



EDUARDO CALIXTO
CONSULTANT

Training Program	: LIFE TIME DATA ANALYSIS FOR RAILWAY INDUSTRY
Discipline	: RELIABILITY, MAINTENANCE & SAFETY ENGINEERING
System	: RAILWAYS ASSETS (ROLLING STOCK, SIGNALLING, INFRASTRUCTURE, LOCOMOTIVE)
Subsystem	: Railways assets
Training Focus	: Historical failure data base, statistic concepts, probability density function parameter estimation, reliability prediction, failure rate prediction, MTTF and MTTR prediction, CROW AMSSA model applied to repairable and non-repairable equipment.
Lesson Code	: 205
Lesson Title	: Historical failure data base, statistic concepts, different probability density function parameter estimation, reliability prediction, failure rate prediction, MTTF and MTTR prediction, CROW AMSA model applied to repairable and non-repairable equipment.
Training Elements	: Historical failure data base, Statistic concepts, Different Probability density function parameters estimation, Goodness of fitness Test Reliability prediction, Failure rate prediction, Reliability Growth Methods Concepts and application. Quantitative Accelerated Test Analysis concepts. Probabilistic Degradation Analysis concepts and application FRACAS Concepts and application
Training Objectives:	<ul style="list-style-type: none">• To define the probability density functions such as exponential, lognormal, logistic, loglogistic, Weibull, Normal, Gumbel, Gama, others based on LDA;• To apply the goodness of fit test such as Plot method, Regression, likelihood, Chi-square, Komogorov Smirnov and Cramer von mises during LDA;• To implement a FRACAS that enable the LDA;• To apply the QALT methods for equipment under different stress level;• To apply RGA Concepts to measure the effect of maintenance and operation on equipment performance;• To apply PDA methods to predict reliability based on equipment degradation;• To apply Warranty Analysis to assess vendors products;



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Day 1:

Subject	Activity	Time	Resources
Module 1 - Introduction (Welcome for participants and scope of training)	Theoretical	30 min	Forms & PPT
Module 2 - Statistic concept	Theoretical	60 min	PPT
Module 3 - Reliability Concepts	Theoretical	30 min	PPT
Module 4 - LDA Methodology	Theoretical	60 min	PPT
Module 5 - Goodness of Fit test (Plot method, Regression Method, Likelihood method, Chi-square method, Smirnov Komolgorov, Cramer Von Mises)	Theoretical	60 min	PPT
Lunch Break: 12:30 – 14:00 hrs.			
Module 6 - Probability Density Functions (Exponential, Normal, Logistic, Lognormal, Loglogistic, Gumbel, Weibull, Gama, Others)	Theoretical	60 min	PPT
Module 7 - Probabilistic Degradation Analysis (PDA)	Theoretical	60 min	PPT
Module 8 - Warranty Data Analysis	Theoretical	60 min	PPT
Module 9 - Preventive Maintenance effect on Reliability	Theoretical	60 min	PPT
	Theoretical	30 min	PPT

Day 2:

Subject	Activity	Time	Resources
Module 1 - Accelerated test data analysis Model (QALT)	Theoretical	60 min	PPT
Module 2 - Reliability Growth data analysis (RGA)	Theoretical	60 min	PPT
Module 3 - FRACAS Concepts	Theoretical	60 min	PPT
Module 4 - FRACAS online application case	Practical	60 min	Software Weibull
Lunch Break: 12:30 – 14:00 hrs.			
Module 5 - LDA Case Studies	Practical	60 min	Software Weibull
Module 6 - RGA Case Studies	Practical	60 min	Software Weibull
Module 7 - Warranty Analysis Case Study	Practical	60 min	Software Weibull
Module 8 - PDA Case Study	Practical	60 min	Software Weibull