This guide applies to everyone from graduates, operators, experienced technicians, planners, and engineers, to supervisors, managers, project managers and subject matter experts.
THE COMPLETE GUIDE TO RCM SKILLS DEVELOPMENT FOR RELIABILITY PROFESSIONALS

This guide applies to everyone from graduates, operators, experienced technicians, planners, and engineers, to supervisors, managers, project managers and subject matter experts.

SO WHAT’S THE END GOAL?

To educate and equip yourself for effective decision making so you can reduce risk and maximize the reliability and availability of your assets.

AND AFTER ALL, YOU GOTTA HAVE GREAT SKILLS.

Here's a snapshot of the learning curve

NOW LET'S DIVE IN

RCM SKILLS DEVELOPMENT

INNOCENCE

RCM 101
UNDERSTANDING RCM FOR MAINTENANCE TASK OPTIMIZATION

Start by gaining awareness of these concepts:

- What is Reliability Centered Maintenance
- What is a Function with Specification?
- How to Identify Failure Modes
- The 7 Questions of RCM
- Preventive and Predictive Maintenance
- What is the PF Curve?
- Selecting the Optimum Task

AWARENESS

RCM 201
USING RCM SOFTWARE TO BUILD AN OPTIMIZED MAINTENANCE PLAN

Next, you'll want to understand how to:

- Create a RCM Study Terms of Reference
- Perform Weibull Analysis
- Perform RCM Analysis
- Random Failures & Age Related Failures
- Produce the Load Sheet / Plan / Work Instructions
- Utilize Reporting

UNDERSTANDING

RCM 301
APPLYING RCM SOFTWARE TO VARIOUS SCENARIOS

Now it's time to hone your skills in RCM software, including:

- Modelling Scenarios
- Using Libraries and Maintenance Templates
- Managing Data Quality
- Version Comparisons
- Configuration Options
- Loadsheets
- Work Instruction Documents
- Producing the ISO55000 AMP (Asset Management Plan)

COMPETENCE

RCM 401
FACILITATING RCM STUDIES

You're ready to learn the intricacies of facilitation:

- Preparing and Collecting Base Data
- Scoping a Study / Setting Boundaries
- Facilitating FMEA Sessions
- Facilitating Maintenance Selection
- Working with the CMMS
- RCM Communications Plan
- Sponsor and Executive reports

EXPERT

RCM 501
KEEPING RCM STUDIES UP TO DATE WITH CURRENT PERFORMANCE

Let's sustain RCM and refine your expertise:

- RCM Strategy is just the Start Line
- The Living Program – a Continuous Improvement Methodology
- Collecting and Cleansing Failure Data
- Advanced Curve Fit and Modeling of Failure Data
- AWB Portal – Analytics, Push Pull Data, FRACAS
- Corrective Action System Management
- High Precision Maintenance – Reduction of Infant Mortality thru Planning

At this stage, you should be able to:

- Collect data
- Update Failure Parameters
- Re-Optimize Maintenance
- Identify Changes
- Implement Changes

AHHH... IF ONLY THEY COULD SEE ME NOW

Focus on developing your RCM skills as outlined above and you'll really be ready to flex your Reliability muscles.

TO START YOUR JOURNEY, VISIT

www.armsreliabilitytraining.com

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www.armsreliabilitytraining.com
The ARMS Reliability Training Curve aligns to the professionals learning journey to be a RCM Expert. Visit www.armsreliabilitytraining.com to learn more.

www.armsreliabilitytraining.com
Using RCM, you can increase the cost effectiveness of your operations, boost machine uptime, and gain a greater understanding of the level of risk your organization manages.

In this introductory course, we put Reliability Centered Maintenance (RCM) under the spotlight. By looking at its history and current application in industry, we show you how RCM can be used across a range of maintenance tasks.

For example, you will discover that:

- RCM is a powerful engineering framework used to define complete maintenance regimes. It is used to identify failures through analysis of data, and to assess the cost of failure.
- With RCM, maintenance is about maintaining optimum levels of performance in machinery, in a defined operating context. RCM reveals whether preventative or predictive maintenance is most appropriate to achieve this.

