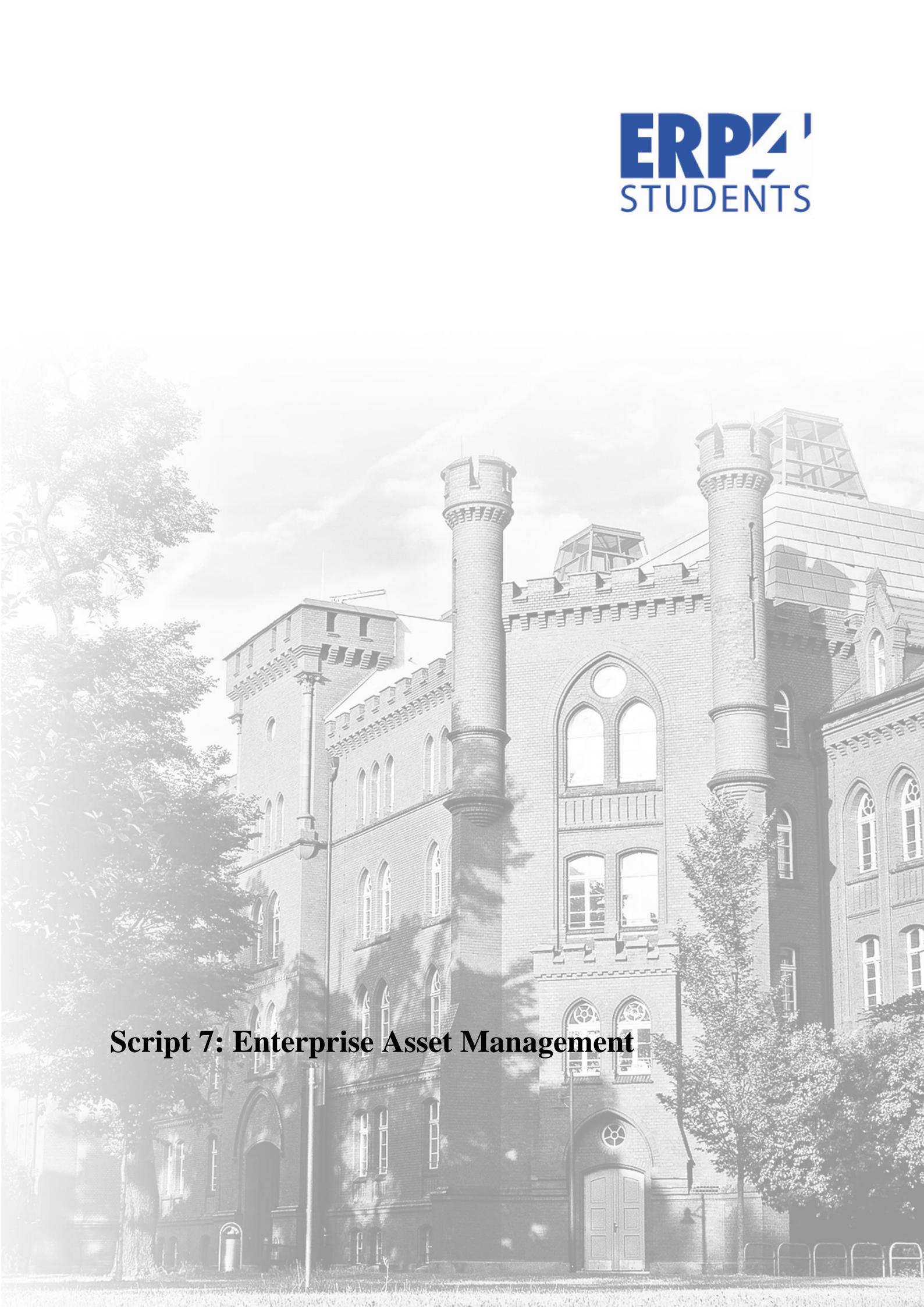


ERPZ'
STUDENTS



Script 7: Enterprise Asset Management

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1 Enterprise Asset Management

This teaching unit aims at giving you an understanding of Enterprise Asset Management (SAP EAM) in the SAP system, which is also referred to as Plant Maintenance (SAP PM). We will show how SAP has implemented the central functionalities that are required to accomplish maintenance processes.

First, the organizational units and master data (so called technical objects) that are relevant to SAP EAM are explained. Then we will focus on the maintenance process and explain how maintenance, repair and service processes are implemented in SAP EAM. Furthermore, important integration points with Asset Accounting in SAP FI as well as Internal Orders and Order Settlement in SAP CO are discussed.

