AIAG VDA FMEA

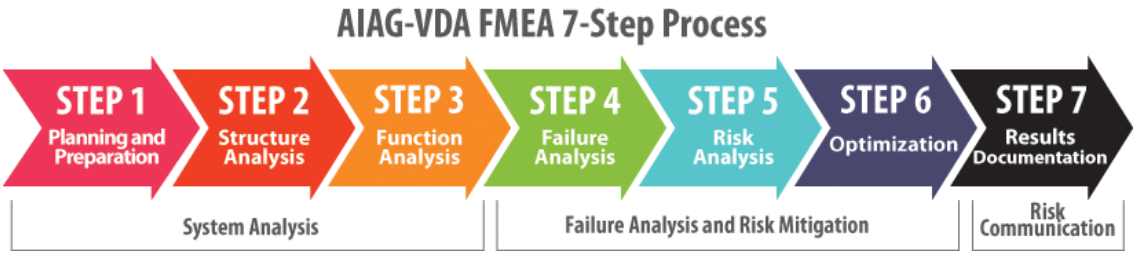
In 2019 the first edition AIAG VDA FMEA manual was released, and with it the FMEA process has been restructured. Existing FMEAs developed using the previous AIAG 4th Edition FMEA or VDA Edition, may remain in their original form for subsequent revisions. When practical, existing FMEAs used as a starting point for new programs should be converted to reflect the new rating scales, analytical methods, and format. New processes and products should be made according to the new FMEA manual.

Transition training available!

DataLyzer supports organizations with the transition to the new FMEA standard. We offer (on-site) training and consultancy in the new 7-step FMEA process and all other important changes. Please contact your DataLyzer account manager or sales@datalyzer.com for more information or to schedule your transition training.

In the remainder of this article we will summarise the major changes, and how DataLyzer FMEA implemented these changes.

The new 7-step approach:



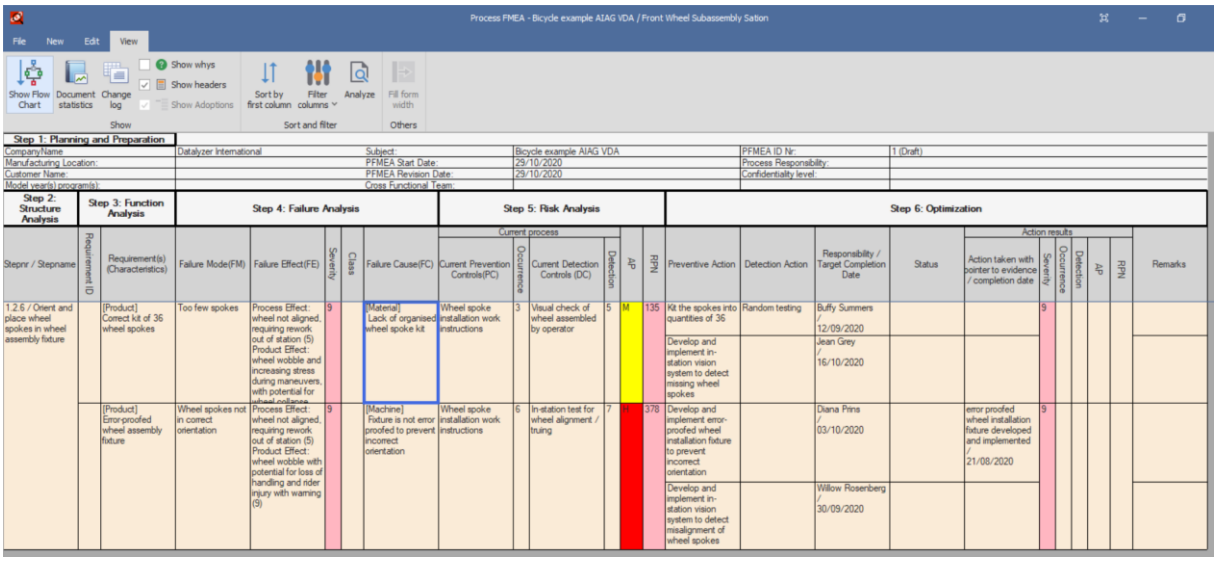
For **PFMEA** the 7 steps are as follows:

- **Step 1** - Planning and Preparation. In this step the Header information is filled out and the scope of the FMEA is decided.
- **Step 2** - Structure analysis. A more detailed breakdown of the manufacturing process is added. *Focus Element* of the PFMEA: the process step station number and name under review. *Next Higher Level*: process item system (the overall manufacturing process). *Next Lower Level process*: work element 4M type (based on Ishikawa approach). This encourages the users to consider the categories of Man, Machine, Material, Method, etc., leading to a more complete list of Failure Causes (FC.)
- **Step 3** - Function Analysis. Added the description of functions and requirements related to the Next Higher Level and Next Lower Level. This supports a clear and complete description of the Failure Effects (FE) and Failure Causes (FC).
- **Step 4** - Failure Analysis. Potential Failure Mode is replaced with Failure Mode (FM) of the Focus Element. Potential Effect(s) of Failure is replaced with Failure Effects (FE) to the Next

Higher-Level Element and / or Vehicle End User. Potential Cause of Failure is replaced with Failure Cause (FC) of the Work Element.

