P3PO: AN INFORMATION SYSTEM FOR SUPPORTING INSTALLATION PROCEDURES AT PETRA III

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Abstract

For the PETRA III project, an information system called P3PO has been developed for supporting the logistics of the installation process and for managing the technical infrastructure. P3PO provides a central information access point for the PETRA III installation status. The system registers all the components of the accelerator and provides work lists which list the tasks and their responsible groups for each component. It records the progress of work and provides support for managing the documentation. Users can access P3PO through an easy-to-use web-interface and obtain for example inventory lists, delivery status reports and task lists for groups or individuals. P3PO is based on DESYs inventory management and engineering data management systems and is in production since summer 2006. The paper describes the system capabilities and reports benefits and experience.

INTRODUCTION

The PETRA III project will rebuild the existing PETRA storage ring to become one of the most brilliant synchrotron radiation sources. A 220m long experimental hall with about 30 experimental stations will be constructed in one octant of the current accelerator. Large sections of the current machine need to be disassembled and will be reconstructed and upgraded after the experimental hall has been erected. Dismantling and reconstructing the accelerator raises numerous logistical challenges, such as coordinating installation activities of several hundred engineers and technicians from a dozen different groups, keeping track of several thousand accelerator components, and organizing component transport and storage space.

The activities occur in different stages: First, thousands of accelerator components need to be removed from the existing storage ring, checked, overhauled and stored during the construction of the experimental hall. In parallel, newly designed components which have been manufactured at other institutes or companies are delivered to DESY and need to be registered, inspected and stored. After construction of the experimental hall is completed, the components have to be (re-) installed in the accelerator according to the upgraded beamline design.

P3PO OBJECTIVES

P3PO is a web-based information system for supporting the logistics and installation process coordination at PETRA III. Figure 1 gives an overview of the P3PO main use cases and illustrates how different user groups benefit from the system. For project members, P3PO should be the single point of information about the status of installation works, the current status or location of components, and information about individual or group work assignments. Mechanical engineers in particular can retrieve a reference specification of the intended beamlines as a basis for their design work. Coordinators, component managers and document managers use P3PO for registering, maintaining and distributing information of their areas of responsibility.

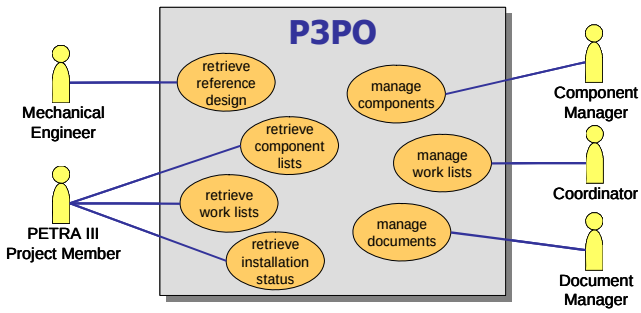

Figure 1: P3PO main use cases.

P3PO ARCHITECTURE

Figure 2 shows a schemativ overview of the P3PO architecture. P3PO has been implemented based on available general-purpose information systems, namely an infrastructure (or asset) management system (AMS) [1] and an engineering data management system (EDMS) [2]. The AMS is optimized for component and infrastructure management and handling work lists for maintenance operations, while the EDMS puts emphasis on the

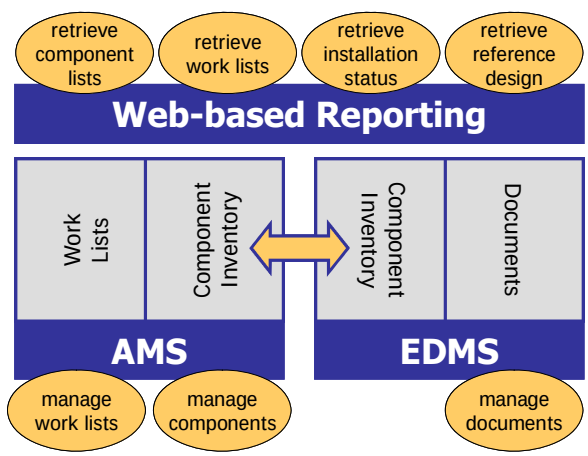

Figure 2: P3PO architecture.