Educational objectives in this unit:

After this teaching unit, you will be able to:

- List the organizational levels used in Enterprise Asset Management
- Define the various organizational units in a plant and cross-plant maintenance
- Define maintenance work centers and their role and functions in Enterprise Asset Management
- Define functional locations
- Identify functional locations by using the structure indicator
- Define equipment
- Identify the application of bills of material in Enterprise Asset Management
- Identify integration aspects of SAP EAM with SAP FI and SAP CO
- Identify and perform the phases of the maintenance process

Scenario for the Case Study

In the practical application section of this unit, you will first focus on the master data (technical objects) in plant maintenance (SAP PM/EAM – Plant Maintenance/Enterprise Asset Management). Subsequently, you will carry out an entire maintenance process from the maintenance request to the conclusion of the maintenance order. You will create a standard report and a standard analysis in the reporting and analysis tools section.

The following figure visualizes the entire process that you will carry out independently on the SAP system. You will mainly focus on the functional areas of SAP EAM, which is a sub-area of the SAP module SAP Logistics (SAP LO). Integration aspects with Controlling refer to cost accounting, cost analyses and order cost settlements.

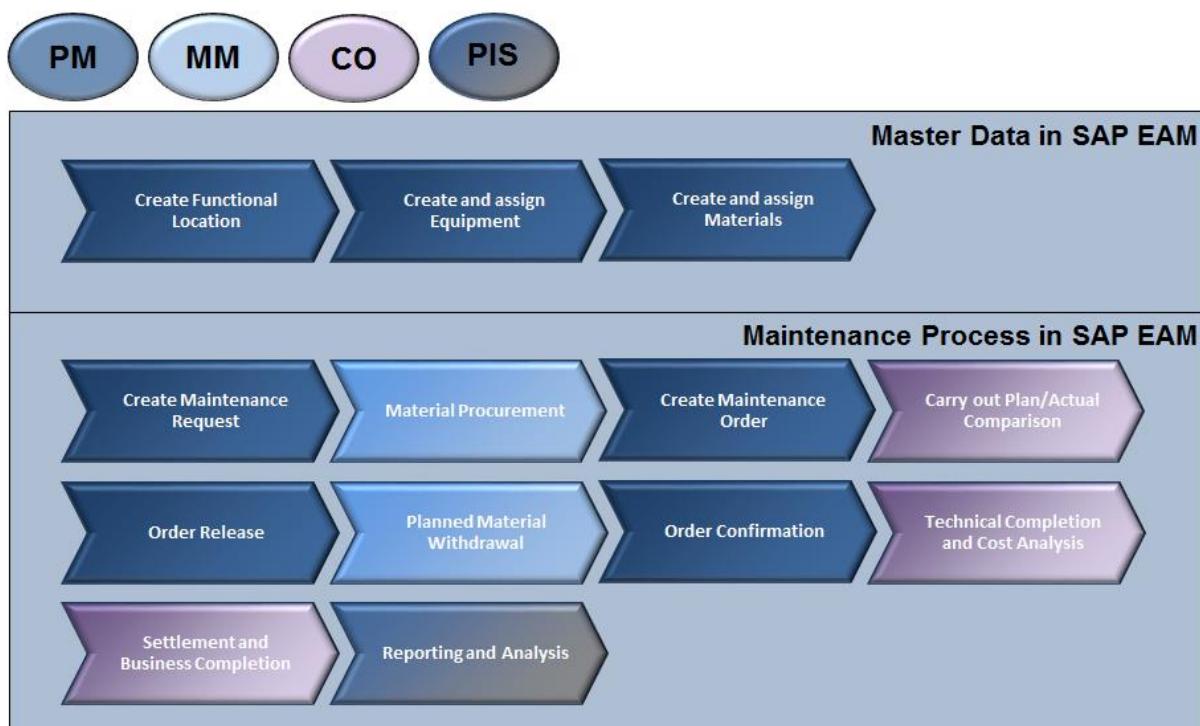


Figure 1: Process Overview: Enterprise Asset Management

2 Basics of Enterprise Asset Management

This section explains the organizational levels of the SAP system that are relevant for Enterprise Asset Management (SAP EAM). SAP EAM is sometimes also referred to as Plant Maintenance (SAP PM). Furthermore, master data of the EAM application are introduced.

