OPERATION AND MAINTENANCE IN THE FM GROUP

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Abstract

2002 has been a transitory year for the operation and maintenance on the tertiary buildings at CERN. The implementation of one unique contract of Facilities Management was the major issue which led to the merging of several technical activities previously carried out through different contracts, for many years. This paper, written after the first eight months of FM activities, presents the distinctive features of the transition period, the main changes in the management of the contract related to the technical maintenance, and the main difficulties encountered. It finally gives figures showing the evolution of some key maintenance indicators from the past years to today, as far as the scope of each activity can be compared.
1 INTRODUCTION

The aim of this paper is to give a general overview of the development of maintenance and operation on the tertiary buildings at CERN, in 2002.

Considering the important changes occurred on the 1st of July in the management strategy of these activities, it is useful to make a few reminders of what is included in the technical scope of the FM contract.

The author will present how the activity has been carried out until today, how it has been monitored by the FM group and the main figures representing the performance during the considered period.

2 FRAME OF THE MAINTENANCE WORKS

2.1 Scope of the contract

As a reminder, the geographical extent of the contract is given in figure 1.

<table>
<thead>
<tr>
<th>Tertiary buildings</th>
<th>Machine buildings</th>
</tr>
</thead>
<tbody>
<tr>
<td>HVAC</td>
<td></td>
</tr>
<tr>
<td>Electricity</td>
<td></td>
</tr>
<tr>
<td>Motorised doors</td>
<td></td>
</tr>
<tr>
<td>Lifts</td>
<td></td>
</tr>
<tr>
<td>Sanitations</td>
<td></td>
</tr>
<tr>
<td>Cleansing</td>
<td></td>
</tr>
<tr>
<td>Civil Engineering</td>
<td></td>
</tr>
</tbody>
</table>

Figure 1: geographical extent of FM maintenance (schematic reminder)

2.2 Type of maintenance to be provided

All the technical activities of the FM contract are supported by the MP5 CAMM system. Some of the activities are performed in both preventive and corrective maintenance; the other ones being only corrective. Table 1 shows what type of maintenance is performed in each field.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Preventive Maintenance</th>
<th>Corrective Maintenance</th>
</tr>
</thead>
<tbody>
<tr>
<td>HVAC</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Electricity</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Sanitations</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Motorized doors</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Lifts</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Cleansing</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Civil Engineering</td>
<td>Roofs cleaning only</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Table 1: types of maintenance provided

The preventive maintenance interventions are based on the PPM’s (Preventive Maintenance Plans), which define, for each category of equipment, the maintenance tasks to be carried out at given frequencies. These maintenance plans have been created since many years and are subject to constant
improvements and updating. The ODM’s (Ordre De Maintenance) are triggered by CERN according to the schedule of MP5.

The corrective maintenance is generated by the Technical Control Room (TCR) whose operator creates a corrective ODM; FM contractor’s operator acknowledges the ODM and dispatches it to his staff or appropriate sub-contractor, for action.

2.3 Basic contractor’s obligations

The basic obligations of the contractor in term of operation and maintenance are the followings:

2.3.1 Preventive maintenance plans

The contractual documents include general descriptions of the tasks (and frequencies) existing in MP5, that the contractor has to perform as preventive maintenance.

2.3.2 Corrective maintenance

The contractor has to intervene upon request of TCR on any equipment object of the contract. Acceptable delays are defined, from 1 hour to 8 working hours depending on the level of sensibility of the breakdown.

The time allowed for introducing data in MP5, following any intervention, and to close the related ODM, is one working day after execution of the ODM.

Major updates, as modifications of objects data (codification, location, status, etc.) and PPM’s are strictly reserved to CERN staff.

3 PERFORMANCE OF THE FIRST SIX MONTHS

3.1 A transitory period

At the 1st of July, the FM contractor, being a new comer at CERN, was in a transitory period with the assistance of CERN staff previously in charge of the activities: learning equipment codification, getting used with the scope of the contract and with the CAMM system organization, etc.

The monitoring established by CERN has therefore been focused on basic criteria in order to ensure a minimum acceptable service level:

- Corrective maintenance:
  - Time To Intervene: reactivity on troubleshooting
  - Recurrence of faults
  - Introduction of necessary data and useful comments at the ODM closure in MP5

- Preventive maintenance:
  - Starting of the work with respect to the foreseen date
  - Respect of work procedures according to specifications (instruction lists of the maintenance plans)
  - Closure of ODM’s with acceptable delay
  - Introduction of necessary data and useful comments at the ODM closure in MP5

The above mentioned checkpoints might be considered as basic issues, but they permitted to discover in simple way recurrent problems concerning the performance of the contract into two main fields:

- Proper performance of the works: in some cases, works were not performed according to maintenance instructions or interventions were cancelled without approval from CERN
management staff: such problems led to re-opening the ODM’s and to considering work as not done.

