PROCESS & QUALITY PROCEDURES FOR TRANSPORT & HANDLING ACTIVITIES

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Abstract

To respect the detailed and complex planning of the LHC installation project it is essential to reduce possible faults in every technical service that can cause delays in the schedule. In order to ensure proper execution of transport and handling activities it is important to get detailed information from the clients as early as possible in order to do the planning and the organisation of the required resources. One procedure that requires greater focus in the future is the preparation of the resources. The goal is to prevent equipment breakdowns and accidents while executing transport and handling activities. In the LEP dismantling project multiple breakdowns of important cranes caused serious problems in the project schedule. For the LHC installation project similar incidents in the reliability of the equipment cannot be accepted because of the high sensitivity of the whole schedule. This paper shall outline the efforts and methods that are put in place in order to meet the LHC installation requirements.

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1 INTRODUCTION

Transports and handling service processes that are performed by ST-HM can be generally described by the structure of sub-processes and sub-process steps shown in figure 1. The process that is basis for the subject of this paper consists of 4 sub-processes – starting with the “Reception of the demand”, ending with “Termination of work”. Every sub-process has itself several sub-process steps.

![Figure 1: Description of transport and handling service process](Image)

The content of the process preparation phase is the verification and study of the clients’ demand for service and an acceptation to perform the work according the clients requirements. The result is the detailed job order.

The next phase is the resource reception and preparation. In this phase the detailed planning is established and the necessary resources are ordered or reserved and prepared for the work. Resources can be budget, material, equipment, personnel etc.

After this phase everything is ready to perform the work and produce the desired result. The output realization is just consisting of the work itself and ends up with the result.

Every phase mentioned needs an input of high quality of the previous phase to guarantee the result that is foreseen. The output realization phase needs well-prepared resources. The resource preparation phase needs exact information of the previous step in order to establish the schedule and the resource planning.

2 PROJECTS FOR IMPROVING TRANSPORT AND HANDLING SERVICE

ST-HM started four projects that should attack the main problems that occurred in the LEP dismantling project. The projects related to the process preparation phases are:

- Development of the EDH-system for transport and handling services

  The EDH-system for transport and handling services helps to get the necessary and complete information of the client. It serves as well to structure the clients’ demands and to optimize the work order efficiency. Ref. [1]
- **Coordination of LHC project requirements by the Transport Working Group (TWG)**

  The TWG is a study group that was mainly established to cover the complexity of LHC installation operations. The working group designs and analyses the realization process of transport and handling operations and verifies the technical and logistical feasibility (resources). It is in direct contact with the clients so that they either can adapt their demands or start other procedures like procurement etc. if conflicts (non-feasibility) are detected. Ref. [2]

  The projects for improving the quality of the resource preparation phase are:

- **Linkage of ST-HM logistics to SIRIAC system of SPL / LS group**

  The linkage between ST-HM logistics and the SIRIAC system of the SPL / LS group should increase the availability of information concerning the external logistic aspects of materials shipping from and to CERN. At the present there is no transparency of external logistic processes, which makes it impossible to organize resources. Ref. [3]

- **Change of the maintenance management strategy**

  This project is described in detail further on in this paper.

  The fact that these projects are related to the preparation phases of the total process indicates that the main chances to improve our services is not seen in the work itself, but in the preparation of the work.

### 3 CHANGE OF THE MAINTENANCE MANAGEMENT SYSTEM

#### 3.1 Introduction

The goal of the maintenance management project is to increase the reliability of our transport and handling equipment for the LHC installation and other important projects.

The method to realize this goal is to get away from the standard maintenance plans that are mainly based on the contractors proposal for maintenance in terms of frequency, working routines etc., For equipment that is of high relevance for the transport and handling operations individual maintenance programs shall be implemented based on the actual equipment condition and history and on the foreseen utilization. As a consequence, important equipment will get more maintenance (qualitative and quantitative) than equipment that is of lower priority.

#### 3.2 Priority system of CERN’s overhead travelling cranes

The following categories were defined in order to define the equipment priority and hence the maintenance plan:

- **Priority 1**: this category of equipment is directly related to the accelerators and the experiments or that is used very frequently (> 28 hours per week),
- **Priority 2**: this category of equipment is not directly related to the accelerators and the experiments but frequently used (> 4 hours < 28 hours per week),
- **Priority 3**: this category of equipment is not directly related to the accelerators and the experiments and that is used less frequently (< 4 hours per week).

