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YEAR 2000 PERFORMANCE REPORT

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Abstract

The mandate of the ST/CV-OP unit consists in the operation and maintenance of the cooling systems and air conditioning installations for the PS accelerator complex, the SPS and LEP machines as well as the heating plants and all CERN pumping stations. This paper intends to provide the performance report related to the last twelve months of activity of the operation unit. The role of the Computed Aided Maintenance and the evolution of a set of performance indicators during last three years will also be presented. A brief analysis of the data and a comment related to opportunity represented by the LEP-LHC transition will follow. In addition the author will try to give in figures a more specific idea of the operation environment, how this function evolves in numbers and which are, in his opinion, the improvement axes and the eventual risks.

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1 INTRODUCTION

This paper intends to provide the performance report related to the last twelve months of activity of the CV operation unit. Though the physics program has always been dependent from the performance of the general services, the technical evolution of the machine and new requirements for year 2000 made the working condition particularly severe. The deeper interdependencies between the services, i.e. cryogenics, cooling and power supply, made the machines very sensible to breakdowns. Small random failures can today affect seriously the physics program and provoke consequences, which are of an order of magnitude bigger if compared with the past. Therefore the availability of the installations for physics became one of the most crucial factor for the entire CV group performance.

The statistics are compiled in collaboration with all control rooms and include a discrete set of data, like the number of hours of running physics, the number of interruptions, the duration and which of the group's equipment is causing the downtime. The Prévessin control room, within the SL division, is responsible for the operation of LEP and SPS accelerators. The main control room in Meyrin within the PS division operates the PS accelerator, while the ST technical control room provides the monitoring of the equipment related to general services. Daily reports and all other data collected are compared, analysed and used to calculate the operation performances.

Due to the deep relation between the quality of the preventive maintenance and the number of failures, jointly with a serious personnel reduction, the section tries to emphasise the importance of the correct implementation of a new Computer Aided Maintenance Management System [CAMM]. The commissioning is foreseen for the beginning of year 2001, and will represent a great improvement of the working conditions, mainly in terms of contract follow up. With the general refurbishing of the cooling and ventilation equipment for LHC and the implementation of the new SCADA system, this is certainly one of the biggest opportunity for CV in a next future.

2 PERFORMANCE STATISTICS

2.1 Data Presented

Each machine, LEP, SPS and CPS is provided with a short report including few statistics and some general comments. The overview will concern also the most important renovation projects and any relevant aspect, which could affect the operation performances. The following set of data is normally used to define the performance of the CV equipment.

- The number of times during the year when a failure in the CV equipment has caused an interruption of the physic program.
- The total number of hours of downtime registered by the physics control rooms caused by CV equipment.
- The CV equipment down time compared with the total hours of downtime for all the services registered.
- The total availability of the CV equipment for physics.

2.2 PS Statistics

The statistics from the leptons and protons period represents the PS data, fig. 1 [1]. This also includes Linacs data.

The PS complex is characterised by the longest run period among all the accelerators present at CERN. During the normal shut-down period there are every year several experimental areas that require constantly water cooling for their appliances. For this reason, the time allocated for maintenance works in PS cooling stations is limited to the minimum. It is worth mentioning that the PS cooling installations are the oldest at CERN and therefore their maintenance requires more time and resources. The access time is the shortest among all the CV installations. Besides the normal maintenance and operation works, the PS team was in 2000 year highly involved in the modification and improvement works of its equipment. They include: renewal of Booster cooling station, replacement of the chilled water pipes in the PS tunnel, replacement of the air handling units in the

TT2 tunnel. A part of this few new installations were constructed, i.e. TOF cooling station, demineralised cooling station in building 180. This workload will certainly increase during the next few years when PS complex together with SPS installations will be the only ones running at CERN before the LHC is finished.

