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# RETENDERING OF ST-CV MAINTENANCE CONTRACT

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## Abstract

During the next three years, the ST/CV group will be deeply involved in the installation works for the LHC project. During this period the need for maintenance activity will decrease. The minimum level will be reached during the "long shutdown" of the PS and SPS machines in 2005. The budget for the maintenance will decrease accordingly, thus the CV group had to review its maintenance strategy. The new contract, which started on January 1st 2003, has been defined to cope with these workload variations during the next years and to guarantee the minimum maintenance activity on the existing equipment. A lump-sum contract based on a win-win strategy has been discarded. The contractor no longer has to guarantee the performance of the CERN cooling and ventilation systems. A new price list strategy based on performance indicators and penalties has been chosen. The contractor now has to guarantee the performance of every maintenance operation demanded by CERN. This modification obliged the Operation section of the CV group to undergo a reorganisation during 2002 and is going to force deep changes in its work organisation.

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# 1 INTRODUCTION

This article concerns the maintenance contract for all cooling and ventilation equipment belonging to the CERN ST/CV group. This contract, as all industrial services contracts at CERN, has a duration of 3-years with the possibility of extension by one year two times.

During the last 5-year period the Gematec consortium held the contract E-057. This period ended in November 2002. Starting from January 2003 a new maintenance contract (E-071) has been in place. The Endel-GTI-Axima consortium adjudicated this contract.

The re-tendering of the maintenance contract marked a change in the spirit of this contract.

This paper describes the reason why the philosophy of the contract changed, the consequences of this change and the opportunities for the future.

# 2 CONSTRAINTS

During the next 5 years (2003-2007) CERN will be deeply involved in the construction of the LHC machine. Most CERN resources will be dedicated to this effort. As a consequence of the evolution of the project, and the resources available, the maintenance needs will vary during this period.

## 2.1 Variation on LHC equipment number

A large part of the existing CV installations have been dismantled during the past 2 years. As a consequence the maintenance activity decreased due to the reduced number of installations to be managed.

The period 2002-2004 is one of transition for ST/CV. New installations will be built whilst some existing ones will be renewed. As a consequence the maintenance needs will start rising again soon.

## 2.2 2005 long shutdown

A long shutdown of the PS and SPS machines has been foreseen during 2005. These installations will be stopped between autumn 2004 and spring 2006, a period of about 18 months. The shutdown maintenance activity, normally performed during 6 months will be spread over a larger period. As a consequence the workload will be drastically reduced during this period.

## 2.3 Shutdowns

The third cause of variation in maintenance workload is related to the normal shutdown and operation periods of the accelerators and is independent from the LHC project. We can say that the maintenance workload during normal shutdown periods (6 months) is roughly double that during the running period of the accelerators (6 months).

## 2.4 Budget restrictions

Another important constraint is the budget of the LHC project, which forced us to reduce the budget of all activities not directly related to the core of the project. CERN financial planning obliged us to postpone activities not strictly necessary, reducing maintenance of installations where possible and postponing related costs until after the LHC project completion.

# 3 THE PHILOSOPHY OF THE CONTRACT

The 4 reasons described above require more flexible contract conditions. The workload will be modulated during the next years by the LHC project constraints and CERN has to develop a tool to allow this kind of modulation.

## 3.1 From lump-sum to pricelist evolution

The previous Gematec contract was based on lump-sum philosophy: the contractor should ensure the availability and reliability of the whole installation park, and a forfeit payment was due for this. This

solution fit the CERN needs during the past years, when the constraints we described before did not exist. The workload was approximately constant and the activities were quite repetitive.

When these new constraints started appearing the contract was found to be inadequate. The budget was reduced and the performance of the contract declined.

This situation forced us to define a new strategy for the new contract. A lump-sum contract was no longer the optimum solution: a pricelist strategy has been chosen. Every individual maintenance activity has been defined in a detailed DQE and a unitary price was asked from the bidders.

The new system allows CERN to ask for the execution of individual maintenance activities on each installation. This gives to CERN the required flexibility to attribute the workload to the contractor in a manner suitable for the coming years.

### 3.2 From win-win to penalties model

Another important evolution of the contract concerns the relationship between the contractor and CERN. With the lump-sum philosophy CERN had entrusted the management of its installation to the contractor. CERN trust in the contractor was implicit, and a win-win approach was the natural consequence.

The new pricelist model requires a different definition of this relationship. CERN will recover completely the role of client and the contractor the role of supplier with advisement duty too. CERN leads the contractor in its activities. The contractor has to ensure a quality of performance and a dedicated penalty and performance indicator scheme has been created to avoid divergence and encourage positive evolution.

## 4 CONSEQUENCES

### 4.1 Responsibility

The first major consequence of this change is the redefinition of responsibilities of the contractor and CERN.

With the lump-sum contract the contractor had the responsibility of the availability and reliability of the system. It was up to them to organize all the maintenance activities, decide on the level of maintenance to ensure the continuity and availability of systems and to organize the maintenance schedule over a long period. CERN had to check the quality of work done and follow its performance.