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management of the technical documentation of components. Both systems are integrated to ensure consistent information [3], and they are exposed only to power users. Casual users who are mostly interested in information retrieval access P3PO through an intuitive and easy to use web-based reporting tool which also supports data export to spreadsheets for further processing.

BENEFITS

P3PO supports the PETRA III project team from early design phases throughout installation and commissioning up to the operational phase. The following sections illustrate some P3PO applications.

Managing Beam Line Reference Designs

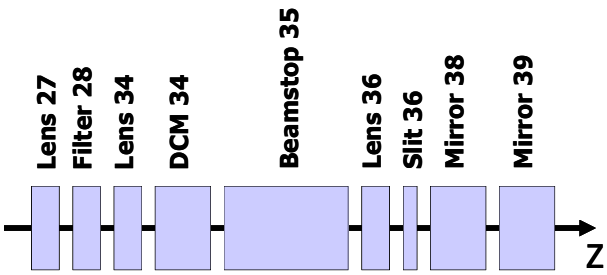


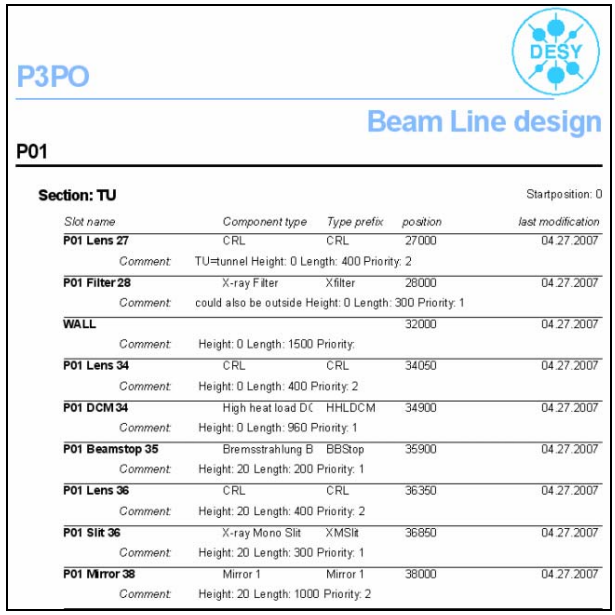
Figure 3: Schematic of beam line reference design.

Beamlines are defined in terms of reference designs which list the planned components and their beam positions. Reference designs are used to verify the beamline design from mechanical and operational perspectives. The elements of the reference design are called “slots”, reflecting their role as placeholders for physical components. Figure 3 illustrates a reference beamline design.

P3PO stores the slot information and enables mechanical engineers to retrieve web-based reports describing the current beam line design. These reports are used as design specifications for creating 3D CAD models of the beamlines and performing collision analysis. Figure 5 shows an example report which describes the beamline “P01”. It lists the slots together with their beam position, the type of component to be installed in the slot and additional information which is relevant for the design team.

Managing Components

All PETRA II and PETRA III components will be registered in P3PO. The system keeps a status for each component and allows tracking components from ordering via delivery and inspection into the operational phase and later maintenance activities. Again, reporting capabilities are used to provide aggregated information about e.g. the delivery status of ordered components and the available (spare) components on stock.


