The 10 Most Common FMEA Mistakes

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Learning Objectives:
The 10 Most Common FMEA Mistakes

- Students who attend this webinar will learn the following:
  - The most common mistakes in performing any type of FMEA
  - The quality objectives for achieving uniformly effective FMEAs

What response do you get when you mention FMEA?

- Few reliability tools elicit stronger responses from quality and reliability professionals than Failure Mode and Effects Analysis.
- Reactions around the virtual “water cooler” range from
  - “waste of time, lack of support” and “don’t want anything to do with it”
  - all the way to “powerful tool, effective way to prevent problems” and “needs to be done across the boards.”

Question

- Why is there so much variation in the application of a tool that has been around for many decades?
- What can be done to help achieve more uniformly successful results?

FMEA Success Factors

There are four broad success factors that are critical to uniformity of success in the application of FMEA in any company:

1. Understanding the basics of FMEAs and Risk Assessment
2. **Applying key factors for effective FMEAs**
3. Providing excellent FMEA facilitation
4. Implementing a “best practice” FMEA process

FMEA Fundamentals

- There are many courses and tutorials that exist covering the *basics* of FMEAs.
- It is essential to the success of FMEA applications that the FMEA facilitator and team thoroughly understand and can apply these basics.
- Basics include FMEA terminology and how to perform FMEAs.
- Understanding the fundamentals of FMEA must be done thoroughly, without short cut.

Review

Failure Mode and Effects Analysis (FMEA) is a methodology designed to:

- Identify *and fully understand* potential failure modes for a product or process
- Assess the risk associated with those failure modes and prioritize issues for corrective action
- Identify and carry out corrective actions to address the most serious concerns

The primary objective of FMEAs is to improve product designs or manufacturing processes.

The secondary objective is to improve Design Verifications Plans (DVPs) or Process Control Plans (PCPs)

Key Factors for Effective FMEAs

This Webinar will focus on the second success factor: "Applying key factors for effective FMEAs"

- As the saying goes . . . "Good judgment comes from experience and experience comes from poor judgment"
  - *What are the primary ways that FMEA can be done wrong? (Mistakes)*
  - *What are the Key Factors that make for effective FMEAs? (Quality Objectives)*

[The following material is excerpted from the book *Effective FMEAs, by* Carl S. Carlson, published by John Wiley & Sons, © 2012]

Mistake #1

Failure to Drive Design or Process Improvements

- Some FMEAs do not drive any action at all
- Some FMEAs drive mostly testing
- Some FMEAs drive ineffective action

Quality Objective #1

The FMEA drives product design or process improvements as the primary objective

A Note on Quality Objective #1

- Reliability Engineering has a multitude of tools to choose from in driving design or process improvements
- The key is to use the FMEA “Recommended Actions” field to identify and execute best practice tools that can optimize designs
- This is one of the reasons that Reliability Engineers need to participate in FMEAs

Mistake #2

Failure to Address All High Risk Failure Modes

- Risk thresholds can be defined by FMEA Team or set as company policy
- In addition to high RPN or criticality, high severity must be addressed
- Some companies fail to take effective action on all high risk failure modes

Quality Objective #2

The FMEA addresses all high-risk failure modes with effective and executable action plans

A Note on Quality Objective #2

- The emphasis on this Quality Objective is to ensure that all of the high risk failure mode/causes are adequately addressed with effective actions.
- Company policy or the FMEA team will define which RPNs or Criticality will rise to the level of high risk
- The key is effective action that reduces or eliminates the risk

Mistake #3

Failure to Improve Test/Control Plans

- Some companies miss the opportunity to improve DVP (Design Review Plan) or Process Control Plans based on failure modes from FMEA
- Some FMEA teams do not include knowledgeable reps from test department
- Result is inadequate testing or control plans

Quality Objective #3

The Design Verification Plan (DVP) or the Process Control Plan (PCP) considers the failure modes from the FMEA