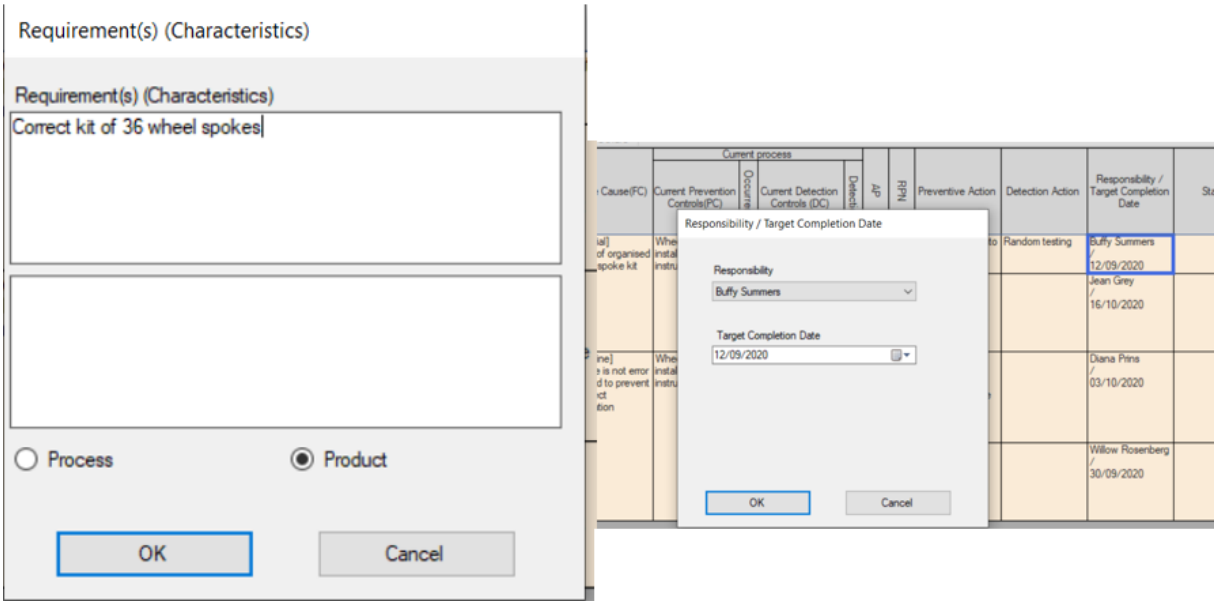
- **Step 5** - Risk Analysis. Classification is replaced with Special Characteristics and Filter Code. Occurrence is replaced with Occurrence of the FC. The Occurrence rating now is based on "prediction of FC occurring", which leads to determining the actual robustness of the Prevention Controls (PC). Current Process Control – Prevention is replaced with Current Prevention Control (PC) of the Failure Cause (FC). Current Process Control – Detection is replaced with Current Detection Control (DC) of the Failure Cause (FC) or the Failure Mode (FM). Detection is replaced with Detection of the FC or FM. Detection is now based on three factors: detection method maturity, opportunity for detection, and ability to detect. RPN is replaced with AP.
- **Step 6** – Optimisation: Recommended Action replaced with Preventive Action and Detection Action. Added the columns: Status (planned, decision / implementation pending, completed, discarded), Action Taken with pointer to evidence, Special Characteristic, and Remarks.
- **Step 7** - Results Documentation: Internal reporting to management and customer reporting.