- RCM is used to monitor, assess, predict and generally understand the workings of physical assets; and to balance acceptable risk against mitigation costs.
- By applying ‘RCM logic’ and the 7 questions of RCM, appropriate maintenance tasks can be identified and applied.
RCM 101 is your introduction to the powerful RCM methodology, and provides an ideal starting point if you plan to participate in RCM studies. In the course, you will use instructor-led scenarios as a fast-tracked method of learning how to interact with the RCM process.

This course is the first in a 5-part series that takes you from innocence to expert.

Course Key Learning
• The history and purpose of RCM, and how it is applied today in industry
• How to interact with actual failure data and model the failure mode using basic curve fit methods
• How to prepare a maintenance strategy and select whether preventative or predictive maintenance is most effective to mitigate failure risks

Course Modules
• What is RCM?
• What are the 7 questions of RCM?
• Identification of failure modes
• Failure data & the 6 curves
• Assessing cost of failure
• Preventative maintenance
• Predictive maintenance
• Choosing the optimal task
• Packaging tasks

Who Should Attend?
• RCM Team Members
• Reliability Engineers
• Project Engineers
• Maintenance Analysts
• Maintenance Superintendents
• Design Engineers
• Plant Performance Engineers

Industries
• Steel
• Mining
• Manufacturing Plants
• Oil and Gas
• Food and Beverage
• Repetitive Manufacturing
• Automotive

Course Information
• Length: 8 hours (1 day)
• Exam fee: Included
• Course type: In-house
• Certification: n/a

INNOCENCE
UNDERSTANDING
RCM FOR
MAINTENANCE TASK OPTIMIZATION

Start by gaining awareness of these concepts:
• What is Reliability Centered Maintenance
• What is a Function with Specification?
• How to Identify Failure Modes
• The 7 Questions of RCM
• How to Assess Cost of Failure
• Preventive and Predictive Maintenance
• What is the PF Curve?
• Selecting the Optimum Task

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To achieve the end goal of installing a strong strategy in your CMMS or ERP system, you need an optimized maintenance plan. To get there, you need RCM and RCMCost.

This course builds upon the knowledge gained in RCM 101, and starts examining the management principles and strategies needed for success.

It explores a range of topics, including:

- The importance and how-to of sound management – to avoid common RCM pitfalls like taking too long, blowing the budget or never getting an investigation off the ground.

- Compliance of RCM with the SAE JA1011 and SAE JA1012 suite of standards. These standards act as a roadmap when building and delivering an optimized maintenance plan.

- Using the FMECA structure to lay the foundation for the RCM process. There are important steps to follow to ensure the fastest delivery of a safe and executable maintenance strategy.

Along the way, you will also learn how to demonstrate the benefit of the strategy to key stakeholders, by showing just how well it aligns to business objectives.

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RCM 201
Course Overview

This course will teach you how to manage the RCM process in the right way, from the outset. In the hands-on 3 day course, you will learn how to produce work instructions and ERP/CMMS load sheets, use RCMCost with the ARMS RIT and, most importantly, achieve successful outcomes.

Course Key Learning
- Weibull analysis and the use of RCM analysis
- How to produce a packaged and optimized set of maintenance tasks
- How to produce ERP/CMMS load sheets, load tables and work instruction documents
- How to quantitatively evaluate the strategy against the business requirements

Course Modules
- Weibull advanced analysis methods
- RCM analysis – using SAE JA1011
- Importance of correctly defining system boundaries, functions and functional failures
- Optimizing individual tasks
- Grouping and routes preparation
- Producing load sheets for common ERP systems
- Generating work instruction documents
- Business case evaluation

Who Should Attend?
- RCM Team Members
- Reliability Engineers
- Project Engineers
- Maintenance Analysts
- Maintenance Superintendents
- Design Engineers
- Plant Performance Engineers

Course Information
- Length: 3 days
- Exam fee: Included
- Course type: In-house/Public
- Certification: n/a

Industries
- Steel
- Mining
- Manufacturing Plants
- Oil and Gas
- Food and Beverage
- Repetitive Manufacturing
- Automotive

AWARENESS

USING RCM SOFTWARE TO BUILD AN OPTIMIZED MAINTENANCE PLAN

Next, you’ll want to understand how to:
- Create a RCM Study Terms of Reference
- Perform Weibull Analysis
- Perform RCM Analysis
- Random Failures & Age Related Failures
- Produce the Load Sheet / Plan / Work Instructions
- Utilize Reporting

www.armsreliabilitytraining.com
Not all RCM studies are the same. Each has a different goal, operating context and definitions. As such, it is important to learn how to adapt RCMCost to suit specific situations or environments.

