

## Course outline for FMEA Workshop



### **5 Day Workshop**

#### **Course Description**

**Failure Mode and Effects Analysis (FMEA)** is a workshop – based course – participants learn by performing real analysis on real projects.

FMEA can be an effective tool for risk management. FMEA can be used to identify, prioritize and manage failure before it occurs.

The elimination, control, or reduction of risk is a total commitment by the entire organisation. Today the focus is on prevention, and the emphasis is to minimize the probability of failure, and to achieve this FMEA is the appropriate and one of the most effective tools.

In this course we will also be looking at the two pillars which assists FMEA , RCFA and RCM.

#### **Learning Objectives**

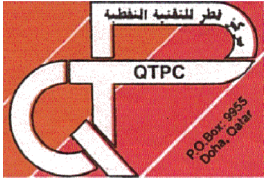
- Understand equipment – FMEA as a tool to anticipate and minimize design and maintenance risks
- How to develop an FMEA strategy
- Perform the FMEA
- How to prioritise risk
- How to communicate why the FMEA should be regularly updated
- Looking at potential failure modes with the help of RCFA and RCM

#### **Aimed At**

This course is aimed at operations, maintenance, instrumentation engineers and project, design engineers, and other personnel for involved in identifying and preventing product or process failure modes.

#### **Group Size**

10 - 20



## Failure Mode and Effects Analysis (FMEA)



Five (5) Days

### Course Overview

Failure Mode and Effects Analysis (FMEA) is a workshop – based course. Participants learn by performing real analysis on real projects. FMEA can be an effective tool for risk management. FMEA can be used to identify, prioritize and manage failure before it occurs.

The elimination, control, or reduction of risk is a total commitment by the entire organisation. Today the focus is on prevention, and the emphasis is to minimize the probability of failure, and to achieve this FMEA is the appropriate and one of the most effective tools.

In this course we will also be looking at the two pillars which assist FMEA, Root Cause Failure Analysis (RCFA) and Reliability Centred Maintenance (RCM).

### Course Outcomes

Upon completion, participants will be able to:

- Understand equipment – FMEA as a tool to anticipate and minimize design and maintenance risks
- How to develop an FMEA strategy
- Perform the FMEA
- How to prioritise risk
- How to communicate why the FMEA should be regularly updated
- Looking at potential failure modes with the help of RCFA and RCM

### Who Should Attend?

- This course is aimed at operations, maintenance, instrumentation engineers.
- Project, design engineers, and other personnel for involved in identifying and preventing product or process failure modes.

### Course Content

#### FMEA Fundamentals

- FMEA and FMECA definitions
- FMEA Objectives
- Prediction Vs Detection

## FMEA Roadmap

### The 9 steps

- Describe Product or Process
- Define the Function
- Identify Potential Failure Modes
- Describe Effects of Failure
- Determine Causes
- Detection Methods/Current Controls
- Calculate Risk
- Take Action
- Assess Results

### FMEA Quantification

- Failure rates – Mean Time Between Failure (MTBF), and probability of failure
- Failure rate sources
- Human error failure rates
- Case studies

### Rational Structure to Determine Scope

- Process FMEA for Concept
- Process FMEA for Process Control
- Structured Sequential Screening
- Failure Mode Definition
- Strategy for Assessing Risk
- High Severity Risks
- High Design Risks
- High Risk Priority Numbers

### FMEA and Related Analysis Techniques

- Understanding RCFA
- Fault Tree Analysis
- Cause & Effect Analysis
- RCM and useful it is to FMEA
- Principles of Reliability Engineering



### Course Instructor

**Mr. James M. Watterson**, is graduated with Masters of Science (Engineering Technology) from Belfast Collage of Technology and he is the member of the several Professional Bodies;

- Fellow – Institute of Operation's Management
- Fellow – Royal Graphical Society
- Member – British Institute of Management
- Chartered Member – The Institute of Logistic and Transports.

He is a highly experienced consultant and trainer with over 35 years experience in various disciplines:- engineering, maintenance, marketing, management, project and contract management. Countries where experience has been gained include; Middle East, Mainland-Europe, North America, Australia and North Africa.

Since the past 30 years, he has delivered hundreds sessions of training courses in the area of technical and management such as;

- HaZOP and HaZARD Management Control
- Project Management

- Troubleshooting with all rotating equipment including turbines- gas and steam applications
- Failure Analysis and Machinery diagnosis
- Root Cause Analysis (RCA)
- Pump maintenance- centrifugal and reciprocating-Dismantling and rebuilding pumps
- Maintenance Planning and Scheduling
- Plant shutdown and Start-Up activities.
- Total Productive Maintenance
- Risk & Hazards Analysis
- Centrifugal Compressors – Operations and Maintenance
- Plant Shutdown and Start-Up Techniques
- Problem-solving and Decision Making
- Contract Management
- Advanced Supervisory Training
- Recruitment skills for hiring new employees
- Pipe design and pipeline trouble-shooting

In the Middle East and North Africa (MENA), he has conducted training course for the company such as; Saudi Aramco, Sabic Industries, Saudi Arabia Electricity Company, Crystal Co., Kuwait Petroleum Corporation, Banagas, Oman LNG, Oman Gas, Oman Occidental Refinery, Adgas, Gasco, Takreer and etc.

