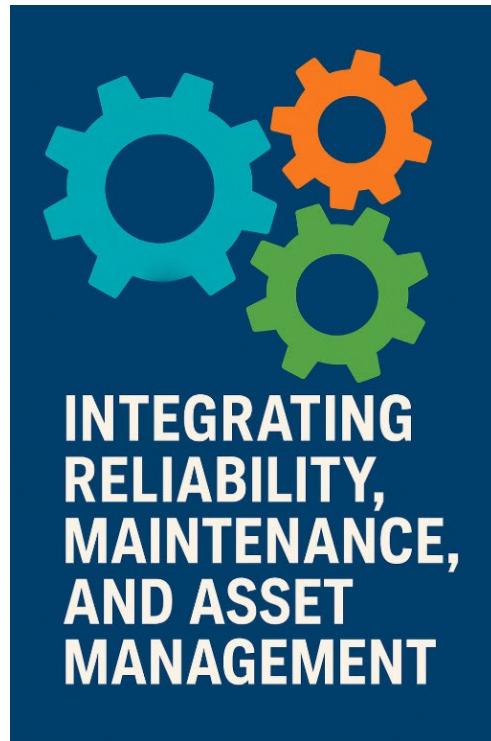


Integrating Reliability, Maintenance, and Asset Management – An Analysis

White Paper

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[The Living Asset Management Think Tank Inc](#)

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1 Executive Summary

Strong capability in asset management, maintenance, and reliability is crucial for creating value, managing risk, and ensuring long-term sustainability. Asset management integrates these disciplines, providing a structured approach to problem-solving and improving asset performance and workforce efficiency. Organisations that combine expertise in all three areas gain a strategic advantage in decision-making, risk management, and sustainable investment planning aligned with their operational goals.

To achieve global competency, internationally recognised certification frameworks are essential for knowledge sharing across industries and regions. With the growing need for sustainable asset practices, immediate action is required to harness this expertise for a more sustainable future.

2 Overview

This paper provides an in-depth analysis of the crucial role that Maintenance and Reliability Professionals play in creating value through Asset Management. Historically, the significance of the value these professionals add has often been overlooked, with their roles perceived as valuable only during the operational phase of the asset lifecycle. However, this paper emphasizes the importance of Maintenance and Reliability Professionals across all phases of the asset lifecycle.

Maintenance focuses on current activities during operations including preventive maintenance (PM), predictive maintenance (PdM), condition monitoring, corrective actions, and repairs. Reliability focuses on predicting what is required to achieve desired future performance, whereas Asset Management focuses on how the present, past, and future lifecycle activities are coordinated to realize value from assets.

Maintenance Management Professionals (MMPs) are responsible for overseeing and improving maintenance operations within an organization. Their key responsibilities include planning and scheduling, maintenance activity execution, resource management, budgeting and cost control, asset information management, compliance and safety, continuous improvement, vendor and contract management, and equipment performance monitoring. Maintenance practitioners are primarily focused on the performance of skilled maintenance activities. On the other hand, Reliability Management Professionals (RMPs) ensure that systems, processes, equipment, or operations perform their intended functions consistently and efficiently over time. Their key responsibilities include analysis of failures, preventive maintenance, predictive maintenance, reliability-centered maintenance, criticality analysis, condition monitoring, data analysis and metrics, risk management, continuous improvement, and asset integrity. MMPs are primarily concerned with today, ensuring assets are meeting current needs ensuring appropriate maintenance are performed. RMPs are more focused on tomorrow's future, meeting future needs with minimum failures and reducing the total cost of ownership.

The paper discusses the importance of integrating these Maintenance and Reliability professionals and the activities they undertake into the Asset Management Landscape to derive

value from implementing Asset Management. It highlights that Maintenance and Reliability Management Professionals are core to creating value from Asset Management and are key to delivering operational availability. The MMP focuses on maintainability, while the RMP focuses on reliability, both crucial for assuring operational availability at a known cost. Ideally, MMPs and RMPs as a team should be more involved during the asset acquisition-design phase to ensure reliability, availability, maintainability, safety, sustainability and operability (RAMS20) are appropriately considered. Both the MMP and RMP functions are well defined in the GFMAM Asset Management Landscape 3rd edition and the GFMAM Maintenance Framework 2nd edition.