2.1 Theory: Organizational Levels of Enterprise Asset Management


THEORY

Organizational levels represent the legal and organizational views of a company and form a framework that supports the activities of a business in the manner desired by management. Furthermore, they permit the accurate and organized collection of business information and support the development and presentation of relevant information in order to enable and support business decisions. This section gives you an overview of the organizational model of SAP EAM. There are several organizational levels that are relevant for SAP EAM but primarily belong to other SAP application. Those organizational levels are explained first. Thereafter, the organizational levels that primarily belong to the Enterprise Asset Management application are described.

2.1.1 Enterprise Asset Management: General Organizational Levels

The following organizational levels are relevant for the SAP application SAP EAM but primarily belong to other applications. You already became acquainted with the following organizational levels:

Client

A **client** is the highest-level organizational unit in an SAP system and constitutes an independent environment with its own set of tables and data, which are separate from other clients. Each SAP system can host multiple clients.

Each client represents the enterprise, company or business, depending on the size. Thus, a client is an organizationally, data model-wise, and legally closed unit. In SAP, clients are identified through their three-digit client number. The GBI Company is mapped in one client of an SAP system.

Company Code

Company structure determines whether a self-contained set of accounts for external reporting purposes is required for a business unit, or not. Therefore, SAP features the **Company Code** as an organizational level. It is the smallest organizational unit for which a self-contained set of books (balance sheet and profit and loss statement) is possible according to commercial law. A complete profit and loss statement can be issued.

The company code is the central organizational element of **Financial Accounting** and, thus, is relevant to almost any process in SAP system, since most processes influence the accounting of the company. Accordingly, at least one company code must be defined in the production environment for a business.

If a business organization consists of more than one company (i.e., a group), company codes can be used to represent the particular companies of the group from an accounting point of view.

Company codes are, generally, defined based on geographic considerations and do usually not cross-national boundaries, since company codes are created with reference to tax law, commercial law, or other FI criteria that are country-specific properties. A company code key is a four-character alphanumeric field.

The GBI has two company codes – one for the US headquarters (US00) and one for the German subsidiary (DE00). It is necessary to separate the two company parts from the point of view of Financial Accounting since each country has its own laws regarding financial statements and taxes.

2.1.2 Enterprise Asset Management: Organizational Levels of SAP EAM

The organizational configuration in Enterprise Asset Management mainly involves plants, which are the central organizational units of Logistics (SAP LO). To be able to use plants for EAM functions – such as maintenance planning and execution activities – they must be defined as so called maintenance planning plants.

Maintenance (Planning) Plant

A plant usually represents a production unit of a company. In SAP EAM specific master data is used – so called technical objects – that represent operational systems of the company and that are implemented and managed on plant level. Plants at which these operational systems are installed are called a **maintenance plant**.

If, in addition to the installed technical objects, maintenance tasks are *planned* and *prepared* in a maintenance plant, then the maintenance plant is simultaneously a **maintenance planning plant** (in short: planning plant). Maintenance planning plants are regular plants from the point of view of other Logistics business processes. By indicating those as maintenance planning plants in the system's customizing they can be used for planning and coordinating maintenance tasks.

A maintenance plant can be divided in **locations**, which structure the plant according to location-based criteria such as building, sites, or coordinates. A maintenance plant can be structured into individual plant sections according to the responsibilities for production. The employee in charge for a particular plant section is the contact person responsible for production and maintenance (e.g., plant engineer).

The employees in charge of planning within a maintenance planning plant are defined using **maintenance planner groups**.

Maintenance Work Centers

A maintenance work center is a regular work center – as you already know it from the Design-to-Operate business process – which is deployed in a maintenance plant. It is considered rather as master data than an organizational unit. Work centers manage the units of work capacity within plant maintenance and can be, for instance, a machine, a group of machines, a person, or a group of people. In SAP EAM, work centers are also referred to as workshops.

In SAP EAM, you use work centers as one of the following:

1. main work center in the master record of equipment or of a *functional location*
2. main work center in a maintenance item
3. main work center in the task list header
4. performing work center in the operations of a task list
5. main work center in the order header
6. performing work center in the operations of an order