This course builds upon the knowledge gained in RCM 201, using real RCM studies and a range of scenarios to demonstrate how RCM studies are successfully completed in different environments.

It explores a range of topics, including:

- Working with different RCM studies, which each have unique "boundaries" or goals. In each unique situation, different modeling scenarios are used to produce desired outcomes.

- The use of libraries – which exist to speed up and enhance RCM efforts. Library components, systems and sub-systems are examined, as well as libraries of alternative "operating contexts".

- Version control and version comparison, as well as configuration options and alternative methods to generate load sheets for CMMS systems like SAP® and MAXIMO®.

- Using the ARMS Reliability Integration Tool (RIT) to perform quality checking, deliver detailed work instructions and produce ISO55000-ready Asset Management Plans.

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RCM 301
Course Overview

This advanced course will teach you how to deal with a variety of RCM study scenarios. Using real-world RCM studies, you will learn how to adapt RCMCost for various RCM project boundary situations.

In the hands-on 2 day course, you will become proficient at using RCMCost with the ARMS RIT software.

Course Key Learning
• How to perform RCM analysis using ARMS RIT
• How to produce a packaged and optimized, error-checked and formatted set of maintenance tasks
• Advanced real examples to produce ERP/CMMS load sheets, load tables, and work instruction documents.
• Methods for testing data and model quality

Course Modules
• Advanced modeling scenarios
• SAE JA 1011 key points
• Building and using reference libraries
• Maintenance templates
• Controlling data quality
• Managing version controls
• Advanced configuration options
• Special modeling methods
• Advanced load sheet production
• Advanced work instruction generation
• Producing the ISO 55000 Asset Management Plan (AMP)

Who Should Attend?
• RCM Team Members
• Reliability Engineers
• Maintenance Analysts
• Maintenance Superintendents
• Design Engineers
• Plant Performance Engineers
• Maintenance Planners
• Graduate Reliability Engineers

Course Information
• Length: 2 days
• Exam fee: Included
• Course type: In-house/Public
• Certification: n/a

Industries
• Steel
• Mining
• Manufacturing Plants
• Oil and Gas
• Food and Beverage
• Repetitive Manufacturing
• Automotive

UNDERSTANDING

Now it’s time to hone your skills in RCM software, including:

• Modelling Scenarios
• Using Libraries and Maintenance Templates
• Managing Data Quality
• Version Comparisons
• Configuration Options
  • Loadsheets
• Work Instruction Documents
• Producing the ISO55000 AMP (Asset Management Plan)

www.armsreliabilitytraining.com
At the heart of successful RCM studies sits a highly competent facilitator. Yet facilitation involves so much more than knowledge of RCM software.

This course builds upon the knowledge gained in RCM 201 and RCM 301, and focuses on enhancing your facilitation skills to ensure that any RCM study you steer is a success.

Using RCMCost software as the tool to build and output an optimized maintenance plan, you will gain rich insights into the strategies and methodologies that facilitators rely on.

The course explores a range of topics, including:

- Creating a “facilitator’s tool kit” using a variety of support and project management functions.
- Preparation for an RCM study, including identification of the data needed, how to collect this data, how to scope the study and establish the study boundary, how to define what is “reasonably likely”, and interact with corporate risk registers.
- The primary role of the RCM facilitator, which is to facilitate the application of the RCM philosophy by asking targeted questions of people chosen for their knowledge of a specific asset or process.
- Other roles of the RCM facilitator, such as managing the analysis, ensuring the application of the RCM logic, time management, and administrative and logistics tasks.

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This course will teach you how to facilitate RCM analyses and studies, equipping you with all the essential skills for successful RCM facilitation.

The hands-on 2 day course uses RCMCost, the AWB Portal (SAP or Maximo) and ARMS RiT software. Packed with practice exercises, you will become adept at steering the facilitation process.