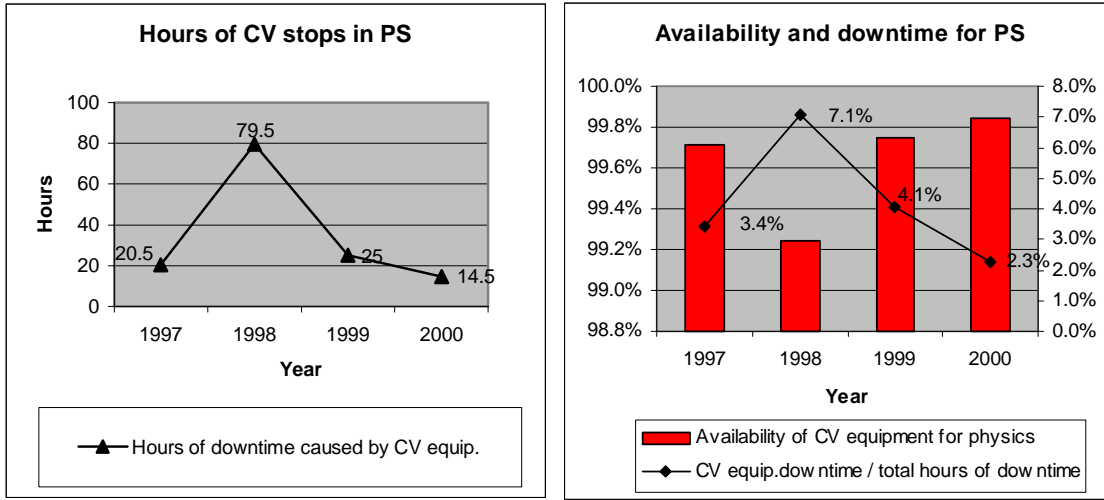


Figure 1: PS statistics

2.3 SPS Statistics

The statistics from the leptons, the protons and the ions periods represents the SPS data, fig.2 [2].

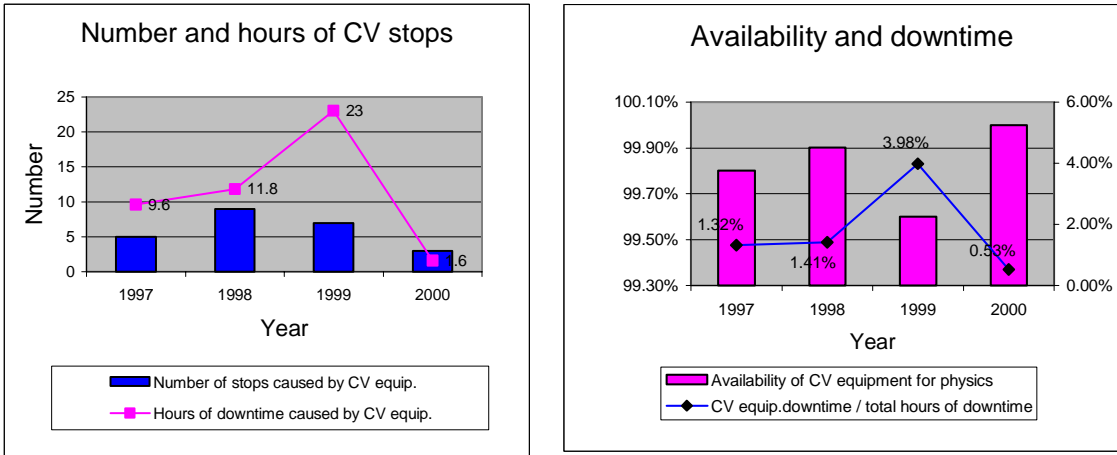


Figure 2: SPS statistics

In year 2000 the operation of the CV equipment of the SPS accelerator has been stable and the equipment has in general been performing well. The installation of new chilled water groups at BA3 was the major modification carried out in the 1999/2000 shutdown. This was a crucial task since this included changing cooling system of the LEP/SPS control room and the Cage Faraday of BA3. The chiller has been performing well but two major problems have occurred. The first one was the problem caused by the supervision system TRACER SUMMIT delivered by TRANE, which has caused malfunctioning of the system. The system has been completely renewed and reinstalled by TRANE in December this year. The second problem was a limited electrical power supply from ST/EL cubicle,

which at the hottest days has stopped the units. A temporary solution was to reduce the absorbed power by the chiller units. A renewal of the power supply is prepared by ST/EL in the beginning of 2001. The operation team of SPS has during year 2000 been heavily involved in the update of the SPS for LHC and the Water 2000 project. The closing off the raw water supply line for the SPS and the related replacement of the SPS demineralised heat exchangers along with the upgrade of the SPS cooling towers have also given a big workload. Moreover several projects have been done directly by the operation team, for instance the renewal of the ventilation of the Cage Faraday in BA3, the installation of a unit for the damper cooling in the tunnel at BA2 and the modification of the SPS demineralised water distribution. The operation team has also been involved in the Rapier migration project, the SPS smoke extraction reengineering and the TCR water2000 supervision project.

2.4 LEP Statistics

The LEP is the last stage in the chain of the accelerators delivering a beam. Downtime for the PS and SPS will immediately affect the LEP, fig3 [2].