In the AIAG VDA form in DataLyzer, this will look like the below example:



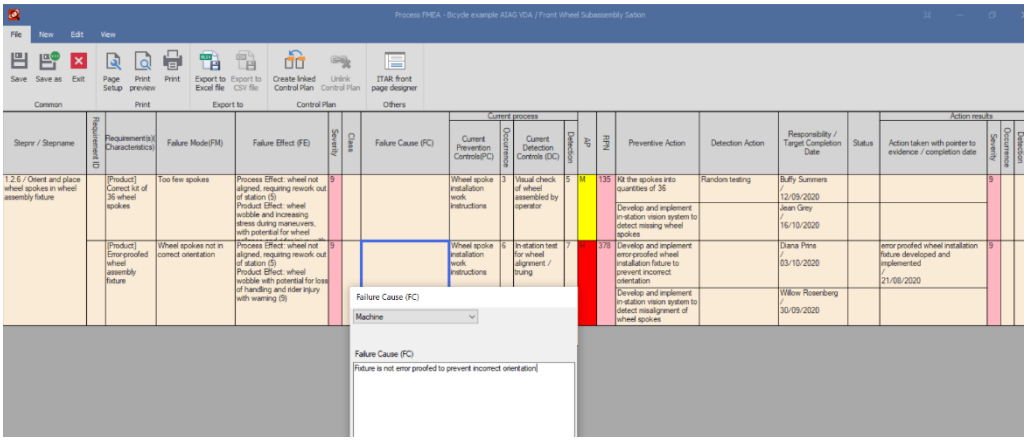
DataLyzer AIAG VDA format

As you may notice in the picture above, we have combined certain cells to make the AIAG VDA form easier to read on one page, as well make the most efficient use of the new columns. In the picture below we show some examples of combined cells. Some choices were made based on the structure in the software, and the way we link Flow Chart, PFMEA and CP. An example of this is using one column to set the product or process characteristics/ requirements, the column will state whether this concerns a product or process requirement, quantitative values can be added, and copied into the CP as characteristic and specification and tolerance.



Failure Cause

In step 4, the Failure Analysis, it is now recommended to use the 4 Ms as a source for Failure Causes. In DataLyzer FMEA you can use Cause Categories to add the 4 Ms as sources for the Failure Cause as follows:



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New Ranking Criteria

In step 5, Risk Analysis, the most important changes have been made to the Ranking Criteria. There are new tables for Severity, Occurrence and Detection. For Severity columns are added to include more information on impact to your plant, impact to ship to plant and impact to end-user.

Rank	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	High	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 is 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	
7	Moderately high	Product may have to be sorted and a portion (less than 100%) scrapped; deviation from primary process; decreased line speed or added manpower	Line shutdown from 1 hour up to full production shift; stop shipment possible; field repair or replacement required (Assembly to End User) other than for regulatory noncompliance	Degradation if primary vehicle function necessary for normal driving during expected service life	
6	Moderately low	100% of production run may have to be reworked off line and accepted	Line shutdown up to one hour	Loss of secondary vehicle function	
5	Moderately low	A portion of the production run may have to be reworked off line and accepted	Less than 100% of product affected; strong possibility for additional defective product; sort required; no line shutdown	Degradation of secondary vehicle function	
4	Moderately low	100% of production run may have to be reworked in station before it is processed	Defective product triggers significant reaction plan; additional defective products not likely; sort not required	Very objectionable appearance, sound, vibration, harshness, or haptics	
3	Low	A portion of the production run may have to be reworked in-station before it is processed	Defective product triggers significant reaction plan; additional defective products not likely; sort not required	Moderately objectionable appearance, sound, vibration, harshness, or haptics	
2	Low	Slight inconvenience to process, operation, or operator	Defective product triggers no reaction plan; additional defective products not likely; sort not required; requires feedback to supplier	Slightly objectionable appearance, sound, vibration, harshness, or haptics	
1	Very low	No discernible effect	No discernible effect or no effect	No discernible effect	

For Severity, Occurrence and Detection a new column is added to show Corporate or Product examples.