P3PO

Beam Line design

P01

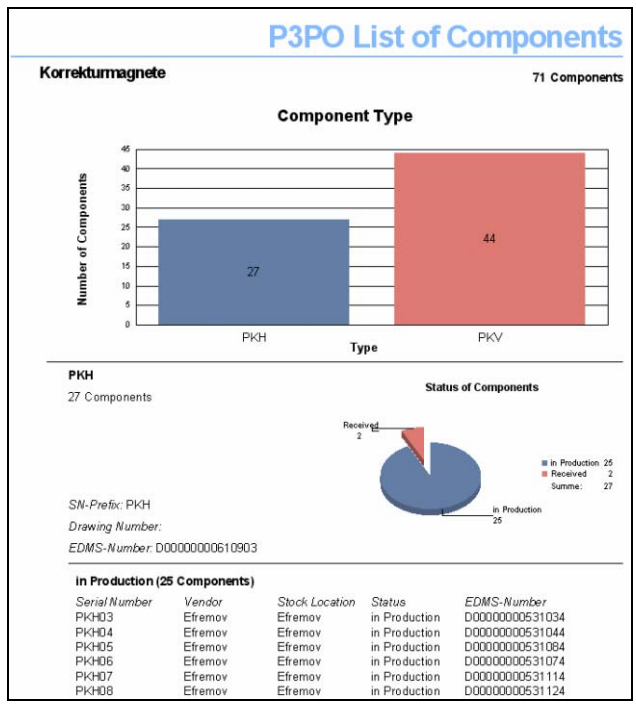
Section: TU Startposition: 0

Slot name	Component type	Type prefix	position	last modification
P01 Lens 27	CRL	CRL	27000	04.27.2007
Comment:	TU=tunnel Height: 0 Length: 400 Priority: 2			
P01 Filter 28	X-ray Filter	Xfilter	28000	04.27.2007
Comment:	could also be outside Height: 0 Length: 300 Priority: 1			
WALL			32000	04.27.2007
Comment:	Height: 0 Length: 1500 Priority:			
P01 Lens 34	CRL	CRL	34050	04.27.2007
Comment:	Height: 0 Length: 400 Priority: 2			
P01 DCM 34	High heat load DC	HHLDCM	34900	04.27.2007
Comment:	Height: 0 Length: 960 Priority: 1			
P01 Beamstop 35	Bremsstrahlung B	BBStop	35900	04.27.2007
Comment:	Height: 20 Length: 200 Priority: 1			
P01 Lens 36	CRL	CRL	36350	04.27.2007
Comment:	Height: 20 Length: 400 Priority: 2			
P01 Slit 36	X-ray Mono Slit	XMSlit	36850	04.27.2007
Comment:	Height: 20 Length: 300 Priority: 1			
P01 Mirror 38	Mirror 1	Mirror 1	38000	04.27.2007
Comment:	Height: 20 Length: 1000 Priority: 2			

Figure 5 Generated reference design for beamline P01

Coordinating Installation Procedures

In order to perform installation tasks, technicians require three specific informations: The slot which needs to be equipped has to be named, the physical component which is supposed to be installed in that slot has to be named (and it has to be compatible with the expected component type of that slot), and installation instructions (e.g. in terms of work lists) have to be provided. Figure 6 illustrates how the informations are related.


P3PO List of Components

Korrekturmagnete 71 Components

Component Type

PKH

27 Components

Status of Components

SN-Prefix: PKH

Drawing Number:

EDMS-Number: D00000000610903

in Production (25 Components)

Serial Number	Vendor	Stock Location	Status	EDMS-Number
PKH03	Efremov	Efremov	in Production	D00000000531034
PKH04	Efremov	Efremov	in Production	D00000000531044
PKH05	Efremov	Efremov	in Production	D00000000531084
PKH06	Efremov	Efremov	in Production	D00000000531074
PKH07	Efremov	Efremov	in Production	D00000000531114
PKH08	Efremov	Efremov	in Production	D00000000531124

Figure 4 Equipment list and delivery status

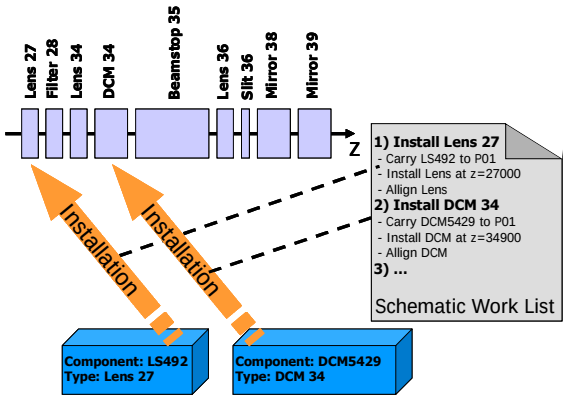


Figure 6 Installation of components in reserved slots.

P3PO enables coordinators to create and associate work lists with components and slots, and it enables project groups or individual team members to retrieve work lists which contain their upcoming tasks (Figure 8). Work progress should be reported to a central coordinator who signs-off completed tasks. The according process documentation such as the change of a component's location or status is then created automatically, this way ensuring high data quality.

Retrieving the Overall Installation Status

Figure 7 shows an example for a high-level progress report as it is usually requested by project management for getting an overview of the overall project status. The reports shows a (simulated) status of the dismantling works in the different sections of the existing PETRA II storage ring, which is necessary for the timely launching of follow-up activities. P3PO can dynamically create such reports from its database.