## **QATAR TECHNICAL PETROLEUM CENTER**



**Trainer:**  
**Marcel C. de**

## **RISK ASSESSMENT** **PROJECT MANAGEMENT COURSE**

### **Course Description:**

The field of risk assessment and risk management is becoming increasingly more complex as we navigate our way through the terrain of Operations, Audit, Compliance, Budgeting and the many other facets of business. In this battle, we often find ourselves justifying all of the components used to assign a proper **Risk Rating** to the many business units within our organizations. Organizations are rightfully demanding data driven results.

### **Course Objective (for Level -1 MANAGEMENT LEVEL) Course**

- ✚ Besides going through the fundamentals of Project Risk Management, the 3 Day training course for the **Management level (Level 1)** will focus on the capability of the Project Department to perform Project Risk Management.
- ✚ The course will examine the current situation, the desired situation and the path to go from current to desired situation.
- ✚ The Level 1 training will include multiple discussion sessions in which we will try to determine how can improve its project risk management and what roadmap should be followed.
- ✚ An outcome of the training course should be a consensus on what needs to be done to maximize the capability of the practitioners to perform adequate risk management on their projects.

- ✚ Also, how to maximize the use of lessons learned and standard data, checklists, templates etc.
- ✚ It should also be determined what activities need to be done on a project level and what activities need to be supported by a central function.
- ✚ In essence the Level 1 training will focus on how to set the stage to enable the project department to gain professionalism when it comes to project risk management

### Course Objective (for Level -2 Practitioners Course)

- ✚ The Level 2 (Practitioner) training course will focus on how to practically perform project risk management on the brownfield projects that company executes.
- ✚ The course will go through the different risk management processes and will give ideas and guidance how to use the tools and techniques in the most effective and efficient manner.
- ✚ The Level 2 Practitioners will gain an understanding on how to conduct the different phases of project risk management and how to coordinate the effort necessary to achieve the most beneficial result.
- ✚ Emphasis will be given to the fact that project risk management needs to be practical, scalable and integrated with other project management processes.
- ✚ Multiple exercises will be done in order to explain and practice the different tools and techniques.
- ✚ Discussions will be held to determine where the main challenges lie with regard to implementing effective project risk management.

### Methodology:

Handouts would be provided and teaching would be interactive through power point slides presentation with examples.

This training course emphasizes on Theory and Class Assessment activities – participants will be divided into small activity groups.

- Participants will be provided with individual and team exercises
- Group discussions

### Percentage of Course Delivery

- a) 70 % class presentation
- b) 30% group and individual exercises/open cases.

Training material, practical exercise will be provided to each participant in the form of printed manuals and CDs.

## Course Assessment

The Course assessment will be done through a Pre-Course Test and a Post-Course Test for all the 3 Batches (1 batch of Level-1 Management Course and 2 batches of Level-2 Practitioners Course)

## Who should attend?

### **Level-1** Management Course

Head of Sections of Projects Department ,Head of Process Projects, Head of Instrument Projects, Head of Electrical Projects, Head of Mechanical Projects, Head of Civil Projects, Project Services Group Leader.

### **Level-2** Practitioners Course

Principal Projects Engineer, Lead Project Engineers, Senior Project Engineers, Project Engineers, Assistant Project Engineers from Process Projects

## Course Content

### Level 1 Management Course

#### Day 1

Time Slot	Agenda
8:00-09:30	<p>Pre-Assessment Test</p> <p><b>Introduction to project risk management</b></p> <ul style="list-style-type: none"><li>• Introduction and Icebreaker</li><li>• What does an organization need to do to perform project risk management and risk assessment?</li><li>• Introduction to Project Risk Management</li></ul>
09:30-09:45	Morning Tea Break
09:45-11:30	<p><b>Introduction to project risk management (continued)</b></p> <ul style="list-style-type: none"><li>• What is project risk management and how does it relate to Enterprise Risk Management?</li><li>• The Challenges of Project Risk Management</li><li>• What are Project Risks</li><li>• Stakeholders risk attitudes and risk tolerances.</li><li>• Exercise</li></ul>
11:30-12:30	Prayers & Lunch



