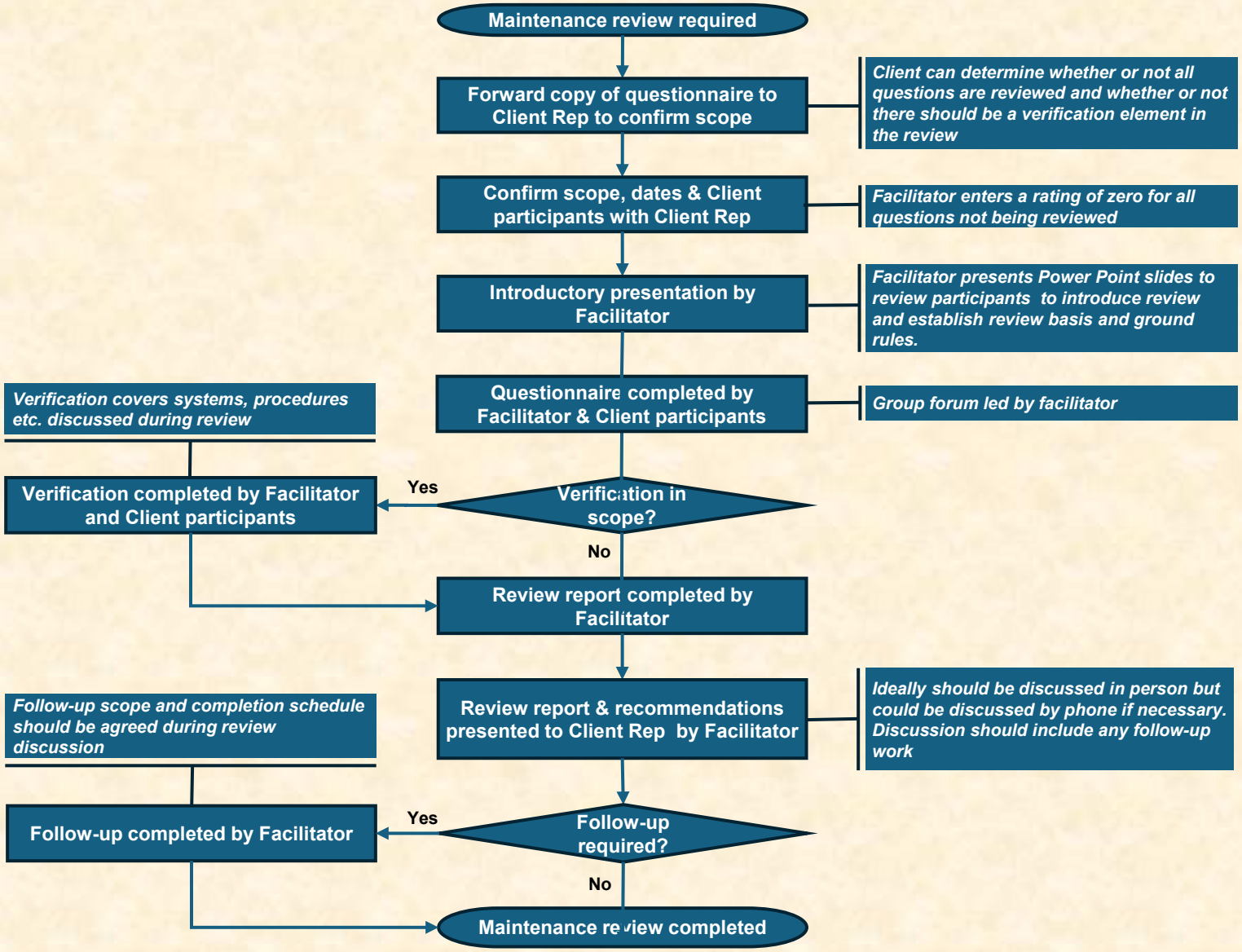
Maintenance Management Review Process

REVIEW PROCESS OVERVIEW

- The main goal of the review should be to evaluate the effectiveness of existing maintenance systems and processes in a structured manner and identify improvement opportunities.
- High level desktop reviews without a verification element are less likely to produce optimum outcomes
- Maintenance systems and processes may vary according to location, scale and operating environment yet still be effective in delivering appropriate outcomes.
- The achievement of optimum review outcomes depends on effective coordination and communication together with the cooperation, openness, willingness and commitment by those involved. Review processes should therefore be collaborative and non-confrontational.
- Review needs to be well planned for expectations to be met and the following aspects need appropriate consideration.
  - Goals and expectations must be clear
  - Scope needs to be clearly defined and aligned with goals and expectations
  - Timetable
  - Participants
  - Facilities
  - Reporting requirements
- Review process exposes participants to best practice maintenance management concepts.

