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Applied Reliability Symposium**

India, 2007

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2007 INTERNATIONAL APPLIED RELIABILITY SYMPOSIUM - INDIA

**SHARING
APPLICATIONS,
SUCCESS
STORIES AND
LESSONS
LEARNED IN
RELIABILITY AND
MAINTAINABILITY
ENGINEERING**



2007	Thursday - April 19
8:30 - 9:10	Registration
9:10 - 9:25	Welcome Address
9:25 - 9:30	5 Minute Break
9:30 - 10:30	SESSION 1 Reliability Goal Setting Madhu Babu and Al Hamad <i>GE Consumer & Industrial - India Innovation Centre</i>
10:30 - 10:50	20 Minute Break
10:50 - 11:50	SESSION 2 Integrating Reliability and Durability Improvements with Six Sigma Hemant Urdhwareshe <i>Institute of Quality and Reliability, India</i>
11:50 - 12:00	10 Minute Break
12:00 - 1:00	SESSION 3 Reliability Growth Modeling Using Bayesian Approach T Chitra and Ravindra Reddy Sabbella <i>Satyam Computer Services</i>
1:00 - 2:00	60 Minute Lunch Break Lunch is provided by the Symposium.
2:00 - 3:00	SESSION 4 Identifying Critical Subsystems in Software Imran Ali <i>GE Consumer & Industrial - India Innovation Centre</i>
3:00 - 3:05	5 Minute Break
3:05 - 4:05	SESSION 5 Successful Application of Reliability Prediction and FMECA - A Case Study Anil Kumar and R. Radhika <i>Centre for Reliability</i>
4:05 - 4:30	25 Minute Break
4:30 - 5:30	SESSION 6 Data Collection Requirements for System Reliability Analysis Hongan Lin <i>ReliaSoft Asia</i>

PROGRAM MATRIX: APRIL 19 - 20, 2007

TRIDENT HILTON - CHENNAI, INDIA

Friday - April 20	
9:00 - 10:00	SESSION 7 Reliability Improvement and Reliability Centered Maintenance (RCM) Implementation in a Process Industry - A Case Study V Ravichandar and S Chandrasekar <i>Lapiz Technical Services</i>
10:00 - 10:05	5 Minute Break
10:05 - 11:05	SESSION 8 Reliability Engineering In Automotive Component Manufacturing Industry - Process and Case Study Using ReliaSoft's Weibull++ and BlockSim S Krishna Kumar <i>Lucas TVS</i>
11:05 - 11:30	25 Minute Break
11:30 - 12:30	SESSION 9 Predictive Engineering and Its Use in Reliability Estimation Radha Krishna Darbha and Nerella Prabhakar <i>GE Consumer & Industrial - India Innovation Centre</i>
12:30 - 1:30	60 Minute Lunch Break Lunch is provided by the Symposium.
1:30 - 2:30	SESSION 10 Application Lessons for Effective FMEAs Carl S. Carlson and Ariel Navaja <i>ReliaSoft Corporation</i>
2:30 - 2:35	5 Minute Break
2:35 - 3:35	SESSION 11 Reliability and Risk Assessment in Civil and Infrastructure Engineering G L Sivakumar Babu <i>Indian Institute of Science</i>
3:35 - 4:00	25 Minute Break
4:00 - 5:00	SESSION 12 A Case Study of Copper Mining System Reliability, Maintainability and Availability Analysis Claudio Spanó <i>ReliaSoft Brasil</i>

The **International Applied Reliability Symposium** provides a forum for expert presenters from industry and government to come together with reliability practitioners from all over the world to discuss the application of reliability principles to meet real-world challenges. The majority of the presenters have been applying reliability, maintainability and related techniques in their day-to-day work for years and the Symposium has been designed to encourage results-oriented presentations with interactive discussions about best practices, success stories and lessons learned.

Topics covered during the event include:

- ❖ **Reliability Goals**
- ❖ **Reliability and Six Sigma**
- ❖ **System Reliability, Maintainability and Availability Analysis**
- ❖ **Failure Modes, Effects and Criticality Analysis**
- ❖ **Reliability Growth Analysis**
- ❖ **Reliability Centered Maintenance (RCM) Analysis**
- ❖ **Reliability and Risk Assessment**
- ❖ **And more...**

THURSDAY APRIL 19, 2007

Registration 8:30 to 9:10 a.m.

