



CAPABILITIES





CONTENTS

Asset Performance	4
Optimal Asset Performance	8
RAMS Studies	10
Maintenance Strategy Development And Optimization	12
Spare Parts Analysis And Optimization	16
Life Cycle Costing	17
Root Cause Analysis And Defect Elimination	19
Process Reliability	20
Vulnerability Analysis And Assessment	21
The ARMS Reliability Difference	22
Global Reach	24
Why ARMS Reliability?	24
Common Ways We Work With Clients	25
Clients and Experience	26



ASSET PERFORMANCE

ARMS Reliability provides solutions to help companies achieve optimal asset performance.



What is your **current performance**?

Why is **optimal performance** not being achieved?

How can **performance be improved**?

ARMS Reliability has a track record of success in partnering with clients to achieve their asset design, maintenance and performance objectives. Our portfolio is cross-platform and cross-industry – including sizable and complex projects within the mining, oil & gas, utilities, manufacturing, and infrastructure sectors.

We have proven success on RAMS studies for major capital projects where our reliability experts develop whole-of-life models including design verification, optimized maintenance plans, budget forecasts, risk evaluations, resource requirements, PM and work instruction document generation and auto loading of maintenance plans to asset management systems.

For existing plants, our ability to model and optimize plant performance leads to immediate and direct results both operationally and on the bottom line.

	EXISTING PLANT	NEW PROJECT
RELIABLE OPERATIONS	Reduce maintenance costs	Prove design capability
PROACTIVE ASSET MANAGEMENT	Find hidden plant	Define asset management processes
COMPLETE COST ANALYSIS	Prioritize plant modifications & additions, budget forecast, resource profiles	Equipment procurement decisions, predict resources



OPTIMAL ASSET PERFORMANCE



RAMS STUDIES

Not sure where to begin with reliability improvement or cost reduction? Not sure which area, asset or problem to prioritize? A high level RAMS study will provide the direction you need. We have the tools to capture RAMS data and using our powerful simulation tool we will provide justifiable prioritization.

MAINTENANCE STRATEGY DEVELOPMENT AND OPTIMIZATION

Maintenance strategies developed using the principles of RCM on critical assets ensures that the right maintenance is specified at the optimum interval. Application of generic maintenance plans from library models ensures that plans are developed efficiently in an appropriate time frame.

SPARE PARTS ANALYSIS AND OPTIMIZATION

Which parts to hold and how many of them, can often be the 20 million dollar question. It is not a simple undertaking to calculate these figures. An understanding of unit cost, frequency of requirement, impact of delay, logistic delays at each storage stage etc. must all be included. Our support can add significant value to your business.

LIFE CYCLE COSTING

Analyzing the cost of an asset over its lifetime can be an important element for assessing different potential solutions before the project begins, including developing a maintenance budget. It can also be useful in analyzing whether to repair or replace an asset. We can provide expert support for estimating your life cycle costs and can assist with business case preparation for large capital expenditure proposals.

ROOT CAUSE ANALYSIS AND DEFECT ELIMINATION

The core role of reliability engineering is to analyze and eliminate defects. ARMS Reliability provides hands-on data analysis with cause-and-effect based solution techniques, including dedicated engineering support, facilitation, training and software.

PROCESS RELIABILITY

Failure to achieve daily production throughput targets can be linked to issues beyond physical equipment breakdowns. Fully understanding process bottlenecks and process system failures can be just as critical to meeting business targets. Thorough analysis of process conditions and capacity leads to contributions to business losses being understood.