REVIEW PROCESS FLOW CHART



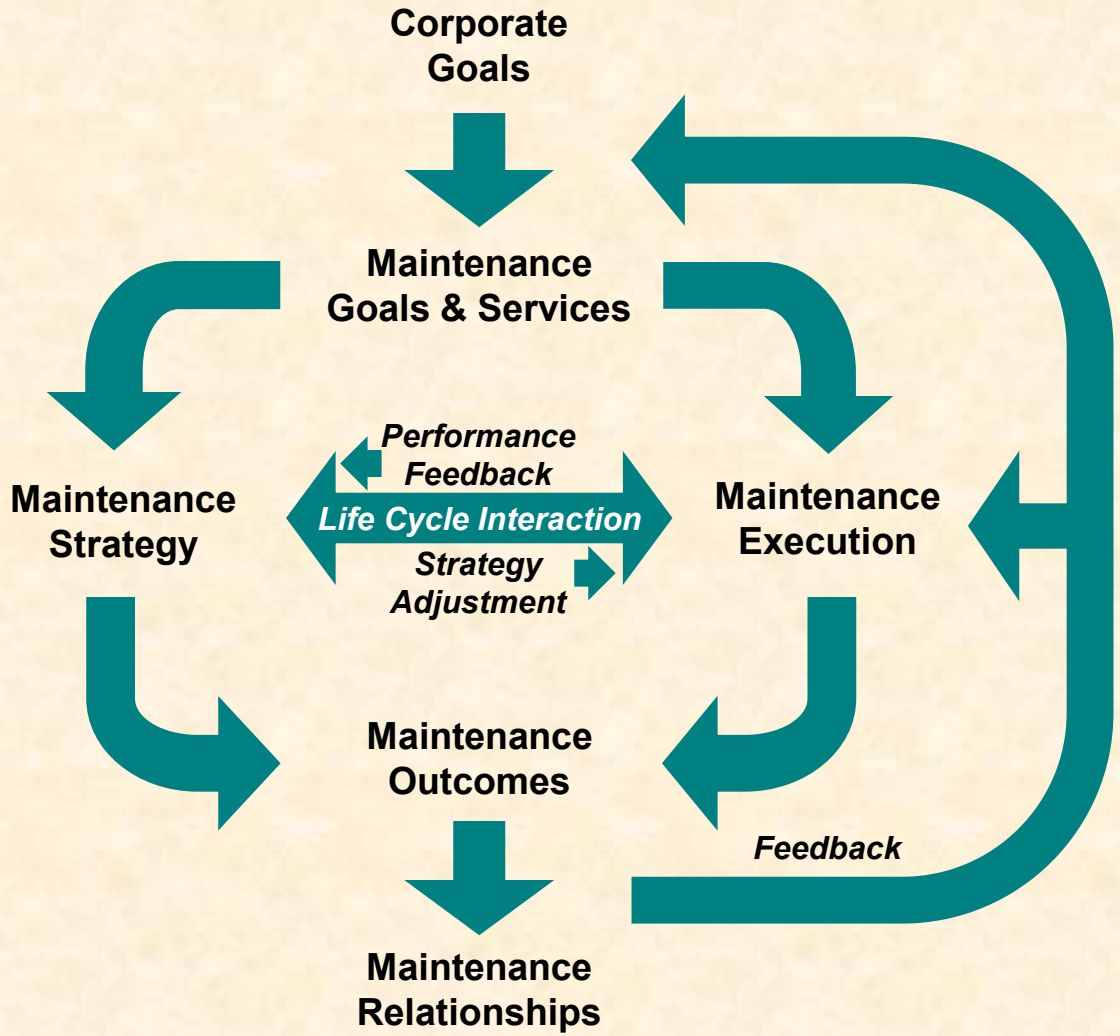
MAINTENANCE MISSION

The maintenance mission involves:

- Developing and continually optimising plant maintenance strategies and programs to ensure the achievement of short-term and long-term marketing and production strategies and objectives effectively and safely. This includes:
  - Optimising equipment availability, reliability & performance
  - Protecting asset condition over its required life cycle

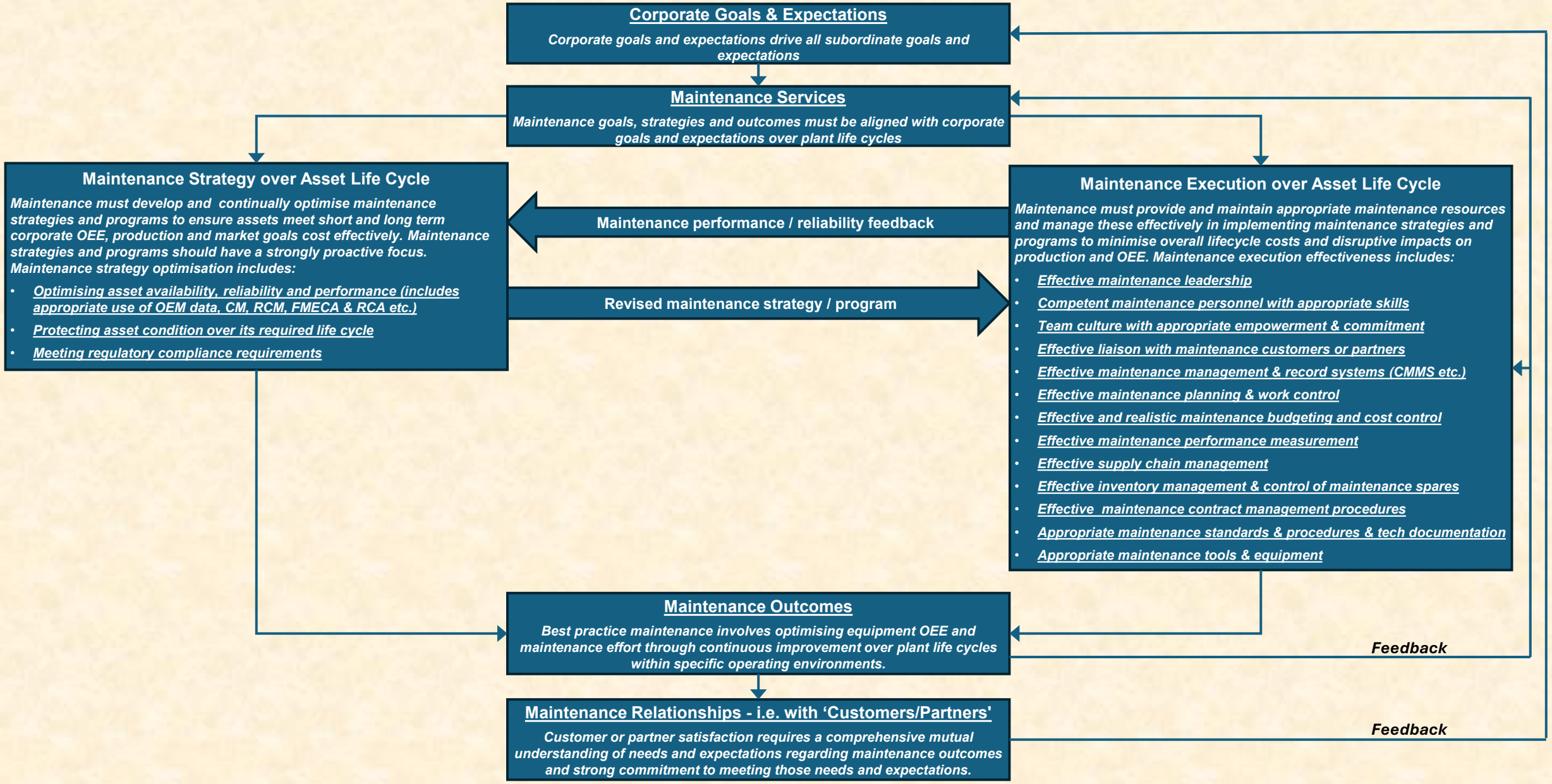
- Providing and maintaining appropriate maintenance resources and managing them effectively and safely in implementing the required maintenance strategies and programmes to minimise overall life cycle costs and disruptive impacts on OEE and production.