- **Integrity of the CAMM database:** in some cases, appropriate data were not introduced in MP5 at ODM closure: right equipment code, appropriate comment related to work done, time passed, date of intervention (start, end), etc. Most of the ODM concerned were re-opened until introduction of proper data.

As a result of this, we couldn’t consider that after the first 6 months, the transitory period was complete yet, and that the activity was running at standard level.

### 3.2 Monitoring tools and indicators

#### 3.2.1 MP5 reporting

The monitoring of the activity is now greatly facilitated by the development of reporting Web tools by the MP5 Support Team in ST Division.

In addition to the usual yearly statistics given below, other simple reports allowed a better management of the maintenance and proper corrective actions have been taken when necessary.

For example the “Top 50” report, gives the possibility to list the fifty equipment which have generated the highest number of faults during a given period (e.g. the last 12 months), and in a specific sector (HVAC, electricity, civil engineering, lifts, etc.).

Starting from this report, the maintenance manager can better investigate on the causes of recurrent breakdowns, take the appropriate actions to improve either the equipment conditions, or the maintenance procedures, or sometimes both.

Table 2 shows some of the actions that have been taken on equipments reported in the highest number of defects in their category.

<table>
<thead>
<tr>
<th>Bldg</th>
<th>Equipment</th>
<th>Function</th>
<th>Nr of ODM 2002</th>
<th>Cause of trouble</th>
<th>Action taken</th>
</tr>
</thead>
<tbody>
<tr>
<td>864</td>
<td>ESIL61-864</td>
<td>lighting</td>
<td>59</td>
<td>Preventive maintenance not performed according to maintenance plan</td>
<td>Notification to the contractor to do the work again and re-opening of 59 ODM’s</td>
</tr>
<tr>
<td>254</td>
<td>UACV3-00101FDEU-00007</td>
<td>Ventilation Water treatment</td>
<td>16 15</td>
<td>Frequent interventions due to imperfect knowledge of equipment</td>
<td>Request to the contractor for analysing the causes</td>
</tr>
<tr>
<td>501</td>
<td>K$INT_SAN</td>
<td>sanitations</td>
<td>22</td>
<td>Misc. plumbing failures</td>
<td>Launch of a monthly preventive round on 5 buildings to minimize repair requests from users</td>
</tr>
<tr>
<td>871</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Table 2: some actions resulting from Top 50 report*
3.2.2  *Key Performance Indicators*

Usual maintenance indicators (KPI’s) like MTTR and MTBF have still to be implemented for the FM activity. If they have not been set up since the beginning of the Facilities Management contract, it’s mainly because their calculation must rely on valid data, regularly introduced by the contractor: this last goal has not been achieved today yet, even if recent progresses in introduction of relevant data have to be pointed out.

It has then to be pointed out that:

- The representative figures for the FM operation and maintenance activity in the 2nd semester of 2002 will have to be considered with some care, due to partially false reporting in the database for this period.
- The implementation of sophisticated calculations to extract KPI’s did not appear as a priority issue, as far as some simple checks based on sampling into the database were sufficient to detect weaknesses and non-conformities in the global management of the maintenance.

Anyway, the basis for computing the KPI’s is set up and their calculation will not take much time as soon as we can consider data as reliable. Some of them are provided in paragraph 4.3 by means of indication.

### 3.3  Performance overview, major events and milestones

#### 3.3.1  *Heating, Ventilation and Air-conditioning*

- **Air conditioning**: particularity: the contract started during the peak period (July), sub-contractor new comer at CERN in this sector, difficulty to have specialized personnel, recourse to additional specialized sub-contractors, splitting of the activity as a result and control getting more difficult.

- **Heating plants**:  
  - Heating start-up was the major milestone for mid-September  
  - In June, discovering of major damages on boilers, had led to important repairs performed in July and August, boilers ready for mid-September, optimized setting-up of the burners.

- **Heating start-up**:  
  - Personnel: 3 new comers among 4 persons  
  - Anticipated by one week to allow smooth startup conditions  
  - Most of the buildings heated in time  
  - A few (minor) buildings started very late (3-4 weeks late) due to technical problems or misunderstanding from contractor  
  - No major complaints from users except in building 31 of which control system felt out of order (obsolete), leading to manual operation.

- **Energy consumptions**:  
  - Reminder: contractual bonus for the Contractor in case of energy savings.  
  - No control of the consumptions and wastes of heating by Contractor.  
  - No proper reporting nor analyze from the Contractor.  
  - Estimated over consumption of 30% for the first 3 months only for Prévessin site.