Course Key Learning
- Roles and processes involved in facilitation, using instructor-led samples and RCMCost examples
- The data collection process, scoping study boundaries and purpose
- Methods to properly facilitate a FMECA session using the 7 questions of RCM
- Facilitating the maintenance selection and maintenance packaging sub-processes of RCM
- Methods to validate the resultant plan, perform QA and work with various CMMS systems

Course Modules
- Preparation for RCM – terms of reference
- Planning for RCM studies
- Defining the RCM study scope, boundary, and operating context
- Performing RCM FMECA using a RCM logic tree compliant with SAE JA1011
- Facilitating maintenance task selections
- Validating the plan results
- Working with your CMMS
- Interacting with a technical writer
- Updating the analysis

Who Should Attend?
- RCM Team Members
- Reliability Engineers
- Maintenance Analysts
- Maintenance Superintendents
- Design Engineers
- Plant Performance Engineers
- Maintenance Planners
- Graduate Reliability Engineers

Course Information
- Length: 2 days
- Exam fee: Included
- Course type: In-house/Public
- Certification: n/a

Industries
- Steel
- Mining
- Manufacturing Plants
- Oil and Gas
- Food and Beverage
- Repetitive Manufacturing
- Automotive

You're ready to learn the intricacies of facilitation:
- Preparing and Collecting Base Data
- Scoping a Study / Setting Boundaries
- Facilitating FMEA Sessions
- Facilitating Maintenance Selection
- Working with the CMMS
- RCM Communications Plan
- Sponsor and Executive reports

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Implementing an RCM study is just the beginning of a successful RCM process. The RCM “Living Program” is designed to evolve your maintenance strategy in line with changing assets.

This advanced course reveals how an RCM study is just the starting point for success, and that an ongoing program of continuous improvement must follow the initial maintenance strategy deployment.

An RCM Living Program is vital to maintaining an up-to-date RCM strategy. Originally called the RCM Living Program by Nowlan and Heap in 1978, it is still regarded as industry best practice methodology.

This course covers a range of topics in this area, including:

- FRACAS (Failure Reporting and Corrective Action Systems) and the asset data integrity controls relevant to collecting performance data.
- Using RCMCost software, the Weibull module and AWB Portal to extract failure data from real world CMMS scenarios; and how to clean-up this data, prepare Weibull data sets, and curve fit the data for inclusion into the original RCMCost maintenance strategy.
- Re-optimizing and augmenting the strategy to counter identified changes (this includes a brief introduction of Apollo RCA).
- Implementing changes and calculating business benefit and cost.

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RCM 501

Course Overview

This course will show you how to operate the RCM Living Program. The hands-on 2 day course uses RCMCost, Weibull, and the AWB portal with the ARMS RIT. It also uses simulated real world performance data to walk through the Failure Reporting process and prepare a next generation maintenance strategy.

Course Key Learning
- Failure Reporting from your CMMS system while using the most advanced integrated software available
- How to capture quality failure data using data integrity controls
  Using less than perfect data to identify changes and implement next generation maintenance strategies to effectively suppress failure modes
- (Note: the in-house course uses current failure data and ERP system where possible)

Course Modules
- Collecting data – manual & ERP portal connections
- Cleansing failure data and producing highly correlated failure models
- Advanced curve fitting of failure data
- Updating original RCM study failure assumptions
- Re-optimization and next generation maintenance strategy production
- Identification of changes
- Implementing changes
- Quantifying the benefit of each change

Industries
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- Mining
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- Oil and Gas
- Food and Beverage
- Repetitive Manufacturing
- Automotive

Who Should Attend?
- RCM Team Members
- Reliability Engineers
- Maintenance Analysts
- Maintenance Superintendents
- Plant Performance Engineers
- Maintenance Planners
- Graduate Reliability Engineers

Course Information
- Length: 2 days
- Exam fee: Included
- Course type: In-house/Public
- Certification: n/a

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WHO WE WORK WITH

vancouver, bc
Calgary, ab
(scheduled to be opened in 2013)

austin, tx

manchester, uk

Montevideo, uru

Johannesburg, rsa
Since 1995, ARMS Reliability has been at the forefront of proactive asset management strategies for a range of blue chip companies throughout the world.

These companies have entrusted ARMS Reliability with delivering business goals through effective asset management and improvements in operating productivity.

The a unique blend of consulting, education and software solutions, we provide a “one stop shop” service to enable our clients to make better decisions to improve Asset Reliability.

Call to book your course today. Ask our Expert trainers to build your team a customized training career path to Expert!

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