BLACKSMITH Consulting

DFMEA and PFMEA pedagogy enabling customer triggered product evolution

How to ensure that customer and operating environment requirements are fully integrated into product design and manufacturing? How can proactive methods eliminate internal and customer quality errors? What are the proven methods used by the International Automotive industry to address and tackle these challenges?

FMEA pedagogy is the essence of the whole Quality System and Product Development initiative – as a good reference SAE recommended practice J1739 which was jointly developed by Daimler, Ford Motor Company and General Motors. FMEA, automotive supplied pre-requisite, is an analytical quality improvement tool that embodies technology and experience of people in foreseeing failure modes of a product, process, design or service and planning on its elimination.

FMEA of each manufacturing process is driven from within its process flowcharts. Rather than a solid document (to pass an audit) it is a “living” tool that recognizes and evaluates the potential failure modes of a product, process or service, its potential effects and root causes. It then offers actions that would lead to eliminating the failures or reducing their occurrence.

FMEA documents the whole process thoroughly and reviews and updates it when changes to a particular product, process, design or service have been proposed. FMEA should also act as a catalyst to excite the exchange of ideas between Design, Quality and other key functions and departments affected, hence promoting an interactive and cross functional team approach to tackle the quality challenges.

ABBREVIATIONS

FMEA [Failure Mode and Effect Analysis]

FMECA [Failure Mode, Effect and Criticality Analysis]

DFMEA [Design Failure Mode and Effect Analysis]

PFMEA [Process Failure Mode and Effect Analysis]

SAE [Society of Automotive Engineers]

RPN [Risk Priority Number]

96%

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The way it works that there is a DFMEA (Design Failure Modes and Effects Analysis). It is the starting point and the top of the Quality Sequence. The modes are addressed and trickled down to the PFMEAs (Process Failure Modes and Effect Analysis). There needs to be a link established between the two and every good auditor is going to look for it. The Control Plans come off of the PFMEAs and from the Control Plans the Work Instructions come. There is a link between them all starting with the DFMEA.

All major Automotive and Industrial OEMs look for a clear linkage from the Design Phase which is driven by Customer/Field/Current process experience. A company cannot have a complete Quality Sequence without the DFMEA because it is in the Product development stage that we develop product risk assessment as a function of Customer response and current Production process capability.

The RPN synthesis of the PFMEA is a risk assessment and actions against processes first delineated at the DFMEA level. It is an important dynamic document the continuously builds over time: constant updates to the DFMEA and PFMEA are the drives for World Class Quality. Of course, also essential is the measurement system analysis studies, including Gauge R&R.

The DFMEA and an understanding on how design and customer risk plays into the Quality System should be transferred to supply chain and factory floor level as an important part of the Quality Sequence. This could be called as “Customer Triggered Product Evolution”. This is where the story begins and it is in the synthesis of our Customer experience where the reliability breakdown starts with the first page of the DFMEA with a complete Boundary Diagram. This all links to failure codes and is quantified as the Labor Claims analysis, all of the Warranty breakdown, Customer Service breakdown and is what should drive the Quality Improvement in the Factory. It’s all meant to” feed” the DFMEA and start the continuous improvement initiative trickling down through the Quality Sequence. This then derivates to initiative to “feed” dynamic risk improvement (as measured by the RPN number).

The BlackSmith Consulting FMEA Advantages:

- Links the Customer/Field/Current process experience with Quality and Process Control tools and parameters
- Drives down the cost of quality and improves the production / operational reliability
- Offers platform of systematic and continuous improvement driving profitability improvements
- Increases customer satisfaction across the supply chain to the end-user level
- Aligns manufacturing operations with the requirements of International Automotive Industry Best Practices
- Establishes a reliability infrastructure that drives the whole business based on Customer “risk”

BlackSmith Consulting consolidates years of experience and offers the Best Practices both from Academic world as well as international Automotive and Industrial business. The DFMEA/PFMEA pedagogy applied has been developed based on the experiences gained collaborating with Fortune 500 companies on highly advanced engineered product and systems (i.e. thermal management and climate control systems).