MOSMS®

MOSMS®: Maintenance Optimum Strategic Management System

Practice Guide

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Outline of MOSMS Practice Guide

Japan institute of Plant Maintenance

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Outline of *MOSMS Practice Guide*

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MOSMS stands for Maintenance Optimum Strategic Management System. It is a planning-oriented system for plant maintenance that contributes to corporate management, proposed by Japan Institute of Plant Maintenance.

The overall concept of MOSMS was published in July 2006 under the title of *Maintenance Administration for Management*. The *MOSMS Practice Guide* concretely describes how to formulate a framework for plant maintenance under the MOSMS concept.

1. Basic concept of MOSMS

The *Maintenance Administration for Management* analyzed the recent changes in the business environment and pointed out that the emphasis on corporate governance is becoming increasingly greater; companies are strictly demanded to fulfill their social responsibilities as well as pursue profitability. The book also indicated that maintenance is closely linked with production. Corporate governance, particularly risk management, is directly linked with the overall profitability of companies, and that is where the importance of maintenance is recognized.

In that perspective, the basic concept of MOSMS is summarized as follows:

① The final goal of maintenance is to maximize the profit of the stakeholders (such as management executives, employees, customers and stockholders). Maintenance must be regarded as a subject matter the corporate executives should address.

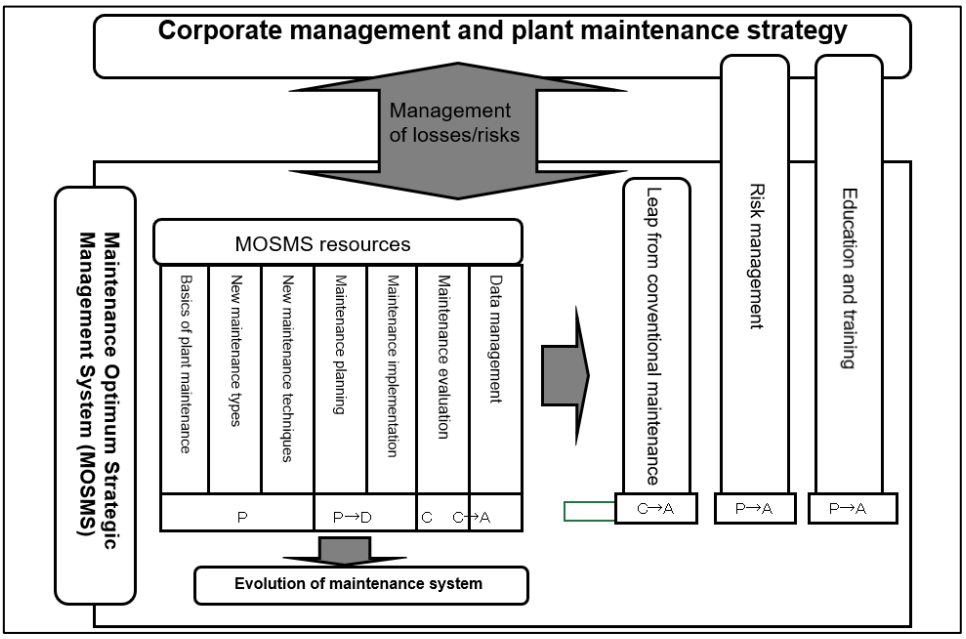
② Corporate executives and the maintenance management department should stand on the same ground and draw a *grand design for maintenance* to minimize losses and risks as part of the corporate strategy.

③ For maintenance to be integrated with the corporate management strategy, practical plans must be made from the corporate management viewpoint, and maintenance must be implemented in a plan-oriented manner.

④ To keep maintenance plan-oriented, a framework must be created so that the PDCA cycle in management works with the PDCA cycle in maintenance.

⑤ In the maintenance cycle, individual existing technologies must be used as resources. The diversity, changes, and advancements in the resources must be incorporated into the cycle while their structures are maintained.

Overall picture of MOSMS



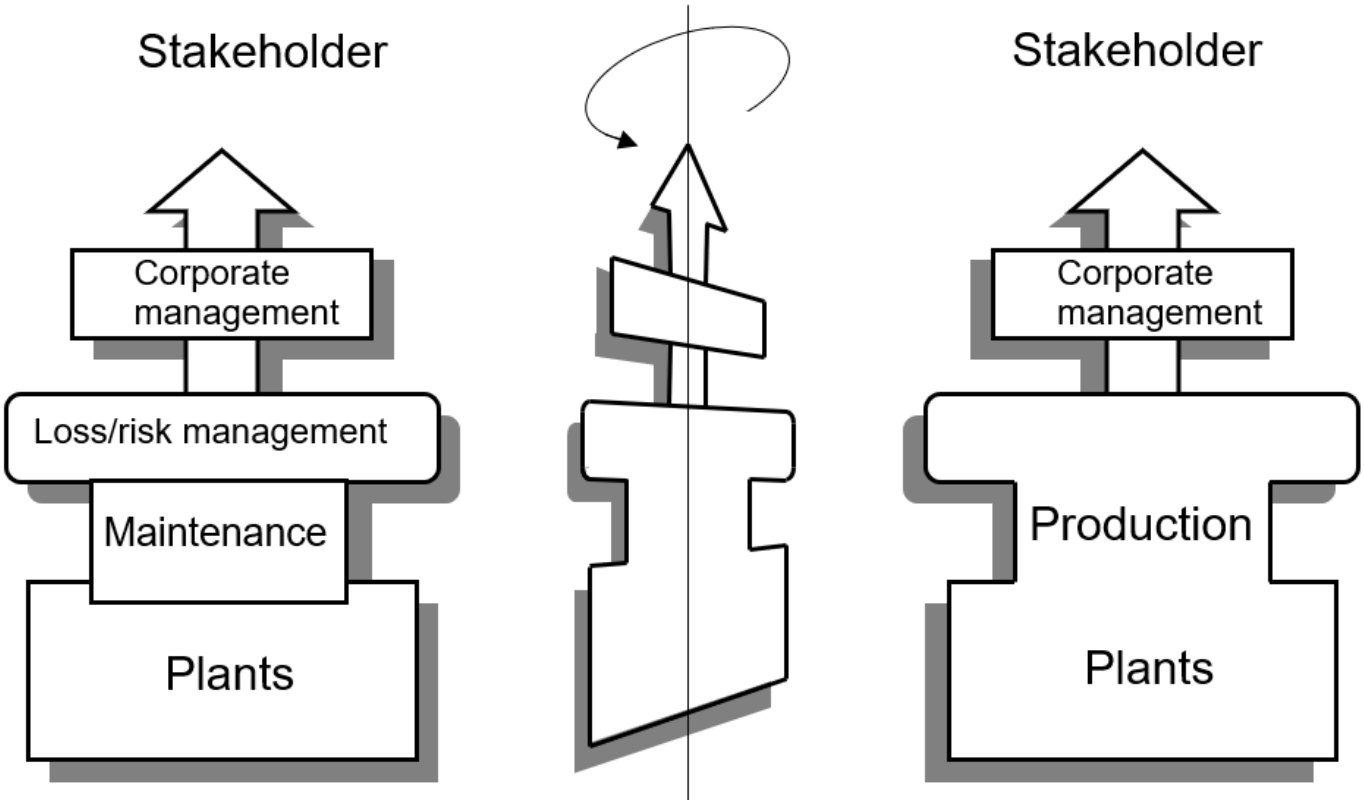
2. Meaning of "Strategic maintenance contributing to corporate management"