12:30-13:30	<b>The Risk Management Framework</b> <ul style="list-style-type: none"> <li>• Risk Management in its context</li> <li>• Risk Management in relation to the project objectives</li> <li>• Risk Management Capability/Maturity of the organization</li> <li>• What are the critical factors for Risk Management in QAFCO?</li> <li>• How to determine how much Risk Management the Organization is capable of</li> <li>• Risk Management integrated with project management processes</li> <li>• The Role of Management in Project Risk Management</li> </ul> <ul style="list-style-type: none"> <li>• Exercise</li> </ul>
14:30-14:45	Afternoon Tea Break
14:45-16:00	<b>Plan Risk Management</b> <ul style="list-style-type: none"> <li>• Critical Success Factors</li> <li>• Components of the plan</li> <li>• Stakeholder Involvement</li> <li>• Roles and Responsibilities</li> <li>• Standardization of the Risk Management Plan</li> <li>• The role of the project support office</li> </ul> <p>Exercise and Discussion</p>

## Day 2

Time Slot	Agenda
8:00-09:30	<b>Plan Risk Management Continued</b> <ul style="list-style-type: none"> <li>• Risk Categories</li> <li>• Risk Breakdown Structure</li> <li>• Using standard data and lessons learned</li> </ul> <p>Exercise</p>
09:30–09:45	Morning Tea Break
09:45-11:30	<b>Identify Risks</b> <ul style="list-style-type: none"> <li>• How to identify risks</li> <li>• Cause, Event, Effect</li> <li>• Risk Triggers</li> <li>• Risk Identification Techniques; SWOT, Cause and Effect, etc.</li> </ul>



	<ul style="list-style-type: none"> <li>• Risk workshops</li> <li>• Managing the Risks on multiple projects (i.e. during shutdown period)</li> </ul> <p>Exercise</p>
11:30-12:30	Prayers & Lunch
12:30-14:30	<p><b>Risk Identification (continued)</b></p> <ul style="list-style-type: none"> <li>• The Risk Register</li> <li>• Risk Data Sheets</li> </ul> <p>Exercise</p> <p><b><u>Qualitative Risk Analysis</u></b></p> <ul style="list-style-type: none"> <li>• Understanding the use of qualitative Risk Assessment</li> <li>• Understanding Scoring</li> <li>• Types of Impact</li> </ul>
14:30-14:45	Afternoon Tea Break
14:45-16:00	<p><b>Qualitative Risk Analysis (continued)</b></p> <ul style="list-style-type: none"> <li>• Data Quality Assessment</li> <li>• Bias</li> <li>• Risk Urgency</li> </ul> <p>Exercise</p>

### Day 3

Time Slot	Agenda
8:00-09:30	<p><b>Quantitative Risk Analysis</b></p> <ul style="list-style-type: none"> <li>• What is Quantitative Risk Analysis?</li> <li>• When to use quantitative analysis?</li> <li>• What do we aim to achieve with quantitative analysis?</li> <li>• The pitfalls of quantitative risk analysis</li> </ul>
09:30-09:45	Morning Tea Break
09:45-	<b>Quantitative Risk Analysis (continued)</b>

11:30	<ul style="list-style-type: none"> <li>• EMV and EMV exercise</li> <li>• Decision Trees</li> <li>• PERT</li> <li>• Probability Distributions</li> <li>• Monte Carlo Analysis and Latin Hyper Cube</li> <li>• Discussion</li> </ul>
11:30-12:30	Prayers & Lunch
12:30-14:30	<b>Risk Response Planning</b> <ul style="list-style-type: none"> <li>• Types of risk responses</li> <li>• Risk Strategies</li> <li>• Contingencies and fall back plans</li> </ul> <p>Exercise and discussion</p>
14:30-14:45	Afternoon Tea Break
14:45-16:00	<b>Risk Monitoring and Control</b> <ul style="list-style-type: none"> <li>• How to monitor risks?</li> <li>• Risk Reporting and dashboards</li> <li>• EVA</li> <li>• Risks vs Issues</li> <li>• Management Commitment</li> <li>• Risk Assurance and Risk Audits</li> </ul> <p>Post Assessment Test and Closing</p>

## Course Content

### Level 2 Practitioners Course

#### Day 1

Time Slot	Agenda
8:00-09:30	<p>Pre-Assessment Test</p> <p><b>Introduction to project risk management</b></p> <ul style="list-style-type: none"> <li>• Introduction and Icebreaker</li> </ul>