MAINTENANCE SERVICE DELIVERY MODEL (SIMPLIFIED)



MAINTENANCE MANAGEMENT REVIEW PROCESS WORKBOOK

MAINTENANCE SERVICE DELIVERY MODEL (DETAILED)



QUESTIONNAIRE (1/3) (questions are contextual to question groups / subgroups)

1.0	**Operational Strategy**
1.1	**Corporate Goals & Expectations**
1.1.1	Have corporate goals and expectations been defined clearly?
1.1.2	Are corporate goals and expectations appropriate and understood by all?
1.2	**Maintenance Service Goals & Strategies**
1.2.1	Have maintenance service goals and strategies been defined clearly?
1.2.2	Have maintenance service goals and strategies been clearly conveyed to all team members?
1.2.3	Are maintenance service goals and strategies aligned with corporate goals and expectations?
2.0	**Maintenance Strategy**
2.1	**Asset Availability**
2.1.1	Is asset availability monitored and optimised effectively?
2.1.2	Are asset availability data records appropriate and readily accessible?
2.1.3	Are asset availability analysis methods appropriate and effective?
2.2	**Asset Reliability**
2.2.1	Is asset reliability monitored & optimised effectively?
2.2.2	Are asset reliability data records appropriate and readily accessible?
2.2.3	Are asset reliability analysis methods and techniques appropriate and effective?
2.2.4	Is failure analysis and improvement action always timely and effective?
2.3	**Asset Performance**
2.3.1	Is critical asset performance monitored & optimised effectively?
2.3.2	Are asset performance data records appropriate and readily accessible?
2.3.3	Are asset performance analysis methods and techniques appropriate and effective?
2.3.4	Is corrective action always timely and effective?
2.4	**Asset Protection**
2.4.1	Is asset condition monitored & protected effectively?
2.4.2	Are asset condition data records appropriate and readily accessible?
2.4.3	Is corrective action always timely and effective?
2.5	**Regulatory Compliance**
2.5.1	Have all statutes and regulations relevant to asset maintenance been identified?
2.5.2	Do maintenance strategies effectively address all relevant compliance requirements?
2.5.3	Has compliance been achieved in all relevant areas?

3.0	**Maintenance Execution**
3.1	**Leadership & Organisation**
3.1.1	Is the maintenance organisation structure appropriate and effective?
3.1.2	Are accountabilities and authorities appropriate and clearly defined?
3.1.3	Do team leaders consistently demonstrate commitment and lead by example?
3.1.4	Do team leaders support their teams effectively?
3.1.5	Do team leaders communicate effectively and consistently?
3.1.6	Do team leaders coach their personnel effectively and consistently?
3.2	**Personnel & Skills**
3.2.1	Are maintenance staff levels appropriate?
3.2.2	Is the staff/contractor ratio appropriate?
3.2.3	Are maintenance personnel competent in all key areas?
3.2.4	Are skills assessed and training needs identified effectively and regularly?
3.2.5	Do training programmes reflect priorities identified by training needs analysis?
3.2.6	Is training effectiveness and associated personnel competence assessed?
3.2.7	Is individual performance assessed regularly?
3.3	**Culture**
3.3.1	Is the level of teamwork satisfactory, do team members support the team & each other?
3.3.2	Are levels of empowerment appropriate?
3.3.3	Is there a strong, consistent focus on continuous improvement and ‘no-blame’?
3.3.4	Have the overall maintenance team values been defined?
3.3.5	Is there widespread commitment to maintenance team values?
3.4	**Interface with Customers / Partners**
3.4.1	Are mechanisms for maintenance/customer/partner interaction appropriate & effective?
3.5	**Management & Record Systems (CMMS etc.)**
3.5.1	Have appropriate maintenance management systems been established?
3.5.2	Have appropriate MMS / CMMS conventions been established effectively?
3.5.3	Has an effective asset hierarchy structure been established for all plant areas?
3.5.4	Has key asset data been defined and established effectively in MMS / CMMS?
3.5.5	Has an effective technical documentation management system been established?
3.5.6	Is interaction between MMS / CMMS and technical documentation systems effective?
3.5.7	Has an effective maintenance records management system been established?
3.5.8	Is interaction between MMS / CMMS and maintenance records systems effective? *(continued)*

QUESTIONNAIRE (2/3) (questions are contextual to question groups / subgroups)

