USE OF A CMMS PIECE OF SOFTWARE TO IMPROVE MAINTENANCE MANAGEMENT AT GANIL

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Abstract

After an internal thorough study undertaken during year 2000, the Ganil laboratory decided to adopt a Computerized Maintenance Management Software (CMMS) to improve and federate its maintenance policy. We therefore decided to use the Carl-Master piece of software based on an Oracle database so that the CMMS project could start in March 2001. First applications went into operation during 2002 and the scope of domains managed by the CMMS is still expanding.

The presentation first explains the basic principles of the software package. Then it both addresses technical and organisational problems encountered when running the project, showing the different steps which led to the CMMS installation whose current status is finally given.

INTRODUCTION

The Ganil facility is a complex of several cyclotrons able to accelerate stable ion beams or, by means of the Spiral extension, radioactive ion beams. It has been providing beam for the physicists since 1983 and it is at the disposal of the national and international scientific communities.

To achieve this goal, the whole installation therefore requires a straight maintenance policy. Also extensions, upgrades and rejuvenation programs allowed the facility to keep a high level of availability as well as extending the machine performances as time passed.

The result is a quite heterogeneous set of equipment to be maintained in terms in age, complexity and diversity.

So the CMMS project [1] started in 2001, aiming to introduce a CMMS tool to improve the maintenance strategy and to help people to manage their equipment.

MAINTENANCE AT GANIL

Scope

Ganil is a quite a large installation and many kinds of equipment have to be maintained. It refers first to the global site infrastructure providing services such as the electrical distribution network, cooling systems, fire detectors and extinguishers, buildings … Then it consists of the beam production complex (accelerators, beam lines …) and the experimental area which are ever evolving.

An estimation for the equipment to be concerned by the maintenance process is around 7000 pieces ; then according to the level of maintenance and granularity to be reached, this could generate a quite larger number of items to be basically maintained.

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Previous organization

Previously to the CMMS project, each technical group managed its own maintenance policy. There was not any common approach to organize maintenance activities, without any standard procedure nor document attached to the maintenance workflow.

In the same way, different tools were used to keep maintenance history for pieces of equipment : paper sheets, word processing documents, spreadsheets, personal databases … Even if some dedicated applications proved to be very useful and well adapted for the need they cover, with time most of these approaches prove to be either obsolete or too limited.

Also, there were several ways of identifying pieces of equipment, according to different logical concepts, designs and approaches, sometimes not suitable for maintenance naming codification.

The last point to be noticed is perhaps the more sensitive one as it deals with people habits. Most of people have been used for years to work without any organized maintenance policy and consequently were not ready to accept the maintenance concepts and to adopt the organization inherent with the CMMS installation.

THE CMMS PROJECT

The CMMS project group

The "CMMS project group" was a transversal structure created by gathering people coming from the technical groups more involved into the maintenance concepts. Its main objectives were :

1) to propose a global maintenance organization able to integrate the existing maintenance flow, people habits and users' needs,
2) to provide as soon as possible some real examples of maintenance applications : these were the so-called "pilot projects".

Beside of these aspects, one major objective for the project has always been to try to convince people rather than to impose to them the CMMS and maintenance concepts. The challenge was therefore to bring a coherent approach but leaving enough freedom to technical groups for a smooth integration.

Global scheduling

The project started with a site audit performed by the CMMS provider to get an accurate view of the maintenance status in each group and to focus on their main attempts considering the use of a CMMS software.

The project itself consisted of two phases. The first one corresponded to the organization and conception phase

including two tasks ; the former one was the so-called "**equipment codification**" step in which we had to define how the Ganil installation would be integrated into the CMMS piece of software, how to build the architecture and what naming conventions should be adopted. The second task known as the "**activities codification**" consisted in implementing a work organization relying on the work management associated to the CMMS software.