As described in the previous section, the goal of MOSMS is a maintenance framework for optimizing the whole company. Building MOSMS means building a framework for total optimization.

The function for total company optimization is nothing but corporate management. The will of corporate management is embodied as individual management tasks. Thus, implementing maintenance at the company-wide level requires a framework of maintenance as corporate management.

＊Here, "management" is defined as "*coordinated activities to direct and control tasks of an organization in order to attain its goal*." The definition derives from the ISO 9000 definition, "coordinated activities to direct and control an organization."

Production and maintenance



(1) Scope of *Maintenance*

Is *maintenance* about the same as mending or repair? If seen within that scope, strategic maintenance or even planned maintenance would not be possible; maintenance would go no further than fixing failures, and total optimization would be unlikely.

Thus, the *MOSMS Practice Guide* defines *maintenance* as follows:

> *Maintenance* encompasses the roles and organizational functions that sustain corporate management and maximize the profit for stakeholders, including managers, employees, customers, and shareholders, by maintaining the functions expected in the six stages of the lifecycle of plants and equipment—① design and manufacture, ② procurement, ③ construction and trial operation, ④ operation, ⑤ inspection and maintenance (including mending), and ⑥ disposal—thus contributing to the reduction in losses and risks inside and outside the sites.

Regarding the phrase “sustain corporate management,” it would be worth noting one thing—if a company aims to be sustainable, so should its maintenance activities. Mending and repairing are but a small part of the lifecycle; they are not everything.

(2) Strategic *Resource Distribution*

The scope of *maintenance* described above covers a broad range of departments and involves complicated work assignment. Resources must be distributed to maximize the efficiency of work assignment, rather than kept independent in different departments.

Strategic resource distribution generally addresses five management resources: people, things, cost, opportunities, and information. You must view from the lifecycle perspective, addressing the entire service life of the plant from introduction through to disposal. You should also grasp how resources are distributed across the entire production activities, establishing a specific renewal policy and drawing up medium- to long-term production plans, plant plans, plant investment plans, and more.

From the same perspective, you should distribute resources while building frameworks for maintenance implementation and management, planning staffs, and planning medium- to long-term maintenance expenses.

Total optimization requires corporate executive leadership. That is the spirit penetrating the *MOSMS Practice Guide*.

3. Objectives of the *MOSMS Practice Guide*

MOSMS Practice Guide is designed to describe concretely how to build a maintenance system that embodies the MOSMS concept.

(1) Building a management cycle that keeps turning

"How can we build a management cycle that keeps turning?" To answer the question, the *MOSMS Practice Guide* presumes the following idea of a management cycle.

The primary focus of MOSMS is to link the management PDCA cycle with the maintenance PDCA cycle and draw a grand design of maintenance strategically. The grand design is presented as the *maintenance strategy*, which forms the basis of building a concrete *maintenance plan*. Then, according to the plan, maintenance is implemented and evaluated.

A management cycle consists of four phases: plan (P), do (D), check (C), and act (A). Each of the PDCA phases has a sub-cycle; the P phase has its own PDCA cycle within as does each of the other phases. Throughout the course of the management cycle, two flow types are interlinked: a big flow that starts with the *maintenance strategy* and leads to the total optimization of the company, and individual flows in the PDCA phases that are led by the plan (P) in each sub-cycle. *Planning-oriented maintenance* in MOSMS means that the grand design of maintenance is strategically drawn along the two flow types.

The *MOSMS Practice Guide* navigates through the two flow types, and concretely describes how to build a framework for *planning-oriented maintenance* by showing how the flows should be interlinked.

(2) Comparing the status quo with the ideal figure

The following factors are essential for keeping a management cycle turning:

① The management cycle and the maintenance cycle are integrated.

② The cycle turns *as a routine*.

The first factor is based on recognizing that *maintenance is a matter of corporate management*; maintenance must be integrated with corporate management. The flow from the maintenance strategy is applicable to this factor.

The second factor means that efficient sustenance is only possible through a framework where routine tasks are optimally combined.

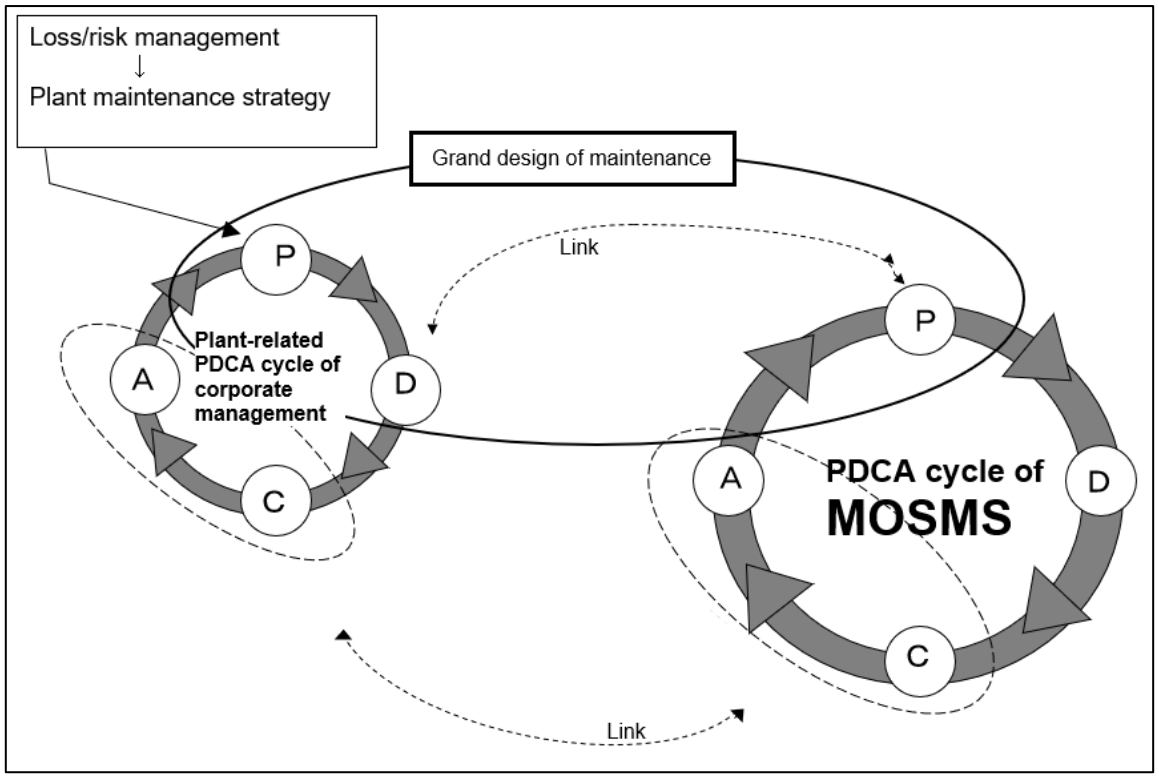
Situations vary with companies and workplaces, and so does how to build a framework that satisfies both ① and ②. Yet you can clearly visualize what is missing and what should be done to deal with it as long as your framework has a step of identifying the status quo.