The 2007 International Applied Reliability Symposium, India begins on Thursday April 19, 2007 with registration activities from 8:30 a.m. to 9:10 a.m.

Welcome Address 9:10 to 9:25 a.m.

To begin the program, Pantelis Vassiliou will represent the Symposium's organizers by delivering a brief welcome address. Mr. Vassiliou is President and CEO of ReliaSoft Corporation. He directs and coordinates ReliaSoft's R&D efforts to deliver state-of-the-art software tools for applying reliability engineering concepts and methodologies. He also consults and lectures on reliability engineering and related topics to Fortune 1000 companies worldwide. Mr. Vassiliou is the original architect of the Weibull++ software and ReliaSoft's founder. He holds an M.S. in Reliability Engineering from the University of Arizona.

Session 1 9:30 to 10:30 a.m.

Reliability Goal Setting

Madhu Babu and Al Hamad *GE Consumer & Industrial - India Innovation Centre*

Setting the Reliability Goal is a challenge in many projects and it is the first step in any "Design For Reliability" project. This presentation talks about a "complete" approach to reliability goal setting. It explains how to set the reliability goal at different product/design scenarios. This presentation reviews various aspects other than customer expectations to consider while setting goals, such as market requirements, competition and warranty. The latter part of presentation will briefly review various data sources that need to be considered for goal setting and the confidence levels associated with those sources.

Session 2 Thursday April 19, 2007 10:50 to 11:50 a.m.

Integrating Reliability and Durability Improvements with Six Sigma

Hemant Urdhwareshe *Institute of Quality and Reliability*

Conventional tools of the Six Sigma (DMAIC) process are frequently not adequate to measure and improve reliability. Moreover, reliability is predominantly a function of design. The Design for Six Sigma (DFSS) process of Concept-Design-Optimize-Verify (CDOV) can therefore be a better strategy to improve reliability and life. Warranty and overhaul data of complex products provides a very good starting point. Life data analysis of warranty failures provides input on reliability baseline performance. Similarly, the data of components/subsystems that have failed and survived until overhaul provide valuable inputs to estimate life. Both these analyses provide critical inputs for baseline data of current durability. Potential DFSS projects can be identified and prioritized using cause and effects matrix. Wherever possible, analysis software are useful to predict improvements. These can be validated with reliability tests, accelerated life testing (ALT) and Multiple Environment Overstress Tests (MEOST).

Session 3 Thursday April 19, 2007 12:00 to 1:00 p.m.

Reliability Growth Modeling Using Bayesian Approach

T Chitra and Ravindra Reddy Sabbella *Satyam Computer Services*

Market requirements demand testing programs to be performed during the development phase of a system in order to improve the system reliability until a pre-defined reliability target is reached. A formal test procedure aimed at discovering and fixing causes of unreliability is known as a Reliability Growth test. This test focuses on system design, system assembly and component selection weaknesses that cause the failures. Reliability Growth modeling complements Reliability Growth testing in terms of deciding on test duration, number of samples to be tested, etc. This presentation gives an overview of how Bayesian statistics are used in modeling Reliability Growth effectively.

Session 4 Thursday April 19, 2007 2:00 to 3:00 p.m.

Identifying Critical Subsystems in Software

Imran Ali *GE Consumer & Industrial - India Innovation Centre*

The methodology proposed in this session calls for identifying every critical function/module and concentrating the effort of development and testing on the critical subsystems to make the core functionalities of the software bug-free and thus make the product more reliable. This presentation suggests a guideline for identification of the critical subsystems that define the core functionality of the product and hence work towards eliminating failures in those subsystems. The vulnerable areas would include areas affected by changes or enhancement to the product, the failure modes based on the functionalities, the customer usage conditions and field failures for the baseline product.

Session 5 Thursday April 19, 2007 3:05 to 4:05 p.m.

