

IMPLEMENTATION OF MAINTENANCE AND RELIABILITY MANAGEMENT SYSTEM (MRMS) IN PERTAMINA HULU ENERGY SUBHOLDING UPSTREAM (PHE SHU) THROUGH FIELD ASSESSMENT OF ISO 55001

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Abstract

As part of the integrated efforts that need to be made to achieve the target of becoming a world-class energy company, PHE SHU seeks to carry out the implementation of the Asset Integrity Management System (AIMS) and develop a MRMS which involves a solid team and is able to complete implementation in a timely, effective, efficient and highly competitive manner, to achieve a production target of 1 million bbl/day and 12 bcf/day in 2030 for national energy security referring to the international standard ISO 55001. MRMS is a reference for the governance of the reliability program and maintenance of production facility assets in the Upstream Subholding environment in the operational phase of the Pertamina Group asset management life cycle. identification of Failure Mode Effect Analysis (FMEA) preparation of maintenance strategy programs in the form of task selection for failure mode control based on studies in FMEA namely preparation of detection work programs in rotating equipment in the form of Predictive Maintenance (PdM) activities, task selection of detection programs in static equipment in the form of RBI activity. Task selection prevention in the form of Preventive Maintenance (PM) activities. Failure finding (function test), including determining time intervals for carrying out inspection activities for the PdM, RBI, PM, function test, ORDC (Operator Routine Duty Check List) programs based on the historical failure rate stated in PAREDA in ensuring that Upstream Oil and Gas Assets are optimized, sustainable, safe & reliable operations.

Keywords: MRMS, PHE SHU, ISO 55001.

1. INTRODUCTION

The purpose of the Maintenance & Reliability Management System for PHE is to improve the performance of their equipment or systems, increase efficiency and productivity, and minimize the risk of downtime and equipment failure which can cause Lost Production Opportunity (LPO). Among the crucial risks is the potential for unplanned shutdown which can cause loss of production. If unplanned shutdown events continue, it can have an impact on the company's reputation and the trust of both shareholders and stakeholders.

It is possible to carry out more comprehensive analyzes such as Failure Mode & Effect Analysis (FMEA), Reliability Centered Maintenance (RCM), Root Cause Failure Analysis (RCFA) and other analysis tools in improving equipment reliability through improving

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strategies and planning in Maintenance & Reliability (M&R) management. With the availability of a database of data reliability that can be used as a reference in a comprehensive analysis for decision making for operational, maintenance and efforts to increase the reliability of the equipment itself. In addition to increasing equipment reliability, an increase in overall maintenance cost efficiency will also be achieved.

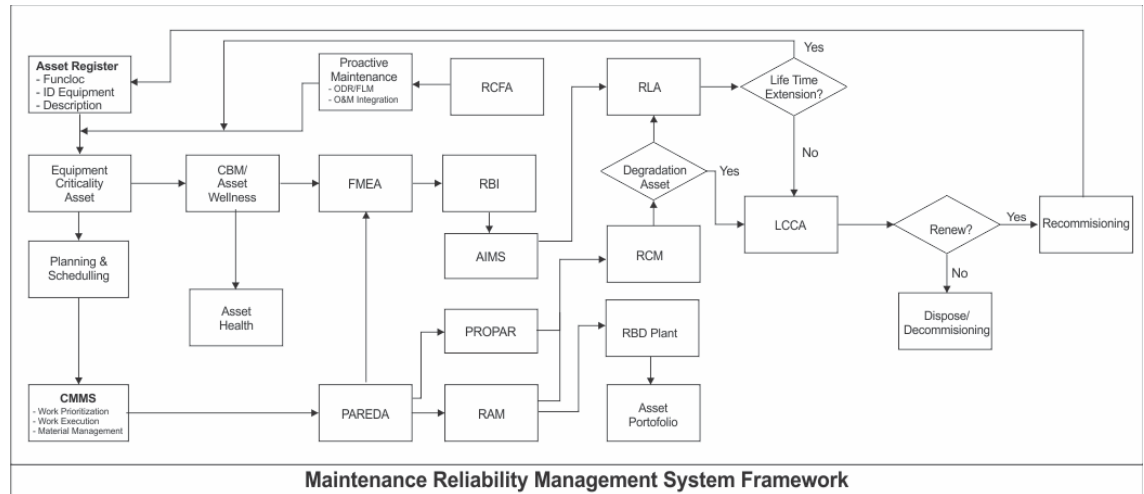


Figure 1. MRMS Framework

2. MRMS METHODOLOGY

The objectives of the Maintenance & Reliability Management System (MRMS) Guidelines are as follows:

