

Chapter 4 : Industrial maintenance

1.0

Jully 2025

Dr. GUENTRI Hocine
Department of electrical engineering
Institute of technology
University center Nour Bachir El bayadh
Email : h.guentri@cu-elbayadh.dz

Attribution - Pas d'Utilisation Commerciale :
<http://creativecommons.org/licenses/by-nc/4.0/fr/>

Table des matières

I - General information on computer-Assisted maintenance	3
1. Introduction :	3
2. The different functional modules of a CMMS.....	3
2.1. "Equipment management" module:.....	3
2.2. "Operational equipment monitoring management" module	3
2.3. "Intervention management" module.....	3
2.4. "Preventive management" module	3
2.5. "Inventory management" module.....	3
2.6. Supply and Purchasing Management" Module.....	3
2.7. "Failure Analysis" Module.....	3
2.8. "Budget and Expense Tracking" Module	4
2.9. "Human Resources Management" Module	4
2.10. "Dashboards and statistics" module	4
3. What is a CMMS for?	4
3.1. A CMMS must allow, at a minimum, the management of:.....	4
3.2. The benefits obtained when implementing a CMMS are:	4
4. Implementation of a CMMS	5
5. Sectors of activity concerned	5
6. CMMS software	5
6.1. Historical	5
6.2. Some major general publishers in CMMS.....	6
7. Benefits Observed.....	6
8. Example of concrete application: production plant.....	6

I General information on computer-Assisted maintenance

1. Introduction :

By definition, CMMS is software that allows you to plan, manage, track, and optimize preventive, corrective, and predictive maintenance activities for a fleet of machines or facilities.

It is used in various industries, including the service sector, hospitals, transportation, and more.

2. The different functional modules of a CMMS

CMMS software is generally divided into modules. Each user can purchase the ones they deem necessary in order to work "leanly" and fully exploit their investment. The following list shows the modules found in the majority of CMMS on the market. It is not exhaustive and the names may vary from one software package to another. These include:

2.1. "Equipment management" module:

This involves describing and coding the breakdown tree structure ranging from the entire fleet to be maintained to the equipment identified and characterized by their DTE (technical equipment file) and their history, then to their own functional breakdown.

2.2. "Operational equipment monitoring management" module

This module will allow you to monitor the performance of equipment based on reliability, maintainability, and availability indicators.

2.3. "Intervention management" module

This module should allow rapid recording of the duration, location, and nature of an intervention.

2.4. "Preventive management" module

This module must allow systematic maintenance to be managed through a calendar schedule per piece of equipment, and the dates must be determined from a meter reading (or a measurement in the case of conditional maintenance). This means that the triggering will be automatic, by a weekly listing of the operations planned for the week. Each operation will be scheduled by its preventive range.

2.5. "Inventory management" module

The system is based on the file of items in the store, including the "maintenance batches" by equipment and on the movements in and out of the store.

2.6. "Supply and Purchasing Management" Module

The maintenance function is characterized by a large number of references and suppliers for small quantities and short lead times. This module must allow for purchasing management.

2.7. "Failure Analysis" Module

The basis of this module is made up of the history automatically populated by each WO (work order) or WO (work order) entry. This allows for a quantitative or qualitative analysis of failures.

2.8. "Budget and Expense Tracking" Module

The objective of this module is to monitor the evolution of expenses by activity within a given budget.

2.9. "Human Resources Management" Module

Specifically adapted to the maintenance department, this module will mainly be an aid to scheduling.

2.10. "Dashboards and statistics" module

Dashboards concerning the formatting of all technical, economic, and social indicators selected to ensure the management of the maintenance service.

3. What is a CMMS for?

The primary objective of maintenance has long been to reduce equipment downtime. Today, maintenance managers are required to manage a range of parameters that have a direct impact on equipment reliability, operating costs, and the quality of products and services.

They must therefore at all times:

1. Control installation costs and understand the financial impact of their decisions
2. Control interventions, schedules, and their costs
3. Optimize human and technical resources
4. Optimize spare parts inventories
5. Have detailed knowledge of technical installations and maintain documentation

Furthermore, the sophistication of the technologies to be maintained leads to specialized personnel, divided into maintenance agents, field technicians, methods specialists, and more.