Successful Application of Reliability Prediction and FMECA - A Case Study

Anil Kumar and R. Radhika *Centre for Reliability*

Reliability Prediction and FMECA are powerful design reliability tools. This presentation stresses the importance of applying these techniques at the design stage itself to achieve high reliability and safety. Reliability Prediction provides an assessment of the reliability of a product in terms of MTBF. It is an analytical method for determining the effects of a design decision before testing and manufacture of the product. It compares design alternatives, facilitates design trade-off studies and highlights overstressed parts (electrical and thermal stress). Failure Rate is the stepping-stone or foundation for Reliability Engineering. FMECA identifies critical failure modes in the system and provides corrective action; thereby making the system design robust. In this session, we are presenting an effective application of Reliability Prediction and FMECA by means of a case study. The case study reveals that most of the components which are identified as critical by Reliability Prediction and FMECA appear as failures in the field.

Session 6 Thursday April 19, 2007 4:30 to 5:30 p.m.

Data Collection Requirements for System Reliability Analysis

Hongan Lin *ReliaSoft Asia*

In a typical maintenance scenario, using standby redundancy to achieve desirable availability is a common strategy. For example, a good number of pumps are deployed in the field and when a pump fails, instead of repairing the pump in the field, the operator swaps the faulty pump with a spare pump (standby) and hence minimizes downtime. The faulty pump is then sent to workshop for repair and after repair, it joins the spare pool. The first part of this presentation shows how such scenarios can be simulated using a software tool to compute reliability matrices (Availability, Optimum Number of Spares, Expected Number of Failures, etc.). In the second part of this presentation, we will take a look at the data collection requirements necessary to support reliability analysis for a system involving repairable Line-Replaceable-Unit (LRU) or standby spare.

FRIDAY APRIL 20, 2007

Session 7 Friday April 20, 2007 9:00 to 10:00 a.m.

Reliability Improvement and Reliability Centered Maintenance Implementation in a Process Industry - A Case Study

V Ravichandar and S Chandrasekar *Lapiz Technical Services*

The Reliability Centered Maintenance (RCM) approach has been applied by many industries and has derived mixed results. The approach may be highly successful in many industries and may not be successful in others. The failure is basically due to not adopting the correct methodology and failure in expert analysis to arrive at proactive task frequencies. This presentation explains about the requirements for initiating RCM, the right methodology, expert FMEA analysis, implementation and sustainability requirements. The presentation includes a case study on RCM analysis of equipment in the Petrochemical Industry.

Session 8 Friday April 20, 2007 10:05 to 11:05 a.m.

Reliability Engineering In Automotive Component Manufacturing Industry - Process and Case Study

S Krishna Kumar *Lucas TVS*

Reliability engineering has become an important element of the new product development process. In the present Indian industry scenario of globalization, it is necessary to predict the reliability of new products and provide assurance to the original equipment manufacturers during the product development period. The multi-national and Indian automobile manufacturers demand reliability prediction of new components being developed in India as part of their sourcing development process. In this presentation, the methodology successfully followed for this purpose for a new automobile component will be explained through an example. For this purpose, ReliaSoft's Weibull++ and BlockSim software are being utilised to get faster, more accurate results.

Session 9 Friday April 20, 2007 11:30 a.m. to 12:30 p.m.

Predictive Engineering and Its Use in Reliability Estimation

Radha Krishna Darbha and Nerella Prabhakar *GE Consumer & Industrial - India Innovation Centre*

The recent trend is to design products using advanced software, which can predict the stress levels for a given condition. Increasingly, most engineering industries have started using this predictive engineering in their product cycle. In addition, a lot of engineering databases talk about the strength of materials. However, in none of these places is the time associated and often it is not sure that these values are valid for the specific use. This presentation brings out an outline of a few guidelines for using predictive engineering and databases and the extent of its use in predicting reliability.

FRIDAY APRIL 20, 2007

Session 10 Friday April 20, 2007 1:30 to 2:30 p.m.

Application Lessons for Effective FMEAs

Carl S. Carlson and Ariel Navaja *ReliaSoft Corporation*

Quality and Reliability tools must be applied correctly to get optimum results and Failure Mode & Effects Analysis (FMEA) is no exception. Yet many companies and organizations continue to accept less than effective results from their FMEA/FMECA applications.