EXPERIENCE

Most of the users are casual users who access P3PO for information retrieval only. They depend on the system being intuitive and easy to use. The web-based reporting

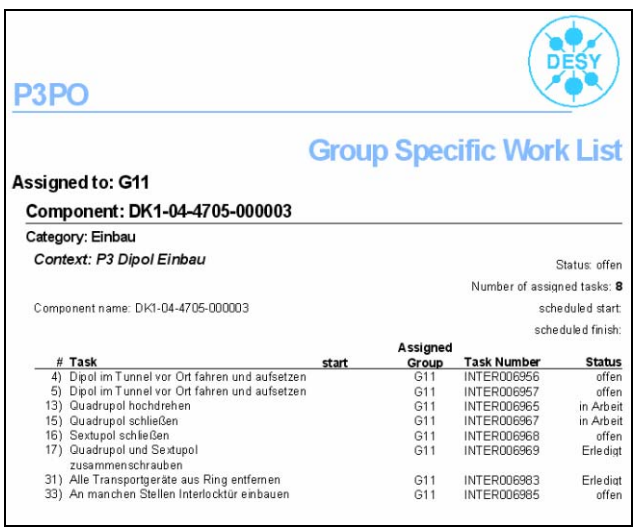


Figure 8 Example for a group specific work list (task names are in German)

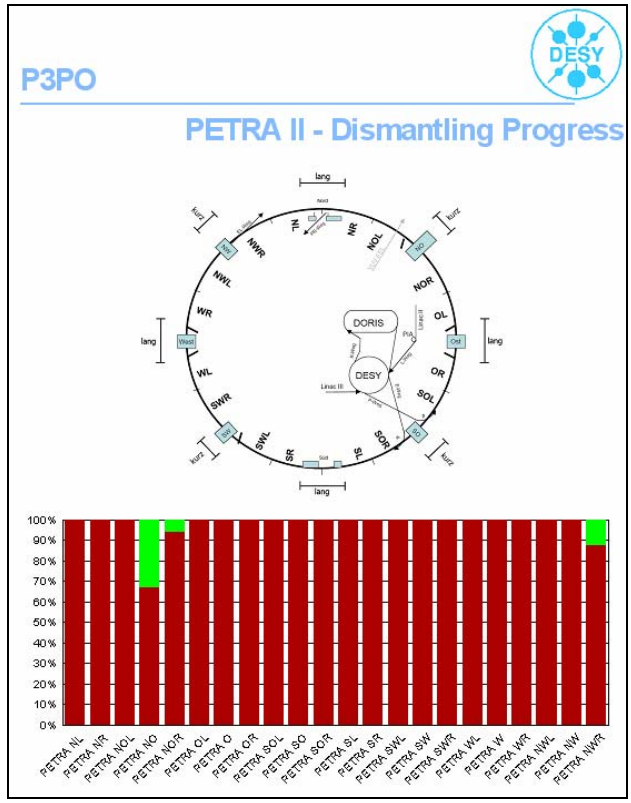


Figure 7 Example progress report of the PETRA II dismantling

component is a very powerful tool for ad-hoc information distribution, and it turned out to be very flexible and responsive as it enable on-the-fly creating of new reports.

The number of data managers has been kept small to ensure a continuous high data qualtiy. Only few and well-trained users are managing component data.

The development of P3PO has benefitted from the available general-purpose information systems, which were already in production for a long time and which had been introduced as part of a long-term information management strategy. Based on these systems, the initial version of P3PO could be launched in less than four months after it had been first requested.

REFERENCES

[1] J. Kreutzkamp, L. Hagge, E. Deffur, A. Gellrich, B. Schulz "Experience with an IT Asset Management System", CHEP2003, La Jolla, CA, March 2003.

[2] J. Bürger et al., "DESY and ILC EDMS: Engineering Data Management for Large Scientific Collaborations", PAC 2007 (these proceedings), Albuquerque, NM, June 2007.

[3] J. Bürger, L. Hagge, J. Kreutzkamp, K. Lappe, A. Robben, "Integrated Information Management for TESLA", CHEP2003, La Jolla, CA, March 2003.