	<ul style="list-style-type: none"> <li>• Introduction to Project Risk Management</li> <li>• What are the practical implications of doing Project Risk Management</li> </ul>
09:30-09:45	Morning Tea Break
09:45-11:30	<b>Introduction to project risk management (continued)</b> <ul style="list-style-type: none"> <li>• What is project risk management?</li> <li>• Types of Risks</li> <li>• Stakeholders risk attitudes and risk tolerances</li> <li>• Risk Thresholds and Risk Capacity</li> <li>• Exercise: Stakeholder Risk Profile Analysis</li> </ul>
11:30-12:30	Prayers & Lunch
12:30-13:30	<b>The Risk Management Framework</b> <ul style="list-style-type: none"> <li>• Risk Management in its context</li> <li>• Risk Management as Part of Project Management</li> <li>• Risk Management in relation to other project management processes</li> <li>• Exercise</li> </ul>
13:30-14:30	<b>Risk Management Processes</b> <ul style="list-style-type: none"> <li>• The advantage of a process approach</li> <li>• System thinking</li> </ul>
14:30-14:45	Afternoon Tea Break
14:45-16:00	<b>Plan Risk Management</b> <ul style="list-style-type: none"> <li>• Critical Success Factors of a Risk Management Plan</li> <li>• Components of the plan</li> <li>• Stakeholder Involvement</li> <li>• Roles and Responsibilities</li> </ul> Exercise and Discussion

## Day 2

Time Slot	Agenda
8:00-09:30	<ul style="list-style-type: none"> <li>• <b>Plan Risk Management(continued)</b></li> <li>• Risk Categories</li> <li>• Risk Breakdown Structure</li> </ul> Exercise
09:30-09:45	Morning Tea Break

09:45-11:30	<b>Identify Risks</b> <ul style="list-style-type: none"> <li>• How to identify risks</li> <li>• Cause, Event, Effect</li> <li>• Risk Triggers</li> <li>• Risk Identification Techniques; SWOT, Cause and Effect, etc.</li> </ul> Exercise
11:30-12:30	Prayers & Lunch
12:30-14:30	<b>Risk Identification (continued)</b> <ul style="list-style-type: none"> <li>• The Risk Register</li> <li>• Risk Data Sheets/Risk Identification Sheets</li> </ul> Exercise <b><u>Qualitative Risk Analysis</u></b> <ul style="list-style-type: none"> <li>• Understanding Scoring</li> <li>• Types of Impact</li> </ul>
14:30-14:45	Afternoon Tea Break
14:45-16:00	<b>Qualitative Risk Analysis (continued)</b> <ul style="list-style-type: none"> <li>• Data Quality Assessment</li> <li>• Bias</li> <li>• Risk Urgency</li> </ul> Exercise

### Day 3

Time Slot	Agenda
8:00-09:30	<b>Quantitative Risk Analysis</b> <ul style="list-style-type: none"> <li>• When to use quantitative analysis?</li> <li>• What to achieve with quantitative analysis?</li> </ul>
09:30-09:45	Morning Tea Break
09:45-11:30	<b>Quantitative Risk Analysis Techniques</b> <ul style="list-style-type: none"> <li>• EMV and EMV exercise</li> <li>• Decision Trees</li> <li>• PERT</li> <li>• Probability Distributions</li> <li>• Monte Carlo Analysis and Latin Hyper Cube</li> </ul>

	Exercise
11:30-12:30	Prayers & Lunch
12:30-14:30	<b>Risk Response Planning</b> <ul style="list-style-type: none"> <li>• Types of risk responses</li> <li>• Risk Strategies</li> <li>• Contingencies and fall back plans</li> </ul> Exercise
14:30-14:45	Afternoon Tea Break
14:45-16:00	<b>Risk Monitoring and Control</b> <ul style="list-style-type: none"> <li>• How to monitor risks?</li> <li>• Dashboards</li> <li>• EVA</li> <li>• Risks vs Issues</li> </ul> Post Assessment Test and Closing

### The Certificate:

Certificate of Attendance will be issued to the participants to the delegates upon completion of the Course

---

### **INSTRUCTOR'S PROFILE:**

**Mr. MARCEL C. DE** , BSc Chemical Engineering (Netherlands), Master of Business Administration (US), PMP, RMP and GPM-b started his professional career in 1981 in the Oil & Gas Industry where he designed, constructed and installed offshore platforms and pipelines. Since then he has worked on several Engineering and Construction projects for the Oil & Gas and the manufacturing industry before branching out into IT projects. Besides Engineering and Manufacturing, his strengths lie in Drawing & Document management, Logistics, Telecom, Contract management, Risk management, Performance management and Balanced Scorecards. For most of his career he has worked in international environments and has strong affinity to different cultures and working methods.