Thus, the *MOSMS Practice Guide* was produced to help you improve the framework for maintenance, starting with identification of the status quo of the company and the workplace.

Maintenance Administration for Management describes how the current framework can be directed toward MOSMS in Chapter 8, *Shift to MOSMS*. The *MOSMS Practice Guide* is more specific; it describes what is to be done, who should do it, and how it should be done.

Use the *Guide* as an ideal figure and compare it with the status quo of your company. With that you can start improving the framework in your company.

Linking the management cycle with the maintenance cycle



4. A *framework* for reducing losses and risks

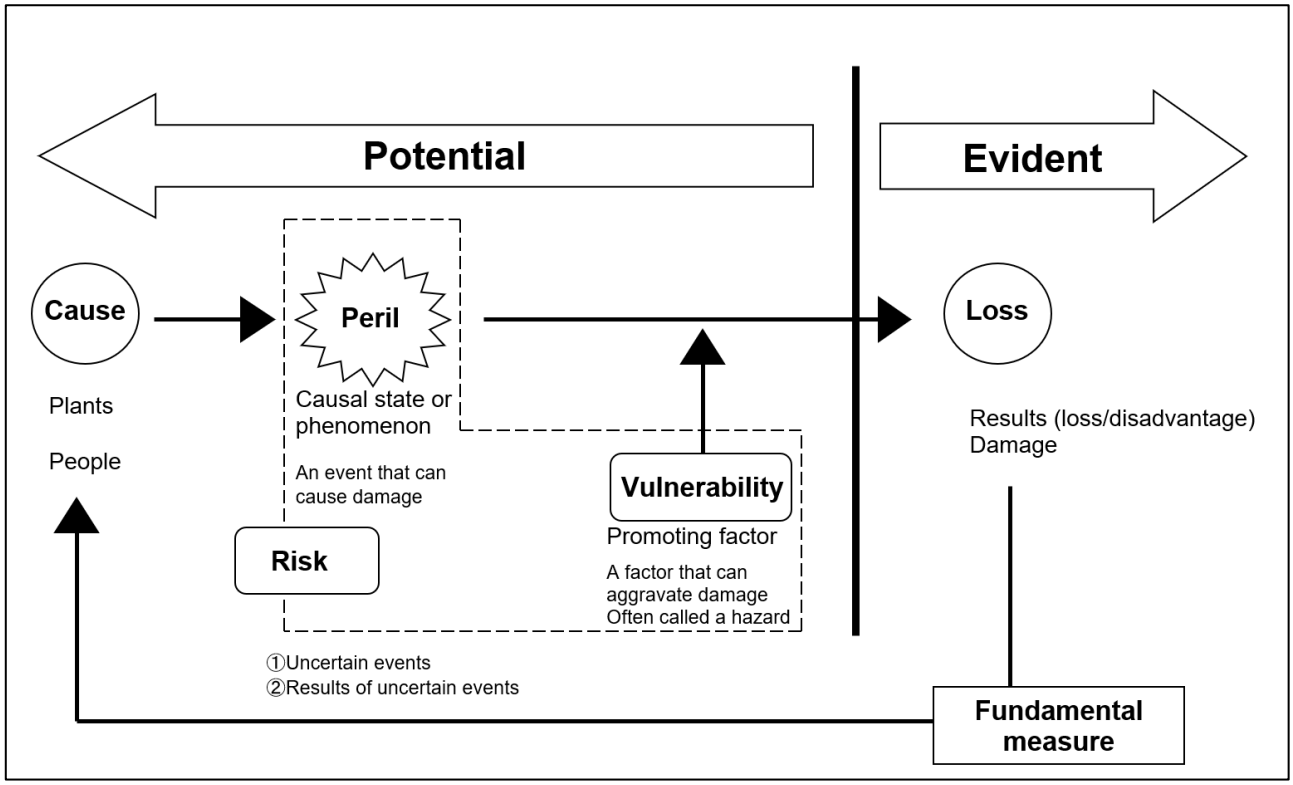
(1) Definition of losses and risks in MOSMS

Under the MOSMS concept, losses and risks are considered different phases of instances originating from the same cause: plant, person, or framework.

- Losses: Evident results of a past event, and the damage thereof
- Risks: Possible events in the future that are currently latent, and the forecast damage thereof

In other words, among the events that have occurred from the same cause, evident ones are called losses and latent ones are called risks. Thus, losses and risks are recognized as part of a consistent concept.

Losses and risks in MOSMS



The *MOSMS Practice Guide* classifies losses and risks as follows:

① Losses/risks regarding opportunities: Losses of, or risks of losing, production and sales opportunities due to a line stoppage, low plant efficiency, low plant operating rate, or abnormal quality, for instance

② Losses/risks regarding plant restoration and repair: Losses caused by or risks of enormous costs or time consumed to restore or repair a plant

③ Losses/risks regarding quality: Losses and risks caused by product quality issues, as in a recall

④ Losses/risks regarding work accidents: Losses caused by or risks of an industrial accident due to a plant issue

⑤ Losses/risks regarding industrial accidents: Losses caused by or risks of an accident such as a fire or an explosion leading to a disaster outside the site

⑥ Losses/risks regarding environmental safety: Losses caused by or risks of damage to the environment outside the site due to leakages and discharges from the site, for instance

⑦ Losses/risks regarding legal issues: Losses caused by or risks of taking legal responsibility due to factors including those described above

Examples of the losses/risks regarding legal issues are risks of compliance failure or approval cancellation. Such risks do not occur in isolation; they can sometimes trigger a chain reaction. Risks of compliance failure can lead to deterioration of the company brand in general, causing so many sales opportunities to be lost that the continuation of the company is questioned. A plant failure could be the root cause of such a chain reaction.

