

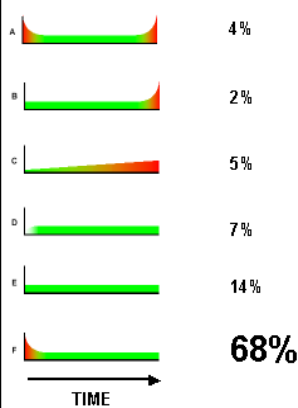


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# Risk-Based Reliability - Centered Maintenance

3-day Workshop

## Failure Patterns



## Course Overview

Risk-Based Reliability Centered Maintenance [RCM] sets out to highlight and formalise the identification, categorisation and management of risk as part of the development of failure management and maintenance management plans.

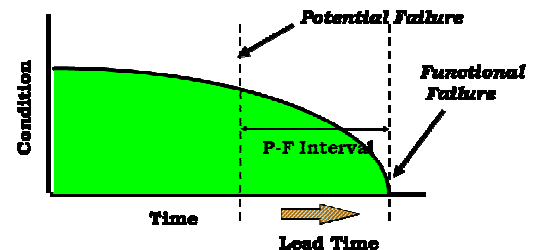
Risk-Based RCM is focussed on firstly identifying the risks involved with possible failures, and then quantifying these risks. After that, the most appropriate and effective way of dealing with these direct physical and economic risks can be determined. In this way, the consequences of a failure can be avoided altogether, or they can be reduced to a tolerable level.

The following aspects are covered:

- Changes in approach to maintenance since the 1940s
- How the role of maintenance has changed as a result of automation and mechanisation
- Development of RCM and the SAE JA 1011 RCM Standard
- Objective of maintenance
- Steps involved to perform Physical Asset Management
- Process involved for the development of support activities for complex equipment
- Implementation of applicable and appropriate Failure Management Policies
- Benefits of implementing RCM

## Supported Standards

- SAE JA 1011/1012
- Mil Std 1629
- AS / NZS 4360 1999: Risk Management
- AS / NZ 3931 1998: Risk Analyses of Technological System [Application Guide]
- SAE ARP 5580 FMEA Std



## Course Objectives

To provide candidates with an introduction to the philosophy, theory and practical experience needed to implement and perform RCM analyses.

Upon completion of this course candidates will:

- Understand the concepts and processes required to perform a Risk- Based RCM Analyses,
- Be able to participate in a Risk-Based RCM Analysis.

Additional assistance, training and experience will however be required to independently implement an RCM programme.



ECSA

Engineering Council of South Africa

CPD Accreditation Number  
 SAIMechE - 00649 - 07/14  
 CPD Category - 1  
 Credits - 3

## For Bookings

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# Reliability Centered Maintenance

## Course Outline

### Introduction to Maintenance Management

- The History of Maintenance.
- The role of Maintenance in the new generation plants and operations.
- The effect of automation and mechanisation on required availability and reliability.
- The effect of automation and mechanisation on the requirement for safety and environmental integrity.
- The effect of automation and mechanisation on the requirement for product and service quality.
- The effect of automation and mechanisation on maintenance costs.

### The Development of RCM

- Traditional view.
- RCM development history.

### The Nature of Failures

- Failure patterns.
- Failure mechanisms associated with direct wear.
- Failure mechanisms associated with erosion, corrosion, metal fatigue, etc.
- Failure mechanisms associated with situations where initial forces are exerted on equipment during startup periods.
- Failure mechanisms where there are no relationship between operating age and the likelihood of failure.
- Typical cover-up work in shutdowns.
- Failure mechanisms associated with some form of human error.

### The Meaning of Maintenance

- Definition of maintenance.
- Opportunity for maintenance to play a meaningful role.
- Objective of maintenance.
- The role of RCM in maintenance.

### Physical Asset Management

- Moving beyond maintenance.
- Development of physical asset management.

### The RCM Process

- Complies completely with the SAE JA 1011 standard.
- Defines the circumstances in which a physical asset or system is expected to operate.
- Defines all the functions of the asset / system, including those of protecting devices.
- Defines and quantifies performance standards.
- Determines the level of analyses and analyses boundaries.
- Defines all the failed states associated with each function.
- Considers the different causes for functional failures [Maintenance, Operations and Design].
- Defines all the different failure modes.
- Defines the processes involved in the failure mode causes.
- Identifies failure modes at the level of causation.
- Develops maintenance policies that are focused on preventing failure modes or at least manage the effect and consequence of a failure mode.
- Considers physical failures, human errors and latent causes.
- Describes the immediate failure effects that will happen when a failure mode occurs [Local effects, next higher level effects, sequence of events and end effects].
- Considers hidden failures, safety and environmental consequences as well as operational and non-operational consequences.
- Determines the risk of each functional failure.
- Determines the probability of each functional failure.
- Quantifies the risk of each functional failure.
- Allow for the development of maintenance tasks that will reduce the risk of failure to a level that will be tolerable to the organisation or else defaults to a suitable maintenance policy.
- Ensures cost effective maintenance plans.
- Considers the relationship between age and failure.
- Considers pro-active and re-active failure management policies.
- Makes provision for different implementation strategies.
- Provides for training of personnel in RCM principles.

### Typical Course Candidates

- Senior Management [including Financial Managers, Human Resource Managers and Risk Managers]
- Middle Management [including Engineers, Senior Technicians, Maintenance and Operations Supervisors or Foreman]
- Plant or Equipment Operators and Maintainers
- Risk-Based RCM Facilitators