

## ***Effective FMEAs***

Written by Carl S. Carlson, published by John Wiley & Sons, © 2012

### **Chapter Descriptions**

The following are excerpts from the opening paragraph to each chapter of the book, under the heading of “In this chapter.”

#### **Chapter 1: The Case for Failure Modes and Effects Analysis**

##### **In this chapter**

Companies and industries across the globe are cutting costs and shortening development times. Yet high reliability and impeccable safety are essential to customer satisfaction and financial viability. This chapter introduces Failure Mode and Effects Analysis, highlights FMEA successes, and illustrates how FMEA improves reliability and safety while reducing warranty costs in a variety of industries. This chapter makes the case for FMEA.

#### **Chapter 2: The Philosophy and Guiding Principles for Effective FMEAs**

##### **In this chapter**

One of the keys to effective FMEAs is for the entire FMEA process to be driven by the correct philosophy, meaning that the approach is based on the vital few guiding principles that support achieving high reliability in today’s competitive environment. This chapter lays out the primary focus areas for doing timely FMEAs effectively. The remaining chapters in this book build on these guiding principles.

#### **Chapter 3: Understanding the Fundamental Definitions and Concepts of FMEAs**

##### **In this chapter**

What exactly is FMEA and what are its key concepts and definitions? This chapter explains the different types of FMEAs and tells how each is used. The majority of the chapter covers a thorough explanation of the key words and concepts of FMEA, each illustrated with multiple application examples for different types of FMEAs.

#### **Chapter 4: Selection and Timing of FMEA Projects**

##### **In this chapter**

This chapter explains the primary selection criteria for FMEA projects and outlines when to do the different types of FMEAs. A technique called Preliminary Risk Assessment is also included, which uses specific selection criteria to identify the most important FMEA projects. The chapter ends by introducing the all-terrain bicycle case study, subsequently used to teach FMEA concepts throughout the book.

## **Chapter 5: How to Perform an FMEA Project – Preparation**

### **In this chapter**

Proper preparation is essential to success in any FMEA project. This chapter outlines the step-by-step tasks that need to be done *one time* to prepare for future FMEA projects, as well as the tasks that need to be done for *each new* FMEA project. Various preparation checklists are included. Each preparation step is illustrated with an example of how the specific step would be done on a bicycle FMEA project.

## **Chapter 6: How to Perform an FMEA Project – Procedure**

### **In this chapter**

As soon as the FMEA preparation steps are completed, work can begin with the FMEA team on the FMEA procedure. This chapter outlines in detail the basic procedure for doing FMEAs, from items through calculation of Risk Priority Numbers, thoroughly explaining each step in the sequence. The emphasis is on how to apply the FMEA procedure in real-world applications. Sample FMEA forms are included (in the appendix). The application of each step in the FMEA procedure is further illustrated with the use of a bicycle example for System, Subsystem, Component and Process FMEAs.

## **Chapter 7: How to Develop and Execute Effective Risk Reduction Actions**

### **In this chapter**

Once the FMEA team has performed the analysis up through RPN calculation, the important work of defining and executing effective actions can begin. This chapter explains how to prioritize issues for corrective action, outlines how to identify and implement the most effective action strategies, and provides key enablers for removing roadblocks to successful execution of FMEAs objectives.

## **Chapter 8: FMEA Case Studies**

### **In this chapter**

This chapter presents a series of case studies on the application of FMEA, in a variety of industries and applications. Five of the case studies are from actual industry applications. Two of the case studies draw from catastrophic events and are included for teaching analysis. The remaining three case studies are fictional examples that provide insight into FMEA application for teaching purposes. Each case study is further evaluated with end of chapter problems.

### **Chapter 9: Lessons Learned for Effective FMEAs**

#### **In this chapter**

Much is learned by observing the mistakes companies have made in doing FMEAs. Based on the experience of over two thousand FMEAs and working with many companies in a wide variety of applications, certain common mistakes show up repeatedly. This chapter outlines the most common FMEA mistakes and describes how to avoid them. FMEA Quality Objectives are described, along with an effective FMEA audit procedure.

### **Chapter 10: How to Facilitate Successful FMEA Projects**

#### **In this chapter**

FMEA teams need the leadership of someone who is skilled in team leadership and facilitation. This chapter outlines the primary FMEA facilitation skills that ensure success in FMEA applications, as well as the central elements for conducting effective meetings. Included in this chapter are techniques to resolve difficult facilitation problems, and maximize team creativity. The chapter also outlines the unique roles and responsibilities of the FMEA facilitator in performing each of the steps of the FMEA procedure.

### **Chapter 11: Implementing an Effective Company-Wide FMEA Process**

#### **In this chapter**

FMEA teams require vigorous support by management with specific strategies and reviews. This chapter outlines a company-wide FMEA process that will result in effective implementation of FMEA projects. The specific roles and responsibilities of management are explained, along with lessons learned from successful and unsuccessful FMEA implementations.

### **Chapter 12: Failure Mode Effects and Criticality Analysis (FMECA)**

### **In this chapter**

Some companies choose to add or are mandated to add a Criticality Analysis to the FMEA procedure, according to specific procedures. This chapter introduces FMECA and explains how it is different from FMEA. The Criticality Analysis is detailed here, including both Quantitative and Qualitative Criticality Analysis. Also included are an outline of FMECA history and specific FMECA scales, standards and examples.

### **Chapter 13: Introduction to Design Review Based on Failure Modes (DRBFM)**

#### **In this chapter**

Many companies are incorporating DRBFM along with FMEA. This chapter introduces the DRBFM methodology, explains how it is different from FMEA, when it should be used, and how it is done. Also covered is a brief history of DRBFM, the DRBFM procedure, DRBFM case studies, available DRBFM references and a section on Design Review Based on Test Results (DRBTR).

### **Chapter 14: Introduction to Fault Tree Analysis (FTA)**

#### **In this chapter**

There are times when it is essential to avoid an undesirable event or other high-risk situation that has numerous and complex potential contributors. This chapter is a brief overview of FTA and how it relates to FMEA, including its history, procedures and examples. Practitioners who will be doing FTA projects are encouraged to do further study or training on FTA.

### **Chapter 15: Other FMEA Applications**

#### **In this chapter**

Many variants of FMEA build on the basic FMEA principles for unique applications. This chapter discusses Reliability-Centered Maintenance, Hazard Analysis, Concept FMEA, Software FMEA, a focused type of FMEA called Failure Mode, Mechanism and Effects Analysis (FMMEA), and a type of FMEA used to develop online diagnostic techniques called Failure Modes Effects and Diagnostic Analysis (FMEDA). Each section includes the basic definitions, a brief history, and a short summary of the fundamental concepts, procedures and examples.

### **Chapter 16: Selecting the Right FMEA Software**

#### **In this chapter**

Using good relational-database software is an essential element for an effective FMEA program in any company. In this chapter, the important characteristics for selection of the best FMEA software are outlined and discussed.

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