#### **Some highlights of his training expertise are:**

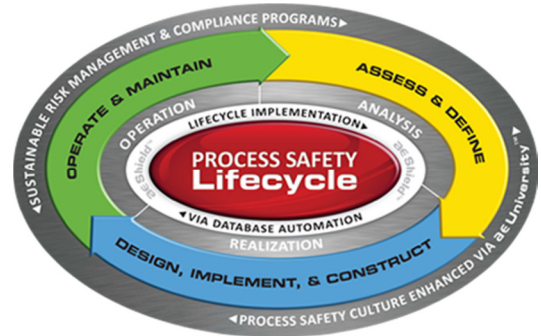
- Project Management; Being an experienced project manager and having PMP certification, are two of the factors that make Marco a very competent project manager trainer. Also his experience in

various industries and international environments make it easy for Marco to adapt to any situation.

- Risk Management. Marco always considered Risk Management as one of the priorities of a project manager, especially coming from high risk industries such as oil and gas and manufacturing. He has a RMP certification himself and is the main trainer for Risk Management and RMP certification.
- Procurement and Contract Management; throughout his career Marco has been involved in RFPs, Contracts, Negotiations and general support to the procurement process. He is familiar with the different types of contracts that are used in the industry and contract standards such as FIDIC and EJCDC.
- Sustainable Project Management; Marco has specialized in training incorporating sustainability into project management following the framework developed by GPM. He has GPM-b certification.

#### **Some of the key training programs conducted by Marcel C. De during the Year 2015**

- **May 2015: Comprehensive Project Management Training for QAFCO in Qatar for 60 candidates, 4 batches.**
- November 2014: Project Management training with simulation for PetronasCarigali in Turkmenistan
- January 2015: Project Management Training for Petra Energy
- March 2015: PMP Preparation Training for Petra Energy
- June 2015: PMP Training for Pertamina in Bandung Indonesia
- July 2015: Risk Management Training for several companies in Malaysia
- August 2015: RMP preparation training in Kuala Lumpur Malaysia
- October 2015: RMP preparation training in Kuala Lumpur Malaysia
- November 2015: 3 day Risk Management Training for Petronas Project Risk Department in Malaysia



## **PROCESS SAFETY MANAGEMENT – (P S M)**

### **Overview and Awareness Course**

#### **Course Overview:**

Unexpected releases of toxic, reactive, or flammable liquids and gases in processes involving highly hazardous chemicals have been reported for many years. Incidents continue to occur in various industries that use highly hazardous chemicals which may be toxic, reactive, flammable, or explosive, or may exhibit a combination of these properties. Regardless of the industry that uses these highly hazardous chemicals, there is a potential for an accidental release any time they are not properly controlled. This, in turn, creates the possibility of disaster.

“Process Safety Management of Highly Hazardous Chemicals”—containing requirements for the management of hazards associated with processes using highly hazardous chemicals to help assure safe and healthful workplaces. This emphasized the management of hazards associated with highly hazardous chemicals and established a comprehensive management program that integrated technologies, procedures, and management practices.

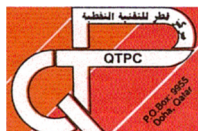
#### **Classification of the Course:**

**The course is presented in two levels of awareness:**

Level - 1 Management Overview Training for Chief Officers, Department Managers, Heads of Sections of Operations & Technical Divisions

Level - 2 Awareness Training for Practitioners for Engineers and Supervisors of Operations & Technical Divisions





## Course Outcomes/ Objectives:

***By the end of the program, participant/s will be able to:-***

- Understand the relevance and importance under the context of Process Safety Management
- Awareness of relevant standard of PSM and monitoring requirements
- Understand the typical implementation path in the organization and the bottlenecks in achieving PSM maturity

## Targeted Audience:

**The client has targeted the following audience for the Level-1 and Level-2 Programs:**

### **Level – 1                      Management Overview Training**

- Chief Officers, Department Managers, Heads of Sections of Operations & Technical Divisions of the Organization.

•

### **Level – 2                      Practitioners' Awareness Course**

- Engineers of operations and Technical division
- Supervisors of Operation and technical division

## **COURSE CONTENT**

**NOTE:** This is a Draft Course Content. The course will be further tailored/ customized to meet the exact requirements of the end user's corporate company. For this purpose, the Trainer needs to know/ see/ read/ understand the following and believes that; end user will supply the relevant information/ documents beforehand if such information/ documents is/ are not confidential. Or will give the Trainer access to its Site for a couple of days; so that; the Trainer can study/ understand the following, to name a few and can have discussions with the Company's PSM Professionals and Production Plant Heads.

- ▶ Company's Procedures related to PSM
- ▶ Company's Leading Indicator Reporting System
- ▶ Company's Management Systems to correlate the relevance of the Company's PSM to its Management System and to understand how the PSM elements are addressed in its Management Systems.
- ▶ Company's operations in order to assess how the Leading Indicators that are encoded in the Company's Leading Indicator Reporting System can be used to assess integrity of the Company's operations.