VULNERABILITY ANALYSIS AND ASSESSMENT

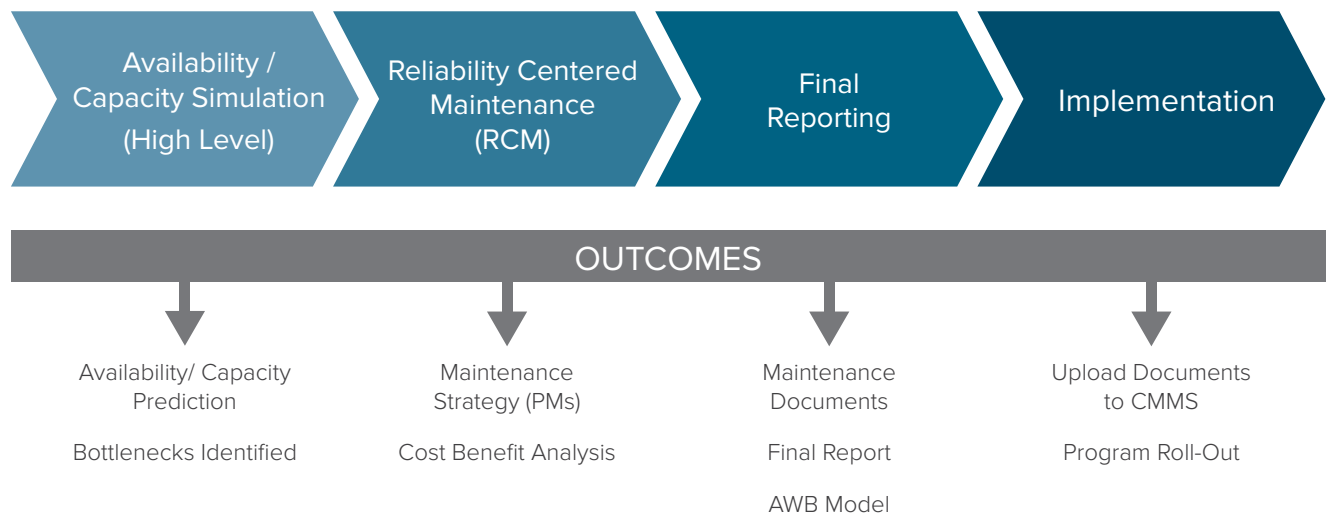
Operating assets of all kinds and ages are vulnerable to defects, including process, system, and human factors which either singularly or in combination lead to potentially catastrophic events. We have pioneered a new way of analyzing vulnerabilities with proven results.

RAMS STUDIES

A high level study of assets focusing on their availability, reliability, maintainability and impact on safety is the ideal place to start on the road to prioritizing asset improvement action.

By pooling all system data into a simple process representation such as a Reliability Block Diagram, simulations can be performed to identify those assets which cause the highest contributions to loss of availability, process capacity and impact to safety, operations and environment.

To keep the process simple and relatively quick, we can identify single dominant failure modes for each asset and compare simulated results to actual. Once there is confidence that the simulations are reflecting reality then the pareto of loss contributors becomes a powerful tool for providing direction.





MAINTENANCE STRATEGY DEVELOPMENT AND OPTIMIZATION

To ensure the best approach to maintenance for your assets, we can provide a range of services that may be performed individually or in combination.



CRITICALITY RANKING

- Which assets can cause significant downtime
- Which asset failures could lead to a fatality
- Which assets are critical for preventing an environmental catastrophe
- Which assets have significant repair or replacement costs, can all be assessed through ranking asset criticality

This can all be assessed through ranking asset criticality.

We can provide engineering support, facilitation, training and software to enable development of Asset Criticality Matrices, and then support the actions resulting from any weaknesses found.

MAINTENANCE STRATEGY ASSESSMENT

Prioritizing which assets require detailed maintenance assessment and which should simply receive OEM based maintenance can be judged by way of a Maintenance Strategy Assessment.

Utilizing the detail within the Criticality Ranking Assessment, or through direct judgment, we can provide engineering support, facilitation, training and software to enable development of Maintenance Strategy Assessment summaries, and then support the maintenance strategy outcome requirements.

MAINTENANCE MASTER DATA

Clean and consistent master data structures support an organizations ongoing reliability improvement efforts through an efficient analysis and update path, along with the ability to leverage learnings on common assets across different locations.

We have extensive experience in cleansing and preparing maintenance data and developing maintenance strategies across numerous projects and industry groups for existing and new assets.

