



MORE EFFICIENCY AND SAFETY AT MAINTENANCE CENTERS AND DEPOTS

Yard Management System (YMS)

SIEMENS

Punctuality, safety and efficiency in passenger and cargo rail transportation require the necessary locomotives, cars and multiple units to be available in line with the relevant requirements. This is the job of maintenance including on-time train make-up. Vehicles and trains are subject to corrective and preventive maintenance and cleaned at maintenance centers and depots.

Maintenance is performed in accordance with the planned vehicle schedules at closely planned, stipulated intervals. Yard management systems (YMS) enable efficient implementation with the required high safety standard. In terms of their overall complexity, the relevant processes are to be planned, scheduled and mapped with sequences, occupancies, make-up and resources.

The use of yard management systems boosts quality in the overall train make-up process, including the required level of safety and punctuality, and thus altogether supports the optimization of operations.

Needs-based solution with YMS

The entire process chain is mapped from the moment the train enters the maintenance center until it leaves it again. Maintenance and make-up are supported on a continuous basis. At the same time, YMSs inform staff about the current operating state of the entire maintenance installation and show current track occupancy both throughout the center and on the entry and exit lines. The necessary scope of maintenance work such as:

- plannable regular work
- repairs
- wheelset diagnostics and replacement of wheelsets/bogies
- indoor and outdoor cleaning
- catering
- emptying of WC tanks
- fresh supplies of water

can be performed both in parallel and on different work levels. All sequences are precisely planned ahead and coordinated with regard to each other. The entire maintenance process is organized, transparently visualized and logged. For this purpose, workplaces, large-sized displays and operating data acquisition terminals are located around the maintenance center.

Facilities and equipment such as wheelset diagnostic systems or outdoor cleaning facilities are linked to the YMS to provide an overview of the overall process.

By communicating with the systems in the interlocking, the YMS tracks trains both within the maintenance center and on the entry and exit lines and automates entries into and exits from the shed. The process covers both operations management for maintenance and make-up and staff safety.



Benefits

Optimization of the entire maintenance process

Increase in reliability and operational safety

Increase in availability
(on-site preventive maintenance and service)

Standard reporting and evaluations

Complete, consistent network integration

Official approval by the Federal German
Railways Office (EBA)

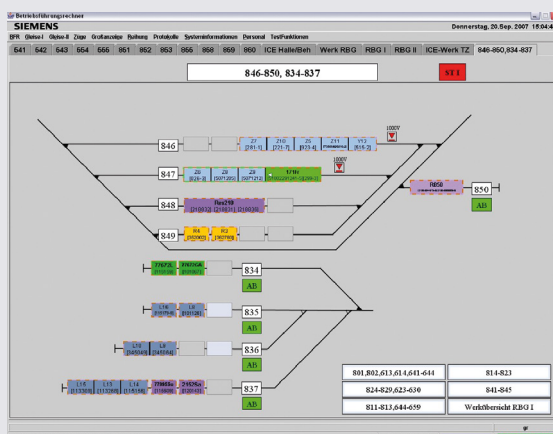
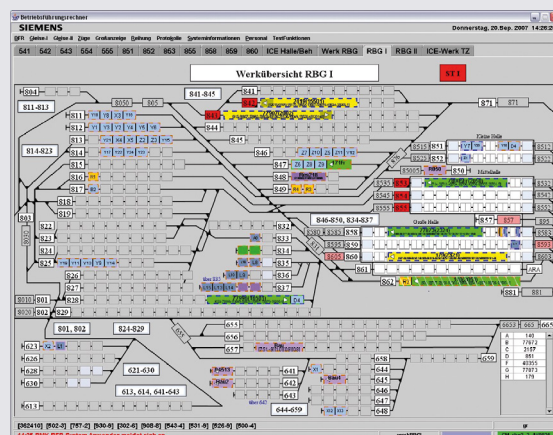
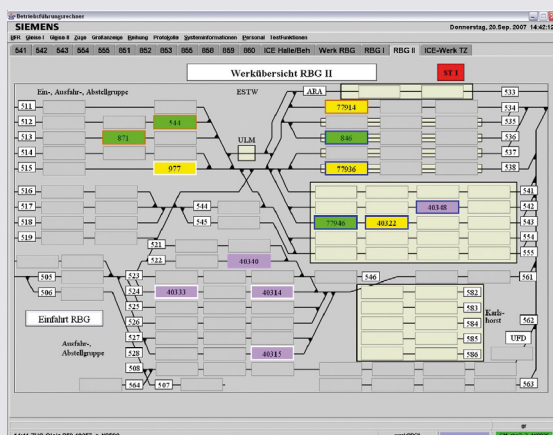
The functions of the YMS include the following:

- visualization and operator control of the equipment and facilities
- automated control of entries into and exits from the maintenance shed
- mapping of shed occupancy
- train tracking with train and vehicle numbers throughout the center
- administration and visualization of train composition data and track segments
- log-on and log-off of staff on the trains
- documented communication between all persons involved in the process
- acquisition of operating data to indicate work performed on trains
- administration and visualization of vehicle schedule data
- message system and archiving
- exchange of data with production systems in manufacturing and rail operations
- quality data export

Constructional details and functions

Due to the central function of the YMS within a maintenance center, the requirements in terms of availability and reliability may be extremely high. This is why a system is used which is both distributed and scalable in line with the respective requirements.