## **Content of MANAGEMENT OVERVIEW TRAINING – 2 Hours Session**

### **Process Safety Management Overview and how these are addressed in the end user's company's Management Systems**

- Definition of a Process Safety Event – case study
- Objective, Benefits & Purposes
- Process Safety Management Overview and its Relevance to company's management system
- PSM Elements as per OSHA 3132 – How asset integrity is covered in this

### **Performing Monitoring and Review**

- Guiding principles in selection of performance indicators as per API RP 754  
Leading and Lagging Performance Indicators
- T-1 to T-4 Process Safety Events
- End user's Leading Indicator Reporting System
- Reporting Systems Prevalent – data for PSEs

## **Content of AWARENESS TRAINING FOR PRACTITIONERS – 1 Day duration Session**

### **Process Safety management overview**

- Definition of a Process Safety Event
- Case studies – Two major Events
- Explanation of 14 elements of PSM
- Relevance to company's management system

### **Assessing Process Safety Management in the Organization**

- Hazards of materials
- Process design and equipment design basis
- PSM auditing

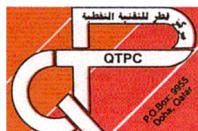
### **Performing Monitoring**

- T-1 to T-4 Process safety events and leading and lagging process  
Safety performance indicators as per API RP 754
- Company's leading indicator reporting system
- Guiding principles for selection of indicators

### **Review**

Objectives, Purposes and Benefits

Roles of Organization in PSM



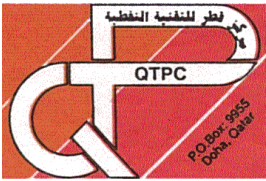
## Instructor's Profile

### **Mr. PradyutMitra:**

- Has expertise in Process Safety Management and has been training the Chemical Organizations to achieve Process Safety Excellence.
- Has acquired a good amount of experience using Leading Indicators.
- Has designed & delivered Advanced Safety training over a number of batches in **Qatar Petroleum (QP)**. This training included at least **10 Elements of PSM**.
- Has conducted Process Safety Management Training Course for Cairn Energy (*an Oil & Gas Extrusion Company in India*) and Alkyl Amines Chemicals in India during the year 2013 and 2014 respectively.
- Has carried out Process Hazard Analysis for complete ShriramAlkalies Plant at Jhagadia, Gujarat, India.
- Since the past 8 years he has delivered training courses in Safety in Oil & Gas, Improvement areas of Quality, HSE, Energy, Hazard Identification & Risk Assessment, HAZOP, QRA, ConsequenceAnalysis of Hazardous Processes.
- He has completed more than 5000 hours of training in Qatar, Kuwait and UAE.
- Throughout his professional career of about 25 years, he held several positions in Oil & Gas, Petrochemical industries as Plant Manager for Praxair Ltd & others such as BOC, Pfizer etc.

He has graduated with a Degree in Chemical Engineering from Indian Institute of Technology and Masters in Business Administration from Indian Institute of Management. He is a:

- Life Member of the Indian Institute Of Chemical Engineers
- Member of the Institute of Engineers (India)
- Chartered Chemical Engineer as Conferred by Institute Of Engineers' (India)
- Lead auditor in Environment Management System



# **Training Program on Reliability Centered Maintenance**



## **5 Day Training Program on Reliability Centered Maintenance**

### **Day 1 Introduction to RCM**

- What is RCM
- Brief History of RCM
- RCM Case Studies

### **Day 2- Introduction of Planned Maintenance**

- Overview of planned maintenance principles
- Characteristics of world-class planned maintenance
- Basic concepts of equipment Failures

### **Day 3 Overview of RCM Analysis Steps and Tools**

- Measures of Equipment performance
- Workshop: Estimating MTTF and equipment failure pattern
- Types of Maintenance Tasks

- Workshop: Identify different appropriate maintenance action
- Overview of six-step RCM analysis approach
- Overview of RCM Analysis Tools.

#### **Day 4 Traditional RCM Analysis Steps**

- Logic Tree Analysis (LTA)
- System Definition and selection using Pareto Analysis
- System Function and Failure Analysis
- Equipment failure mode identification
- Equipment Failure Mode Categorization

#### **Day 5 Applying Risk-based Tools in RCM**

- Overview of risk
- Risk-based system selection
- Risk based maintenance Task
- Risked –based task selection guides
- Managing an RCM project
- Resources needed
- Workshop: Scoping an RCM Analysis

➤ **Predictive maintenance and Reliability centered maintenance**

➤ **Advantages of predictive maintenance**

➤ **What to maintain and how to maintain.**

## **Learning Objectives:**

This program covers the basics of Reliability Centered Maintenance, Reliability theory, Preventive and Predictive Maintenance, evaluation of failure rates and applying these concepts in actual operation and maintenance practices.

