



ABSTRACT

Injecting beams in CERN facilities is subject to the CERN safety rules. It is for this reason that the Beam Permit approval procedure was improved by moving away from a paper-based workflow to a digital form. For each facility, the Beam Permits are signed by the various responsible specialists (Access systems, safety equipment, radiation protection, etc...). To achieve this, CERN's official Engineering Data Management System (EDMS) is used. The functionality of EDMS was extended to accommodate the additional requirements, whilst keeping a user-friendly web interface. In addition, a new webpage within the CERN OP-webtools site was created with the purpose of providing a visual overview of the Beam Permit status for each facility. This new system is used in the CERN Control Centre (CCC) and it allows the Operations team and all people involved in the signature process to follow the Beam Permit status in a more intuitive, efficient and safer way.

BEAM PERMITS IN EDMS

At the beginning of 2015, The CERN Beams Operations group (BE-OP) decided to move Safety Permits from paper (Fig.1) to a digital system. The Beams Departmental Safety Officers (BE DSO) in agreement with the BE-OP group leader decided eventually to use EDMS as the new tool for Safety Permits management.

BEAM PERMIT 2017	ZONE: PS-RING
<p>1. All shutdown works complete: The Technical Facility Coordinator states that the integrity of the infrastructure is preserved, in particular all shielding blocks and ventilation doors are in place to receive beam knowledge. The integrity of the infrastructure has been inspected and validated by the BE-DSO.</p>	<p>Machine Facility Coordinator</p> <p>Group: EN-ACE</p>
<p>2. Recommencing phase complete: The Recommencing Coordinator states that the integrity of the infrastructure, including outside areas, and in particular all shielding walls, fences and ventilation doors, is preserved. Any new or modified shielding has been inspected and validated by the BE-DSO. The equipment groups in charge of EEO have tested their equipment and made them available for operation with beam.</p>	<p>Recommencing Coordinator</p> <p>Group: BE-OP</p>
<p>3. Access system functionality: The access system for the machine is fully operational. All safety and control functions are operating. No non-compliance, suspension or status of EEO must be reported, as comment, associated to the EEO signature. The electronic signature of the control software (if applicable) of the access system will be obtained in the ECHB comment.</p>	<p>Access system responsible person</p> <p>Group: BE-ACE</p>
<p>4. BE DSO tests: The purpose of the BE DSO tests is to validate the correct operation of the safety functions of the access system and of all "EEO". The DSO test is done according to procedure (EEO-1000). The DSO tests are usually performed after completion of the steps above, as well as after having collected the information from the equipment groups responsible for EEO, as well as from EN-ACE (when appropriate).</p>	<p>DSO (DSO, DSO or DRSO)</p> <p>Group: BE-DSO</p>
<p>5. Radiation protection: The RP responsible person states that a visual inspection of radiation shielding has been performed when and where appropriate. Radiation protection (control measurement, identification and beam responsibility) is operational. Limitations on beam operation can be expressed in accordance with included shielding.</p>	<p>RP-AS Sector Leader or designer</p> <p>Group: HSE-RP</p>
<p>6. Patrols: The area is patrolled according to BE-OP patrol procedures. EDMS: 073865, 073866, 073867, 073868, 073869, 073870, 073871, 073872, 073873, 073874, 073875, 073876, 073877, 073878, 073879, 073880. The patrol includes checking the cleanliness and tidiness of the area, the integrity of access barriers, radiation shielding, and ventilation doors, but first of all the presence of any person in the zone.</p>	<p>Patrol leader or Shift Leader on duty in CCC</p> <p>Group: BE-OP</p>
<p>7. Final Authorisation for Beam: As to point the machine is operational for beam. The BE-OP group leader (or the relevant CSAP chairman, or the project leader for commissioning machines) accepts the machine for operation with the scope of the restrictions that have been made in writing.</p>	<p>BE-OP Group Leader or deputy</p> <p>Group: BE-OP</p>
<p>Beam Permit suspension by any qualified person: Reason for suspension (including possible reference documents) will be mentioned by the requestor, when changing the status to "Suspended", as a comment on EDMS.</p>	<p>Beam Permit suspension: Action undertaken to resume the safe situation will be given as a comment on the EDMS Beam Permit. The reaction will be approved by the requestor of the suspension and the final approval of the Beam Permit.</p>
<p>Beam Permit cancellation: Reason for cancellation (during the run or at the end of the run) will be given as a comment when changing the status of the Beam Permit to "Cancelled" in EDMS. The reason for cancellation will be mentioned in the comment.</p>	<p>Beam Permit cancellation: The reason for cancellation will be mentioned in the comment.</p>