A Note on Quality Objective #3

- The FMEA team will often discover failure modes/causes that were not part of the Design Controls or Test Procedures
- The key is to ensure that the Test Plan (DVP) or Control Plan is impacted by the results of the FMEA
- This can be done by including test/control membership on FMEA team or through well written actions

Mistake #4

Not Including Interfaces in the FMEA

- Empirical data shows that at least 50% of field problems can occur at interfaces
- Some companies focus on part or subsystem failures and miss the interfaces

Quality Objective #4

The FMEA scope includes integration and interface failure modes in both block diagram and analysis

A Note on Quality Objective #4

- Interfaces can be included as part of the item by item analysis or as a separate analysis
- It is recommended that the preliminary FMEA Block Diagram clearly show the interfaces that are part of FMEA scope

Mistake #5

Disconnect from Field Lessons Learned

- Some companies provide no linkages between FMEAs and field data
- It takes concerted effort to integrate problem resolution databases with FMEA
- Otherwise serious problems are repeated

Quality Objective #5

The FMEA considers all major "lessons learned" (such as high warranty, campaigns, etc.) as input to failure mode identification

A Note on Quality Objective #5

- Field failure data can be brought into generic FMEAs on a regular basis
- Then, when new program-specific FMEAs are started, they benefit from field lessons learned
- If generic FMEAs are not used, new FMEAs should be seeded with potential field problems and show how they will not be repeated in the new design/process
- The key is to hold the FMEA team responsible to ensure that major field problems are not repeated

Mistake #6

Wrong Level of Detail in the Analysis

- Some FMEAs go into too much detail
  - makes it difficult to focus on areas of higher risk
  - “missing the forest for the trees.”
- Some FMEAs go into too little detail
  - makes it difficult to determine root cause and effective corrective actions.

Quality Objective #6

The FMEA provides the correct level of detail in order to get to root causes and effective actions

A Note on Quality Objective #6

- Good FMEA facilitation keeps the team focused on areas of risk that lead to root causes and corrective actions.
- FMEA discussion should be limited to areas of concern by team members, and avoid lengthy discussions on low-risk issues.
- The higher the risk the more important and in depth should be the discussion.
- Lower risk issues should receive less, but appropriate discussion.

Mistake #7

Doing FMEAs Late

- Many companies do FMEAs late and this reduces their effectiveness
- FMEAs should be done concurrently with the design process and completed by design or process freeze dates

Quality Objective #7

The FMEA is completed during the "window of opportunity" whence it can most effectively influence the product or process design

A Note on Quality Objective #7

FMEAs need to be done during the "window of opportunity" to best impact design of product or process.

For Design FMEAs:

- Too early: before design concept is established
- Too late: after design freeze
- Ideal: while design of product is being developed

For Process FMEAs:

- Too early: before manufacturing or assembly concept is established
- Too late: after manufacturing or assembly process is finalized
- Ideal: while design of the manufacturing or assembly process is being developed

Mistake #8

Inadequate Team Composition

- Some FMEA teams do not have the right experts on the core team
- Some FMEA teams do not have good attendance
- Some FMEA team members just sit in their chairs and don't contribute to team synergy

Quality Objective #8

The right people are adequately trained in the procedure and participate on the FMEA team throughout the analysis

A Note on Quality Objective #8

- People have blind spots
- Key is to get the people who are knowledgeable and experienced about potential failures and their resolutions actually showing up at the meetings
- Attendance takes management support
- Team size is best between 4 and 8 people
- If team gets too large, consider breaking up the FMEA into additional limited scope FMEAs

Mistake #9

Improper Procedure

- There are hundreds of ways to do FMEAs wrong
- Some companies do not encourage or control proper FMEA methodology
- Training, coaching and reviews are all necessary to success

Quality Objective #9

The FMEA document is completely filled out "by the book," including "Action Taken" and final risk assessment