Under the MOSMS strategy, a technical approach must be taken to address the causes of losses and risks. Concurrently, you must identify the source plants and maintenance jobs that can cause losses and risks in corporate management aspects.

(2) Matching corporate executives' judgment with technical foundation

Corporate executives and the maintenance management department share a common objective: to minimize losses and risks. The two sides must always keep the objective in mind and draw a *grand design of maintenance* on the same ground. For that purpose, when making decisions on loss/risk minimization from the corporate management perspective, corporate executives must consider what things look like from the engineering perspective. The tasks recognized by the maintenance management department (that is, in the field) must be adequately reflected in the judgment made from the corporate management perspective. The *MOSMS Practice Guide* was designed with emphasis on the following two viewpoints as a guide to building a framework for matching corporate executives' judgment with technical foundation.

① **Technical aspects determined with emphasis on *logic* and *comprehensiveness***

Losses and risks must be minimized logically based on the technical foundation provided from field staff. Maintenance must comprehensively cover all plants without any omissions.

② **Adequate *prioritization***

Practical maintenance does not consist only of *logic* and *comprehensiveness*. Maintenance can be practical only when *economic efficiency*, determined by the business environment, is taken into account. Emphasizing economic efficiency, however, can result in exclusion of some technical aspects from the logical, comprehensive selection. The excluded technical aspects become residual risks.

Technical aspects must be adequately prioritized so that the corporate management judgment can be matched with the technical foundation—with *uncertainty* taken into account.

(3) Framework for addressing *uncertainty* caused by human factors

No matter how carefully a logical and comprehensive plan is thought out, losses and risks occur in the field due to unforeseeable errors.

Errors are often caused by human factors: operation errors due to failure to follow operation procedures, errors in plant design and installation, implementation errors in maintenance construction, and oversights during inspection and management, for instance.

Thus, the framework must not only be logical and comprehensive but also allow such uncertainties to be addressed. In other words, *daily routines* in individual sub-cycles must be designed with due consideration to the uncertainty caused by human error. Daily routines must be built as a framework that can control human error. The *MOSMS Practice Guide* places great emphasis on addressing uncertainty, especially in the maintenance implementation phase.

5. Structure of *MOSMS Practice Guide*

The overall structure of the *MOSMS Practice Guide* is described below:

[*Maintenance strategy* phase]

① Maintenance strategy formulation guide

[*Maintenance planning* phase]

② Maintenance planning guide

③ Maintenance data management guide

④ Maintenance budget planning guide

[*Maintenance implementation* phase]

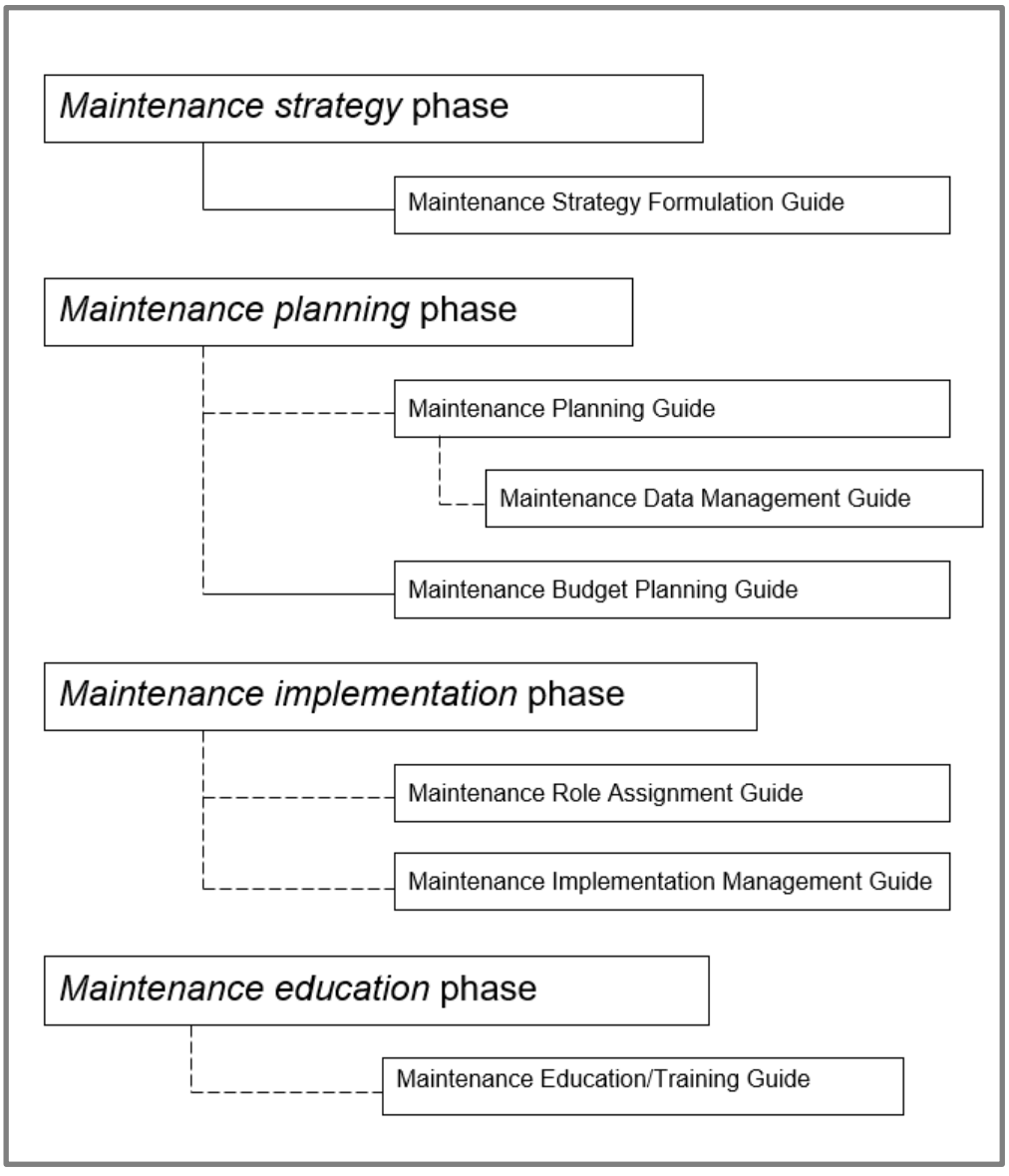
⑤ Maintenance role assignment guide

⑥ Maintenance implementation management guide

[*Maintenance education* phase]