3.5.9	Has an effective personnel records management system been established?
3.5.10	Have effective inventory management systems and procedures been established?
3.5.11	Is interaction between MMS / CMMS and supply chain management systems effective?
3.5.12	Is interaction between MMS / CMMS and financial systems effective?
3.5.13	Are all aspects of work requests / work orders actioned effectively using MMS / CMMS?
3.5.14	Are all aspects of goods & services requisitioning / procurement actioned effectively using MMS / CMMS?
3.5.15	Have asset BOMs been defined and established in MMS / CMMS?
3.5.16	Is MMS / CMMS used effectively for developing budgets?
3.5.17	Is MMS / CMMS report generation satisfactory?
3.5.18	Does MMS / CMMS user friendliness and performance meet user needs in all key aspects?
3.5.19	Has all appropriate MMS / CMMS functionality been fully and effectively utilised?
3.5.20	Are MMS / CMMS users competent in its use and is MMS / CMMS accessibility satisfactory?
3.5.21	Are MMS / CMMS work records consistently satisfactory?
3.5.22	Can maintenance work details, labour and spares records be retrieved & analysed effectively?
3.5.23	Is interaction between MMS / CMMS & supply chain systems re spares usage effective?
3.5.24	Is maintenance failure data available, retrieved & analysed effectively?
3.5.25	Is interaction between MMS / CMMS & other maintenance record systems effective?
3.5.26	Are filing systems for hard copy records catalogued & managed effectively?
3.5.27	Do maintenance records meet regulatory compliance requirements?
3.6	**Planning**
3.6.1	Is all non-urgent work planned appropriately and effectively?
3.6.2	Is the proactive / reactive work ratio satisfactory?
3.6.3	Is the maintenance backlog satisfactory?
3.6.4	Does maintenance planning keep pace with work request / work order generation?
3.6.5	Is planning consistently effective (e.g..estimated versus actual)?
3.6.6	Are periodic work plans reflecting operations & maintenance priorities used consistently?
3.6.7	Are short, medium and long-term work plans employed effectively?
3.6.8	Are maintenance projects such as shutdowns planned effectively?
3.6.9	Is interaction between MMS / CMMS and project planning systems effective?
3.6.10	Have PM work orders & SPLs been established in MMS / CMMS for all relevant assets?
3.6.11	Have CM work orders been established in MMS / CMMS for all relevant assets?
3.6.12	Is the linking of supplementary documentation to work orders satisfactory?
3.6.13	Is access to asset data during work planning satisfactory?
3.6.14	Is access to materials data during work planning satisfactory?
3.6.15	Is access to maintenance standards & procedures during work planning satisfactory?
3.6.16	Is hazard management planning integrated with work order planning effectively?
3.6.17	Is the generation of SPLs during work order planning satisfactory?
3.6.18	Is the reservation of materials during work order planning satisfactory?
3.6.19	Is coordination between maintenance and operations during work planning effective?
3.6.20	Are work order costs estimated appropriately and consistently prior to implementation?
3.6.21	Are work orders approved consistently and appropriately prior to implementation?
3.6.22	Are work orders covering multiple equipment items, handled effectively by MMS / CMMS?
3.7	**Work Control**
3.7.1	Are periodic work plans implemented consistently and effectively with regular progress updates?
3.7.2	Is coordination between maintenance & operations consistently effective?
3.7.3	Is coordination between maintenance & engineering support consistently effective?
3.7.4	Is permit issue coordinated effectively and consistently to minimise work delays?
3.7.5	Have inventory systems been optimised to minimise work delays consistently?
3.7.6	Have procurement systems been optimised to minimise work delays consistently?
3.7.7	Have maintenance tools & equipment systems been optimised to minimise work delays?
3.7.8	Are labour man-hrs recorded effectively?
3.7.9	Is lost or non-productive time recorded effectively and consistently?
3.7.10	Are work orders closed out effectively and consistently without undue delay?
3.7.11	Is the level of rework acceptable?
3.7.12	Is the level of rework recorded effectively?
3.8	**Budgets & Cost Control**
3.8.1	Are budget and cost control accountabilities devolved appropriately and effectively through the maintenance team?
3.8.2	Are budgets zero based?
3.8.3	Is MMS / CMMS used effectively in budget development?
3.8.4	Is MMS / CMMS used effectively for cost control and reporting?
3.8.5	Has account coding been optimised?
3.8.6	Are maintenance costs reviewed regularly?
3.9	**Performance**
3.9.1	Is maintenance performance regularly and effectively monitored and reported using KPIs?
3.9.2	Are KPIs appropriate?
3.9.3	Is all KPI supporting data accurate, timely and readily accessible?

QUESTIONNAIRE (3/3) (questions are contextual to question groups / subgroups)