The priority categorization of the cranes is flexible and may vary according to the projects and the demand of special operations by the clients. Therefore the maintenance manager has permanently to analyze project documents, check the resource schedule of the transport and handling contractor and keep up direct communication to clients and the ST-HM operation section.

Figure 2 shows the new workflow compared to the former maintenance work-flow system.
3.3 Adaptation and realization aspects

Another aspect to discuss is the adaptation and the financial aspect of the new maintenance system. This method has to be realized with the same amount of maintenance budget.

Figures 3 and 4 show principally the functioning of the former and the new maintenance system.

Figure 3: Standardised maintenance program of the former maintenance system

<table>
<thead>
<tr>
<th>Priority 1:</th>
<th>10% of our cranes are very important for projects and highly used (~ 35 cranes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maintenance intensity:</td>
<td>Cat. A+C = 48h + prev.CBM + inspections = 192h</td>
</tr>
<tr>
<td>35 x 240h</td>
<td>8400h</td>
</tr>
</tbody>
</table>

Figure 4: New maintenance management system with focused on priority equipment

<table>
<thead>
<tr>
<th>Priority 2:</th>
<th>30% of our cranes are used frequently but in normal condition (~ 105 cranes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maintenance intensity:</td>
<td>Cat. A+C = 48h</td>
</tr>
<tr>
<td>105 x 48h</td>
<td>5040h</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Priority 3:</th>
<th>60% of our cranes run less than 20 hours per year (~ 210 cranes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maintenance intensity:</td>
<td>Cat. A = 16h</td>
</tr>
<tr>
<td>210 x 16h</td>
<td>3360h</td>
</tr>
</tbody>
</table>

/ total 16'800h
In the former system all equipment was nearly treated equally. The constructors’ recommendation was basis for the maintenance intensity. Mostly there was one category A of 16 hours (light maintenance) and one category C of 32 hours (intensive maintenance) intervention foreseen per crane and per year. This gives an estimate of 16800 total hours per year for all cranes that are inventoried.

Based on this quantity of hours, there exist the following guideline for maintenance of the cranes for the new maintenance system:

- Priority 3: preventive maintenance level 1 (former category A) might be important to prevent corrosion on important parts and to keep up equipment functional.

- Priority 2: normal preventive and condition based maintenance level 1 and 3 (former categories A and C) have to be performed on the basis of the constructors recommendation to ensure normal utilization.

- Priority 1: preventive and condition based maintenance, inspections and modifications in addition to the standard maintenance in such an extent to guarantee a requested reliability. Continuous surveillance might be necessary to prevent breakdowns.

As it is exemplarily calculated in picture 5 we gain about 192 hours for additional maintenance services on priority 1 cranes compared to the standard maintenance program. This means that a lot of flexibility and additional maintenance for fulfilling the clients’ demands by shifting calculated maintenance towards the real needs.

One has to be aware that this calculation is a theoretical model to explain the new system. Practice might show up limits especially in the availability of the quantity of the resources. Actually it caused already (positively) a different focus of all our maintenance personnel towards the clients need.

4 CONCLUSION

The central point in terms of quality management is to provide the result as demanded by the clients.

With the mentioned and presented projects we focus on fulfilling the clients demand. The EDH-system guides the client in reflecting all necessary information necessary to plan a transport and handling service. The service of the Transport Working Group consists in consulting and early feasibility studies. The new system of the maintenance management of transport and handling equipment centres the operation schedule of the clients and provides more reliability for the operations because of the individualised program of maintenance interventions.

The motivation of implementing these elements had been to eliminate inefficiency. First experience show, that our personnel and our contractors have now better information to take decision about the priorities of their work. In fact, the quality procedures seem to help very well in managing the actual situation of budget limitation and personnel reduction within the ST Division. Further efforts must be done to obtain a tighter and well-organised quality management and to improve the provided services.

REFERENCES

[1] Formulaire EDH - Demande d’intervention transport-manutention: S. Prodon
[3] Logistique ST-HM pour le projet LHC: S. Prodon