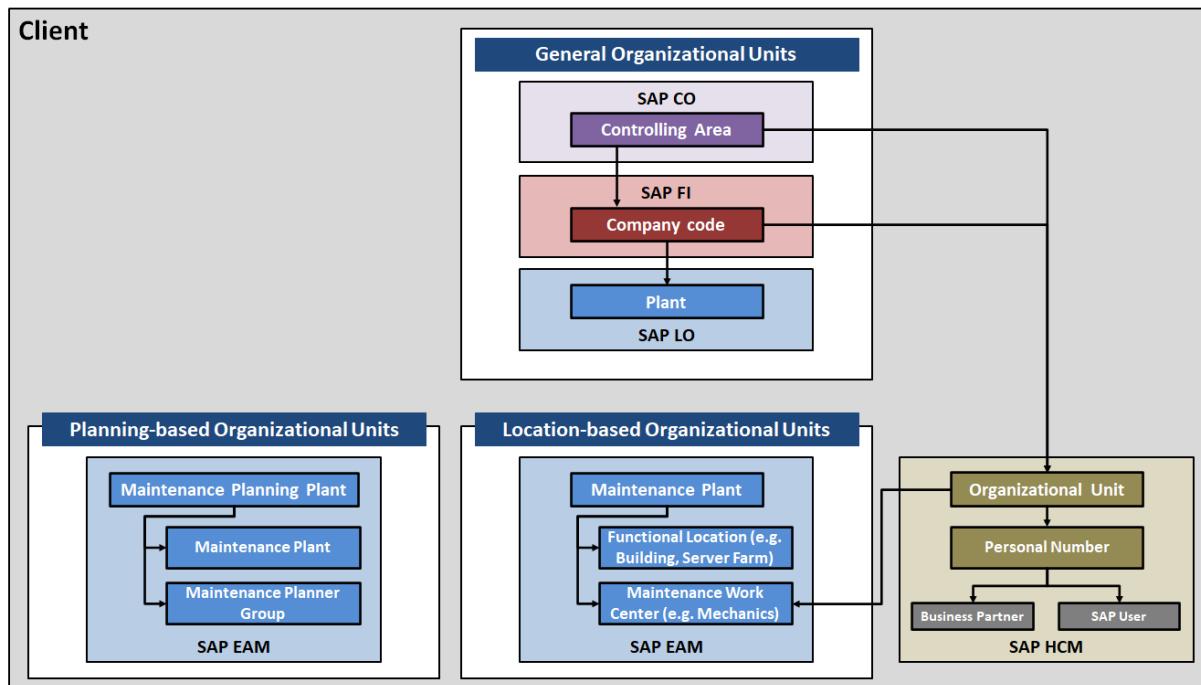


Figure 2: Organizational Levels in Enterprise Asset Management

Maintenance Planning and Cross-Plant Maintenance

Requirements for maintenance of technical objects can arise either from the maintenance planning plant or from another maintenance plant, which is assigned to the planning plant. These maintenance tasks refer to work that needs to be performed on technical objects in the maintenance planning plant or in other (maintenance) plants. Other maintenance plants that are not indicated as planning plants and, accordingly, do not plan the maintenance tasks for their technical objects, must be assigned to a maintenance planning plant that is then responsible for the maintenance work performed. The planning plant is the organizational unit responsible for creating the corresponding maintenance order as well as for coordinating the maintenance activities. The planning plant can also pass the execution of the maintenance activities to the assigned maintenance plants.

Consequently, the following scenarios are possible for planning and executing maintenance work:

1. **Plant-specific Maintenance:** In *plant-specific maintenance*, the planning plant equals the maintenance plant. In general, the maintenance requirements are planned in the same plant where they occur. Correspondingly, maintenance orders are carried out by

workshops of the same plant and spare parts are stored in the same plant (e.g., plant DL00).

2. **Cross-plant Planning:** In *cross-plant planning*, several maintenance plants are assigned to a maintenance planning plant. For instance, a maintenance requirement – such as repair of a technical system – occurs in a plant (e.g., plant SD00). Thus, plant SD00 is the maintenance plant. For all other functions (maintenance planning, order execution, spare parts storage), however, a different plant is responsible (e.g., maintenance planning plant DL00).
3. **Other scenarios:** Planning requirements of a plant (e.g., plant SD00) as well as procuring spare parts are carried out in a different plant (plant DL00). However, maintenance operations (tasks) are carried out by locally available workshops in the maintenance plant (SD00).