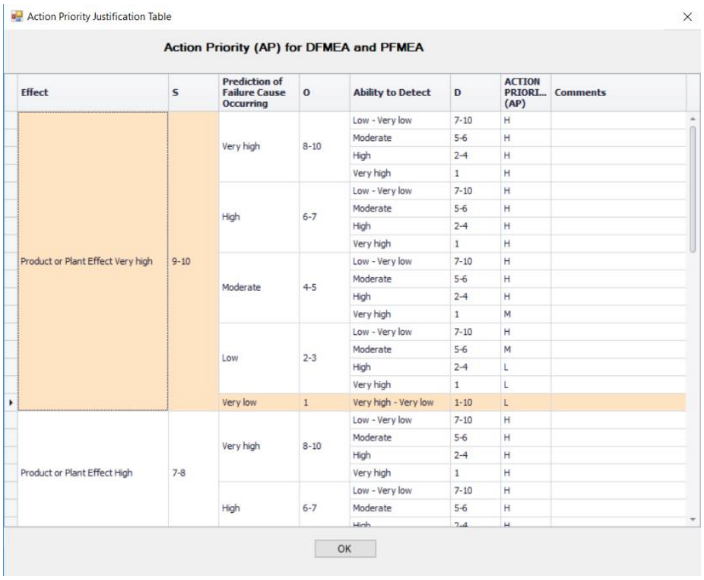
Rank	Prediction of Failure Cause Occuring	Type of Control	Prevention Controls	Corporate or Product Line Examples
10	Extremely high	None	No prevention controls	
9	Very high	Behavioural	Prevention controls will have little effect in preventing failure cause	
8	Very high	Behavioural	Prevention controls will have little effect in preventing failure cause	
7	High	Behavioural or Technical	Prevention controls somewhat effective in preventing failure cause	
6	High	Behavioural or Technical	Prevention controls somewhat effective in preventing failure cause	
5	Moderate	Behavioural or Technical	Prevention controls are effective in preventing failure cause	
4	Moderate	Behavioural or Technical	Prevention controls are effective in preventing failure cause	
3	Low	Best Practices: Behavioural or Technical	Prevention controls are highly effective in preventing failure cause	
2	Very low	Best Practices: Behavioural or Technical	Prevention controls are highly effective in preventing failure cause	
1	Extremely low	Technical	Prevention controls are extremely effective in preventing failure cause from occurring due to design (e.g. part geometry) or process (e.g. fixture or tooling design). Intent of prevention controls - Failure Mode cannot be physically produced due to the Failure Cause.	

For Detection there is a new focus on the maturity of the detection method:

Rank	Ability to Detect	Detection Method Maturity	Opportunity for Detection	Corporate or Product Line Examples
10	Very low	No testing or inspection method has been established or is known	The failure mode will not or cannot be detected	
9	Very low	It is unlikely that the testing or inspection method will detect the failure mode	The failure mode is not easily detected through random or sporadic audits	
8	Low	Test or inspection method has not been proven to be effective and reliable (e.g. plant has little or no experience with method, gauge R&R results marginal on comparable process or this application, etc.)	Human inspection (visual, tactile, audible), or use of manual gauging (attribute or variable) that should detect the failure mode or failure cause	
7	Low	Test or inspection method has not been proven to be effective and reliable (e.g. plant has little or no experience with method, gauge R&R results marginal on comparable process or this application, etc.)	Machine-based detection (automated or semi-automated with notification by light, buzzer, etc.), or use of inspection equipment such as a coordinate measuring machine that should detect failure mode or failure cause	
6	Moderate	Test or inspection method has been proven to be effective and reliable (e.g. plant has experience with method, gauge R&R results acceptable on comparable process or this application, etc.)	Human inspection (visual, tactile, audible), or use of manual gauging (attribute or variable) that will detect the failure mode or failure cause (including product sample checks)	
5	Moderate	Test or inspection method has been proven to be effective and reliable (e.g. plant has experience with method, gauge R&R results acceptable on comparable process or this application, etc.)	Machine-based detection (semi-automated with notification by light, buzzer, etc.), or use of inspection equipment such as a coordinate measuring machine that will detect failure mode or failure cause (including product sample checks)	
4	High	System has been proven to be effective and reliable (e.g. plant has experience with method on identical process or this application), gauge R&R results are acceptable, etc.	Machine-based automated detection method that will detect the failure mode downstream, prevent further processing or system will identify the product as discrepant and allow it to automatically move forward in the process until the designated reject unload area. Discrepant product will be controlled by a robust system that will prevent outflow of the product from the facility	
3	High	System has been proven to be effective and reliable (e.g. plant has experience with method on identical process or this application), gauge R&R results are acceptable, etc.	Machine-based automated detection method that will detect the failure mode in-station, prevent further processing or system will identify the product as discrepant and allow it to automatically move forward in the process until the designated reject unload area. Discrepant product will be controlled by a robust system that will prevent outflow of the product from the facility	
		Detection method has been proven to be effective and	Machine-based detection method that will detect the cause	

Action Priority

RPN numbers will be replaced with Action Priority. Where RPN counts Severity, Occurrence and Detection equally, Action Priority puts most emphasis on Severity, then Occurrence and lastly Detection. In DataLyzer FMEA we have implemented this as seen in the picture next to the text. Sometimes 3 categories are not enough to effective prioritize actions, therefore within DataLyzer FMEA it is also possible to show both RPN and AP next to each other.



Effect	S	Prediction of Failure Cause Occurring	O	Ability to Detect	D	ACTION PRIORI... (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	
				High	2-4	H	
				Very high	1	M	
		Low	2-3	Low - Very low	7-10	H	
				Moderate	5-6	M	
				High	2-4	L	
				Very high	1	L	
		Very low	1	Very high - Very low	1-10	L	
Product or Plant Effect High	7-8	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	

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