Furthermore, the paper underscores the importance of considering feedback and input from Maintenance and Reliability professionals across the asset lifecycle (e.g. lust to dust), from the early phase of creating capacity to produce to the middle phase of operating and maintaining capacity, and the end phase of retiring capacity. It also provides an example of the Dreamworld incident to illustrate the consequences of poor maintenance and reliability practices.

In conclusion, the paper emphasizes that Asset Management is about balancing cost, risk, and performance, which involves making informed decisions based on high-quality information provided by Maintenance and Reliability professionals. The integration of these areas of expertise is critical for organisations to achieve their desired value.

3 Purpose of this White Paper

The purpose of this paper is to provide an overview of the important role Maintenance and Reliability Management Professionals play in creating value from Asset Management.

4 Background on Maintenance, Reliability Management Professionals and Asset Management Professionals.

Historically there has been a lack of acknowledgement of the important role both Maintenance and Reliability Management Professionals play in creating and sustaining value for organisations. Many organisations have moved to implementing Asset Management but have not been investing in advancing the critical capabilities of Maintenance and Reliability professionals. There is a perception that their roles are only valuable in the operational phase of the asset lifecycle – recognizing that it may extend to the design phase for Reliability Professionals. Traditionally these Maintenance and Reliability professionals have been underrepresented in decision making when organizations are considering the need to create, acquire or build new assets or replace existing assets. In support of this claim:

- The term Maintenance is well understood as people have life experience in maintenance – it typically conjures up a technician fixing a fault or performing a repair.
- The term Reliability is well understood as people again have life experience in Reliability – was the product reliable or unreliable at meeting the expected performance.
- Culturally, people may equate a career in Maintenance to 'Skilled Trades/Tradies/Technicians' and thus not recognize those engaged in Maintenance as a Professional career path and may constrain Reliability Professionals to those who are Reliability Engineers.

It is therefore worth defining what is meant by “Maintenance Management Professional” and “Reliability Management Professional,” as these individuals may not be bestowed with such a job title within an organisation.

A Maintenance Management Professional (MMP) is an individual responsible for overseeing and improving the maintenance operations within an organization. Their role ensures that all equipment, machinery, and infrastructure are maintained in good working condition to deliver desired productivity, minimize downtime, improve availability, and extend the lifespan of assets where required. Here are some key responsibilities and characteristics of a Maintenance Management Professional:

1. Planning and Scheduling Maintenance: The MMP develops and implements preventive, predictive, and corrective maintenance schedules to ensure that all equipment runs efficiently and that breakdowns are minimized. In some global regions, this expertise in planning and scheduling processes is referred to as 'Maintenance Work Management (MWM)'..
2. Resource Management: They manage maintenance teams, including skilled trades, technicians, technologists and engineers, ensuring they have the necessary tools, training, people and financial resources to carry out their work effectively.
3. Budgeting and Cost Control: The MMP is responsible for creating maintenance budgets, controlling expenses, and optimizing costs related to equipment repairs, spare parts, and labour.
4. Asset Information: They are involved in tracking and managing assets, ensuring that maintenance records, equipment lifecycle data, and equipment performance and failure metrics are accurately documented and reviewed.
5. Compliance and Safety: The MMP ensures that all maintenance activities comply with industry regulations, safety standards, and environmental requirements.
6. Continuous Improvement: They focus on improving maintenance strategies by adopting new technologies, utilizing improvement methodologies (e.g. FMECA or RCM or RCA), and applying industry best practices to enhance efficiency and reduce downtime.
7. Vendor and Contract Management: They may oversee relationships with external vendors and service providers for outsourced maintenance services, ensuring that service level agreements (SLAs) are met.
8. Performance Monitoring: Using tools such as KPIs (Key Performance Indicators), the MMP monitors maintenance and maintenance process performance, equipment reliability, equipment availability, and operational efficiency to make informed decisions and drive improvements.