Through the use of the ARMS Library we also have the ability to support the rapid creation and deployment of maintenance structures and maintenance strategies for an organization.

RELIABILITY CENTERED MAINTENANCE (RCM)

Detailed maintenance assessment is now commonly performed through combining Failure Mode and Effect Criticality Analysis (FMECA) and Maintenance Task Assignment into a single RCM approach.

ARMS Reliability has been performing RCM studies for over 15 years in all industries, consequently our expertise and ability to leverage off our extensive library of task data means immediate value add benefits.

We can provide engineering support, mentoring, facilitation, training and software to enable worthwhile RCM studies to be performed on your most critical equipment.

We can provide simulation software to support judgments of maintenance strategies, to justify why a run-to-fail, or preventative, or inspection, or predictive strategy has been chosen.

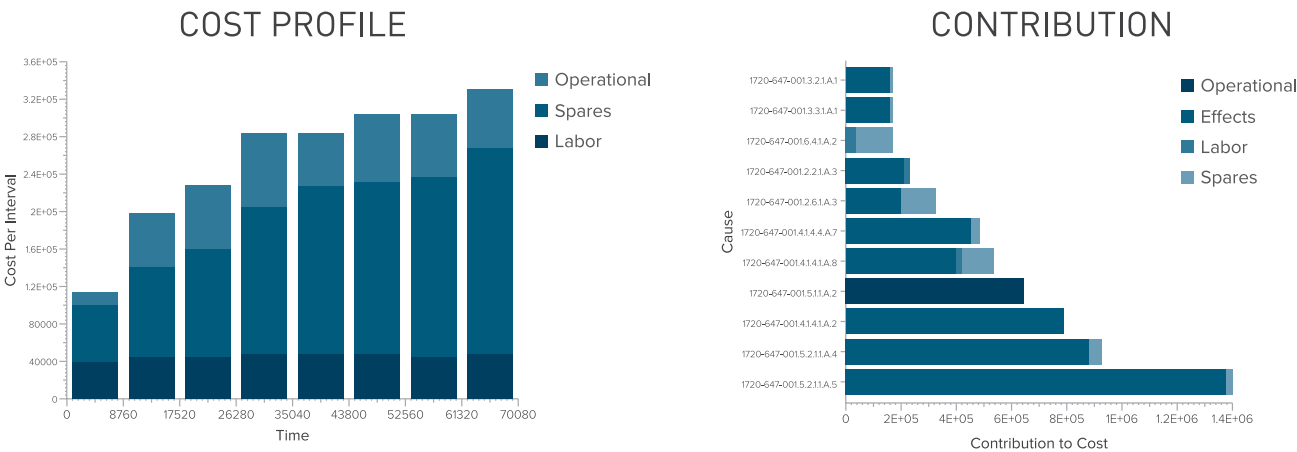
Feeding into this study will be current maintenance strategies, OEM recommendations, statutory requirements, Risk Based Inspections (RBI), as well as capturing the knowledge and know-how of your Subject Matter Experts (SMEs), and our extensive equipment libraries.

We challenge task and shutdown frequencies and simulate optimized intervals to minimize cost, safety, environmental, and operational impacts.

In addition we can provide the ability to generate documentation directly from the resulting strategies. Almost any configuration of report including inputs from other sources can be applied.

TYPICAL GENERATED DOCUMENTS:

- FMECA reports
 - RCM summary reports
 - Budget forecasting reports
 - Maintenance strategy documents for upload to your CMMS
- Spares usage and holding level optimization reports
 - Preventative maintenance task instruction documentation
 - Direct integration of RCM to your CMMS