- Provide guidance directions to Regions, Zones and Work Areas/Fields in achieving goals or carrying out a task in an effective and efficient manner. providing information about procedures, steps, or principles to follow.
- Improve consistency, helping ensure that actions taken by Regions, Zones and Work Areas/Fields in the same situation will be uniform and consistent. This can help in avoiding ambiguity or different interpretations.
- Minimizing risk or as a tool to minimize risk or errors in an activity or process. They can identify best practices, demonstrate risk control measures, or provide warnings of potential hazards.
- Ensuring compliance with certain regulations, laws or standards. They provide clear instructions on what to do or avoid to comply with applicable requirements.
- Drive efficiency and productivity, directing Regions, Zones and Work Areas/Fields to use best practices, tools or approaches that have been proven effective in achieving the desired results. This can help improve efficiency, increase productivity and save time.
- Establish and maintain standards play a role in establishing and maintaining standards expected by management, also help maintain quality, integrity, and consistency in the implementation of tasks or activities.

2.1. Systematic & Structure

Asset governance - Life Cycle Asset Phase-1 namely reliability by design, then reliability is maintained in Phase-2 with MRMS governance. The reliability of Plant facilities begins to decline or degrade over time in operation. In Phase-3 and Phase-4, an asset management strategy is needed that considers and adjusts the remaining effective operational life of the

Plant. If recommendations from monitoring, assessment and evaluation results require a new development project, then the process will refer to the Maintenance & Reliability Management System (MRMS) while still considering follow-up recommendations during production engineering activities and production operations.

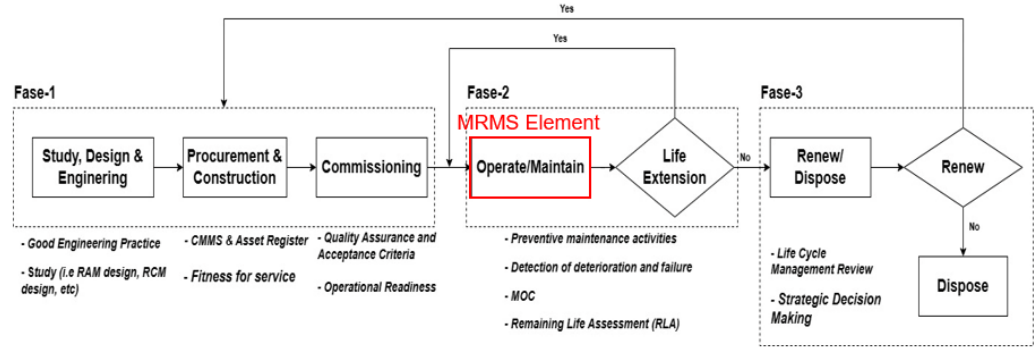


Figure 2. MRMS in Operation Phase

2.2. RCM Stages

There are several stages in the MMRS standard as explained below:

Stage-1 is the Planned Maintenance phase with the aim that the equipment or plant being operated is in accordance with the conditions and needs of operations and the environment.

Table 1. MRMS Stages

Stage	MRMS Stage	Element
Stage 1	Planned Maintenance	<ul style="list-style-type: none"> - Asset Register (Base ISO 14224) - Equipment Criticality Assessment - Planning & Scheduling - Material Management - Preventive Maintenance - Work Order Prioritization - Work Execution/Review - CMMS
Stage 2	Predictive & Proactive Maintenance	<ul style="list-style-type: none"> - PAREDA - Condition Based Monitoring/Asset Wellness - PdM - FMEA - RBI - RCFA (Bad & Worst Actor Analysis)
Stage 3	MRMS & PROPAR Integration	<ul style="list-style-type: none"> - ORD/FLM - Asset Performance /KPI - Maintenance & Operation Integration - PROPAR & AIMS Integration Philosophy
Stage 4	RMC Stage	<ul style="list-style-type: none"> - RCM - RAM - RLA - Life Cycle Cost Analysis
Stage 5	Operational Excellence	<ul style="list-style-type: none"> - Operational Excellence

Stage-2 is the Predictive & Proactive Maintenance phase where this phase is the main focus in the Production Process. Asset governance is the key to maintaining sustainable asset reliability.

Stage-3 is the AIMS PROPARG Integration phase, this phase determines the consideration of several strategic aspects that will determine asset resilience so that it can operate properly.

Stage-4 is the RCM Stage phase where the aging phase occurs in assets, this phase becomes a consideration whether the asset will be decommissioned / disposed of or renewed. At the end of Phase-4, lifetimes extensions are carried out based on the results of the Remaining Life Assessment to maintain assets so they can operate properly within the stipulated time. If it requires some more complex considerations such as economic aspects, risks and others, it will be carried out in Phase-3.