This program is intended for all operations / maintenance / project personnel from petroleum, petrochemical, fertilizer, power plants and equipment intensive industries.

After participation in this programme, participants shall be able to assess the reliability of their industries and carry out predictive maintenance of their plant, which could save substantial maintenance costs and avert costly equipment failures.

## **Training Methodology**

1. Fully comprehensive manual
2. Supporting Power Point Presentation
3. Case studies
4. group studies



### ***COURSE INSTRUCTOR***

**Mr. James M. Watterson**, is graduated with Masters of Science (Engineering Technology) from Belfast Collage of Technology and he is the member of the several Professional Bodies;

- Fellow – Institute of Operation's Management
- Fellow – Royal Graphical Society
- Member – British Institute of Management
- Chartered Member – The Institute of Logistic and Transports.

He is a highly experienced consultant and trainer with over 35 years experience in various disciplines:- engineering, maintenance, marketing, management, project and contract management. Countries where experience has been gained include; Middle East, Mainland-Europe, North America, Australia and North Africa.

Since the past 30 years, he has delivered hundreds sessions of training courses in the area of technical and management such as;

- HaZOP and HaZARD Management Control
- Project Management
- Troubleshooting with all rotating equipment including turbines- gas and steam applications
- Failure Analysis and Machinery diagnosis
- Root Cause Analysis (RCA)

- Pump maintenance- centrifugal and reciprocating-Dismantling and rebuilding pumps
- Maintenance Planning and Scheduling
- Plant shutdown and Start-Up activities.
- Total Productive Maintenance
- Risk & Hazards Analysis
- Centrifugal Compressors – Operations and Maintenance
- Plant Shutdown and Start-Up Techniques
- Problem-solving and Decision Making
- Contract Management
- Advanced Supervisory Training
- Recruitment skills for hiring new employees
- Pipe design and pipeline trouble-shooting

In the Middle East and North Africa (MENA), he has conducted training course for the company such as; Saudi Aramco, Sabic Industries, Saudi Arabia Electricity Company, Crystal Co., Kuwait Petroleum Corporation, Banagas, Oman LNG, Oman Gas, Oman Occidental Refinery, Adgas, Gasco, Takreer and etc.





## Reliability Centred Maintenance (RCM) Course



### Course Overview Five (5) Days

This program covers the basics of Reliability Centred Maintenance, Reliability theory, Preventive and Predictive Maintenance, evaluation of failure rates and applying these concepts in actual operation and maintenance practices.

This program is intended for all operations/maintenance/project personnel from petroleum, petrochemical, fertilizer, power plants and equipment intensive industries.

After participation in this programme, participants shall be able to assess the reliability of their industries and carry out predictive maintenance of their plant, which could save substantial maintenance costs and avert costly equipment failures.

### Course Outcomes

Upon completion, participants will be able to:

- Understand how to use the resulting risk ranking as the basis for prioritising and managing all maintenance activities.
- Understand the applicability of actuarial analysis in the application of RCM.
- Participate in the development of a successful physical asset maintenance plan based on the RCM principles.
- Understand how to align the implementation of RCM and the resulting failure management policies to the risks associated with processes, systems, and physical assets and their possible failures.

### Who Should Attend?

This is an excellent workshop for anyone that is looking to improve the efficiency and effectiveness of their existing maintenance plans and are interested in the impact of future maintenance activities on the reliability of their equipment and the cost of failure. The workshop will be of practical benefit to: Technicians, Engineers, Planners and Managers.

### Course Content

Introduction to RCM

- What is RCM
- Brief History of RCM

- RCM Case Studies

#### Introduction of Planned Maintenance

- Overview of planned maintenance principles
- Characteristics of world-class planned maintenance
- Basic concepts of equipment Failures

#### Overview of RCM Analysis Steps and Tools

- Measures of Equipment performance
- Workshop: Estimating MTTF and equipment failure pattern
- Types of Maintenance Tasks
- Workshop: Identify different appropriate maintenance action
- Overview of six-step RCM analysis approach
- Overview of RCM Analysis Tools.

#### Traditional RCM Analysis Steps

- Logic Tree Analysis (LTA)
- System Definition and selection using Pareto Analysis
- System Function and Failure Analysis
- Equipment failure mode identification
- Equipment Failure Mode Categorization

#### Applying Risk-based Tools in RCM

- Overview of risk
- Risk-based system selection
- Risk based maintenance Task
- Risked –based task selection guides
- Managing an RCM project
- Resources needed
- Workshop: Scoping an RCM Analysis

#### Predictive maintenance and Reliability centred maintenance

#### Advantages of predictive maintenance

#### What to maintain and how to maintain



#### Course Instructor

**Mr. James M. Watterson**, is graduated with Masters of Science (Engineering Technology) from Belfast Collage of Technology and he is the member of the several Professional Bodies;

- Fellow – Institute of Operation's Management
- Fellow – Royal Graphical Society
- Member – British Institute of Management
- Chartered Member – The Institute of Logistic and Transports.