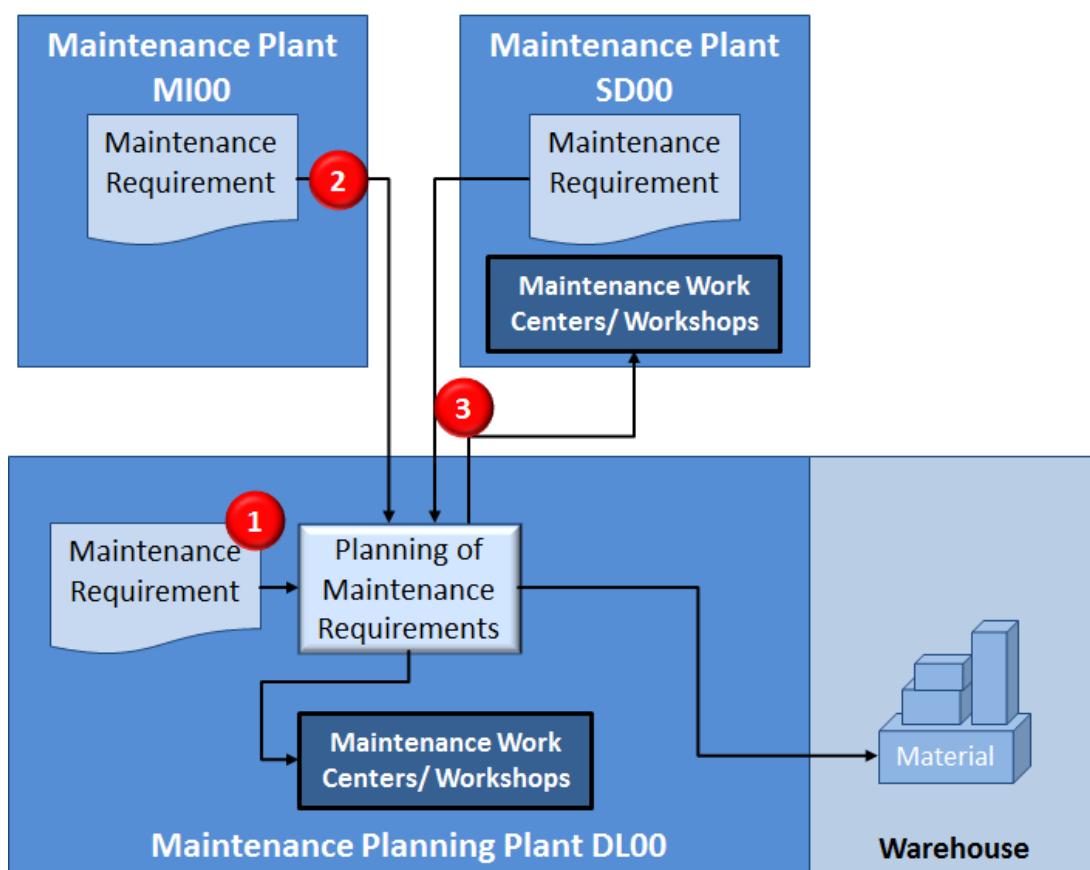


Figure 3: Cross-Plant Maintenance

2.2 Theory: Master Data of Enterprise Asset Management



THEORY

Generally, a company has several facilities that need maintenance, e.g., servers, factory machines, robots or buildings. These facilities are referred to as assets. We have already discussed assets from an accounting-based perspective in the SAP system. In the sub-ledger FI-AA asset values for acquiring and retiring assets as well as depreciations from the asset values are posted and reconciled with the General Ledger. Posting assets on account assignment objects in Controlling are also possible in the asset master data record.

In contrast to this accounting view on asset values, EAM looks at assets from a technical perspective. The main focus of EAM is to map the technical systems of a company in the SAP system in order to allow maintaining and managing these systems and their components and make sure they function appropriately. To properly structure the technical systems of a company, **technical objects** are used in the SAP system. Technical objects depict the master data of SAP EAM. Advantages of this structuring are the reduction of time required for managing the technical objects, the maintenance processing is simplified and faster evaluation of maintenance data is enabled.

2.2.1 Types of Technical Objects

Technical objects depict the master data of SAP EAM. Four different types of **technical objects** can be distinguished:

- **Functional Locations** are elements within a *technical structure* and represent areas of a system in which objects can be installed. These *technical structures* can be subdivided according to functional, process-oriented or spatial criteria.
- **Pieces of Equipment** are individual objects that are regarded as autonomous components or units within a functional location.
- **Serial Numbers** are assigned to materials to differentiate them from other items. They allow materials to be regarded as individual items. Inventory management can be carried out on basis of serial numbers.
- **Bills of Materials** can be used to structure *functional locations* and *pieces of equipment* in more detail by assigning components to them. Technical objects that contain further components can be referred to as assemblies.

Functional locations, pieces of equipment and serial numbers can be used as reference objects for service notifications, service orders, maintenance notifications and maintenance orders.

