Training Title

PRINCIPLES OF RELIABILITY ENGINEERING

Training Duration

5 Days

Training Date & Duration

REF RM045	Principles of Reliability Engineering	5	22-26 April 2024	$6,500	Paris, France

Will be held at any of the 5-star hotels. Exact venue will be informed once finalized.

Training Fees

- **$6,500 per participant for Public Training including very useful, illustrative Materials/handouts, Tea/Coffee, Refreshments, International Buffet Lunch.**

Training Certificate

Define Management Consultancy & Training Certificate of course completion will be issued to all attendees.

TRAINING OVERVIEW

TRAINING INTRODUCTION & DESCRIPTION

Reliability Engineering has moved forward enormously in recent years, and it is often difficult to keep abreast of the latest thinking and techniques. This seminar bridges that gap and presents recent, but proven, developments in Risk Management to improve safety and uptime. It will also show how the application of fundamental reliability techniques can be used to improve equipment run-lengths. Failure rate is a key driver for improved uptime, but Mean Time to Repair is just as important. Maintainability requires equipment that is serviceable (easily repaired) and supportable (cost-effectively kept in or restored to a usable condition). Combine this with reliability (absence of failures) to significantly improve the safety and uptime of a facility.

There is a growing realization that a safe, reliable facility depends on how well we manage risk, so we begin with a discussion of quantitative and qualitative risks. Human failures are more difficult to manage, but they matter a lot, so we will address this subject in some detail. This leads us into techniques such as FMECA (Failure Modes, Effects, Criticality Analysis) and RCM (Reliability Centered Maintenance) that help plan our work and improve our equipment reliability considerably. For less critical equipment, using the REM (Review Existing Maintenance) technique is a highly effective risk management tool. In addition, the course will show how to maintain safety-critical instrumentation using the SIL (Safety Integrity Level) technique. Static equipment is given special consideration and the course will demonstrate how and where Risk-Based Inspection (RBI) should be used. You will also learn about Root Cause Analysis, a powerful reactive problem-solving tool that uses a systematic and structured approach to eliminate failures permanently. The course will provide a good understanding of where and how to apply the method.

Implementation of the results of these analyses is the key to reaping the benefits. Analysis is the easy bit; implementing the results always poses challenges. So, we will see how to grind away at the hard parts - writing new maintenance routines, scheduling work, then doing it on time, recording history, and then reaping the rewards. Finally, we will see how to implement change successfully.

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For this we need to understand critical success factors, change management, the importance of good communication and how to track progress. Sustained improvement needs a process to hold the gains.

Application of the reliability methods taught in this seminar will produce a positive impact on business goals, for example:

- **Maintain and improve reliability and availability,**
- **Maximize safety,**
- **Achieve best practice maintenance, and,**
- **Develop world class performance.**

This will be an interactive, enjoyable and interesting learning experience. It will utilize a variety of methodologies including lectures and slide presentations. The seminar is structured to give you an introduction to the key Reliability Engineering processes with a thorough grounding in the main elements. It offers practical advice and guidance on their use, particularly as they are applied in industry. Examples and group exercises allow delegates to acquire a more detailed and practical understanding. A comprehensive Case Study will reinforce learning. Examples of actual obstacles encountered during actual studies will be highlighted. The participation of delegates will be encouraged throughout. Delegates will also have the opportunity to discuss issues relevant to their workplace if they so wish.

TRAINING OBJECTIVES

- **To learn how to define, measure and predict reliability,**
- **To learn how to use key Reliability, Maintainability and Risk techniques to improve profitability and safety,**
- **To determine where, when and why each technique should be applied,**
- **To find out how to implement the analysis results effectively,**
- **To be able to determine value added by this work,**
- **To learn how to get started on a Reliability Improvement Program.**

The effective use of proactive and reactive reliability-based methods will significantly improve the safety and uptime of your facility and this seminar will show you exactly how.

WHO SHOULD ATTEND

Reliability engineering and operations personnel involved in improving reliability, availability, safety, maintainability, and profit performance in existing or proposed process systems and equipment. Participants should have foundation skills in statistical analysis and reliability techniques for equipment.

If you are a manager, supervisor, engineer, logistics specialist, an academic or other professional seeking to understand reliability and uptime improvement, this workshop will be able to help you. It is aimed at people with a stake in Operational Success working in the Oil & Gas Industry such as the Reliability Team, Maintenance Engineering Team, Shutdown & Campaign Team, Barge &Subsea Team. The course has also been specifically designed to be of substantial benefit to both technical and non-technical personnel employed in the activities that support the O&M sector.