Fig. 1: Beam Permit Template (PS Ring zone)

First documents were based on the basic approbation process used in EDMS (old method) where documents went through three steps ("In Work", "Engineering Check" and "Released"). All signatures were inserted by adding comments while the documents were in "Engineering Check" status. Once the facilities were approved by all signatories, the documents were moved to "Released" and the Safety Permits were approved.

At the beginning of 2016, a new prototype was presented with the aim to improve the process and adapt EDMS to the Safety Permits needs (Fig.2). This new prototype contains a workflow that follows the logic of the Safety Permits process with descriptive names for each status, a new access right structure for the various stages of the process and a new way to sign off foreseen activities (not available in EDMS at that moment).

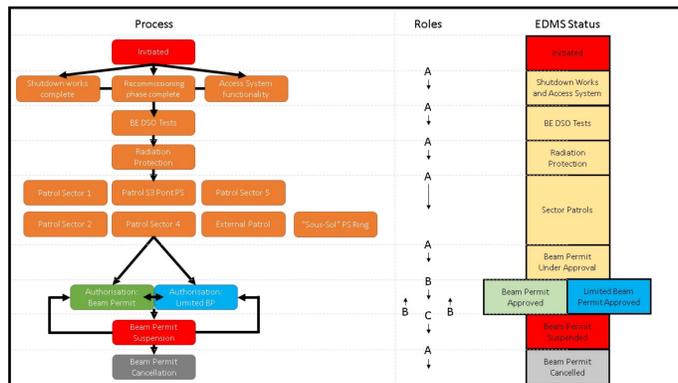


Fig. 2: Beam Permit Procedure (PS Ring zone)

BEAM PERMITS IN OP-WEBTOOLS

Once first Beam Permits were using this new method in EDMS (Fig.3), BE-OP requested the creation of a new tool in the existing OP-Webtools portal (used already by the Operations team) with the aim to have a main view of all Beam Permits from a fix display installed in the PS Complex island of the CERN Control Centre (Fig.4).

Following the development of the new tool, operators have the means to acquire the status of each Beam Permit in an efficient way, reducing the time needed to introduce Beam in each facility and reducing the risk of misunderstandings.

RESULTS

Twelve beam permits and five hardware permits of the PS Complex have been in operation since 2017 run, using the new system with very good results. The process has been much clearer for specialists and operators and it has been easier for other CERN staff to follow the workflow for each facility.

Some issues arose during the testing phase and thanks to the continued effort for the improvement of EDMS, all problems were solved before moving it from the test phase to production.