The main computers form the basis for monitoring and controlling the maintenance equipment. The database computers administer the master data and the message archive, whereas dedicated workstation computers implement communications to third-party systems. Depending on the availability requirements, all these components can be designed as hot-standby, redundant components.



Detailed track views

Maintenance center
overviews of multiple
units and cars

Standard PCs are used as operator control and monitoring computers by the operations coordinators, on the shopfloor and in the offices. In view of the fact that the YMS user interface can be called up via a standard browser (e.g. Internet Explorer or Firefox), it can be integrated into the respective operator's communication and network environment completely and without being explicitly installed at workplaces on site. This means that users with adequate authorization are provided with access via standardized workplaces at any time and for more than one location.

Operating data acquisition terminals can be installed both in the maintenance sheds and alongside the outdoor tracks. These terminals are operated contactlessly by chip for staff log-on and log-off and for reporting that work has been completed. Large-sized displays with train numbers, times and a description of the work involved are used for visualization at the workbays in the maintenance center.

Programmable logic controllers including the associated sensors and actuators are used for automation in the shed, e.g. for location tracking, monitoring of working platforms and cranes, overhead-line control, and for the control of gates and doors, warning systems and other facilities and equipment.

Interfaces to operator- or center-specific production systems (e.g. SAP) enable data to be exchanged (e.g. train composition data) for operations management in the maintenance process.

Trains and vehicles are tracked within the maintenance center via standardized links to train tracking systems in the interlocking and / or appropriate identification systems such as Sofis.

Process control and visualization

Process control and visualization are performed by means of various views with different levels of detail which are selected via appropriate menus and tabs.

Maintenance center overviews of multiple units and cars

The maintenance center overviews provide an overall view of the center, indicating the locations of vehicles, their status and degree of completion, and track occupancy.

Detailed track views

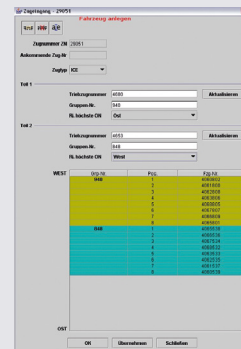
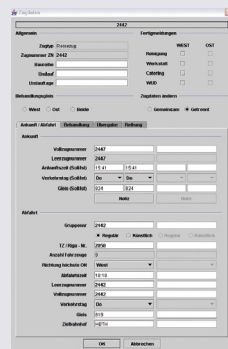
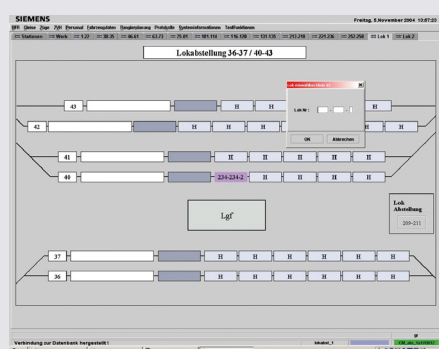
Detailed track views show stabled vehicles on the respective make-up and stabling tracks together with their status and the status of trackside equipment such as train pre-heating facilities. Recorded operating data is used for visualization in particular for trackside log-ons and log-offs and to ensure the safety chains.

Manual train occupation entry

The manual train occupation entry feature can be used to manually enter the relevant tractive units and cars in their intended composition for the trains to be formed on the make-up tracks.

Administration and visualization of vehicle schedule and train composition data

Vehicle schedule and train composition data is recorded upon train arrival and compared with the data contained in the systems for center-specific planning. This can be done automatically, e.g. by trackside identification, data transfer from the production systems, or manually. Data can be corrected and updated by appropriate administration options and input screen forms.



Administration and visualization of vehicle schedule and train composition data



Shed tracks with visualization and operator control

An overview of all tracks in the shed or one particular shed track can be displayed. In addition to occupancy, all relevant information such as the status of the shed doors, traffic lights, warning systems, working platforms and track switches for activating / deactivating the overhead contact line's power supply is displayed.