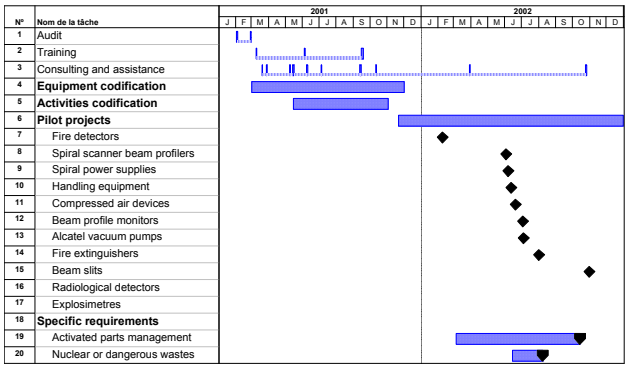

Figure 1: Global project scheduling.

The second phase aimed to develop the "**pilot projects**" being the first applications to be set into operation. They were chosen carefully according to several criteria : interest, short-time or mid-time benefits, size, complexity, people availability and openness for the project, use of various CMMS functionalities ….

THE CARL MASTER SOFTWARE

The Carl Master choice

At the end of an evaluation procedure, we decided to make use of the "Carl Master" software provided by Carl-International [2]. The main reasons for this choice were mainly the product ergonomic and the ability from the provider to give us assistance along the project progress.

Main characteristics

The Carl Master software relies on an Oracle database for which clients are running within Windows platforms.

The software consists of modules corresponding to the classical CMMS functionalities to manage equipment, work, inventory, budget, human resources, purchasing ...

Equipment management

The equipment management module allows to organize equipment along three predefined managed trees : a principal tree, an auxiliary one and a family one (to define models). Specific links can be established between these trees to get transversal views of equipment.

Work management

Work and activities can be organized, scheduled and archived with the work management module, according to the intervention cycle :

- The **Maintenance Request** step corresponds to the work initialization (user's demand).
- The **Work Order** step is only required in case of work having to be prepared and previously scheduled. From the work order are generated **Work Sheet(s)** to be given to the field workers.
- The **Work Report(s)** corresponds to the intervention itself and integrates all the information needed to keep a full maintenance history : equipment, location, function, spare parts, workers' names, sub-contracts, working time, diagnostic, work description, comments …
- **Predefined Work Order** allow to trigger Work Orders according to calendar dates, counters or specific conditions.

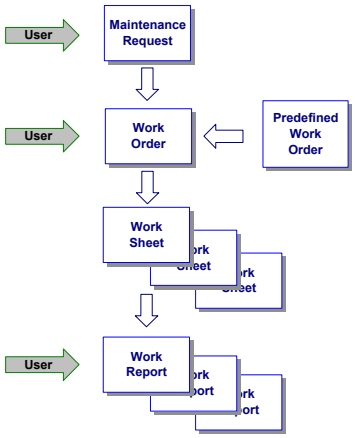

Figure 2 : The work cycle.

Users can enter the workflow at different levels according to the complexity, the preparation phase to be followed and the maintenance procedures to be applied. The simplest intervention consists of a single Work Report so by-passing the upstream steps.

GANIL MAINTENANCE USING CARL MASTER

Integrating Ganil into Carl Master

Before starting any application within the CMMS software, it was mandatory to properly establish all the basic rules according to the Ganil structure (both organizational and technical) and the software capabilities. So were produced reference documents [3], [4] explaining how to organize and name pieces of equipment, giving syntax and codification rules, proposing a maintenance organization and providing procedures for users (more details can be found in [1]).

Building and organizing maintenance trees

The main tree is implemented as a functional distribution and is linked to the (auxiliary) geographical tree presenting location of equipment. The third tree collects equipment models arranged as families.

Mapping the Ganil installation into the trees consisted in integrating and mixing different approaches, concepts, ways of doing maintenance with respect of rules issued from safety requirements. It had also to take in account

the characteristics for pieces of equipment as well as the physical or logical networks organization …

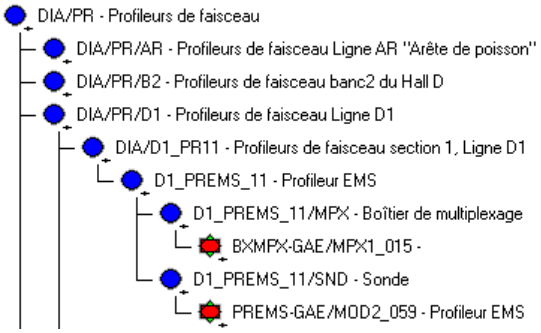

Figure 3 : The beam profilers branch displaying both the profilers and their associated electronic processing boxes.

