Introduction To Reliability Engineering

Introduction:

Increasingly, production organizations deploy reliability engineering techniques like Reliability-Centered Maintenance (RCM), including failure modes and effects (and criticality) analysis (FMEA,FMECA), root cause analysis (RCA), condition-based maintenance, improved work planning schemes, etc. These same organizations are beginning to adopt life cycle cost-based design and procurement strategies, change management schemes and other advanced tools and techniques in order to control the root causes of poor reliability. However, the adoption of the more quantitative aspects of reliability engineering by the production reliability assurance community has been slow. This is due in part to the perceived complexity of the techniques and in part due to the difficulty in obtaining useful data.

This course is an introduction to concepts in engineering design, testing, and management for highly reliable components and systems. Introduction to Reliability Engineering covers methods of reliability analysis for the design and assessment of engineering components and systems. Topics include behavior of engineering systems and reliability concepts such as probability of failure, indices of reliability, independence, redundancy, and systems structure. It introduces methods of parameter estimation, life testing, quality assurance, and reliability verification.

This course teaches the principles of improving asset management and maintenance decision using fundamental principles of Reliability Engineering. Attending this course will broaden ones technical ability to tackle asset reliability in a more effective manner using the many tools learned. The purpose of this course is to provide an introductory body of information that will give the engineer, engineering manager, or corporate manager the resources to start the process of organizing a reliability department within the company.

Who Should Attend?

Maintenance managers, reliability and maintenance engineers, top level maintenance technicians, production managers, plant engineers, design engineers, reliability engineers/technicians, operators, safety engineers, risk engineers, safety engineers and anyone who is involved in Reliability Engineering strategies or methodologies to include design engineers for capital projects engineers

Course Objectives:

By the end of this course delegates will be able to:

- Understand elements of reliability program plans and other documents that are necessary to support customer requirements
- Identify the reliability characteristics that are critical to the design and development of electronic systems
- Understand the Design for Reliability (DfR) and the tools used
- Use the design tools necessary to ensure a reliable product including prediction, allocation, and FMEA
- The student will gain an appreciation of the importance of reliability to system and product success
- How to apply reliability statistics to improve asset management
- What is the Life Cycle Cost philosophy
- The steps for performing a LCC analysis
- The simple 5 Why method of failure investigation
- Fundamentals of Event and Causal Factor Mapping for incidents and failures
- Fundamentals of using Logic Trees to uncover the physical, human, and latent causes of failures

- Fundamental RCM philosophies
- Failure Modes and Effects Analysis for RCM
- The difference between FMEA and FMECA
- How to identify mechanical, electrical, and stationary failure modes using condition monitoring (PdM) technologies
- How to identify the common traps of each PdM technology
- Basics in the usage of Monte Carlo simulation in RCM and Availability analyses
- Components of Human Factors Engineering in reliability
- The important terms and definitions in reliability statistics
- How to apply basic statistics in the maintenance environment
- How to calculate Net Present Value (NPV)
- The importance of RCM, RCM terminology
- Evaluating failure consequences

Course Outline:

- Reliability Engineering Fundamentals
- Basic Principles of Reliability Analysis
- Reliability Statistics
- The Reliability Improvement Process
- Role of the Reliability Engineer
- Making Reliability Improvement Normal Practice
- Reliability tools and techniques
- Life Cycle Cost Analysis
- Failure Modes and Effects and Consequence Analysis (FMECA)
- Reliability Centered Maintenance (RCM)
- Root Cause Analysis (RCA)
- Weibull Analysis, RCM with Monte Carlo Simulation
- Availability Simulation, Condition Monitoring

- Human Factor Engineering
- Reliability Centered Design (RCD)
- Failure Reporting, Analysis and Corrective Action System (FRACAS)
- Failure Modes and Effects Analysis (FMEA)
- Process FMEA, Design FMEA, Maintenance FMEA
- FMECA & Risk Priority Number (RPN)
- Cost vs. Risk Ratio Calculations
- Failure Data Introduction, Failure Data Analysis
- Failures and Survivors
- Stability of data, Separating failure modes
- Weibull parameters
- Event Trees and Fault Trees, Failure Reporting Systems
- Pareto Charts, Timelines and failure modes
- Probability distribution plots
- Failure mode distributions
- Weibull Analysis using failure data
- Fault Tree Analysis Introduction
- Reliability Block Diagrams (RBD)
- Maintenance Optimisation
- Cost Benefit Analysis
- Optimising Preventive Maintenance
- Optimising Predictive Maintenance (Condition Monitoring)
- Repair-Replace decisions
- Reliability Improvement
- Human Factors and Human Error
- Reliability Growth Cause Analysis
- ACE 3T Procedures
- FRACAS/RCFA/5 Whys
- Precision Maintenance