Stage-5 is the Operational Excellence phase where a superior culture, efficiency, productivity and quality improvements in business operations are achieved. The main goal is to achieve high and optimal operational performance by eliminating waste, optimizing processes.

2.3. MRMS Category & Classification

MRMS manages assets that function as production facilities, security or protection facilities, and support facilities (utilities) which in the event of a failure will disrupt the performance of the Plant. The purpose of implementing the MRMS guidelines is in line with the Pertamina Holding program, namely as follows:

1. Ensuring equipment reliability and integrity of critical equipment/systems that are very important to safety/protection and production functions.
2. Maintain optimal production Availability in a safe and sustainable operation in accordance with the Plant life cycle.
3. Early failure detection of critical equipment that can trigger Loss of Production Opportunity (LPO).
4. Mitigation of repeated failures that can trigger LPO in the Facility impacting safety, the environment, and production.
5. The implementation of MRMS in the PHE SHU environment has maturity which is divided into five stages as described in the PHE SHU MRMS Maturity model in the figure below.

MRMS MATURITY MODEL



Figure 3. MRMS Maturity Models

3. RESULTS AND DISCUSSION

PHE SHU is one of subsidiary entity of PT Pertamina (Persero) group. It has specific uniquely compared to other PT Pertamina (Persero) subsidiaries. Apart from being in charge of managing a portfolio of more than 53 domestic and 5 overseas subsidiaries, 6 joint ventures and affiliates, PHE SHU also manages and supervise operations in 48 domestic upstream oil and gas working areas and 3 overseas working areas. In an effort to supply oil and natural gas to meet domestic needs, PHE SHU is obliged to improve and ensure that oil and natural gas production operations can run reliably and efficiently. With a large and diverse number of assets, one of the databases needed is reliability data from tools/equipment to become the basis for analysis in an effort to ensure reliable equipment that supports the availability of production units/systems in accordance with the operating context and targets that have been set.

The MRMS guidelines are prepared as guidelines for managing assets within the Upstream Subholding environment, developing and creating alternative equipment maintenance strategies within PHE SHU, as one of the efforts to support the vision and mission of becoming a world-class national energy company and realizing national energy security.

This guideline is a reference for the Governance program for the reliability and maintenance of production facility assets in the Upstream Subholding environment through the implementation of processes based on applicable regulations, ISO, International Standards and best engineering practices.

The management of elements in the MRMS Guidelines is based on ISO 55001 which consists of a comprehensive set of elements that complement one another as shown in Figure 4.