3.10	**Supply Chain**
3.10.1	Is the procurement of goods and services timely and cost effective?
3.10.2	Do all requisitions include appropriate specifications, inspection and delivery requirements?
3.10.3	Is invoice matching and approval of accounts for payment timely and effective?
3.10.4	Are there supply agreements in place to assist in minimising inventory levels?
3.10.5	Has supply chain been effectively and appropriately optimised re materials pricing, delivery, quality and inventory level?
3.10.6	Is test documentation for incoming goods managed effectively?
3.11	**Inventory Management**
3.11.1	Are inventory levels monitored / adjusted in line with logistics issues and OEE targets?
3.11.2	Has inventory been catalogued effectively with full OEM procurement specifications, appropriate asset cross-referencing and accurate stock locations etc.?
3.11.3	Is inventory managed effectively to minimise stock losses / deterioration and stock issue delays?
3.11.4	Are there any unofficial satellite stocks?
3.11.5	Are refurbishable / rotable spares managed effectively to optimise availability?
3.12	**Contract Management**
3.12.1	Are maintenance contracts managed effectively re time, cost, quality?
3.12.2	Are there effective tendering / contract management procedures and documentation in use?
3.12.3	Are contract / contractor payments administered within the MMS / CMMS?
3.12.4	Are contract management records controlled and managed effectively?
3.12.5	Do contractual disputes occur more frequently than necessary?
3.13	**Documentation**
3.13.1	Is documentation controlled and managed effectively?
3.13.2	Is documentation readily accessible?
3.13.3	Is documentation appropriate and complete?
3.13.4	Is documentation accurate and up to date?
3.13.5	Does documentation meet regulatory compliance requirements?
3.14	**Standards, Specifications & Procedures**
3.14.1	Are standards, spectifications and procedures controlled and managed effectively?
3.14.2	Are standards, specifications and procedures readily accessible?
3.14.3	Are standards, specifications and procedures appropriate and sufficiently detailed?
3.14.4	Are standards, specifications and procedures accurate and up to date?
3.14.5	Do standards, specifications and procedures meet regulatory compliance needs?
3.15	**Tools & Equipment**
3.15.1	Are tools and equipment controlled and managed effectively?
3.15.2	Are tools and equipment readily accessible?
3.15.3	Are tools and equipment appropriate (fit for purpose) and in good condition?
3.15.4	Are tools and equipment quantities sufficient?
4.0	**Maintenance Outcomes**
4.0.1	Is asset OEE being optimised effectively?
4.0.2	Is continuous improvement used effectively to identify maintenance improvement opportunities?
4.0.3	Are maintenance corrective actions consistently effective and timely?
4.0.4	Is maintenance budgeting and cost control consistently effective?
4.0.5	Are assets being protected effectively?
4.0.6	Are regulatory compliance requirements being met effectively and consistently?
5.0	**Maintenance Customers / Partners**
5.0.1	Is there strong commitment by maintenance to meeting customer / partner expectations?
5.0.2	Is there strong commitment by customers / partners to meeting maintenance expectations?
5.0.3	Are customer / partner relationships managed effectively with effective two-way interaction?
5.0.4	Is there consistently good alignment between maintenance and operations objectives?
5.0.5	How good are relationships with key customers / partners at present?

Review Question Response Rating System

1 *= Ineffective or doesn't exist*

2 *= Significant improvement required; minimum needs met*

3 *= Some improvement required; most needs met*

4 *= Satisfactory, needs met fully*

0 *= Not assessed*

Abbreviations:

MMS *= Manual and/or partially integrated computerised maintenance management system*

CMMS *= Integrated, computerised maintenance management system*

OEE *= Overall Equipment Effectiveness* ***PM*** *= Preventive Maintenance* ***CM*** *= Condition Monitoring*

BOMs *= Bills of Materials* ***SPLs*** *= Service Parts Lists* ***OEM*** *= Original Equipment Manufacturer*

WORKSHEET '7. REVIEW FORM-NOTES AND SCORES (DE)'

	A	B	C	D	E	F	G	H
1	MMAPS							
2	**Maintenance Management Review Form *(with notes, comments & scores)***					***Review ID:***		
3	***Rating:***	***1*** *= Ineffective or doesn't exist,* ***2*** *= Significant improvement required, minimum needs met,*				***Reviewer:***		
4		***3*** *= Some improvement required, most needs met,* ***4*** *= Satisfactory, meets needs fully,* ***0*** *= Not assessed*						
5								
6	**Issue #**	**Functional Groups & Subgroups**	**Questions** ***Contextual to Functional Groups / Subgroups***	**Techniques & / or Systems Used:**	**Gaps Perceived by Users:**	**Comments:**		**Rating**
7	**1.0**	**Operational Strategy**						
8	**1.1**	**Corporate Goals & Expectations**						
9	1.1.1	Corporate Goals & Expectations	Have corporate goals and expectations been defined clearly?					
10	1.1.2	Corporate Goals & Expectations	Are corporate goals and expectations appropriate and understood by all?					
11	**1.2**	**Maintenance Service Goals & Strategies**						
12	1.2.1	Maintenance Service Goals & Strategies	Have maintenance service goals and strategies been defined clearly?					

MMAPS

Maintenance Management Review Form *(with scores, without notes / comments)*

Review ID:

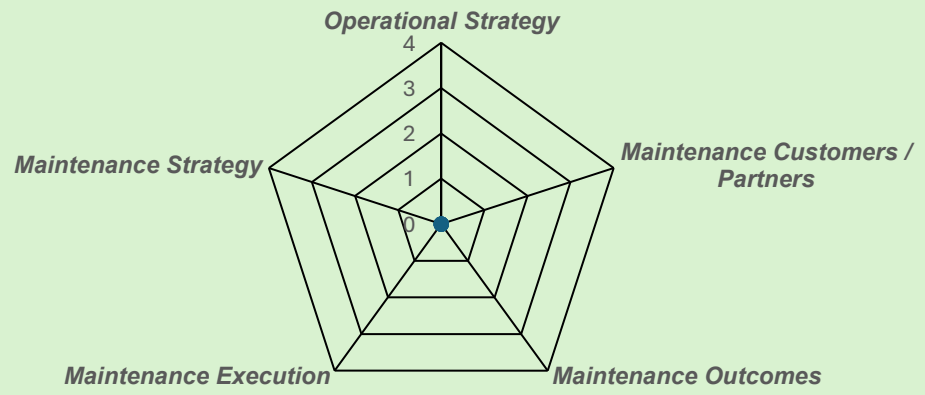
Date:

Rating: ***1*** *= Ineffective or doesn't exist,* ***2*** *= Significant improvement required, minimum needs met,*
3 *= Some improvement required, most needs met,* ***4*** *= Satisfactory, meets needs fully,* ***0*** *= Not assessed*