With a pricelist contract CERN has to take charge of the responsibility of the maintenance organization: every maintenance responsible shall define the level of maintenance he wants for the installations on his duty, order these activities and check the execution of the work. He is the responsible for the availability and for the long term reliability of systems under his control. In the definition of the workload he has to take into account the budget constraints and ensure the maximum performance of the installation with the available budget.

What is now the responsibility of the contractor? The contractor offered a price for the execution of each individual operation. He has to ensure the performance of all individual activities requested. The performance has to fit with the “instruction list” described in the DQE, with the related international standard in the maintenance sector. Nevertheless, the maintenance expert has to consult and support CERN in the definition of the maintenance levels for every installation.

### 4.2 MP5 database

MP5 is the commercial tool the ST division chose to manage all maintenance activities inside the division. It is a CAMMS (Computer Aided Maintenance Management System) based on the Oracle database, where all equipment and maintenance activities are defined, planned and stored.

The change in the contract strategy has forced reorganization of the database and a redefinition of its role. The first great revolution is the database organization of the equipment. In a lump-sum contract the aim of the activity is to ensure the performance of a system. A “functional” hierarchy of the database was sufficient: for example, the SPS machine/primary cooling system/pumping station.

With a pricelist contract maintenance activities are requested for equipment with identical (or similar) characteristics. All ST/CV installations in CERN have been analyzed, a coherent class/category grid (33 Classes and 147 categories) has been defined using an "object hierarchy" principle: for example, pumps/centrifugal pumps/pump power of 10-50kW. For every category of equipment all the maintenance activity has been described in the DQE.

The ST/CV equipment database entered in MP5 was not ready for this kind of philosophy. About 16000 items of equipment have to be classified using the new grid. This demanded (and is still demanding) a great effort from the responsible people of the operation of different systems that have to enter the class/category definitions for each item. At this time (March 2003) 45% of the equipment has been classified.

The second great revolution is related to the role of the CAMM System. With a lump-sum contract the database has principally a repository function. With a pricelist contract the database is the engine of the system: it is used to launch the activities, to organize their schedules and, especially, to define the invoicing. This involved a great change in the work organization.

### 4.3 Work organization

This second revolution concerns the relation between the CERN operation team and the contractor. The MP5 database assumes a central role: all official communications between the parts have to be traced through MP5. The contractor can no longer accept verbal orders and instead has to ask for orders to be entered in the MP5 database, as only orders entered in MP5 will be paid.

This new procedure obliged the CERN responsible people, even those unfamiliar with using PCs, to adopt MP5 as a working tool. MP5 permits us to order, follow and check all contractors' activities and has to be used in the day-by-day running of the contract.

## 5 OPPORTUNITIES

The modification of the contract structure opens new possibilities in the organization of the maintenance activities, in the optimization of the maintenance techniques and in the management of the database. The following paragraphs will give a picture of these development possibilities.

### 5.1 Integration of maintenance techniques

The previous "functional" organization of the equipment was the direct consequence of the management of the activities and the organization of the responsibility inside the operation team. This organization did not facilitate communication between responsible persons from different machines (PS, SPS, LEP). Furthermore, the contractor's organization could be, and in fact have been, built using this "functional" hierarchy too. The same maintenance activity, operated on the same kind of pump could be performed in different ways without causing inconvenience on the contract life.

During the contract definition in 2002, the ST/CV/OP section spent a great deal of effort to integrate the different approaches of maintenance in an unique statement to define every "instruction list" for any category and class of equipment. The new DQE summarizes all previous CERN procedures for equipment maintenance that, in the past, could have separate "lives" and diverge.

From this moment on, all maintenance activities on the same type of equipment (for example, centrifugal pumps) will be managed in the same way and all local improvements will have a global effect on the maintenance procedures.

### 5.2 Development of predictive maintenance

The new database organization will open the way for the evolution of the maintenance philosophy from a preventive to a predictive one. The coexistence of functional and object database structures can permit the historical analysis of the systems in both directions: the maintenance history of the equipment (e.g. pump AB1234) that has been installed in 3 different functional positions (e.g. PS1, SPS12, and PS3) at CERN during its life. And more: the history of the functional position (e.g. SPS12) where the equipment (e.g. pump AB1234) has been installed during a certain period.

This analysis will allow us to foresee the future behavior of installations and to guide maintenance policy.

### 5.3 Implementation of reliability tools

All data coming from MP5 history can be treated with dedicated tools to estimate the reliability of different equipment in different functional positions at CERN (especially for the more critical positions). This information will be the basis for any future maintenance decisions to reduce the maintenance level if unnecessary and optimize maintenance intervention where needed.

Criticism of equipment can be determined from observation of the history of their failures, their frequency, gravity and their detection facility. Dedicated intervention can be planned on those items where the criticism is highest, increasing the reliability of the entire system.

## 6 CONCLUSIONS

The 2002 re-tendering of the ST/CV maintenance contract resulted in a significant revision of the spirit of this contract. ST/CV has invested a great effort in the definition of a type of contract that better suits the current, and future, situation. This revision forced, and is still forcing, deep changes in the work organization inside the operation section and between CERN and the new contractor. The path that has been chosen will provide opportunities of development of the maintenance strategy during the next years. CERN has to know and understand these opportunities and launch the necessary actions to implement them.