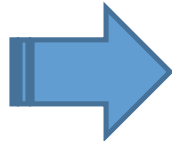
# Action Priority (AP) Table

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

## AIAG 4<sup>th</sup> Edition

$$RPN = S \times O \times D$$

All three weighted equally



## AIAG & VDA FMEA Handbook

S, O, D considered at the same time, while weighting Severity highest, then Occurrence, then Detection  
Determines Priority of Action = H, M, L

# Adoption / Deployment Timing

- Expect “rolling change” not immediate changeover
  - No expectation for “rework” of existing FMEAs
  - Handbook recommends utilizing for updates to “Family” FMEAs
- Possible sequence for transition
  1. Allow several months for OEM and supplier training
  2. Acceptance of new methods, rating tables, forms on supplier FMEAs
  3. Then shift to requirement for new products or processes
- Expect timing for adoption / deployment from OEM’s to be communicated at AIAG Quality Summit in October, 2019



*Thank You!*