Site Project
Compiled by: Jason Ballentine
Approved by: ARMS Reliability

MAINTENANCE STRATEGY

Task Group	Failure Mode Id	Description	Interval (hrs)	Stat ?	Type	Dur	Crew
Mech Insp Heating Ramp 1Y	26295220ABB001.1.1.A.1	Inspect steel frame for corrosion, physical damage and warping	8760	False	Inspection	0.5	Millwright
	26295220ABB001.1.1.A.2	Inspect welds for corrosion, visual cracks and lack of anti-corrosion coating	8760	False	Inspection	0.5	Millwright
	26295220ABB001.1.1.A.3	Inspect structural bolts for looseness or missing bolts	8760	False	Inspection	0.5	Millwright
	26295220ABB001.1.1.A.5	Inspect walkways for corrosion, physical damage and loose fixings	8760	False	Inspection	0.5	Millwright
Cont Insp Heating Ramp 1Y	26295220ABB001.1.1.A.6	Perform magentic particle inspection in conjunction with regulatory requirements on all suspension eyes, welds and pins	8760	False	Inspection	0.5	Contractor
Elec Insp Heating Ramp 1Y	26295220ABB001.1.1.A.7	Inspect cable tray for looseness	8760	False	Inspection	0.5	Electrician
Mech Insp Heating Ramp 1Y	26295220ABB001.1.1.A.8	Inspect fixing flange for corrosion, physical damage and deformation	8760	False	Inspection	0.5	Millwright
	26295220ABB001.1.1.A.9	Inspect base plate for corrosion, physical damage and warping	8760	False	Inspection	0.5	Millwright
	26295220ABB001.1.1.A.10	Inspect spring feet for corrosion, visual cracks, broken spring and deformation	8760	False	Inspection	0.5	Millwright
Elec Insp Heating Ramp 6M	26295220ABB001.4.1.1.A.1	Inspect thermocouples readings history	4380	False	Inspection	0.5	Electrician
	26295220ABB002.4.1.1.A.1	Inspect thermocouples readings history	4380	False	Inspection	0.5	Electrician
Elec Insp Heating Ramp 1Y	26295220ABB002.4.2.1.A.1	Calibrate pressure switch	8760	False	Planned	0.5	Electrician x 2
	26295220ABB002.4.2.1.A.2	Inspect the switch mounting screws and electrical connections for tightness.	8760	False	Inspection	0.1	Electrician x 2
	26295220ABB002.4.2.1.A.3	Inspect the switch mounting screws and electrical connections for tightness.	8760	False	Inspection	0.1	Electrician x 2
	26295220ABB002.4.2.1.A.4	Inspect the switch mounting screws and electrical connections for tightness.	8760	False	Inspection	0.1	Electrician x 2

TASK BASED MAINTENANCE (TBM)

A Task Based Maintenance (TBM) approach is often the most efficient where the criticality judgment is low, or where speed of results is important.

Utilizing a combination of:

- Current maintenance strategies (if existing)
- Our equipment extensive library data
- OEM recommendations
- Risk Based Inspections (RBI)
- Input from Subject Matter Experts (SMEs)

Maintenance tasks are sourced and brought together into a common format.

We can provide engineering support, mentoring, facilitation, training and software to produce quick TBM spreadsheets, and generate direct documentation in almost any configuration.

Typical generated documents include:

- Asset maintenance task reports
- Preventative maintenance task instruction documentation
- Maintenance strategy documents for upload to your CMMS

INTEGRATION WITH YOUR COMPUTERIZED MAINTENANCE MANAGEMENT SYSTEMS (CMMS)

RAMS studies are performed to justify the amount of equipment, amount of redundancy, risk and optimal maintenance strategy. To make the most of the information developed from these studies the aim should be to have it transferred directly to the CMMS to ensure data alignment between strategy and work management.

ARMS Reliability has expert knowledge and tools for the effective maintenance deployment of strategies into CMMS, including SAP, Ellipse, Pulse and Maximo.

ENTERPRISE DATA MIGRATION

The installation of a new CMMS gives a business the unique opportunity to implement common processes and data across their operations. It will also allow them to clean and consolidate their Preventive Maintenance and Materials-related master data. A CMMS system using standard practices and consistent master data structures supports ongoing reliability improvement efforts through an efficient analysis and update path, along with the ability to leverage learnings on common assets across all plants, where applicable.

We can supply expertise and tools to support your organization with the activities required to enable the successful migration of data to the new environment.

