RELIABILITY TOOLS AND INTEGRATION FOR OVERALL RELIABILITY PROGRAMS

OBJECTIVE

In order to minimize total Life Cycle Costs (LCC), a Reliability Engineer must do two things: 1) choose the best reliability tools from all of the tools available and must apply these tools at the proper phases of a product life cycle, and 2) properly integrate these tools together to assure that the proper information is fed forward and backwards at the proper times. This course will review each of these tools, describing what they are, when to use them, and how to integrate them in with the rest of the program.

As part of the course, we will learn about Reliability Integration, the process of seamlessly and cohesively integrating reliability tools together to maximize reliability and at the lowest possible cost.

WHO SHOULD ATTEND

This course is intended for anyone involved in the design, testing, or manufacturing of a product.

OUTLINE

- **Elements of a Reliability Program**
  - Basic Definitions
  - Reliability vs. Cost
  - Product Life Cycle Matrix
  - Integration Phases
    - Integration in the Concept Phase
    - Integration in the Design Phase
    - Integration in the Prototype Phase
    - Integration in the Manufacturing Phase
- **Phase I: Integration in the Concept Phase**
  - Benchmarking
    - Definition
    - Different types of benchmarking
      - Product Benchmarking
      - Process Benchmarking
    - How to perform
    - How the results of benchmarking lead to a gap analysis
  - Gap Analysis
    - Definition
    - How to perform
    - Using Benchmarking and the Gap Analysis to help write the Reliability Program and Integration Plan.
  - Reliability Program and Integration Plan
    - Definition
    - How to define the elements of the plan
    - Where to get the metrics
    - Defining the schedule
    - Integrating all of the activities together within the Plan

- **Phase II: Integration in the Design Phase**
  - Reliability Modeling and Predictions
    - Objectives of a Reliability Prediction
    - Standards Available
    - General Assumptions
    - Inputs Required
    - Available Methods
    - Multiplier Factors
    - Examples
    - How to use Modeling and Predictions in preparation for HALT and HASS
  - Failure Modes, Effects, and Criticality Analysis (FMECA)
    - Objectives of a FMECA
    - Standards Available
    - Design FMECA
    - User FMECA
    - Software FMECA
    - Process FMECA
    - Top-down Approach
    - Bottom-up Approach
    - Examples
    - How to use a FMECA in preparation for a HALT
  - Derating Analysis
    - What is derating
    - How to apply principles
    - How to use derating analysis in preparation for a HALT
  - Design of Experiments
    - Advantages over conventional experiments
    - How to perform
    - When to use Design of Experiments in Conjunction with HALT and HASS
  - Fault Tree Analysis (FTA)
    - When to use
    - How to perform
    - When to Use FTA in Conjunction with HALT and HASS
  - Stress-Strength Analysis
    - Definition
    - How to perform
    - How to use in conjunction with HALT and HASS

- Tolerance and Worst Case Analysis
  - Definition
  - Types of Tolerance Analyses
  - When to use and when not to use
  - How to perform
  - How to use in conjunction with HALT
- Human Factors Analysis
  - How to perform
  - Considerations for Safety, Maintainability, and Preventive Maintenance
  - How to use Human Factors Analysis in Planning for HALT and HASS
- Maintainability and Preventive Maintenance (PM)
  - Definitions
  - How to perform a Maintainability Prediction
  - How to decide on a PM schedule
  - How to Use Maintainability and PM in Conjunction with HALT and HASS

- **Phase III: Integration in the Prototype Phase**
  - Highly Accelerated Life Testing (HALT)
    - What is HALT
    - Why HALT works
    - Planning for a HALT
      - Using results from the Modeling and Predictions FMECA, and Derating Analyses to help develop the HALT Plan
    - Executing the HALT
      - Using a FRACAS for root cause analysis on each failure
    - Using the HALT results to help plan the RDT
    - Using the HALT results to define the HASS profile
  - Failure Reporting, Analysis and Corrective Action System (FRACAS)
    - How to set up a FRACAS
    - Different types of FRACAS tools
    - How to use a FRACAS in conjunction with a HALT
  - Reliability Demonstration Test (RDT)
    - What is an RDT
    - How to set up an RDT

- Different variables
- How to use the results of HALT and Predictions in planning an RDT

- **Phase IV: Integration in the Manufacturing Phase**
  - Highly Accelerated Stress Screening (HASS)
    - Setting up a HASS based on HALT results
    - Running Proof-of-Screen
    - Using RDT and FMECA results to identify possible wearout mechanisms that need to be taken into account for HASS
    - Using Reliability Prediction results to help determine how much screening is necessary
  - On-Going Reliability Testing (ORT)
    - What is an ORT
    - How to set up an ORT
    - Different variables
    - Comparing ORT to HASS
    - How to use the results of a prediction when Setting up an ORT
  - Repair Depot Setup
    - Key factors involved in setting up a repair depot
    - Sending NTF hardware back through HASS
  - Field Failure Tracking System
    - Purpose of a field failure tracking system
    - Linking field failure information with predictions
    - Using failure analysis tools with field trends
  - Reliability Performance Reporting
    - How to set up
    - What metrics to track
    - Comparing results with Reliability Program and Integration Plan
  - End-of-Life Assessment
    - Gathering and plotting data
    - Comparing with predicted results
    - How to use the results of reliability predictions and FMECA's to assist in EOL assessment

- **Summary**
  - Reliability vs. Cost
  - Summary of Phases
  - Summary Tools within this Phase
  - Benefits of Integration
  - Next Steps
    - Implementation
    - Further Education in Integration
    - Related courses by Ops A La Carte
  - Contact Information