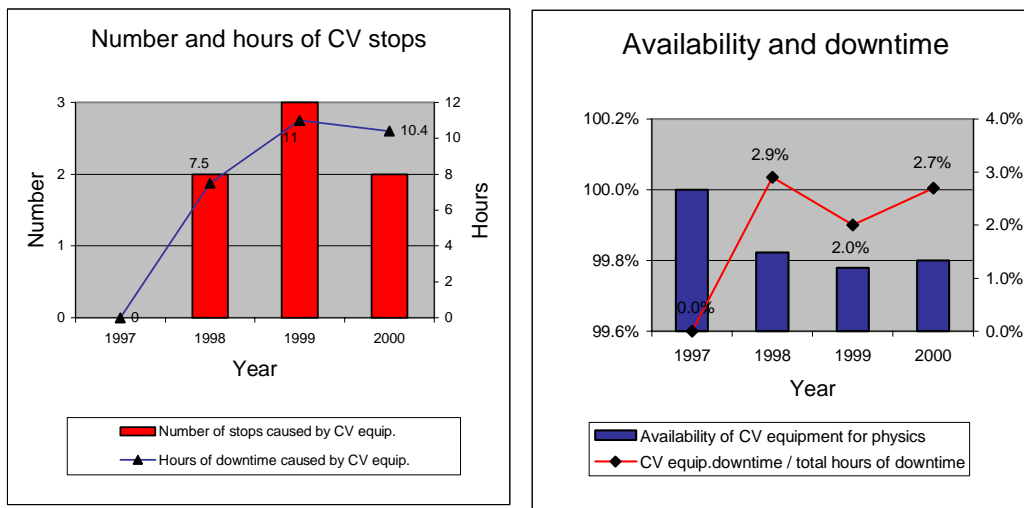


Figure 3: LEP statistics

In 2000 there was a very high demand for physics and the continued increase of the beam energy has pushed all systems to the limits. The most serious breakdown had place in the last week of the prolongation period of LEP. It is worth to notice that the number of hours of downtime due to ST/CV equipment in 2000 decreased comparing to the proceeding year in spite of the increased demand for the cooling capacity.

2.5 Utilities Statistics

The performances of the utilities are not registered separately by the control rooms. However this year has been particularly favourable to this team in terms of results, surely the highest level of availability and operational flexibility in the last three years. It is worth notifying that there were no major stops of the pumping stations, neither of the Heating Plants. The Co-generation Plant was entirely available during its stand-by period, however its use change with the new electric tariffs that apply to CERN. The most important change in the operation of the pumping stations is Water 2000 project that implies closing of the SPS cooling loop as well as converting EIF (Eau Industrielle Froide) and EIC (Eau Industrielle Chaude) networks for Meyrin site into drinking water networks. The works started in September 2000 and will continue over 2 years.

3 EQUIPMENT CONDITIONS

The installations in charge to the operation section have been built when the accelerators have been constructed. Anyhow the high equipment quality and the preventive maintenance program have allowed fair operational flexibility and great equipment availability. However the increasing

cryogenics, the lack of spare parts no longer produced and the new requirements in terms of the accelerator performance have made very urgent the renovation of several CV installations. The situation fortunately is supposed to improve in a next future. The LHC project had a sort of dragging effect, and the refurbishing of LEP installations will be followed by several other renovation projects, i.e. the pumping stations and the raw water distribution.

4 MAINTENANCE CONTRACT AND FOLLOW UP

CV is actually in charge of more than 5150 parent-equipments. The asset value has been estimated to exceed the 400 MCHF. CERN staff provides the preventive maintenance, the corrective one and the minor works. Moreover the personnel is involved in all new projects, as work supervisors, support to the design or project managers. Since the decision to outsource a part of the maintenance, the section encountered a continuous reduction of the staff number: 50% to 70% reductions per team since 97. In parallel a personnel reduction also affected the maintenance contract. In this context, during year 2000 the section put a strong accent on the analysis of processes, functions and procedures, in order to increase efficiency and effectiveness. Naturally the reflection included the contract too. The operation is now working with a result oriented contract since 97 and developed a fairly good experience in this field. For all these reasons it has a direct interest in the renewal and upgrade of the maintenance contract.

Concerning the activity follow up, the operation section has been in the van not only for the process identification and the function description. The definition and implementation of an effective set of performance indicators [4] has been one of the greatest hits of last two years. It has represented a clear example where important concepts, like equipment availability or operational flexibility, have been effectively translated into measurable and usable parameters. These are the indicators that actually provide the section with the data required for all performance statistics. Due to the dimensions of the equipment park, spread over more than 550 hectares, a correct follow up of the maintenance activity requires an effective "Computer Aided Maintenance Management" system (CAMM) and 2001 seems to be the year where the new CAMM centre will be finally operational.

5 CONCLUSION

Last year was particularly favourable for the operation. It is worth to emphasise that the pumping stations and the heating plants encountered no major stops all along the running period, as the co-generation plant that was entirely available. Less than two hours downtime were attributed to SPS and LEP performances were particularly good in respect of the very critical machine requirements.

These results are mainly the fruit of a constant and discreet effort provided by the personnel, which has often performed its mission under stress in a very difficult environment. This thankless hidden work oblige to a certain recognition and the best opportunity consists in the resolution of those small problems that can easily be faced today during LHC euphoria and strongly improve the working conditions tomorrow.

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