SPARE PARTS ANALYSIS AND OPTIMIZATION

Spare part requirements may be assessed within an integrated RAMS or RCM project approach or separately, focusing purely on the factors affecting spares holding levels.

We can provide engineering support, mentoring, facilitation, training and software to produce accurate spares holding level recommendations at each storage location, and support cataloging integration of spares and BOMs into your CMMS.

This can cover start-up and commissioning spares, two years operating spares, capital, critical and insurance spares, as well as budget reporting including high cost spare replacement forecasts.





LIFE CYCLE COSTING

Life Cycle Costing is a tool for assessing different project options that have been proven to meet the operational needs and determine the lowest overall cost to your business, lowest capital intensive solution, or lowest operational costs through its lifetime.

It can also be a useful tool for assisting in making decisions on whether to repair or replace an asset by modeling when the repair costs for a set lifetime will exceed the capital cost of replacement. These results are essential when developing asset management plans

ARMS Reliability can provide analysts, engineering support, mentoring, facilitation, training and powerful and easy to use software to support life cycle costing analysis in your business.



ROOT CAUSE ANALYSIS AND DEFECT ELIMINATION

The identification of defects through obvious breakdowns, undesirable availability and/or recurring problems can be achieved through RAMS studies, CMMS notifications and/or Process Reliability studies. These studies will prioritize the defects that have the biggest impact on the business.

ARMS Reliability has dedicated facilitators and instructor/ mentors to carry out and educate others to effectively problem-solve through a structured approach that is consistent and reliable. The results of a defect elimination exercise creates a common reality with more buy-in from stakeholders, identification of all possible solutions and clarity over when a problem is solved.

We can provide facilitators, engineering support, mentoring, training, dedicated software, and even entire defect elimination process implementation to support your goal of improving defect elimination in a systematic, justified solution.



PROCESS RELIABILITY

Through analyzing the losses in process capacity, the contributions due to either production or reliability failings can be understood. Once categorized, actions can be prioritized to make the biggest impact to improved capacity.

ARMS Reliability has at their disposal dedicated Process Reliability software which uses Weibull distribution analysis to pinpoint areas for improvement. Nameplate production ratings may be specified (similar to concepts originating from six-sigma methodology) and compared with demonstrated production data, which may then be compared to different plants or different time periods.

We can provide analysts, engineering support, mentoring, facilitation, training and dedicated software to support your goal of improving process reliability in a systematic, justified solution.

VULNERABILITY ANALYSIS AND ASSESSMENT

ARMS Reliability will provide an expert facilitator, questioning -and-capture technique, and category reporting tool to guide you through identifying and prioritizing your vulnerabilities.

Applicable at any stage in the asset lifecycle, the VAA process conducts a formal, holistic hazard study to identify areas of serious risk to operational interruption, safety, environment or any other unwanted consequence.

These studies are typically completed within a month, including a 5 day site-based workshop session. VAA can be applied to any process based industry and has been used globally with great success in offshore Oil and Gas installations.

ARMS Reliability can help you identify your vulnerabilities and provide an action plan to minimize their risk.





THE ARMS RELIABILITY DIFFERENCE

We have proven ways to help our clients create value and deliver results, and achieve this with a customer centric approach. We have expert knowledge on master data configuration requirements for reliability and the effective maintenance deployment of strategies into CMMS, including SAP, Ellipse, Pulse and Maximo.

- Phased approach to building mature reliability programs
- Scalable process for Enterprises
- Standard methodology
- Standard data formats
- Extensive “hands on” industry experience with existing facilities, new projects and big maintenance build projects
- Industry specific library capabilities
- Global library development, execution and governance tools and services
- Accumulated knowledge of failure profiles for use in reliability studies along with industry libraries and standards
- Maintenance templates for consistency
- Integrates RCM, Criticality Ranking, FMEA, RBD, Process Reliability and Lifecycle costs
- Supports proactive asset management to ISO55000
- Experience delivering reliability improvements since 1995 through consulting services, training and software
- Seamless “low touch” integration with numerous CMMS/EAM systems
- Experience in establishing failure parameters for new equipment in conjunction with OEM suppliers, industry libraries and past projects
- The ARMS approach provides configuration capability to automate the generation of:
 - Work Instruction documents and templates
 - CMMS Load sheets
 - QA tool (CMMS business rules)
 - PM Library Template documents
- The ARMS Enterprise Library solution supports:
 - Corporate Governance
 - Leverage of existing work
 - Share learnings across organization
 - Standardized yet flexible approach to asset maintenance strategies

