

How to Organize and Run a Failure Investigation

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Preface

This book presents a proven systematic approach and template to advance a failure investigation, including a discussion of the methodology required, organizational tools, and a review of failure investigation concepts. This book provides a learning platform for personnel from all disciplines: materials, design, manufacturing, quality, and management. Guidance is provided in areas such as learning how to define objectives, negotiating the scope of an investigation, examining the physical evidence, and applying general problem-solving techniques.

The systematic approach explained herein examines the relationship between various failure sources (e.g., corrosion) and the organization and conduct of the failure investigation. The examples provided focus on the definition of and requirements for a professionally performed failure analysis of a physical object or structure. However, many of the concepts learned have broader applicability in other areas of business, manufacturing, and life in general.

Professional failure analysis is a multilevel process that includes the metallurgical analysis of the physical part itself, and also much more. This book is intended to showcase some of the latest thinking on how the different “layers” of a failure investigation process should work together leading to a concise, well-supported and well-documented root cause, resulting in corrective action when the investigation is complete.

Failure investigations cross company functional boundaries and are an integral component of any design or manufacturing business operation. Learning the proper steps to organize and professionally conduct investigations is essential for solving manufacturing problems and assisting with redesigns. Examples of how competent materials engineers can use these concepts in a failure investigation are emphasized here.

After completing this book, readers shall have the mindset that a well-organized failure investigation is the proper method and will take action to apply the concepts learned. At first, it may be difficult for your customers to appreciate the time and effort it takes to conduct a successful failure

investigation. Perhaps they want you to conduct their investigation a specific way and according to their preferences. They may already have a “silver bullet theory” they just want you to confirm. Remember, Rome was not built in a day. You will not convince anybody in five seconds; it takes time. Once your customers see how well the methods presented in this book work and how convincingly the evidence leads to the root cause and corrective actions, they will come around. Readers shall come to appreciate that a few hours spent in preparation may save a lot of time and money and may even be the key to achieving a successful conclusion to the failure investigation.

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February 2, 2005

About the Author

Dr. Daniel P. Dennies, FASM, is an Associate Technical Fellow for the Boeing Company and has 25 years of experience as a metallurgist. The majority of his career has been in the U.S. space and aerospace industries working on projects such as the Space Shuttle Main Engine, the National Launch System, the National Aerospace Plane, expendable launch systems like Delta and Titan, and most recently, the International Space Station and Space Shuttle programs. He is an expert in failure analysis and also works as an expert witness. Dr. Dennies is a recipient of the coveted NASA Silver Snoopy Award.

A member of ASM for 25 years, Dr. Dennies was named a Fellow of ASM in 2002. He has held positions on local as well as national committees. He has served as chair of the ASM Chapter Council and has participated as a “Materials Mentor” at Materials CampsSM sponsored by the ASM Materials Education Foundation since the program began in 2000. Dr. Dennies is currently serving on the Foundation’s Board of Trustees. He is also a contributing editor to ASM’s *Journal of Failure Analysis and Prevention* and teaches the ASM course, “How to Organize and Run a Failure Investigation.” Dr. Dennies received the 2002 ASM Materials Engineering Institute Instructor of Merit Award and the 2004 ASM International Allan Ray Putnam Service Award.

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