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TRAINING METHODOLOGY:

A highly interactive combination of lectures and discussion sessions will be managed to maximize the amount and quality of information and knowledge transfer. The sessions will start by raising the most relevant questions and motivating everybody find the right answers. You will also be encouraged to raise your own questions and to share in the development of the right answers using your own analysis and experiences. Tests of the multiple-choice type will be made available on a daily basis to examine the effectiveness of delivering the course.

Very useful Course Materials will be given.

- **30% Lectures**
- **30% Workshops and work presentation**
- **20% Group Work& Practical Exercises**
- **20% Videos& General Discussions**

TRAINING OUTCOME

At the end of the course, the delegates will be able to:

1. **Define measure and predict reliability.**
2. **Use the reliability equation to aid in improving equipment maintenance strategies.**
3. **Analyse system design to determine if projected capacity will meet capital requirement.**
4. **Analyse and improve system safety.**
5. **Predict life cycle costs to make buy/replace decisions and to determine which equipment or system will create the most value for the business.**
6. **Develop the equipment MTBF and MTTF and to improve the plant Overall Equipment Efficiency (OEE).**

DAILY COURSE OUTLINE

The course content will include the following which will be covered in 5 days of time.

- **Introduction to Reliability Engineering**
- **Basic Reliability Theory**
- **Reliability Engineering Fundamentals – Reliability engineers vs. maintenance engineering and the Engineered Maintenance Strategy.**
- **Series and parallel reliability**
- **Reliability failure analysis and reporting**
- **Reliability Statistics – Mean, Median and Mode; Standard Deviation; Linear Regression.**
- **MTBF and MTTF; Reliability Predictions; Basic System Analysis; Weibull Calculations.**
- **Failure rate/MTBF**
- **Using statistical analysis to predict system performance.**
- **Life Cycle Cost Analysis – LCC Philosophy and Benefits; Financial Statements; the Cost of Money; ROI & ROA; and Life Cycle Cost Calculations.**
- **Reliability Block Diagrams**
- **Maintainability Engineering**
- **Quantitative Risk**
- **Qualitative Risk**
- **Failure mode and effects criticality analysis (FMECA)**

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– Different Types of FMECAS; Functions – Primary and Secondary; Functional Failures & Hidden Failures; Failure Modes; Effects; and Criticality.

- **Fault-tree analysis (FTA)**
- **Weibull Analysis - Introduction; Definition of Reliability; Weibull Shapes; Maintenance Tactics; Understanding Failure Distributions; Weibull in Complex Systems; and Wei Bayes.**
- **Simulation Modelling**
- **Performance Measurement**
- **Human Error and its Causes**
- **Learning from Failures**
- **Performance Measurement**
- **Reliability Cantered Maintenance – Definition of RCM; Types of Maintenance; Failure Patterns; Underlying Analysis Philosophies; Foundational Changes; 7 Steps of RCM; and RCM Decision Logic.**
- **Condition Monitoring - Quantifying Mechanical Asset Health; Quantifying Electrical Asset Health; and Quantifying Stationary Asset Health**
- **Total Productive Maintenance / OEE**
- **Safety Integrity Levels**
- **Task-bundling**
- **Problem solving process - Root Cause Analysis Root Cause Analysis (RCA) – Examples of RCA techniques improving OEE; Discuss and demonstrate Logic Trees; Discuss and demonstrate Causal Factor Mapping; Using Pareto analysis to select chronic failures to address with RCA; and selling the benefits of RCA to management.**
- **Human Factors Engineering – Procedures Based Maintenance; Basic Job Mapping; and Introduction to Work Procedures.**
- **Work execution**
- **Compliance**
- **Reliability Cantered Design (RCD) – Purpose of RCD; Importance of RCD; RCD Process; RCD FMEA; and Ramifications of RCD.**
- **Performance Monitoring**
- **Implementation**
- **Failure Reporting, Analysis and Corrective Action System (FRACAS) – Basic Elements; Failure Reporting; Roles and Responsibilities; Analysis Methods; and Database Elements.**
- **Reporting Results**
- **Holding the Gains**

NOTE:

<u>Pre & Post Tests will be conducted.</u>

<u>Case Studies, Group Exercises, Group Discussions, Last Day Review & Assessments will be carried out.</u>

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