All these reasons contribute to the use of dedicated and communicative IT: a tool at the service of stakeholders and decision-makers. A true repository of knowledge and expertise for the maintenance department, this tool is capable of importing and exporting data to purchasing, accounting, and quality.

3.1. A CMMS must allow, at a minimum, the management of:

1. Technical Reference: The equipment description, organized by function in a tree structure, includes the information necessary for maintenance operations and analysis.
2. Maintenance Work: Work is tracked by technical reports entered and used differently depending on the user.
3. Maintenance Work Planning: Whether preventive or curative, maintenance requires operational planning and an intervention methodology.
4. Procurement and Inventory: A good strategy for procuring maintenance items and streamlining their use allows for significant savings while improving the overall reliability of the production facility.

3.2. The benefits obtained when implementing a CMMS are:

1. Reduced labor, spare parts, and administrative processing costs
2. Improved equipment reliability and availability
3. Better cost management, budget preparation, and assistance with calls for tenders
4. Improved maintenance work history

5. Improved intervention planning, search for the optimal preventive/corrective ratio based on the industry
6. Improved inventory management

4. Implementation of a CMMS

Certainly, various paths are possible. However, forgetting certain steps can lead to irremediable failure. Here are three of them:

1. **Development of specifications by establishing a multidisciplinary group.** Consultation of suppliers and review of references and the entire environment.
2. **Selection of the CMMS tool and its necessary modules.** Based on a well-defined problem, the answer is assumed to be straightforward. The software selection will be made after a detailed call for tenders and testing of the selected products.
3. **Appointment of an internal CMMS project manager:** this is the crucial step. The role of this project manager is indeed multiple: preparing people and methods for the software package's arrival, involving the relevant management, organizing technical support, overseeing budgets, and preparing databases.
4. **User consultation and training:** At all levels, users expect the CMMS to assist them in their work with minimal constraints.

5. Sectors of activity concerned

All sectors of activity that have assets to maintain are interested in using a CMMS tool. These include:

1. Industry (manufacturing, automotive, pharmaceuticals, etc.)
2. Energy (gas, oil, electricity, etc.)
3. Transportation (road, rail, air, etc.)
4. Medical (hospitals)
5. Real estate (social housing, rental housing, corporate and headquarters, general resources, etc.)
6. Etc.

6. CMMS software

6.1. Historical

Ø Appearing in the 1980s, the first CMMS software packages were designed to meet the needs of the industry. They subsequently found applications in other sectors, such as hospitals (medical device maintenance) and transportation (road and rail network maintenance).

Ø To meet these new targets, some CMMS vendors offered solutions specialized in specific business areas.

Ø At the same time, CMMS software packages were enriched with new features beyond the strict framework of maintenance (regulatory management, plan management, consumption monitoring, etc.). Since 2008, most of the global leaders in the CMMS market have been acquired by generalist vendors (particularly ERP vendors) in order to expand their offerings or conquer the market.

6.2. Some major general publishers in CMMS

Table 7 shows some of the main general CMMS publishers

Table 7 : Some major general publishers in CMMS

Publisher name	Distributed software
IBM	Maximo asset management
Infor global solution	Infor EAM
Apave	Mainta
GE Healthcare	AssetPlus
Isilog	IWS
Kimoce	Kimoce asset management
KPF Groupe	OPTIMa
Ventyx	Asset suite
Sphinx Manager	Sphinx manager
IfmH	Qb7

7. Benefits Observed

Here is a table that shows the interest of CMMS.

Table 8 : The benefits of a GMAO

Before CMMS	After CMMS
Unplanned downtime: 12 hrs/month	Reduced to 4 hrs/month
Maintenance cost/month: \$9,000	Reduced to \$6,500
Preventive tasks completed: 60%	Increased to 95%
Asset availability: 85%	Increased to 97%

8. Example of concrete application: production plant

An industry composed of

- 3 production lines
- 100 critical pieces of equipment
- 6 technicians

With CMMS:

- A compressor is programmed to be changed every 1,000 hours.
- The CMMS automatically generates a work order.
- The technician receives it on their mobile app.
- They perform the task, enter the parts used, take a photo, and close the job.
- The data is recorded in the machine's history.