2.2.1.1 Functional Location

A **functional location** is an element of a (complex) technical system. It can represent a multi-level hierarchically ordered technical structure such as a piece of equipment, a building, an assembly line or parts of them. *Functional locations* can be structured according to spatial (e.g., building 1, building 2), technical (e.g., press, press rack, press hydraulics) or functional, i.e., process-oriented criteria (e.g., polymerization, condensation).

Functional locations are created to subdivide a technical system or a building into units relevant for plant maintenance. Thereby, a functional location very often takes on the function of the location (e.g., server room, server farm) where individual objects (e.g., servers, processors,

memory, etc.) can be installed. In the business processes of EAM, it is possible to view removal and installation of components of a functional location (e.g. a server processor) both from the point of view of the **functional location** where the component is installed and also from the point of view of the individual object that is installed or removed.

Functional location = multi-level, hierarchical structure, organized according to ...



Figure 4: Functional Locations

2.2.1.1 Creating Functional Locations

Since *functional locations* represent and structure *technical systems*, they should be defined in the SAP system when one of the following criteria is met:

- You want to represent the structure of the technical systems of the company according to functional criteria.
- You want to be able to run maintenance operations and tasks for particular areas of technical systems and you want to record and document all work that is performed for these objects.
- You want to be able to collect and store technical data for particular parts of technical systems and you want to be able to evaluate this data over a longer period of time
- You want to be able to monitor maintenance costs for parts of technical systems
- You want to be able analyze what effects the usage conditions have on the likelihood of damage to the installed equipment.

You define a functional location in transaction IL01 or Fiori App *Create Functional Location*. The master data record of a *functional location* consists of the following main views that are displayed in different tabs:

- **General:** Here, general information like the classification, object type, reference data, manufacturer, etc. is entered.
- **Location:** The physical address of the location along with the maintenance plant, where it is installed as well as additional information such as work center is entered here.
- **Organization:** This tab contains a series of interesting assignment possibilities for the 'technical' object *functional location* to other applications of the SAP system.

In the Account assignment section you assign the functional location to

- o Company code and business area for assignment in SAP FI
- o Asset master data record for assignment in FI-AA
- o Account assignment objects such as cost center, WBS-Element, Orders for cost object assignment in SAP CO

In the Responsibilities area you assign the maintenance planning plant, the planner group and the maintenance work center that are responsible for this location.

- **Structure:** On this tab, the main information that is entered is the structure indicator (see next chapter), higher-level *functional locations* as well an indicator that determines if equipment can be installed in this functional location.

The screenshot shows the SAP Fiori interface for managing functional locations. The top navigation bar includes icons for user, back, home, and SAP logo, followed by the title "Change Functional Location: Mas...". Below the title are tabs for "Object info...", "Address", "Partners", "Superior locations", "Structure list", and "Classification". The "Organization" tab is selected. The main content area displays functional location details: Functional loc.: DL00-S-PACK9999, Cat.: M Technical system - standard; Description: Packing Plant 9999; Status: CRTE. Below these are sections for "General", "Location", "Organization", and "Structure". The "Organization" section contains "Account assignment" and "Responsibilities" tabs. The "Account assignment" tab is active, showing fields for Company Code (US00, Global Bike Inc.), Business Area (BI00, Bikes), Asset (highlighted with a red box), Cost Center (NAPM1000, NA00), WBS Element, StandgOrder, and SettlementOrder. Arrows from three callout boxes point to the Asset, Cost Center, and SettlementOrder fields. The callout boxes are: "Organizational Assignment in SAP FI" (for Asset), "Assignment to an Asset Master Data Record in FI-AA" (for Cost Center), and "Account Assignment Objects in CO" (for SettlementOrder). The "Responsibilities" tab shows fields for Planning Plant (DL00, Plant Dallas), Planner Group (P00, Dallas Group), Main WorkCtr (MANT1000, / DL00), and Catalog Profile. An arrow from a callout box points to the Main WorkCtr field. The callout box is "Organizational Assignment/Responsibility in SAP EAM".

Figure 5: Master Data Record of a Functional Location (1): SAP-System-Screenshot

Additional data or links in the equipment master record can be activated by using tabs or called up by using push buttons.

Further information that the master data of a functional location can contain, includes, for instance, business partners and their addresses, links to assigned documents, technical drawings and multi-lingual texts as well as measuring points and counters that represent a physical device that measures a particular parameter for the object.