In summary, an MMP plays a vital role in ensuring the efficient functioning of an organization's physical assets, contributing to reduced operational costs and improved productivity through effective maintenance strategies. A MMP contributes to Asset Availability – typically through the principle of Maintainability.

A Reliability Management Professional (RMP) is an individual who is responsible for ensuring that systems, processes, equipment, or operations perform their intended functions consistently and efficiently over time, minimizing failures and downtime. The role primarily focuses on enhancing the reliability, availability, maintainability, and overall performance of assets in industries such as manufacturing, oil and gas, electrical and water utilities, aerospace, and others.

Key responsibilities of a Reliability Management Professional include:

1. Failure Analysis: Investigating the root causes of equipment failures (eg RCA) and developing solutions to prevent or minimize the consequences of future occurrences.
2. Preventive Maintenance: Designing and implementing maintenance strategies that aim to minimize unplanned downtimes by predicting and preventing failures before they occur.
3. Asset and System Criticality Analysis (ACA): Process where an organization evaluate the importance of each asset or system within its operations to determine how significantly a failure of that asset or system would impact business functions. ACA supports the prioritization of maintenance and risk mitigation efforts on the most critical assets.
4. Reliability-Centered Maintenance (RCM): Applying RCM principles to identify critical assets and determining the best maintenance strategies to optimize performance and reliability. Closely related is Failure Modes Effects Criticality Analysis (FMECA) methodology.
5. Condition Monitoring: Using predictive maintenance tools, like vibration analysis or thermography, to monitor the condition of equipment and detect potential issues early.
6. Data Analysis and Metrics: Analyzing data on equipment performance, reliability metrics (like Mean Time Between Failures - MTBF), and repair logs to identify trends and areas for improvement.
7. Risk Management: Identifying potential risks to reliability and working to mitigate them through design, process, or operational changes.
8. Continuous Improvement: Driving continuous improvements in reliability by fostering a culture of proactive maintenance and operational excellence.
9. Asset Integrity: Ensuring that assets are managed effectively throughout their life cycle to deliver maximum value.

In summary, a Reliability Management Professional works to enhance operational reliability and performance by proactively managing assets, preventing failures, and applying data-driven strategies.

According to ISO 55000, Asset Management is a systematic approach that focuses on the value assets provide to an organization over time (past, present and future). It aligns financial, technical, and operational decisions with organizational objectives, promoting both vertical and horizontal coordination. Effective leadership and sustained commitment at all levels are crucial for successful asset management, establishing clear roles, responsibilities, and a collaborative culture. The primary outcomes of asset management include assurance, adaptability, and sustainability. It provides better organizational oversight and accountability, enables rapid adaptation to changes, and promotes long-term thinking by considering future impacts, risks, uncertainties, and opportunities to realize value. By integrating these principles, organizations can achieve a balanced approach to cost, risk, and performance, ultimately making informed decisions that drive value creation from assets

Key responsibilities for an asset management professional, based on ISO 55012:

Involvement in Asset Management Activities: Asset management professionals are actively involved in the development and execution of asset management frameworks, plans and strategies. This includes understanding and adopting operational requirements and policies established by the organization's strategic asset management plan (SAMP).

Knowledge and Awareness: They need to have a high level of knowledge and awareness of the required activities established by asset management plans and strategies. This ensures that they can effectively contribute to achieving the organization's asset management objectives.

Competence Development: Asset Management Professionals are responsible for acquiring and demonstrating the necessary competencies to execute asset management activities. This involves continuous learning and development to improve and stay current with their skills and knowledge.

Continual Improvement: They contribute to the continual improvement of the asset management system by participating in the evaluation and enhancement of asset management processes. This includes providing feedback and suggestions for improvement.