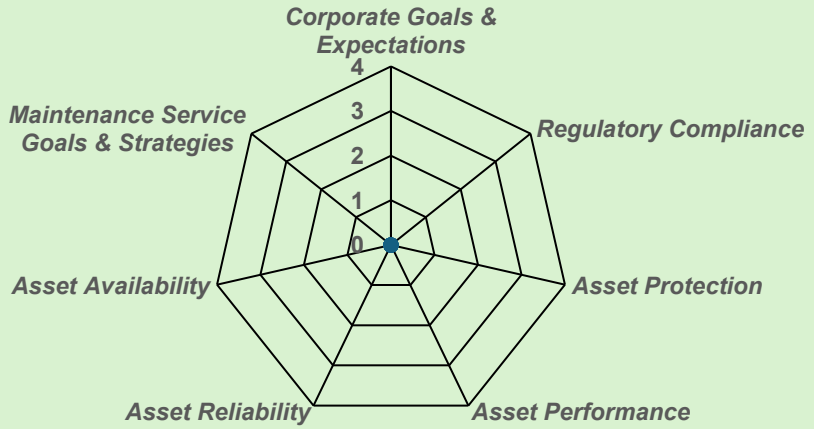
Note: Questions are contextual to Functional Groups and Subgroups		**Rating**
1.0	**Operational Strategy**	
1.1	**Corporate Goals & Expectations**	
1.1.1	Have corporate goals and expectations been defined clearly?	0
1.1.2	Are corporate goals and expectations appropriate and understood by all?	0
1.2	**Maintenance Service Goals & Strategies**	
1.2.1	Have maintenance service goals and strategies been defined clearly?	0
1.2.2	Have maintenance service goals and strategies been clearly conveyed to all team members?	0
1.2.3	Are maintenance service goals and strategies aligned with corporate goals and expectations?	0
2.0	**Maintenance Strategy**	
2.1	**Asset Availability**	
2.1.1	Is asset availability monitored and optimised effectively?	0
2.1.2	Are asset availability data records appropriate and readily accessible?	0

REVIEW CHARTS (1/3)