⑦ Maintenance education/training guide

MOSMS Practice Guide



6. *Maintenance strategy* phase

(1) Outline of the *Maintenance Strategy Formulation Guide*

In the *maintenance strategy* phase, an optimal maintenance framework is formulated for the company (or workplace) as a whole, that is, for corporate management. The *Maintenance strategy formulation* guide describes what to do in this phase. Following is an outline:

① **Clarifying the company-wide production policy and the plant maintenance policy**

The objective of maintenance is to optimize the company as a whole. Therefore, the plant maintenance policy must be clarified as a company-wide policy.

② **Analyzing the status quo—*maintenance level evaluation***

③ **Analyzing the status quo—*loss/risk evaluation***

Corporate executives assess the current ability of the maintenance management department (namely, the past results). The assessment focuses on whether the past and present maintenance activities have been formulated as a framework, and how much the activities contribute to reducing the losses and risks regarding corporate management. *Evaluation of maintenance* is the driving force that turns the PDCA cycle in the *maintenance strategy* phase.

The guide presents evaluation methods for ② and ③ individually. For ②, it presents the *maintenance cash-out* index (the sum of the maintenance expenses and the monetary value of the serious losses due to the plant). For ③, it presents the *Loss/Risk Check Sheet* and the *Priority Management Item Extraction Sheet* based on the check sheet.

④ **Establishing maintenance strategy**

According to the *priority management items* found in the analysis of the status quo, maintenance strategy is planned, and implementation staffing is designed.

⑤ **Planning medium- to long-term resource distribution**

Medium- to long-term resource distribution is planned.

⑥ **Building a maintenance information management system**

The objective is to ensure corporate compliance, share information, and management IT risks through maintenance. A system for maintenance information management is organized to establish, maintain, and update criteria and standards.

This system is part of the framework for incorporating the results of maintenance activities into the strategy of the next term; both corporate executives and field staff are involved.

⑦ **Building a risk management system**

A *system for risk management* is organized to deal with the residual risks in the maintenance management department. *Risk communication* is particularly important for corporate management.

7. *Maintenance planning* phase

Maintenance planning is a process through which the maintenance strategy is converted into a concrete technical plan.

(1) Outline of the *Maintenance Planning Guide*

The *Maintenance planning* guide describes what to do in the *maintenance planning* phase. Following is an outline:

① **Identifying target plants**

Set up the scope of maintenance planning and the boundaries of management responsibility. Then determine the management categories of the target plants. These target plants and pieces of equipment will be the minimum unit of management and will be used for registration on an equipment list. The equipment list is closely related to *maintenance data management*.

② **Specifying priority levels**

Assign priority levels to the management segments (minimum units for managing plants and pieces of equipment) through risk assessment.

③ **Creating a maintenance plan**

According to the assigned priority levels, designate a maintenance type to each of the *constituents* of the plant/equipment (minimum management unit). Accordingly, create medium- to long-term and annual maintenance plans.

This process is closely related to *maintenance budget planning*. If a maintenance plan is revised because of the budget, clearly determine residual risks due to the revision.

④ **Planning spare parts management**

Manage spare parts to cope with sudden failures.

⑤ **Planning investments in plant maintenance and renewal**

Evaluate the plant from a comprehensive perspective. Then choose the action to take from the three below, and establish priorities.

- Maintaining and continuing the existing maintenance system (inspection and servicing)
- Re-designating maintenance types and continuing inspection and servicing
- Starting to plan renewal

⑥ **Setting up a maintenance evaluation index**

Set up an evaluation index that indicates the maintenance achievements.

(2) Outline of the *Maintenance Data Management Guide*

The *Maintenance data management guide* describes standard procedures for *maintenance strategy formulation*, *maintenance planning*, *maintenance implementation management* and *maintenance data management*. *Maintenance data management* is for evaluating maintenance.

The guide gives concrete examples of the following items:

- Maintenance data and computerized maintenance management system (CMMS)
- Equipment management ledger
- Maintenance planning calendar (medium- to long-term and annual)
- Management history management system
- Maintenance evaluation system
- Maintenance information management terminology

(3) Outline of the *Maintenance Budget Planning Guide*

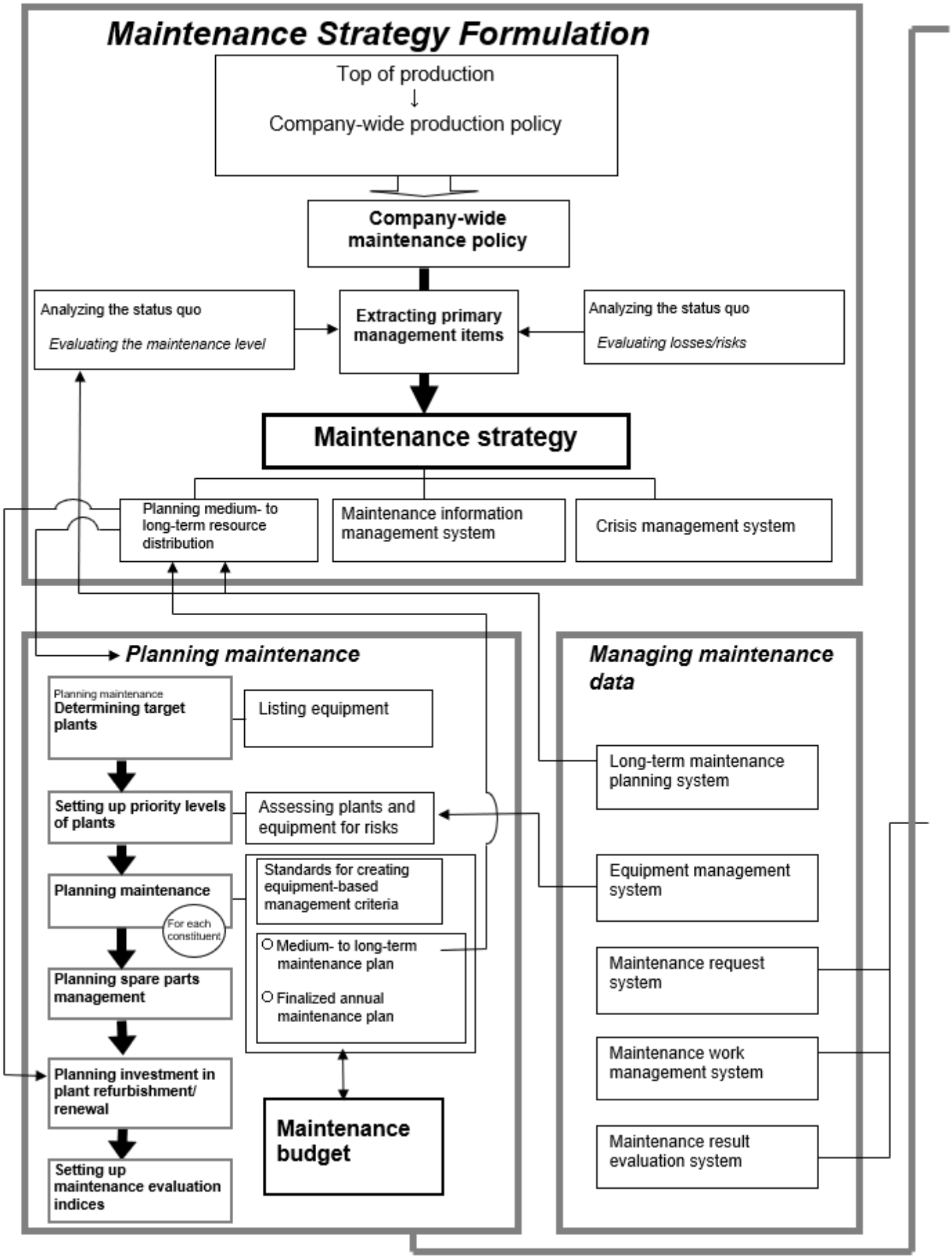
When a maintenance plan is created, maintenance types are designated according to priority levels as described in (1) above. When a budget is planned, the maintenance types are reflected on them. The budget planning phase will reveal the need for collaboration between corporate executives and the maintenance management department.