Collaboration and Coordination: Asset management professionals work collaboratively with other personnel and departments involved in asset management activities. This includes fostering teamwork and ensuring that all efforts are aligned towards achieving the organization's asset management objectives.

For an asset management manager, the main roles and responsibilities include:

Implementation of Asset Management Plans: Managers are responsible for developing and executing asset management plans and strategies. This involves ensuring that these plans are aligned with the organization's strategic asset management plan (SAMP) and overall objectives.

Resource Management: They must ensure that the necessary resources, including personnel, financial, and technological resources, are available and effectively utilized to achieve asset management objectives.

Monitoring and Evaluation: Managers are tasked with monitoring the performance of the asset management system and its processes. This includes evaluating the effectiveness of asset management activities and making necessary adjustments to improve performance.

Communication and Awareness: They need to ensure that all personnel are aware of their roles and responsibilities within the asset management system. This involves promoting awareness of the asset management policy and the implications of not conforming to the system's requirements.

Competence Development: Managers are responsible for establishing competence requirements for personnel involved in asset management activities. This includes developing plans for personnel to acquire the necessary asset management knowledge, skills, expertise and to demonstrate proficiency.

Continual Improvement: They should promote continual improvement within the asset management system by supporting and encouraging personnel to contribute to the system's effectiveness and making decisions based on monitored and analyzed results.

Support and Cooperation: Managers create and maintain an environment that supports the involvement and cooperation of personnel. This includes fostering collaboration across different groups and ensuring that everyone is working towards the same asset management objectives

The Global Forum on Maintenance and Asset Management (GFMAM) has done a great job of producing a freely available globally agreed "Asset Management Landscape 3rd edition" and "Maintenance Framework 2nd edition". This is a great start, but how do organisations derive value from implementing Asset Management? In recent years there has been a lot of focus on Asset Management and the Asset Management System (ISO 55001) but the deriving of value from

implementing AM is intrinsically linked to the integration of all the components of the AM Landscape.

5 Maintenance and Reliability Management Professionals in delivering Operational Availability

Having understood what the key responsibilities and characteristics of the MMP and RMP are within an organization, it is evident that they are key to the delivery of Operational Availability, and they have valuable insights when organizations are considering the need to create, acquire or build new assets or replace existing assets.

The MMP is primarily focused on Maintainability and the RMP on Reliability. The diagram following helps to show the interdependencies between the principles of Availability, Reliability, Maintainability and Supportability and in turn the roles of the MMP and the RMP. Maintainability and the overall lifecycle cost of that maintainability is an outcome of Design just as much as Reliability is.

As Asset Management is about the outcome of assuring Operational Availability at known cost and a tolerated risk then the importance of MMP and RMP cannot be understated. Maintenance like all quality processes must follow a plan, do, check, act approach to be effective. The methods necessary to develop good maintenance plans are well understood and there may be differences in how, and to what level, risk based processes such as FMECA or RCM.

If the MMP is given a voice at all phases of the lifecycle – then the performance of the organisation is likely to improve as errors of design and delivery are driven out before entering the maintenance process and creating overall value for the organisation. It is in the execution of maintenance and the refinement of maintenance programs that there is common ground between the RMP and the MMP – the organisation has to have a ‘just’ and an ‘AM’ culture where there is parity between these functions to achieve this outcome. Maintenance and Reliability should be seen as a value creation activity not as a cost. The GFMAM AM Landscape clearly points out that ‘asset management is the coordinated efforts of the organization to deliver value from assets’. The integrated nature of MMP, RMP, and AMP professional roles, along with other key stakeholders in the organization drive a successful AM culture.

There is growing recognition that the process for deriving the maintenance must be an auditable process – it is core to AM. The Safety Case should require the delivered Maintenance Program to be subject to equal testing and evaluation by both the MMP and the RMP as it is a critical control – historically the experience has been that this is not the case. If an organization has a sound asset management culture and all within have an understanding of where maintenance tasks come from and why they are important, failure rates will reduce. An organization that values MMP and RMP will demonstrate this.