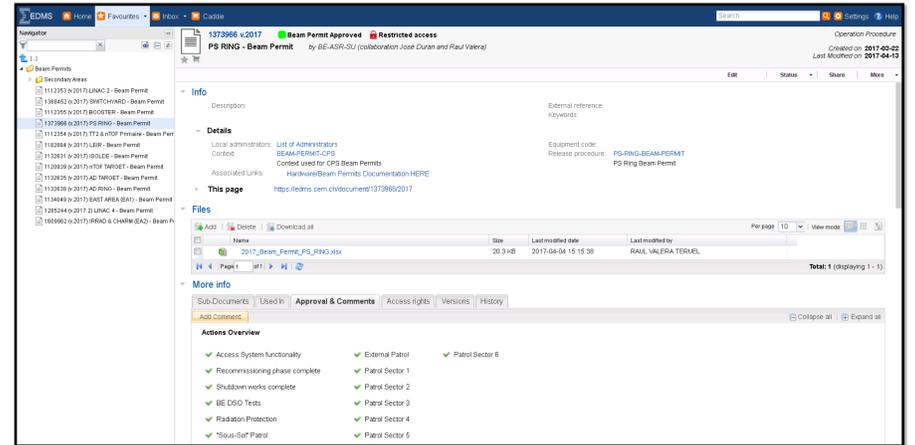


Fig. 3: EDMS Document (PS Ring zone)

In summer 2017, the new experiment BASE in the Antiproton Decelerator facility started using a similar workflow adapted to secondary beam areas (areas receiving secondary particles as protons collide with a fix target with the aim to produce antiprotons that are finally sent to the experiment) with positive feedback.

PROJECT STATUS

Existing Beam Permits of the PS Complex will keep the same workflow and just some minor modifications will be made such as adding some "Actions" (signatures) to some Beam Permits and renaming one of the statuses for the next year.

In terms of software, some new features have been requested by BE-OP to EN-ACE-EDM. It includes visual improvements of EDMS, new tools to manage Beam Permits and other features like a new automatic notification system that will save time for future Beam Permits implementation, configuration and maintenance.

There are also some improvements that are being done in the OP-Webtools side with the aim to give more information about Beam Permits to operators while keeping the fast and simple overview of the Beam Permits.

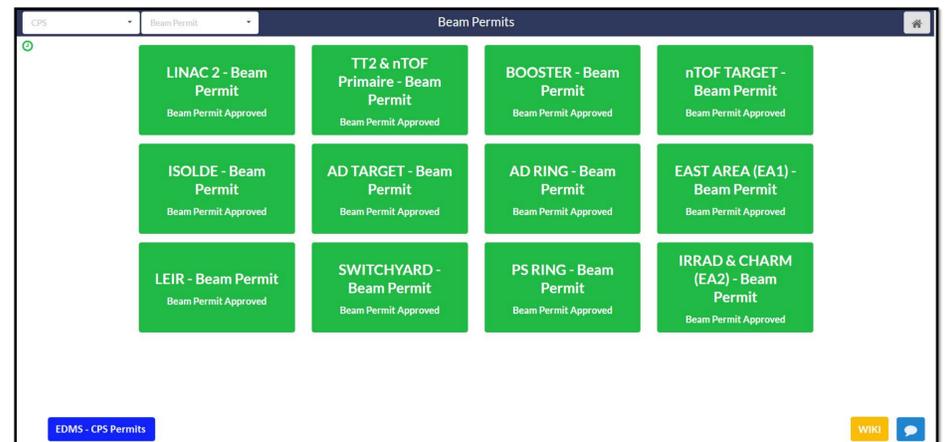


Fig. 4: Beam Permits webpage in OP-Webtools

A wikipage with information related to this new method is available. It is used by CERN staff members as a guide and it helps them to be informed about new improvements on the system.

CONCLUSIONS

After the first test using this new method for the PS Complex, we have learnt not just about the new process itself with all advantages but also about the way to organize our planning for next years.

In the near future, other Safety Permits will be implemented for the Super Proton Synchrotron (SPS), the Large Hadron Collider (LHC) and the experimental areas linked to them (they use the old EDMS method). The rest of the facilities of the PS Complex will integrate the new process. New facilities such as the new Linear Accelerator 4 (LINAC 4) will use the new process from the start.

New features and improvements will be developed in EDMS and the Beam Permits webpage. A future implementation into the CCC Access Systems will be studied.

For the 2018 run, we are working on the improvement of the system thanks to a continued communication among the BE-OP group, the BE DSO and the EN-ACE-EDM section with the aim to cover all aspects (safety, infrastructure, operation...) for each current and future facility using the new method and the possibility to improve and adapt each system to the new needs.

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