A Note on Quality Objective #9

- One of the most common FMEA errors is to fail to get to root cause
- Expert input is necessary
- Follow-up actions based on poorly defined causes will not work and FMEA will not be successful

Mistake #10

Lack of Efficient Use of Time

- Some companies mandate FMEAs, then do not ensure the time is well spent
- Preliminary work must be completed, meetings well run and high risk issues efficiently followed up
- Ask FMEA team if their time is well spent and take action to address shortcomings

Quality Objective #10

The time spent by the FMEA team is an effective and efficient use of time with a value-added result

A Note on Quality Objective #10

- If this Quality Objective is met, then future FMEAs will be well attended and supported by subject matter experts and management

FMEA Quality Objectives

1. DESIGN IMPROVEMENTS *The FMEA drives product design or process improvements as the primary objective.*
2. HIGH RISK FAILURE MODES *The FMEA addresses all high-risk failure modes with effective and executable action plans.*
3. DVP/CONTROL PLAN *The Design Verification Plan (DVP) or the Process Control Plan (PCP) considers the failure modes from the FMEA.*
4. INTERFACES *The FMEA scope includes integration and interface failure modes in both block diagram and analysis.*
5. LESSONS LEARNED *The FMEA considers all major "lessons learned" (such as high warranty, campaigns, etc.) as input to failure mode identification.*

FMEA Quality Objectives

6. LEVEL OF DETAIL *The FMEA provides the correct level of detail in order to get to root causes and effective actions.*
7. TIMING *The FMEA is completed during the "window of opportunity" whence it can most effectively influence the product or process design.*
8. TEAM *The right people are adequately trained in the procedure and participate on the FMEA team throughout the analysis.*
9. DOCUMENTATION *The FMEA document is completely filled out "by the book," including "Action Taken" and final risk assessment.*
10. TIME USAGE *Time spent by the FMEA team is an effective and efficient use of time with a value added result.*

Summary

- FMEA practitioners can learn from the most common mistakes, and turn them into quality objectives.
- These 10 FMEA quality objectives should become the focus for FMEA quality.
- FMEAs that meet all 10 quality objectives are excellent FMEAs, and will help achieve safety and reliability goals.

More Information

- This webinar was based on the book *Effective FMEAs*, by Carl S. Carlson, published by John Wiley & Sons, © 2012
- Information about the book and links to useful FMEA articles and aids can be found on www.effectivefmeas.com.
- If you have questions or comments about this webinar, the subject of FMEAs, or the book *Effective FMEAs*, please send an email to the author at Carl.Carlson@EffectiveFMEAs.com.

Next Webinar:
How to audit FMEAs using quality objectives

- The FMEA quality audit procedure is an essential part of ensuring good quality FMEAs. Yet, little is written on how to perform a positive and beneficial FMEA audit process.
- A high-quality FMEA is not attained merely by filling out a form.
- FMEAs must achieve each of the quality objectives. The purpose of an FMEA audit is to assess how well the FMEA quality objectives are achieved. The results of the audit provide valuable feedback to improve future FMEAs.

Author Biography

- Carl S. Carlson is a consultant and instructor in the areas of FMEA, reliability program planning and other reliability engineering disciplines, currently supporting clients of ReliaSoft Corporation.
- He has 30 years experience in reliability testing, engineering, and management positions, including manager of product reliability at General Motors.
- He co-chaired the cross-industry team that developed the commercial FMEA standard (SAE J1739, 2002 version) and was a past member of the Reliability and Maintainability Symposium (RAMS) Advisory Board.
- He holds a B.S. in Mechanical Engineering from the University of Michigan, is a senior member of ASQ and a Certified Reliability Engineer.
- He is the author of “Effective FMEAs”, published by John Wiley & Sons, 2012. He can be reached at Carl.Carlson@EffectiveFMEAs.com. Information about the book and useful aids to performing FMEAs can be found on www.effectivefmeas.com.