6 The Rationale for the Importance for Asset Management

Implications of getting it wrong. The Dreamworld incident 2016.



No thorough engineering assessment on deadly Dreamworld ride in 30 years, coroner finds

There were “frighteningly unsophisticated systems” in place on Dreamworld’s most popular ride in 2016 when four people were killed

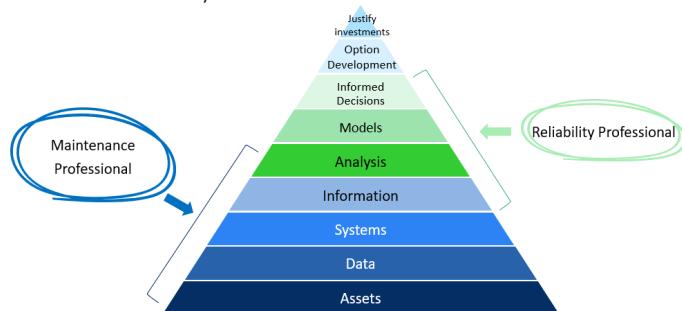
“It remains unknown and impossible to understand why the conveyor kept going if the water level dropped on the ride,” a coroner has found.

This is a real example of what happens when an organisation gets its approach to maintenance and reliability wrong.

Asset Management is all about the balance between cost, risk and performance which is another way of saying it is all about decision making. When making decisions it is all about having the right information to be able to make the decision. The better the information a decision is based on, it usually goes without saying that the better the decision. In the figure below it shows how critical in the data / information is you have about your assets and associated condition, costs, risks and performance. As shown, if the information captured by both your Maintenance and Reliability professionals is of poor quality than the decisions will be sub-optimal. If the quality is good than there is a very high probability the right decisions will be made. The value that is created is by having the integration of all this information that has been produced, by the Maintenance and Reliability Professionals, which then informs the executive when decisions are being made. Therefore the integration of these functions are intrinsically linked to if organisations are achieving value through asset management or not.

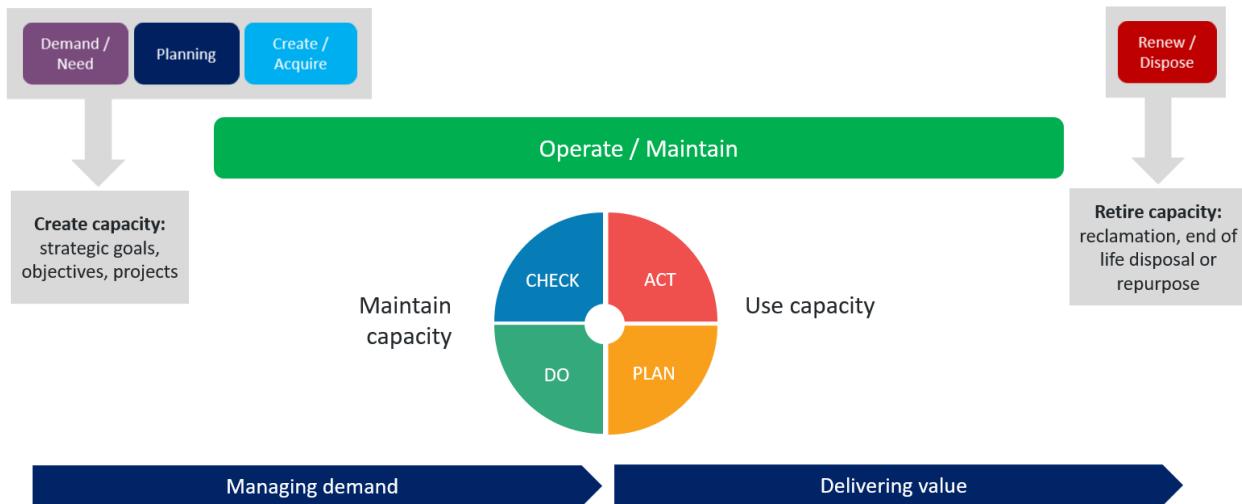
Informed decision making

Maintenance and reliability decisions



Asset lifecycle

Creating and delivering value



Across the asset lifecycle, it is important to consider the feedback and input from all stakeholders, including Maintenance and Reliability professionals.