| GLOBAL REACH

- 📍 ARMS Office Locations
- ARMS Client Locations



WHY ARMS RELIABILITY?

OUR CAPABILITIES

Our ability to empower clients with the knowledge to make the best business decisions supersedes common reliability consulting approaches. It's our thorough, detailed approach that puts us a cut above the rest.

TECHNICAL EXPERTISE

In our 20 years of operation, we have accumulated rich knowledge and experience in reliability methods which allows us to provide more efficient and effective reliability studies, best-in-class software, and valuable training.

PROVEN SUCCESS

We have gained an international reputation for reliability engineering services that deliver positive outcomes. We have completed more than 700 successful projects with some of the major players across a range of industries - global companies that trust us to deliver results.

COMMON WAYS WE WORK WITH CLIENTS

Whether you have a new project in the pipeline or want to improve an existing facility, our range of services are flexible and can be tailored to suit your needs.

- Embedded Experts in your Organization
- Software Implementation, Customization, and Support
- Long Term Engagements
- Short - Medium Term Engagements
- Staff Augmentation
- Coaching and Mentoring
- Pilot Projects
- Training



OIL & GAS

Sample of projects:

- Fortis BC - Tilbury LNG Plant RAM
- Williams Mobile Bay LNG Plant RAM
- Queensland Gas Corporation RAM
- Brion Energy - Dover North RAM
- Cenovus - Christina Lake Phases A-E RAM
 - Christina Lake Phase F RAM
 - Foster Creek Phases A-E RAM
 - Foster Creek Phases F-G RAM



MINING

Sample of projects:

- AngloGold Ashanti - Fixed Plant Optimization and Expansion
- Nyrstar - Fixed Plant Audits and Assessments
- Teck - Fixed Plant Optimization and Expansion
 - Fixed Plant Expansion & PaR Crane Improvements
 - Mine and Fixed Plant Optimization
- BHP Billiton - Greenfield RAM Modelling for Mine, Fixed Plant and Port facilities
- Peabody Energy - D11 Dozers - Optimize Maintenance Strategy, Compare "Repair vs Replace" projects



MANUFACTURING

Sample of projects:

- Essroc/Italcementi
- Lafarge
- Goodyear
- Bristol Myers Squibb
- Weyerhaeuser



FOOD & BEVERAGE

Sample of projects:

- Cadburys Australia
 - Hobart Batch Mixing Plant RCM Study
 - Melbourne - Bag Filling Line RCM Study
- Princes UK - Oil Filling Line



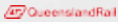
CLIENTS & EXPERIENCE

Our clients come in all shapes and sizes and from a diverse range of industries and disciplines

RAIL & INFRASTRUCTURE

Sample of projects:

- Metro Transit of New York
- Amsted Rail
- V/Line
- EDi Rail
- Queensland Rail



UTILITIES - POWER GENERATION & DISTRIBUTION

Sample of equipment experience in the area of maintenance strategy development:

- Horizontal Impulse Turbines
- Grease lubrication systems
- Vertical Impulse Turbines
- High pressure / low pressure air systems
- Single runner Francis-type reaction turbines
- Penstock water systems
- Generators
- Service water systems
- Cooling water drains
- Control systems
- Dewatering systems
- Intake structures
- Hydraulic Oil Systems



UTILITIES - WATER

Sample of equipment experience in the area of maintenance strategy development:

- Cooling water drains
- Dewatering systems
- Grease lubrication systems
- High pressure / low pressure air systems
- Penstock water systems
- Service water systems
- Control systems





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