Given the increasing importance of Design for Reliability tools, it is imperative that FMEA is done effectively to improve product/process designs and to support manufacturing and maintenance applications. Companies no longer have the time or budget to squander valuable resources with any tool that is not fully effective. What are the specific FMEA lessons that separate best practice from poor quality? How can we make this tool live up to its potential? How can FMEAs be done in a timely manner with full support from subject matter experts and management?

This tutorial examines a variety of applications, ranging from effective and timely FMEAs to poorly constructed and executed FMEAs. Attendees will understand the primary pitfalls that generate less than effective outcomes and learn the "vital few" keys to successful FMEAs. Each of these success factors must be understood, cultivated and implemented to achieve maximum success in FMEA applications. Why settle for less than uniformly effective FMEAs?

Session 11 Friday April 20, 2007 2:35 to 3:35 p.m.

Reliability and Risk Assessment in Civil and Infrastructure Engineering

G L Sivakumar Babu *Indian Institute of Science*

Reliability and risk assessment in civil and infrastructure assumes considerable importance in view of the large-scale investments made in India in the area of civil engineering construction and infrastructure in recent years. There is a growing realization of the importance; and methods and tools based on probabilistic considerations are being developed and implemented. This presentation seeks to present some concepts related to reliability assessment and its application in civil infrastructure with typical examples.

Session 12 Friday April 20, 2007 4:00 to 5:00 p.m.

A Case Study of Copper Mining System Reliability, Maintainability and Availability Analysis

Claudio Spanó *ReliaSoft Brasil*

This presentation describes a project to develop the Reliability, Maintainability and Availability Analysis of a Copper Mining System, including the Mining and Production Process. The project was comprised of system modeling (using Reliability Block Diagram, RBD), data collection and analysis (Reliability and Maintainability), simulations to obtain Availability, and conclusions. Data from equipment downtime logs was used to analyze the Reliability and Maintainability of every piece of equipment in the mining system. The main objective was to provide a statistical model to allow the user to identify system weakness and propose changes for improvement. This method facilitates qualitative analysis in conjunction with intuition.

HOTEL ACCOMMODATIONS

The 2007 ARS, India will be held at the Trident Hilton, Chennai in Chennai, India. Through a special arrangement with the hotel, a reduced rate is available for Symposium participants. Please refer to the Applied Reliability Symposium and/or ReliaSoft when making your reservations.

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2007 International Applied Reliability Symposium, India

Industry and government sharing applications, success stories and lessons learned.

April 19 - 20, 2007
Chennai, India



Registration Information - One Form Per Attendee

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|--|----------------|
| <input type="checkbox"/> Advanced Registration (must be received by March 31, 2007) | Rs.7000 |
| <input type="checkbox"/> Standard Registration | Rs.8000 |
| <input type="checkbox"/> Full-Time Student (Student ID Required) | Rs.5000 |

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Submit Registration Via Phone, Fax or Mail:

Phone: (+91) 44-4208-7785 or (+91) 44-4208-7784 Fax: (+91) 44-4208-7756

Mail: ReliasolutionsSoft Pvt Ltd; Maalavika Centre, 5th Floor, 144/145, Kodambakkam High Road, Nungambakkam, Chennai - 600 034

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Additional Information

- **Hotel Reservations:** You will need to make reservations on your own. Please contact the hotel directly.
- **Substitutions:** Substitutions are allowed provided that ARS is notified 7 days prior to the Symposium start date.
- **Cancellations:** Cancellations received up to 15 working days prior to the Symposium start date will be entitled to a full refund of the registration fee minus a Rs.500 administration fee. After this period, all cancellations will be subject to the full registration fee.
- **No Shows:** Registrants who do not attend and who do not notify ARS of cancellations are subject to the full registration fee.
- ARS reserves the right to cancel/reschedule the Symposium at any time up to 4 weeks prior to its start date. In the event of cancellation, all registration fees will be refunded. ARS is not responsible for any other charges, such as non-refundable airline tickets.

Registration fee includes attendance to your choice of presentations, copies of the proceedings and any other handouts, daily lunch and refreshments during the breaks. A certificate of attendance will be provided.

INTERNATIONAL APPLIED RELIABILITY SYMPOSIUM INDIA 2007



The 2007 ARS, India is organized by ReliasolutionsSoft Pvt Ltd
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