The logged-on staff, work and system statuses and the operating mode selected by the operations coordinator for entry into the shed are also displayed. Safety chains stored in the YMS ensure that trains can only be moved or access provided once the necessary conditions have been met.

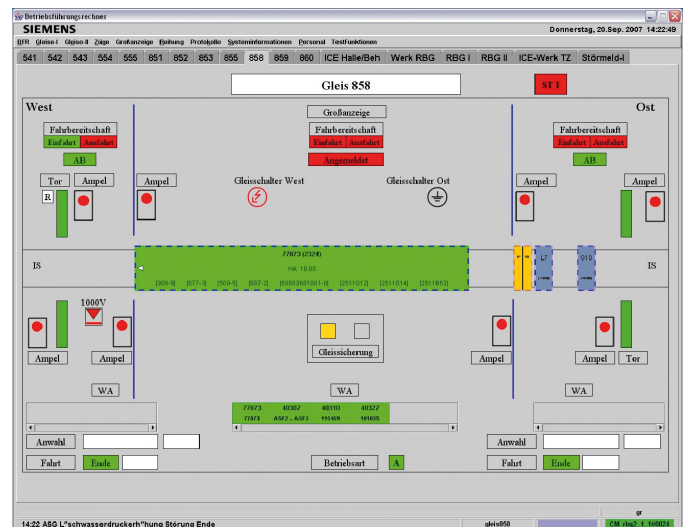
In the screen form, the operations coordinator can enter operator commands by mouse-clicking menu buttons. In the shed itself, the scheduled trains, together with their entry and exit times including the allocated work, are shown on large-sized displays next to the shed tracks.

Acquisition of operating data and communications

Via the operating data acquisition function, staff log-ons are integrated into the safety chain for shed entries and exits. At all times, there is an up-to-date overview of all staff who are logged on for work on the trains and the track.

All log-ons and log-offs and all messages received from the automation systems and connected third-party systems are archived and can be used for subsequent, more detailed evaluation. This is the basis for the formation of KPIs (key performance indicators) and the export of quality data which, in overlaid systems, are important for optimization of the overall process.

Communication between the persons involved in the process (signalmen in the interlocking, operations coordinators, etc.) is tool-based and is verifiably documented. In particular, this involves train handovers, "train ready" messages and route calls.



Shed tracks with visualization and operator control

Angemeldete Mitarbeiter im Werk

Anmeldezeit	Karten Nr.	Mitarbeiter	Einsatzgebiet	Arbeitsgruppe	Funkger. Nr.	Gleis / Segment
20 Sep 2007, 15:10:33	0223	Herr Müller 1	RBG2	-	-	542
20 Sep 2007, 15:52:41	0522	Herr Müller 2	DB Services	-	0162-4309626	536 / Ost
20 Sep 2007, 16:23:39	0543	Herr Müller 3	Catering	-	-	536 / Ost
20 Sep 2007, 16:36:35	0617	Herr Müller 4	DB Services	-	-	544
20 Sep 2007, 16:37:47	0332	Herr Müller 5	RBG2	-	-	544
20 Sep 2007, 16:44:18	0137	Herr Müller 6	RBG2	-	-	537 / West
20 Sep 2007, 16:47:01	0684	Herr Müller 7	DB Services	-	-	537 / West
20 Sep 2007, 16:51:43	0631	Herr Müller 8	DB Services	-	-	535 / Ost

Anforderungen von Rangierstraßen RBG1 und RBG2

Typ	Anforderung	Rücknahme	R-Nummer	Zug	Von	Nach	Über 1	Über 2	Über 3	Erledigt
ANFORDERUNG	14:18:23		40350	40360	541	541	503	527	582	
ANFORDERUNG	14:16:39		40329	846	554	536 W...			519	
ANFORDERUNG	14:06:54		40313	77936	862	538 W...				
ANFORDERUNG	13:54:17		40303	40303	824	859 W...	861			

Typ	Anforderung	Rücknahme	R-Nummer	Zug	Von	Nach	Über 1	Über 2	Über 3	Erledigt
ANFORDERUNG	13:51:16		40336	40336	824	833				
ANFORDERUNG	13:49:35		40303	40303	832	824 W...	801			
ANFORDERUNG	13:47:54		40329	546	513	537				
ANFORDERUNG	13:44:47		40319	40319	513	536				
ANFORDERUNG	13:30:21		40329	879	555	516				
ANFORDERUNG	13:16:52		40319	977	538	515				
ANFORDERUNG	12:54:59		40320	40320	516	537				
ANFORDERUNG	12:54:13		40336	40336	519	542				
ANFORDERUNG	12:51:28		40319	77914	515	534				
ANFORDERUNG	12:44:10		40366	691	513	536				

Acquisition of operating data and communications

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