24B - Service Life Estimation Analysis

Presenter

Harry I. Saraidaridis, Lead Reliability Engineer, iRobot Corporation - Government & Industrial Division
saraidaridis@ieee.org

Session Summary

One key area of concern in today's electronic systems for the telecommunications and defense markets is service life. This is essential for high availability and cost sensitive systems. *Service life* is defined as the useful life of a fielded system during which the system performs according to its specification, and during which time its failure rate is constant (for all practical purposes) and free of any wear-out failure mechanisms with rapidly increasing failure rate. Usually customers for such systems require a service life of up to 10 years or higher and/or a specified number of missions.

This presentation provides guidelines for performing a service life estimation analysis. That involves establishing service life requirements and goals at multiple levels: system level and its sub-systems, assemblies and components. When performing such an analysis, key factors such as environment (temperature, humidity, shock and vibration, etc.), application (electrical stress, power dissipation, etc.), and field system usage must also be considered, since these factors have a significant impact on system service life. Consequently, such an analysis and its results focus on the use of part selection and derating strategies to meet customer service life requirements.

A service life estimation analysis focuses on investigating all the parts in the bill of materials, and on identifying components or modules with service life limitations. Certain electronic components and electro-mechanical parts or modules have known service life limitations. For example, an aluminum electrolytic or gold capacitor has a limited service life, and is highly dependent on the operating temperature; its endurance life doubles for every 10ºC decrease in ambient operating temperature. Storage drives like hard disk drives have limited service life, and are highly dependent on temperature, usage, and shock and vibration. This analysis also addresses mechanical parts and modules like fans, motors, and bearings. These parts are challenging and require a very careful analysis to ensure that the failure rate due to wear-out mechanisms does not exceed the service life requirements. The presentation includes an example of service life estimation analysis for parts with service life limitations such as batteries, connectors, relays and switches, uPs and ASICs, optical devices and modules, EEPROMs and Flash Memories, etc.

About the Presenter - Harry I. Saraidaridis

Harry I. Saraidaridis is a Lead Reliability Engineer with iRobot Corporation. Harry has extensive experience in planning, implementing and managing a reliability program across all product cycle phases (from concept to retirement) of telecommunications and military systems, while working for AT&T/Lucent Technologies Bell Laboratories, Raytheon IDS, Motorola ECC, and iRobot. He was involved in all aspects of RAM (reliability, availability, and maintainability) programs and tasks, including RAM requirements and allocation (at system, board and component level), failure rate modeling using probabilistic distributions, reliability prediction and service life estimation, FMECA and FTA, part selection and derating guidelines, part qualification testing, accelerated stress testing (HALT and HASS), statistical analysis of data (life test, factory test, field returns, and repair data), process re-engineering, and insight into telecommunications (Telcordia) and military standards.

Harry is a member of IEEE and IEEE Reliability Society, Boston Chapter. He has a BS in Mathematics and Physical Science from Eureka College and an MS and PhD in Statistics from Case Western Reserve University.