2.2.1.1.2 Structure Indicator

On the *Structure* tab of the master data of a functional location, you enter a **Structure Indicator**. The identification for functional locations is created using this structure indicator.

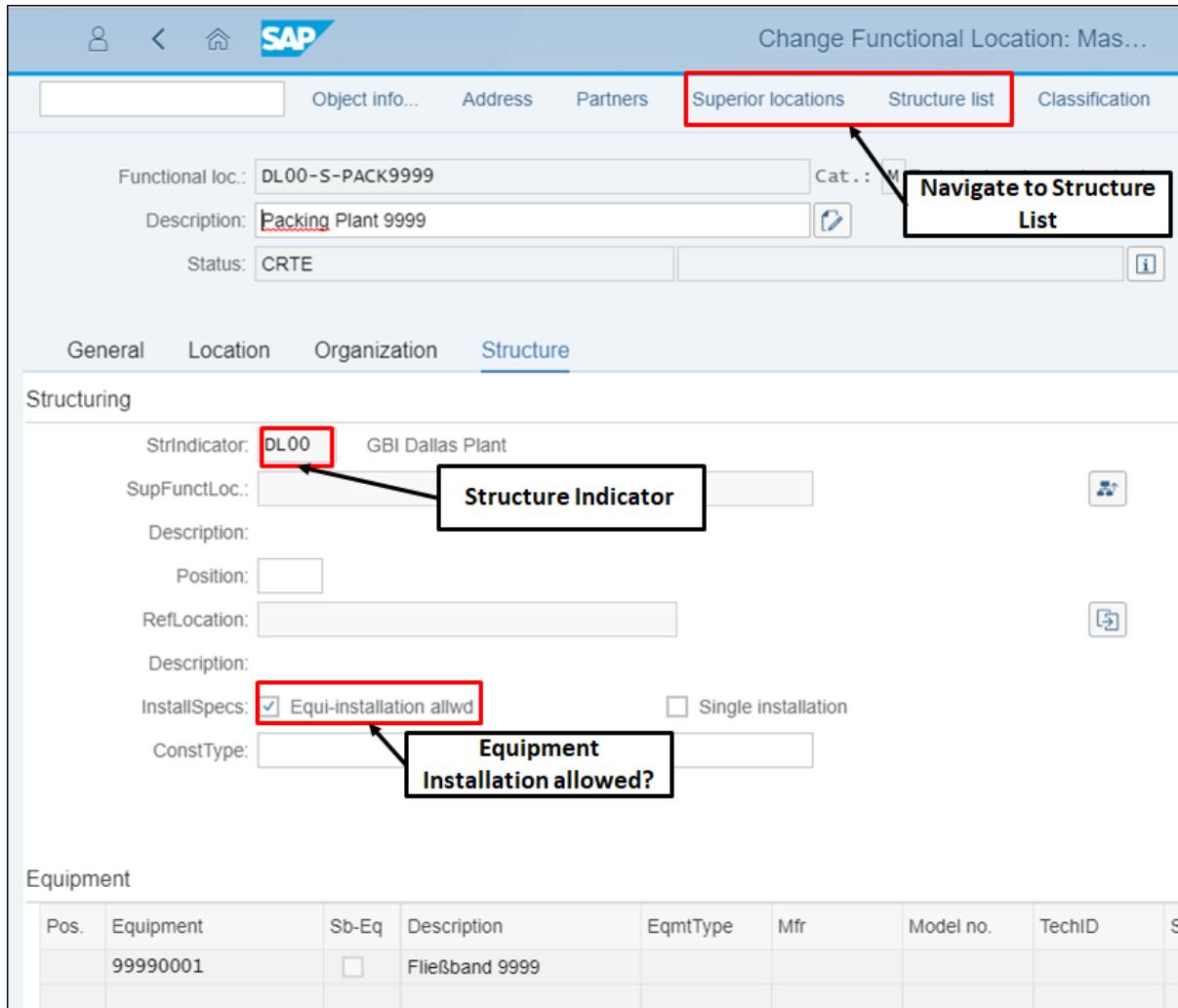


Figure 6: Master Data Record of a Functional Location (1): SAP-System-Screenshot

The structure indicator not only allows to uniquely identifying a *functional location* but also already comprises information about the hierarchical structure of all components on each hierarchy level. The structure indicator, therefore, consists of two entry fields that are set in the system's Customizing: **coding template** and **hierarchy levels**:

- The coding template determines which types of characters can be used for identification (letters and/or numbers) and how these characters can be combined or split. The identification of a *functional location* can contain up to 40 characters, which is the maximum length of the coding template.
- The hierarchy levels determine which levels ends at which character and how many levels the structure may contain.