A key concept across the lifecycle is the capacity to produce. This capacity may be measured in classic terms of widgets per hour produced in a manufacturing process, or megawatts of electricity generated, mega-litres of drinking water treated or similar. Capacity can also be measured in terms of numbers of transit users, or hospital beds available and is measured by levels of service.

The early phase of the lifecycle is focused on creating the capacity to produce. This is where demand planning and scenario analysis occurs for the product or service. Many organisations jump directly to an asset solution to address problems instead of clearly defining the problem to be solved with the requisite requirements. Decisions are made in terms of asset investment planning to align to organizational strategic objectives. Many times, capital projects are identified, financed and constructed during this phase of the asset lifecycle. Organisations that are doing asset management well will approach this as a Total Expenditure (TOTEX) decision, not just CAPEX. When new assets are introduced without the appropriate funding, it is not uncommon to see where corners are cut on maintenance because of these funding shortfalls. Decisions made during this early phase of the lifecycle have a profound impact on the capacity of the assets to produce and the associated lifecycle cost structure for these assets. Investments in this phase are often measured as capital expenses (CAPEX). Typically, this phase lasts one to five years.

The end of the lifecycle is the period where the organization is focused on retiring the capacity to produce. This asset retirement obligation (ARO) may include reclamation, end of life disposal, repurposing of the asset, or sale of the assets to a new owner. Typically, this phase lasts one to three years.

The middle of the lifecycle during the Operate and Maintain Phase is when the roles of Maintenance Management Professionals and Reliability Professionals shine. During this period, the Operations personnel focus on using the available capacity to produce and the Maintenance

and Reliability teams are focused on maintaining the capacity to produce. Frequently, this capacity is measured in terms of asset availability. As this phase of the lifecycle may last 20 – 100+ years, this is a critical period for long term ability of the organization to manage the demand for its products and services, as well as deliver the expected value. The investments made in maintenance and operations, frequently measured as Operating Expenses (OPEX) can easily exceed the upfront capital expenditures by several orders of magnitude.

This lifecycle highlights the opportunity for organizations to increase the value available through incorporating the recommendations and learnings of Maintenance Management Professionals and Reliability professionals into the early 'create capacity' phase.

7 Results and Conclusions

Ensuring an organization has capability in asset management, maintenance, and reliability is critical to long-term success and sustainability. Asset management serves as the golden thread that integrates these disciplines, creating value beyond their individual contributions. When executed effectively, it provides a systematic approach to identifying root causes of issues related to both assets and the people managing them. Recruiting professionals across all three fields enhances decision-making and enterprise risk management, enabling organizations to confidently plan short, medium, and long-term investments based on desired outcomes or service levels. Additionally, global collaboration is essential to developing transferable competencies and internationally recognized certification schemes, ensuring expertise can be applied across borders. Given the critical role these disciplines play in sustaining our planet, immediate action is necessary to build a future-ready workforce and secure long-term environmental and economic sustainability.

8 About the Living Asset Management Think Tank Inc

The Living Asset Management Think Tank Inc. is a group of internationally based, passionate asset management professionals who firmly believe in the value that asset management as a discipline, can provide asset intensive organisations.

The Think Tank provides a forum where fresh ideas and concepts that enhance that value are discussed, leading to improved long term organisational and social outcomes - for organisations and individuals alike across the globe.

The Think Tank recognises that thought leadership in this discipline is not bounded by geography or professional background and so encourages participation from anyone with a similar passion.

<https://livingassetmanagement.com/>