He is a highly experienced consultant and trainer with over 35 years experience in various disciplines:- engineering, maintenance, marketing, management, project and contract management. Countries where experience has been gained include; Middle East, Mainland-Europe, North America, Australia and North Africa.

Since the past 30 years, he has delivered hundreds sessions of training courses in the area of technical and management such as;

- HaZOP and HaZARD Management Control
- Project Management
- Troubleshooting with all rotating equipment including turbines- gas and steam applications
- Failure Analysis and Machinery diagnosis
- Root Cause Analysis (RCA)
- Pump maintenance- centrifugal and reciprocating-Dismantling and rebuilding pumps
- Maintenance Planning and Scheduling
- Plant shutdown and Start-Up activities.
- Total Productive Maintenance
- Risk & Hazards Analysis
- Centrifugal Compressors – Operations and Maintenance
- Plant Shutdown and Start-Up Techniques
- Problem-solving and Decision Making
- Contract Management
- Advanced Supervisory Training
- Recruitment skills for hiring new employees
- Pipe design and pipeline trouble-shooting

In the Middle East and North Africa (MENA), he has conducted training course for the company such as; Saudi Aramco, Sabic Industries, Saudi Arabia Electricity Company, Crystal Co., Kuwait Petroleum Corporation, Banagas, Oman LNG, Oman Gas, Oman Occidental Refinery, Adgas, Gasco, Takreer and etc.

## **Day 1 – FMEA Fundamentals**

- FMEA and FMECA definitions
- FMEA Objectives
- Prediction Vs Detection

## **Day 2 – FMEA Roadmap**

- The 9 steps
  - Describe Product or Process
  - Define the Function
  - Identify Potential Failure Modes
  - Describe Effects of Failure
  - Determine Causes
  - Detection Methods/Current Controls
  - Calculate Risk
  - Take Action
  - Assess Results

## **Day 3 – FMEA Quantification**

- Failure rates – MTBF, and probability of failure
- Failure rate sources
- Human error failure rates
- Case studies

## **Day 4 – Rational Structure to Determine Scope**

- Process FMEA for Concept
- Process FMEA for Process Control
- Structured Sequential Screening
- Failure Mode Definition
- Strategy for Assessing Risk
  - High Severity Risks
  - High Design Risks
  - High Risk Priority Numbers

## **Day 5- FMEA and Related Analysis Techniques**

- Understanding RCFA

- Fault Tree Analysis
- Cause & Effect Analysis
- RCM and useful it is to FMEA
- Principles Of Reliability Engineering

### **Methodolgy for Training**

- Course will be supported by:-
  - Fully comprehensive manual
  - Supporting Power Point Presentation
  - DVDs of case studies
  - Case Studies
  - Group Studies
  - Self- Assessment



#### ***COURSE INSTRUCTOR***

**Mr. James M. Watterson**, is graduated with Masters of Science (Engineering Technology) from Belfast Collage of Technology and he is the member of the several Professional Bodies;

- Fellow – Institute of Operation’s Management
- Fellow – Royal Graphical Society
- Member – British Institute of Management
- Chartered Member – The Institute of Logistic and Transports.

He is a highly experienced consultant and trainer with over 35 years experience in various disciplines:- engineering, maintenance, marketing, management, project and contract management. Countries where experience has been gained include; Middle East, Mainland-Europe, North America, Australia and North Africa.

Since the past 30 years, he has delivered hundreds sessions of training courses in the area of technical and management such as;

- HaZOP and HaZARD Management Control
- Project Management
- Troubleshooting with all rotating equipment including turbines- gas and steam applications
- Failure Analysis and Machinery diagnosis

- Root Cause Analysis (RCA)
- Pump maintenance- centrifugal and reciprocating-Dismantling and rebuilding pumps
- Maintenance Planning and Scheduling
- Plant shutdown and Start-Up activities.
- Total Productive Maintenance
- Risk & Hazards Analysis
- Centrifugal Compressors – Operations and Maintenance
- Plant Shutdown and Start-Up Techniques
- Problem-solving and Decision Making
- Contract Management
- Advanced Supervisory Training
- Recruitment skills for hiring new employees
- Pipe design and pipeline trouble-shooting

In the Middle East and North Africa (MENA), he has conducted training course for the company such as; Saudi Aramco, Sabic Industries, Saudi Arabia Electricity Company, Crystal Co., Kuwait Petroleum Corporation, Banagas, Oman LNG, Oman Gas, Oman Occidental Refinery, Adgas, Gasco, Takreer and etc.