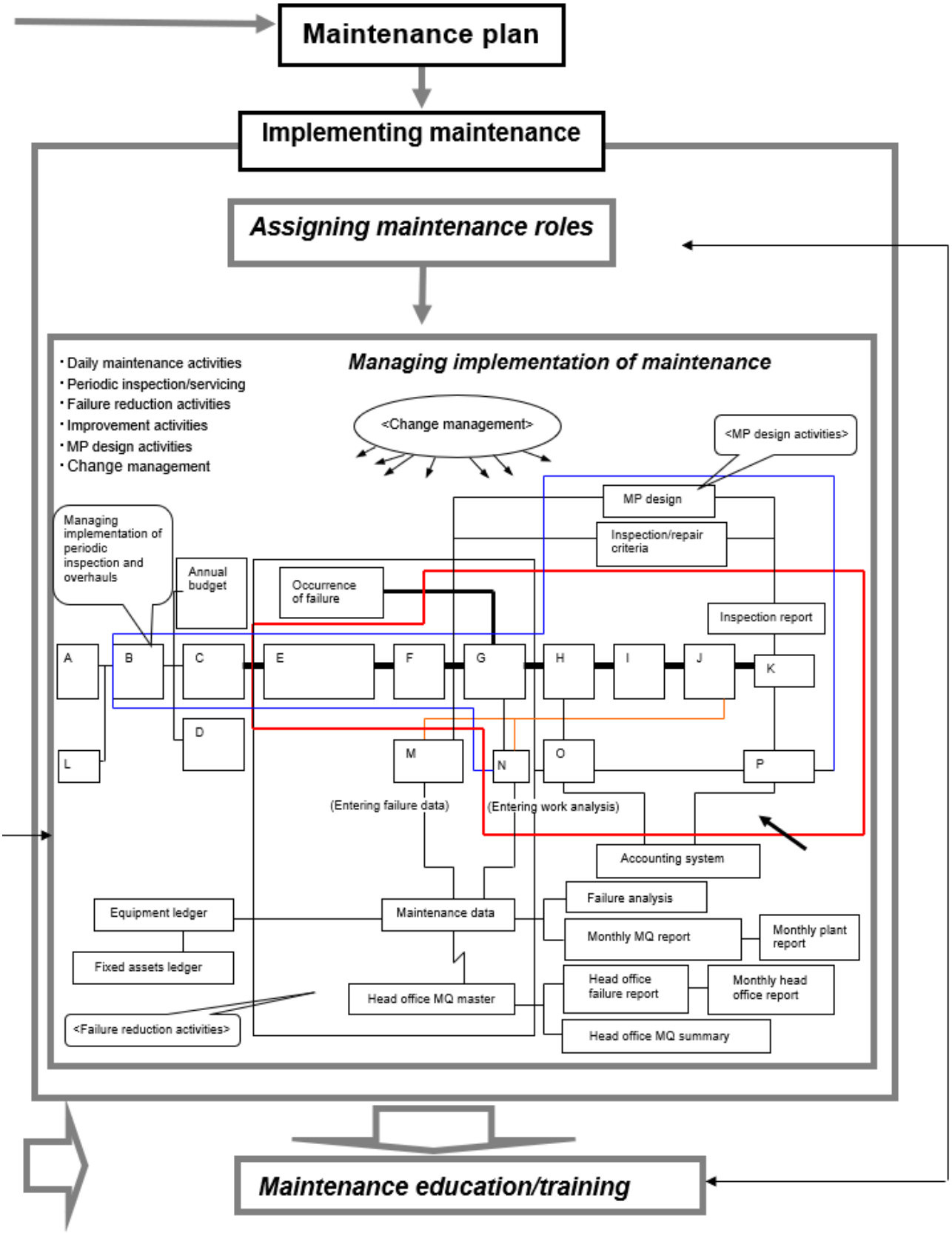
Corporate executives see things from the management theory perspective; the maintenance management department sees things from the technical perspective. While the corporate executives want to minimize the ballpark maintenance expenses, the maintenance department wants to maximize the amount of money available for maintenance. If the two sides stick to their perspectives, their claims have to contradict each other. That is where MOSMS comes in—no matter how contradictory the two perspectives seem, there must be a way to unite them.

The *Maintenance budget formulation guide* provides the two sides with the same yardstick: losses and risks. It allows them to assess the corporate management aspects and the technical aspects on the same ground. It introduces a new categorization scheme to expense management, because the conventional categories—*normal expenses*, *non-normal expenses*, and *reserve fund*—prevent the corporate management and technical interests from being blended. Specifically, the guide introduces a maintenance budget planning method based on *characteristics-based classification*.