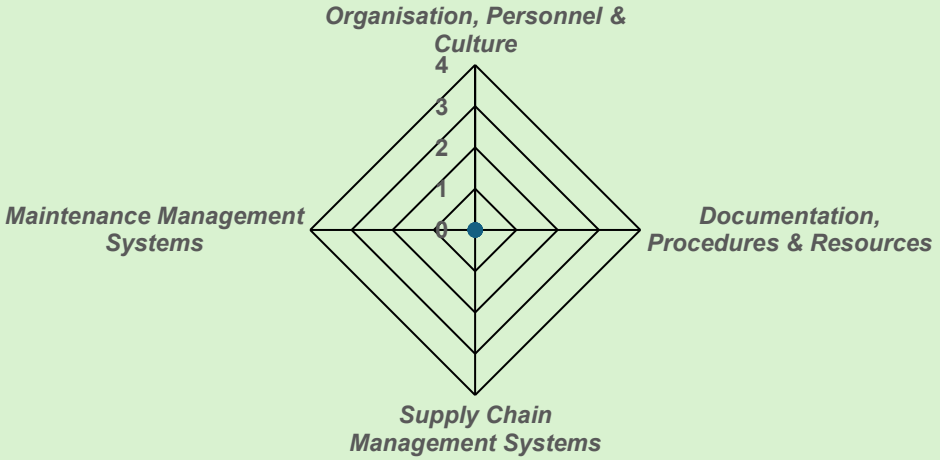
Overall Maintenance Effectiveness



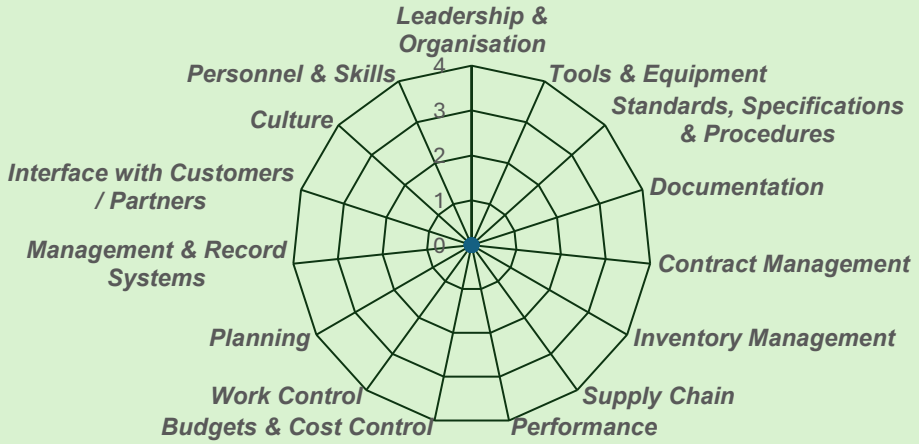
Operational & Maintenance Strategy



Maintenance Execution Overview

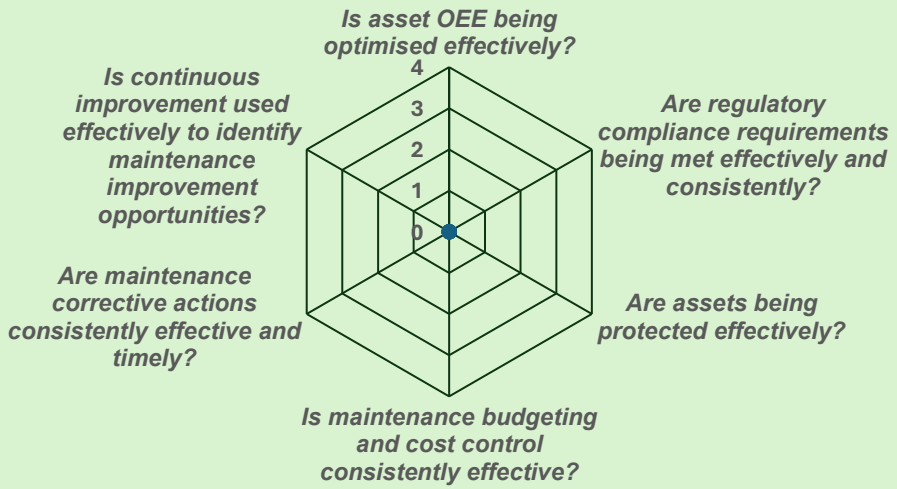


Maintenance Execution in Detail

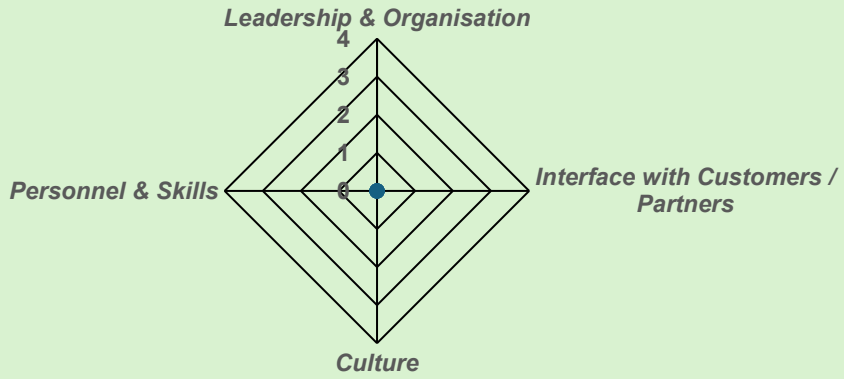


REVIEW CHARTS (2/3)

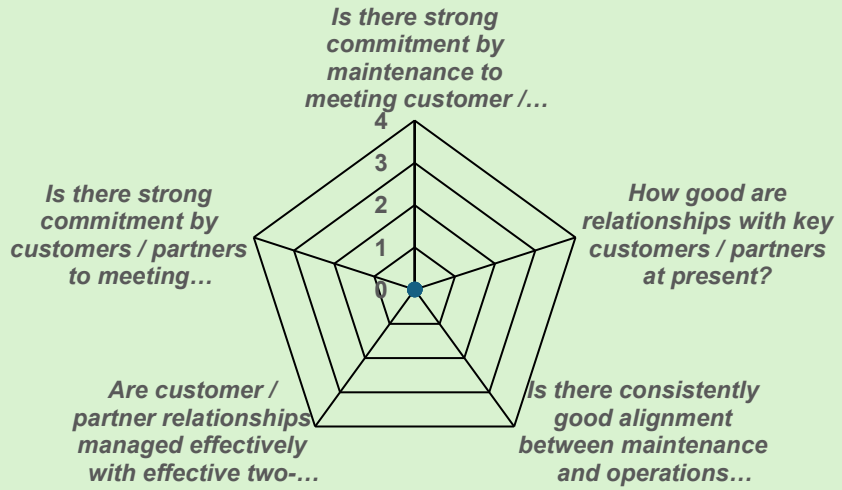
Maintenance Strategic Outcomes



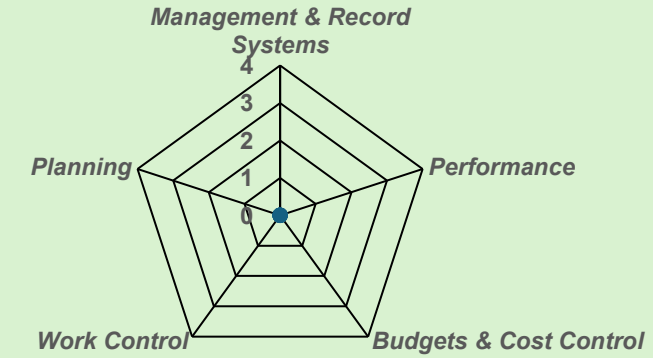
Maintenance Execution
Organisation, Personnel & Culture



Maintenance Customer / Partner Relationships

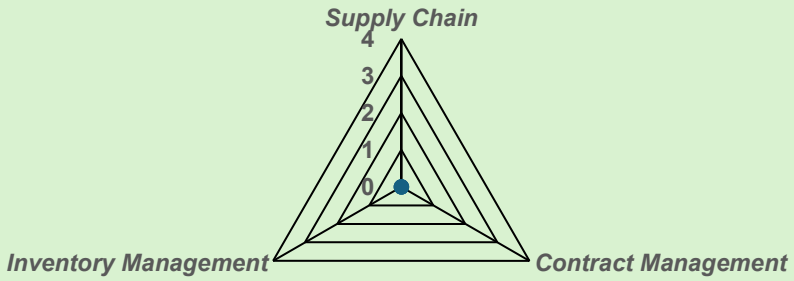


Maintenance Execution
Maintenance Management Systems

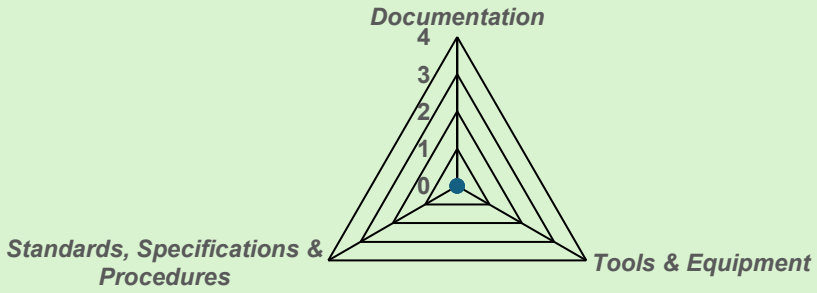


REVIEW CHARTS (3/3)

