

11D Physics of Failure (PoF) - Tools and Methodologies

Presenter

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Session Summary

Failing to understand basic mechanisms for part and system failures is at the heart of some very expensive, high profile warranty claims. Almost on a daily basis we hear of product recalls, safety warnings, and in some cases personal injuries caused by a product or service. We are left to wonder: what went wrong? Fully understanding the cause or causes of failure requires knowledge of how things fail due to their application environments, material properties, design margins, and user interface.

The Physics of Failure (PoF) reliability approach analyzes the physical basis of an item's design, manufacturing and application to determine the underlying mechanism for failure. This process is accomplished by using laboratory testing and physical analysis of either the actual item or some representative model to understand a potential failure mechanism. An alternative approach is to simulate basic physical and chemical design models to determine fundamental knowledge of potential failure mechanisms. Knowledge derived from these simulations is then applied to identify, understand, and prevent potential mechanisms leading to failures that are due to design and manufacturing deficiencies or application stresses.

This presentation details the application of the PoF approach to hardware design as a preventive and as a failure analysis tool. Session topics include:

- Physics of Failure Overview
- Traditional vs. PoF Techniques
- Benefits of PoF
- Tools
- Electronics applications
- Mechanical applications
- Summary
- Conclusion

About the Presenters – Kenneth P Rispoli and Leroy Gould

Kenneth P. Rispoli, Sr. Principal Engineer, Failure analyst-Material Engineering Department Staff, Raytheon Company. Ken is responsible for failure analysis of semiconductor, electronic, and electro-mechanical devices and assemblies at Raytheon's Material Engineering. He has over 30 years experience in the fields of component evaluation, failure analysis, and application engineering and specification. Recent work includes the assessment and integration of COTS electronics in military systems using Failure Mode and Effects Analysis (FMEA), together with physics of failure methodologies. Ken is an active member of the Electronic Device Failure Analysis Society and the IEEE. He is an instructor of Statistical Process Control and Design of Experiments, and holds a BS in Electrical Engineering from Merrimack College, along with an MS in Electrical and Computer Engineering from the University of Massachusetts, Amherst.

Leroy Gould, Senior Electrical Engineer, Failure Analyst-Reliability Analysis Lab. Lee has over 35 years experience in the field of Reliability Test Engineering and Failure Analysis, and is a Senior Electric Engineer in the Reliability Analysis Laboratory in Tewksbury, MA. Recent works includes Destructive Physical Analysis and Counterfeit Part Detection. Lee holds degrees in Electronics Engineering and Industrial Technology from Northeastern University. In addition, he was an instructor in the field of Computer Applications for 12 years at Massasoit Community College and Northeastern University.