The *characteristics-based classification* is based on the technical concept called *maintenance types*. For instance, *preventive inspection expenses* belongs to the category of *planned maintenance/preventive maintenance* under *maintenance types*. Preventive inspection is defined as an inspection or diagnostic job that is conducted in a planned manner for preventive purposes though not mandatory under the law. If resources were not adequately allocated to preventive inspection, what risks would surface and what losses would result? That is what should be considered in the budget planning phase. Thus, maintenance types should be selected on the technical foundation according to the *Maintenance planning guide*; they should then be combined with the resources allocated under the maintenance strategy according to the *Maintenance budget planning guide*.

Guide relationships





A: Medium- to long-term maintenance plan, B: Annual plan, C: Monthly schedule, D: Budget/expenses management sheet,
E: Weekly process meeting, F: Work plan, G: Work request sheet, H: Ordering of construction,
I: Implementation of construction, J: Inspection, K: Trial operation, L: Maintenance type,
M: Failure cause analysis sheet, N: Results, O: Order form, P: Acceptance inspection sheet

→ **Daily maintenance activities**

8. *Maintenance implementation* phase

Two guides are used in the *maintenance implementation* phase: the *Maintenance role assignment guide* and the *Maintenance implementation management guide*.

(1) Outline of the *Maintenance Role Assignment Guide*

Role assignment in the maintenance management department has one objective: to build an organizational system that ensures comprehensiveness of the implemented maintenance activities. Clearly indicate who does what—who will conduct which maintenance functions in practice.

To do so, classify all the functions and tasks involved in the maintenance activities, assess the capability of the organization, and decide individual roles.

Today, the number and quality of people are a common concern in areas requiring expertise. From the perspective of the *maintenance functions and role assignment*, outsourcing cannot be neglected. The guide is no exception and includes management of outsourcing.

(2) Outline of the *Maintenance Implementation Management Guide*

The *Maintenance implementation management guide* addresses various phases of implementing maintenance activities.

Each phase is provided with an individual guide, which represents the sub-cycle in that phase. The fundamental cycle underlying the sub-cycles should be designated as the *maintenance job flow*.

① **Management of implementing routine maintenance activities**

This part is for the operation department and maintenance management department to securely conduct routine maintenance activities. The guide describes how to use the *Work (request/planning) check sheet* and the *Work environment safety check sheet* effectively.

② **Management of implementing regular inspection/construction work**

This part describes how to create an implantation-based periodic maintenance plan and how to effectively use the *acceptance inspection sheet* for the construction departments and business partner companies.

③ **Promotion system for activities to reduce failures**

This part describes how to build a promotion system for activities to reduce failures, centering on the effective use of the *Analysis sheet for failure causes*.

④ **Promotion system for improvement (kaizen) activities**

This part describes how to promote *planning-oriented improvement activities*, where a maintenance system is built concurrently with improvement engineering. Ordinary improvement activities tend to lose their effectiveness once they are terminated, but *planning-oriented improvement activities* do not.

⑤ **Promotion system for MP design activities**

This part, consisting mostly of case studies, describes how to promote and implement *MP design activities*, where maintenance information is incorporated in the design phase.

⑥ **Change management**

This part describes *change management*, where management cycles are set up for all changes regarding, for instance, plant designs, operation methods, maintenance types, and role assignment. For the management cycles to function properly in change management, carefully observe every change and determine the need for management.

9. ***Maintenance education*** **phase**

(1) Outline of the *Maintenance Education/Training Guide*

To plan *what human resources to nurture*, you need to have a clear view on *what kind of maintenance should be achieved*. Thus, before starting to plan education or training, you need to have a maintenance policy established according to the management principles during the formulation of *Maintenance strategy*.

Based on the maintenance policy, decide the fundamental policy for education/training and implement maintenance education/training accordingly.

The *Maintenance education/training guide* consists mostly of case studies, describing procedures for the following:

① Formulating the basic policy for education/training

② Planning education/training for specialized maintenance engineers

- Identifying required functions, techniques, and skills
- Setting up an ideal figure (*job classification profile*)
- Creating education guidelines
- Creating and implementing an education plan
- Tracking and controlling education/training

③ Planning education/training for operators

④ Educating managers regarding maintenance

The qualification/education programs provided by Japan Institute of Plant Maintenance will be consistent with the *MOSMS Practice Guide*.

MOSMS will help you clearly define your management policy and strengthen your maintenance management department and, as a result, the production department will exhibit an unshakeable stability. That is why the *MOSMS Practice Guide* was developed.

Japan Institute of Plant Maintenance would like the MOSMS Practice Guide to be introduced and used by every corporate member. With many actual cases reported from the corporate members, the MOSMS Practice Guide will be upgraded, having all eyes of the world on the new Japanese way—a strong manufacturing industry standing on the foundation of excellent maintenance capabilities.

Because MOSMS encompasses a wide range of subject matter, its features are summarized at the end of the book. Refer to *Using MOSMS Effectively* as a quick guide to MOSMS features.

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INDEX

examples：[Maintenance level evaluation form & Criteria for Maintenance Level Evaluation]