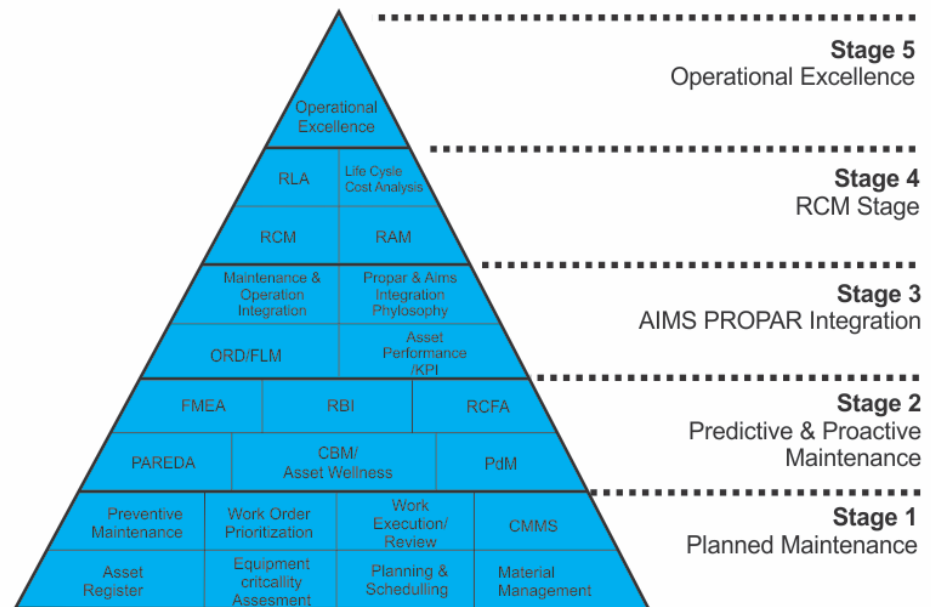


Figure 4. MRMS Pyramid

Table 2. ISO 55001 Elements

No	Clauses
1	General requirements
2	Asset management policy
3.1	Asset management strategy
3.2	Asset management objectives
3.3	Asset management plan(s)
3.4	Contingency planning
4.1	Structure, authority and responsibilities
4.2	Outsourcing of asset management activities
4.3	Training, awareness and competence
4.4	Consultation, participation and communication
4.5	Asset Management System documentation
4.6	Information management
4.7.1	Risk management process(es)
4.7.2	Risk management methodology
4.7.3	Risk identification and assessment
4.7.4	Use and maintenance of asset risk information
4.8	Legal and other requirements
4.9	Management of Change
5.1	Life Cycle Activities
5.2	Tools, facilities and equipment
6.1	Performance and condition monitoring
6.2	Investigation of asset-related failures, incidents and nonconformities
6.3	Evaluation of compliance
6.4	Audit
6.5.1	Corrective & Preventative action
6.5.2	Continual Improvement
6.6	Records
7	Management review

Table 3. MRMS Elements

Stage	MRMS Element
1	Preventive Maintenance
	Planning & Scheduling
	Asset Register
	Equipment Criticality Assessment
	CMMS
	Work Order Prioritization
	Work Execution /Review
	Material Management
2	FMEA
	CBM/Asset Wellness
	PdM
	RCFA
	RBI
3	ORD/FLM
	Asset Performance KPI
	Maintenance & Operation Integration
	Propar & AIMS Integration Philosophy
4	RLA
	RCM
	RAM
	LCCA
5	Operational Excellence

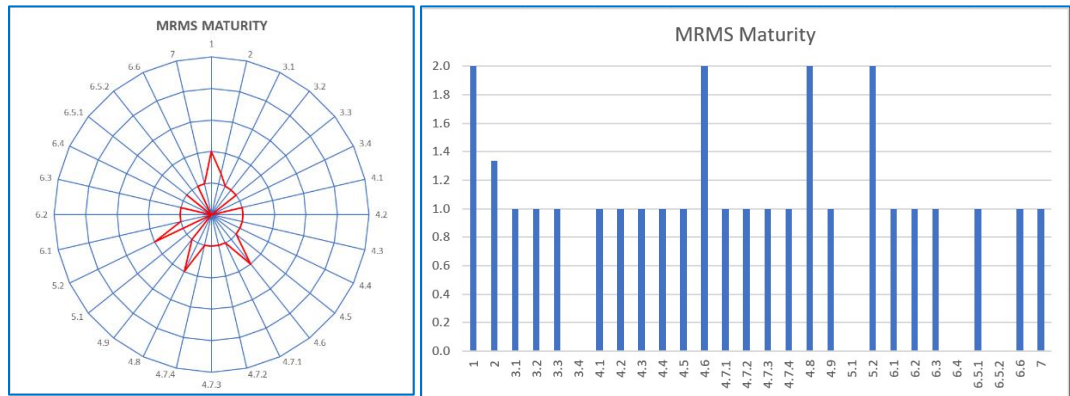


Figure 5. MRMS Pyramid

Figure 5 shows the results of evaluating the maturity level of a Pertamina work area in implementing MRMS. The results of the maturity assessment are still at stage 1.

4. CONCLUSION

To achieve the MRMS objectives, commitment from Top Management to lower level management is required in the field in all MRMS activities in several PHE SHU organization (Regional, Zones, Work Areas/Field/Assets). This commitment can be demonstrated by establishing MRMS policies, goals and objectives, ensuring the availability of resources (human, infrastructure, technology and finance), establishing authority and allocating responsibilities, documenting rules, authorities and responsibilities, and showing oneself as a visible leader. To show as a visible leader, management must be actively involved in MRMS activities according to their capacity.

MRMS planning ensures that MRMS activities are followed and complied with by all parties involved in MRMS implementation activities (such as: surface facilities analysis planning must be in accordance with existing standards, operational control, compliance with safety practices, demonstrating safety behavior and leadership, acting against non-compliance, etc). Implementation of the MRMS plan must refer to laws, standards and codes that apply at the national and international levels.

The effectiveness of the implementation of the work can be seen from the results of performance monitoring and evaluation. Monitoring and evaluation of MRMS performance is carried out with the aim of knowing MRMS performance to support oil and gas production operations so that they can run safely, reliably and optimally through optimizing production facilities, implementing process safety management, maintaining the integrity of production facilities and maximizing reliability and availability to meet targets set by the company.

The implementation of MRMS must carry out a performance evaluation of the achievement of the standards set, the occurrence of performance deviations will be used as a basis for carrying out further corrective actions. Evaluation is carried out every 2 years.

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