#### 3.3.2  *Electricity*

- **General**: Sub-contractor used to this activity at CERN, no major problems but:
- Reactivity sometimes too low on power cuts troubleshooting,
- Preventive maintenance not always performed according to specifications (lighting)
  - **Major events**: power cuts due to networks failures and to emergency stop tests led to point out:
    - Low reactivity in case of alarms floods even when announced in advance: complaints from users.
    - Poor reporting due to data missing on feedback: start of intervention time, end of intervention time (now corrected)

3.3.3  **Lifts:**
No problems in that area, the sub-contractor being very specialized (inherent to the sector of activity), periodic maintenance has been done according to rules, no particular event.

3.3.4  **Motorized doors:**
No particular problem, good follow-up from the contractor.

4  **STATISTICS FOR YEAR 2002**

![Figure 2: evolution of tertiary repair requests](image)

This first chart gives a general overview of the FM activity from the point of view of corrective maintenance, i.e. the evolution of the number of repairs throughout years.

Data related to other activities are not given in that chart as they cannot be compared to the past years. However, the total volume of repair requests for the six month FM period is provided in table 3.

4.1  **Civil engineering**
In the field of Civil Engineering, the scope of the activity (i.e. the equipments or buildings to maintain) kept the same in 2002 as in the previous years.
We can thus highlight the overall reduction of 25% of breakdown repairs, compared with 2001. In many categories of activity, like metal and wood fittings, Venetian blinds, false ceilings and flexible floor coverings, the number of corrective interventions has decreased by 30% to 70%.

Since neither preventive maintenance nor consolidation works have been performed in these fields, it is clear that these figures do neither result of any strategy nor of a better effectiveness from anyone. The explanation of this drop in the number of repairs requests from users is not easy to find, except in a mix of several possible reasons: CERN’s population more focused on other priorities? sensitivity to reduce expenditures? less control from ST (staff and Contractor) on the condition of infrastructure?

On the opposite, we can point out an increase of the numbers of failures on roofs waterproofing (+12%) and roads surfaces (+86%) despite of consolidation works regularly carried out over the past years. We can see one more time that levels of consolidation investments, which have always been under the minimum necessary, must be definitively increased.

4.2 Technical activities

- HVAC: no particular comments, the frame of activity is almost unchanged and the number of repair requests is stable.

- Electricity: the number of interventions has decreased, but the frame of activity has also been reduced by excluding lighting of the machine buildings and tunnels from the FM contract. No statistic is significant before next year.

- Motorised doors and lifts: these activities also have been split between ST-HM and ST-FM in 2002. No possible statistics before next year.

Figure 3 shows the breakdown of the corrective maintenance for technical activities and civil engineering, from July to December 2002.

![Figure 3: overall breakdown of corrective maintenance](image)

Table 3 gives the same figures in absolute value.
Finally, for the whole year 2002, the total number or repairs is 6’000, i.e. 13% less than in 2001.

4.3 Key performance indicators

As an indication, we give in table 4 the results of a quick calculation of the MTTR (Mean Time To Repair), i.e. the mean duration of the corrective interventions, for some activities, and we compare the results of the first and the second semester of 2002. The number of ODM’s on which the MTTR is calculated is also given.

<table>
<thead>
<tr>
<th></th>
<th>1st semester 2002</th>
<th>2nd semester 2002</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MTTR</td>
<td># ODM</td>
</tr>
<tr>
<td>HVAC</td>
<td>1.7 hours</td>
<td>549</td>
</tr>
<tr>
<td>Electricity</td>
<td>0.7 hours</td>
<td>1’286</td>
</tr>
<tr>
<td>Sanitation</td>
<td>3.0 hours</td>
<td>312</td>
</tr>
</tbody>
</table>

Table 4: calculations of MTTR (examples)

5 CONCLUSION

Performing the outsourcing of the maintenance management for tertiary infrastructure through one global Facilities Management contract has been a major challenge for ST-FM group in 2002: CERN had to transmit its know-how to a new-coming contractor, which often happened to rely on new-coming sub-contractors as well. This was much heavier than expected and it cannot be considered as complete.

Therefore, the service levels required to the FM Contractor, which are the same as in the past years, have been difficult to reach on a short term, as for instance the principle of “intervention within x hours and feedback to the user within y hours”, that was implemented with a lot of efforts in the field of civil engineering troubleshooting in 2001, has not yet found any equivalence again up to now.

However, the specified service levels, even if not reached at present, have to be fulfilled and will be satisfied progressively.

The preventive maintenance has to be optimized on the basis of a CERN-Contractor partnership and, as far as the troubleshooting is concerned, the legitimate expectation of the User to get intervention in a reasonable time and feedback as well, represents the main objective.