Check items			Questions		Material checked (Document)	Rating scale				
			No.			1	2	3	4	5
1. Maintenance policy and medium- to long-term plan	1-1 Maintenance policy and tasks	(2) Identifying tasks	4	Do you analyze the maintenance data to identify the tasks for improvement?	[Achievement index data]	There is no organizational framework for analyzing or storing maintenance data.	No indices have been set up to analyze maintenance data properly.	Indices have been set up to analyze maintenance data properly.	Maintenance data is properly analyzed according to the indices set up to identify the tasks for improvement.	Maintenance data is properly analyzed according to the indices set up to identify the tasks for improvement, and it has been done continuously.
2. Planning maintenance	2-1 Planning maintenance	(2) Setting up units of maintenance management	18	Do you have minimum units of maintenance management (management units tailored to the actuality of maintenance) set up for all the plants and equipment covered by the maintenance plan (that is, in what units the plants and equipment are maintained)?		No management categories are set up for the plants and equipment.	Management categories are systematically set up according to the hierarchy: process, plant, and equipment.	Minimum management units (management units tailored to the actuality of maintenance) are set up according to the maintenance type (in-company, outsourcing, etc.).	Appropriate minimum management units are set up for all the plants and equipment covered by the maintenance plan.	Minimum management units for maintenance are used for efficiently and effectively planning, evaluating, and implementing maintenance (as in failure analysis and work analysis)
		(6) Setting up equipment-based management criteria	28	Are the technical grounds clearly described and documented regarding maintenance of every plant of a high priority level? Do you have inspection reports and checklists, which are used for inspections/diagnosis or maintenance, as the technical grounds for the criteria?	[Grounds for setting the equipment-based management criteria]	Technical grounds are not clearly described for maintenance of high-priority plants. For instance, inspection reports and checklists, which are essential to inspections/diagnosis or overhauls, are not available and thus equipment-based criteria cannot be set up properly.	Inspection reports and checklists, which are used for inspections/diagnosis or maintenance, are available but are not used for setting up technical management criteria.	Inspection reports and checklists, which are used for inspections/diagnosis or maintenance, are used to designate management points (management indices) and technical management criteria for each constituent.	Concrete maintenance methods are designated for each constituent, describing how the management points (management indices) and technical management criteria can be met.	Technical grounds for the equipment-based management criteria are documented for plants of high priority levels.
	2-4 Planning annual maintenance budget	(1) Planning annual maintenance budget	37	Is the maintenance budget broken down in accordance with the technical maintenance types (characteristics-based classification of maintenance expenses)?	[Annual maintenance budget summary]	No one recognizes the importance of maintenance cost analysis.	People recognize the importance of maintenance cost analysis, but the maintenance budget is not broken down in accordance with the technical maintenance types (characteristics-based classification of maintenance expenses).	The maintenance budget is broken down in accordance with the technical maintenance types (characteristics-based classification of maintenance expenses).	The maintenance management department reviews the maintenance budget proposal according to the characteristics-based classification of maintenance expenses, and reports the outcome to the corporate executives.	Both the corporate executives and the maintenance management department manage the maintenance budget and actual expenses according to the characteristics-based classification of maintenance expenses.
3. Planning and managing implementation	3-2 Jobs of maintenance management department	(2) Standardizing jobs	44	Do you have a standardized work procedure that encourages PDCA cycles across the entire maintenance work (a job flow for maintenance jobs)?	[Job flow for maintenance jobs]	No standardized work procedure (job flow) is available for maintenance work in general.	A job flow is available for maintenance jobs, but the work procedure does not encourage PDCA cycles across the entire maintenance work (it is applicable to some jobs only).	A work procedure that encourages PDCA cycles across the entire maintenance work (a job flow for maintenance jobs) is available.	A job flow is available and it is free of unnecessary work. Daily jobs include improvement activities, such as failure reduction, cost reduction, and productivity improvement.	A job flow is available and is updated according to the results of reviewing the maintenance types, management criteria, and inspection/servicing cycles (including entries to the computerized maintenance management system (CMMS))
	3-6 Managing daily maintenance tasks	(2) Checking work environment/safety	63	Do you ensure work safety by using the work (ordering/planning) check sheet and the work environment/safety check sheet in pairs?		The work (ordering/planning) check sheet and the work environment/safety check sheet are not used in pairs.	There is no clear framework for using the work (ordering/planning) check sheet and the work environment/safety check sheet in pairs.	There is a clear framework for using the work (ordering/planning) check sheet and the work environment/safety check sheet in pairs.	There is a framework for the work (ordering/planning) check sheet and the work environment/safety check sheet to always be used in pairs.	The work (ordering/planning) check sheet and work environment/safety check sheet are always used in pairs and thus industrial accidents, pollution, and equipment failures are prevented.
4. Implementing and improving maintenance tasks	4-2 Daily inspection by operators	(1) Daily inspection by operators	80	Does the operation department spontaneously make daily inspection standards through consultation with the maintenance management department?	[Daily inspection standards]	No daily inspection standards are made.	Daily inspection standards are available, but they are not developed spontaneously by the operation department.	The operation department spontaneously makes daily inspection standards in accordance with the daily inspection items determined through consultation with the maintenance management department.	The operation department spontaneously makes daily inspection standards that consist of an inspection checklist and an inspection manual, for instance. They comprise a framework for keeping inspection quality high and ensuring work safety.	The operation department spontaneously makes daily inspection standards with assistance from the maintenance management department based on the equipment-based management criteria.
	4-3 Promoting failure reduction activities	(2) Failure analysis system	88	Are failure analysis and countermeasures adequate for the skills level of the supervisor (manager) of the job?		Failure cause analysis reports are not made.	Failure analysis and countermeasures are not adequate for the skills level of the supervisor of the job (they are left to individual staff members).	A staff member makes a failure cause analysis report, and checks the contents with the supervisor from a technical perspective. (The task is not just left to the staff member.)	The results of technical reviews are incorporated in failure cause analysis reports, which are then shared at technical review meetings in the maintenance section (team).	Failure cause analysis reports function as part of the framework for handing down skills. People are aware that the importance of the reports is not only in writing them but also in gaining knowledge through discussions with senior members.
5. Evaluating maintenance and organizing frameworks	5-6 Sharing maintenance evaluation results	(1) Sharing maintenance evaluation results	115	Do you have a framework for the past maintenance records and maintenance evaluation results to be reported to and reviewed by the corporate executives and other departments of the business establishment (monthly and annual maintenance reports, for instance)?		There is no framework for the past maintenance records and maintenance evaluation results to be reported to and reviewed by the corporate executives and other departments of the business establishment.	There is a framework for the past maintenance records and maintenance evaluation results to be reported to and reviewed by the corporate executives and other departments within the business establishment. Maintenance quality (MQ) indices, however, are not clearly set up to ensure consistency of evaluations across multiple terms.	Evaluation items are specific to individual manufacturing complexes or plants. Maintenance quality (MQ) indices, which are intended to improve quality of work such as failure handling and servicing, are clearly set up, and maintenance records are evaluated continuously across multiple terms.	The maintenance quality (MQ) indices are constantly recorded and summed up in monthly maintenance reports, organized into semester or annual reports, and used to visualize the trend of the fiscal year (term).	The headquarters monitors the weak points and problems of individual manufacturing complexes, and thus the corporate executives can evaluate maintenance.
6. Educating and training maintenance staff	6-4 Educating maintenance managers	(1) Educating maintenance managers	129	Are the functions (capabilities) required for production and maintenance managers defined? Are the education contents designed with emphasis on the management of the factory floor, rather than on enhancing the expertise of individuals?	[Manager education items]	The functions (capabilities) required for production and maintenance managers are not defined.	The functions (capabilities) required for production and maintenance managers are defined, but not from the perspective of strategically planning and implementing maintenance.	The functions (capabilities) required for production and maintenance managers are defined from the perspective of strategically planning and implementing maintenance.	The contents of manager education are designed with emphasis on the management of the factory floor rather than on enhancing the expertise of individuals.	Effective maintenance supervisor education is implemented continuously through evaluation of maintenance levels.

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