Maintenance Execution
Supply Chain Management Systems

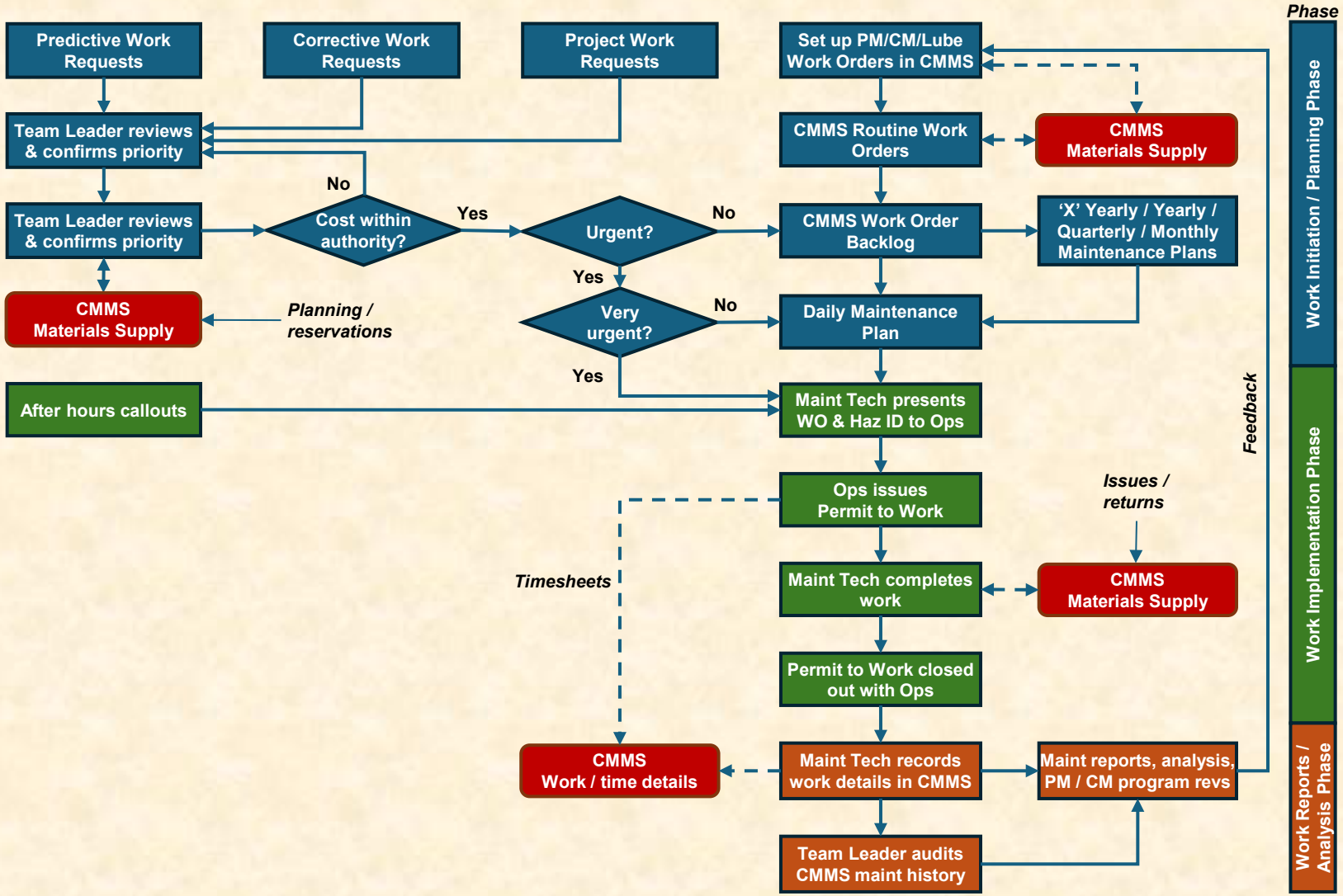


Maintenance Execution
Documentation, Procedures & Resources



TYPICAL MAINTENANCE WORK CONTROL PROCESS

Simplified



MAINTENANCE TERMS

Proactive Maintenance (>70% of overall maintenance effort)

Prearranged, planned maintenance actions or work carried out to optimise equipment reliability, availability and performance or rectify known deterioration prior to the occurrence of any avoidable, undesirable or uncontrolled effect on production. Proactive maintenance includes on-condition tasks, condition monitoring, predictive maintenance and preventive maintenance.

Reactive Maintenance (<30% of overall maintenance effort)

Maintenance actions or work carried out in response to unplanned or unexpected events, including functional failures, potential failures, deterioration or breakdowns etc., which have avoidable, undesirable or uncontrolled effects on production.

Planned Maintenance (>90% of overall maintenance effort)

All maintenance actions or work, either proactive or reactive, for which appropriate planning and preparation has taken place. Planning may include breaking the task into logical steps, allocating resources to each step, arranging spares, interfacing with production, hazard identification and work scheduling etc.

Condition Monitoring (CM)

The use of analytical techniques to monitor equipment condition and obtain serviceability data over time so that reliability can be assessed and faults or deterioration (potential failures) detected and diagnosed prior to causing any uncontrolled effect on production.

These analytical techniques detect potential failure effects falling into the following groups: dynamic effects, particle effects, chemical effects, physical effects, temperature effects and electrical effects.

Predictive Maintenance or Condition Based Maintenance

Maintenance actions or work scheduled in response to condition monitoring predictions and diagnoses to optimise reliability and availability.

Preventive Maintenance (PM)

Maintenance actions or work carried out on a periodic basis to physically monitor equipment condition and/or rectify known equipment deterioration.

Corrective Maintenance

Maintenance actions or work carried out in response to failures, potential failures or deterioration etc. to correct defects and return equipment to acceptable condition.