

# Risk Based Maintenance

## INTRODUCTION

- The cornerstone of plant integrity is ensuring that assets are correctly designed, operated and maintained within the requirements. The profitability of plants is significantly influenced by the cost-effectiveness of the preventive maintenance strategy in place. Assets are subject to deterioration mechanisms and potential damage throughout their service life. To ensure that the required reliability, availability and safety is being delivered within acceptable cost, we need to understand the deterioration mechanisms the assets will be exposed to and their effects (risk), to be able to find the most effective maintenance task for this asset in the current circumstances. This entails identifying the deterioration mechanisms, determining their failure rates, risk criteria and the extent, frequency, and methodologies for maintaining the assets.
- Traditionally, maintenance strategies are based on experience and in some cases developed in response to significant failures. In general, they do not take full account of failure risks nor of the degradation mechanisms that the asset is exposed to in operation. As a result, organizations will not do the right maintenance actions or in the right frequency to avoid failures, while others would unnecessarily overspend, resulting in significant waste of resources and sometimes maintenance induced failures as an unwanted result.
- This intensive 3-day training course introduces the Risk Based Maintenance (RBM) methodology that enables the assessment of the likelihood and potential risk of asset failures. RBM provides organizations the opportunity to prioritize their assets for maintenance, optimize maintenance methods, frequencies and resources, develop specific long term maintenance plans and integrate it with current methodologies like Failure Mode Effect & Criticality Analysis (FMECA), Risk Based Inspection (RBI) and Potential Failure Analysis (PFA) as well as the maintenance workflow. This results in improved safety, lower failure risks, fewer forced shutdowns and reduced operational costs. Thus, maintenance really adds value to the organization.
- You will learn how to apply this systematic and integrated use of expertise from the different disciplines that impact plant integrity. We will discuss several examples of industry wide RBM projects, their successes and failures and how to learn from it.

This training course will feature:

- Understanding & applying the Risk Based Maintenance (RBM) methodology to be able to develop an effective maintenance strategy in your own environment
- The concept of risk and risk-thinking in maintenance
- The probability of failure, failure behavior of systems and its impact on risk
- Choosing the right maintenance task and (predictive) maintenance technology
- How to integrate RBM with other methodologies like FMECA, RBI and PFA, as well as the maintenance workflow
- Cost/benefit thinking and using decision support tools to make maintenance more effective
- How to use Key Performance Indicators to measure the performance

## OBJECTIVES

At the end of this training course, delegates will have:

- An understanding of the concept and practical application of a Risk Based Maintenance program
- Knowledge of the potential contribution of RBM to maintenance effectiveness and performance
- Guidelines indicating how RBM interacts with workflow management and other methodologies
- Hints and tips for practical application of RBM so as to achieve the best results
- A practical approach to develop an action plan to utilize RBM in their own areas of responsibility, fitting RBM into the Asset Management and measuring results

## WHO SHOULD ATTEND?

- This training course is directed towards Maintenance & Reliability Engineers, Maintenance and Engineering Professionals and Maintenance and Production Heads, who wish to update themselves on Risk Based Maintenance, maintenance reference plans, judge its suitability for their needs, and learn how to implement it for the benefit of their organizations.

## Course Outline

### Overview of the Maintenance & Reliability Aspects

- The business impact of maintenance
- Asset Management as a framework to realise value from assets
- Cost-benefit decisions: the right amount of maintenance
- The maintenance reference plan
- Deterioration of assets – basic failure behaviour of assets and systems
- Reliability, Availability, Maintainability, Safety
- Understanding risk: a key driver for preventive maintenance
- The risk matrix
- Wrap-up

### Implementation Aspects

- The seven steps of Risk Based Maintenance: integration of Failure Mode Effect & Criticality Analysis (FMECA)
- Failure patterns & Weibull distribution
- Determine maintenance tasks and frequencies
- Integrating spare parts, tools and facilities
- Alternative tasks for specific equipment
- inspection & testing

## Implementation Aspects

- Optimization: Using Decision Support Tools to optimize maintenance tasks & frequencies
- Implementing Predictive Maintenance technologies
- Implementation aspects and integration with maintenance workflow management and other methodologies like Risk Based Inspection (API 580) and Potential Failure Analysis (PFA)
- Monitoring performance
- Action plan to implement RBM
- Wrap-up