Establishing naming conventions

HARD - MAN / DEVICE_ID

For pieces of equipment, we adopted a standard naming convention. It consists of two mandatory fields ("HARD" for the hardware category and "MAN" for the manufacturer) and the "DEVICE_ID" field left open for any existing codification rule or able to be chosen as the manufacturer serial number or a Ganil incremental one.

Implementing technical data

The CMMS database is also used to store technical characteristics or any useful data related to equipment.

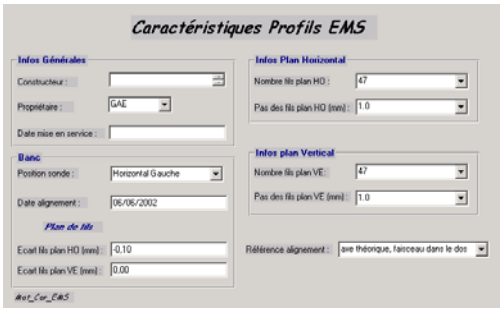

Figure 4 : The beam profilers characteristics.

Setting a maintenance organization

Introducing a CMMS piece of software is much more that proposing a new software to help and to ease maintenance : it's a new work organization to build and to propose for the whole laboratory by changing and federating people habits in a common and coherent way.

A work flow diagram has been designed suiting to the Ganil needs and requirements. To achieve this goal, different profiles were defined for actors involved into the maintenance process with specific rights on the CMMS software according to the tasks they are qualified for.

Customizing the CMMS application

Taking benefit of the software capabilities, the CMMS has been customized in order to provide a better and smooth integration into our environment by creating specific interface screens or dedicated reports (developed using Centura Report Builder). Doing this way allows both to propose customized reports and to run specific SQL requests on the database. Also views were created so that people are able to easily retrieve the information they want into Excel work sheets or Access databases.

Management of radiological problems

Beside of maintenance objectives, the CMMS approach is also used to manage equipment concerned by radiological problems. Inside the geographical tree, each cave is divided into two logical sub-locations according to the activation which could be produced by the beam :

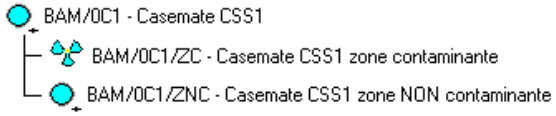

Fig. 5 : Cave representation inside the geographical tree.

Therefore this gives a way to keep track of any material fulfilling a function located into these particular area. Also an operation procedure is proposed for people to help them to handle these so concerned equipment. Work orders are subdivided in smaller steps implemented within Carl-Master as "operation codes" implementing each phase of the legacy procedure (radiological controls, authorization or refusal, certificate number …).

Beside of that, a dedicated organization has been set to handle nuclear or dangerous wastes considered inside the CMMS as standard maintenance items to be managed.

Current use

Table 1 : Main domains currently using the CMMS to achieve their maintenance (September 2003).

TECHNICAL TOPIC	*Nb. eqpt*
Power supplies	600
Beam slits	100
Vacuum pumps	300
Control - Command / PCs	300
Fire detectors / extinguishers	800
Cooling systems	150
Handling devices	350
Security devices : Explosimetres, O_2 detectors, $\theta^{\circ C}$ detectors ...	100
Radiological detectors	120
Beam profilers	250
Beam control devices	1500
Miscellaneous	300

REFERENCES

[1] E.Lécorché, G.Sénécal, "Installation of a CMMS piece of software aiming to improve the maintenance strategy at Ganil," 1st Accelerator Reliability Workshop, ESRF, February 2002

[2] Carl-International company is located in Lyon, France

[3] E.Lécorché, G.Sénécal, "Codification Equipements," GANIL/P/GMAO/014/DT, October 2001

[4] E.Lécorché, G.Sénécal, "Codification Travaux," GANIL/P/GMAO/019/DT, November 2001