FMEA for Monitoring and System Response

A new handbook published jointly by AIAG and VDA, providing an insight into guidelines for conducting FMEA (demonstrative version published in 2017), aside from a substantial innovation in terms of approaching the risk analysis and withdrawal from RPN calculation as a product of *severity, occurrence and detection,* contributes considerably to the process of analyzing itself. One of the new features is FMEA-MSR.

The purpose of the analysis of FMEA for Monitoring and System Response (FMEA-MSR) is to identify how systems may fail when used by a final customer. It should be used to supplement DFMEA (that is structure FMEA).

FMEA-MSR is supposed to help keep safety and compliance with legal regulations (concerning the environmental protection) when using products by the final customer. It encompasses potential failures which may occur under normal working conditions, and their direct impact on the system. The essential purpose of the analysis is to establish whether the system or final user can detect a failure, if any.

This method performs well as a supplement for hardware and software operation, that is components and systems with built-in software. The approach is combined with HARA (*The Hazard Analysis and Risk Assessment)* pursuant to ISO 26262 and ASILs (*Automotive Safety Integrity Levels).*

Nowadays MSR is necessary to ensure a proper collection of diagnostic data of the car and make these data user-friendly for vehicle user and manufacturer. Information cascade supports managing potential complaints and market recalls. Each of these issues can help you save money as early as at the stage of creating a product and its operation.

The risk assessment in this approach is composed of 6 stages (analogical to new approach to DFMEA and PFMEA) and starts with building a tree which includes systems and subsystems as well as their intended and unintended functions. A similar analysis sequence has long been known thanks to VDA approach and VDA 4.2. handbook. If you have already cooperated with German customers, then FMEA compliant with VDA is made in a similar manner.

A detailed analysis starts from establishing the *severity* level. Here the table does not deviate from DFMEA's table in the new handbook and focuses on effects for the user. The table supporting the occurrence frequency assessment contains information on how often the vehicle use problems occur or may occur. Occurrence frequency descriptions refer to the intended service life of the vehicle.

Detection assessment has been replaced with monitoring criteria assessment. Here you can clearly see a reference to product hardware and/or software (products with built-in software). To determine the size of this criterion, you must check if it is possible to detect the problem by the vehicle system or user (driver). Another aspect which needs to be taken into consideration is certainly the system response, that is solution which assures a desired system response or user's action.

Determining particular points lets you assess risk at 3 levels: high, small, medium. The table included in the handbook does not refer in any way to RPN number but to new AP measure (Action Priority). This measure shows if the specific failure is properly monitored, detected and if the system/driver responds or has a chance to respond/react in accordance with intended method.

The example of practical adoption of the approach to data collection is Tesla car which is able to anticipate potential road collision. To see the mechanism, please watch the video: https://youtu.be/QO1elT85Vmg.

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