The following figure illustrates the buildup of a structure indicator.

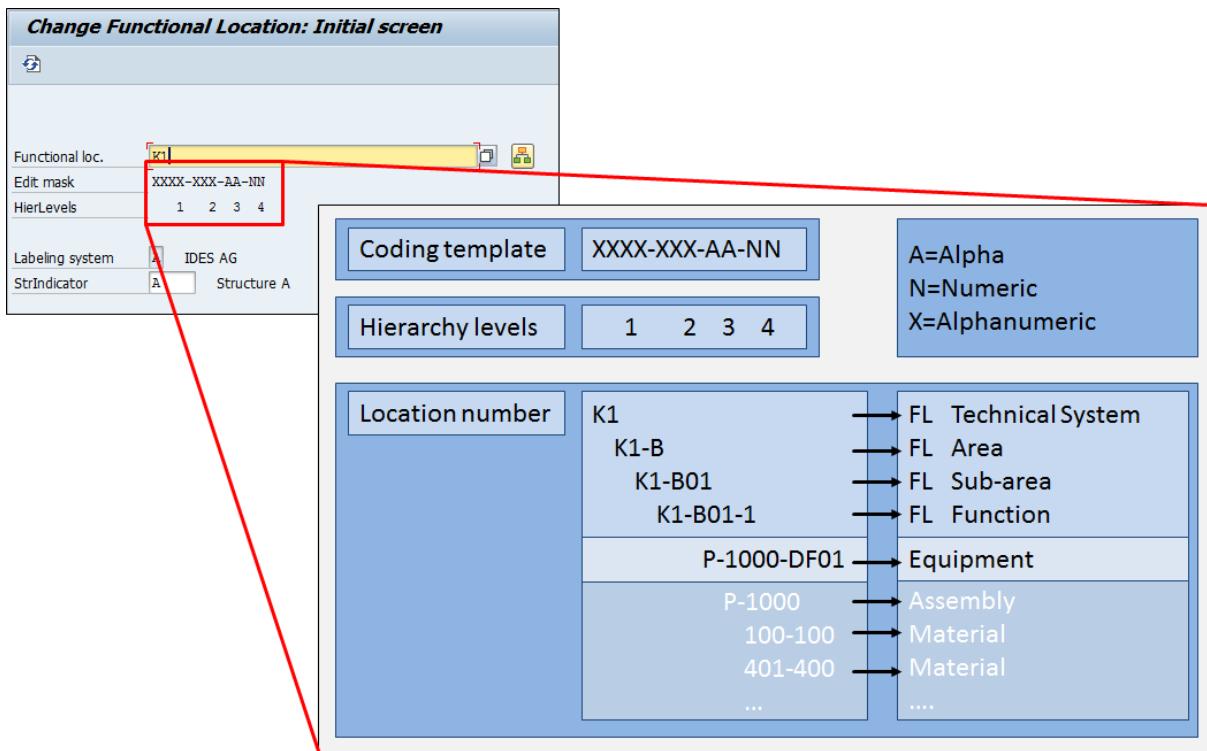


Figure 7: Structure Indicator: SAP-System-Screenshot

The following figure displays the complex hierarchical structure of a functional location that maps the technical structure of a “Clarification Plant” – including all its components – in SAP EAM. From this screenshot you can also see the buildup of the structure indicator:

- The top level is the **functional location** K1 (Clarification Plant). K1 is the structure indicator for this functional location.
- K1 consists of multiple other functional locations, such as K1-ZPW, K1-M, K1-B, etc. You can see that this second hierarchy level has a Structure indicator of the type K1-XXX. There are further levels of functional locations that are contained in the higher-level functional locations, e.g. K1-B01, K1-B01-1, etc.
- Some functional locations have **Equipment** installed. For instance, the functional location K1-B01-1 has several equipment installed, e.g., P-1000-DF01, P-1000-DF02, P-1000-DF03, etc. Note that equipment have their own ID, which is more like a material number.
- Equipment can consist of **assemblies** and other **materials**. An Assembly is a material that is composed of other materials and, thus, possesses a bill of materials.

This hierarchical structuring of a technical system facilitates maintenance of the asset greatly. It allows monitoring the health of the system on different levels and to repair, replace, and remove items (materials, equipment) when required. The structure indicator can tell at what position a technical object is installed in the functional location by its structure indicator.

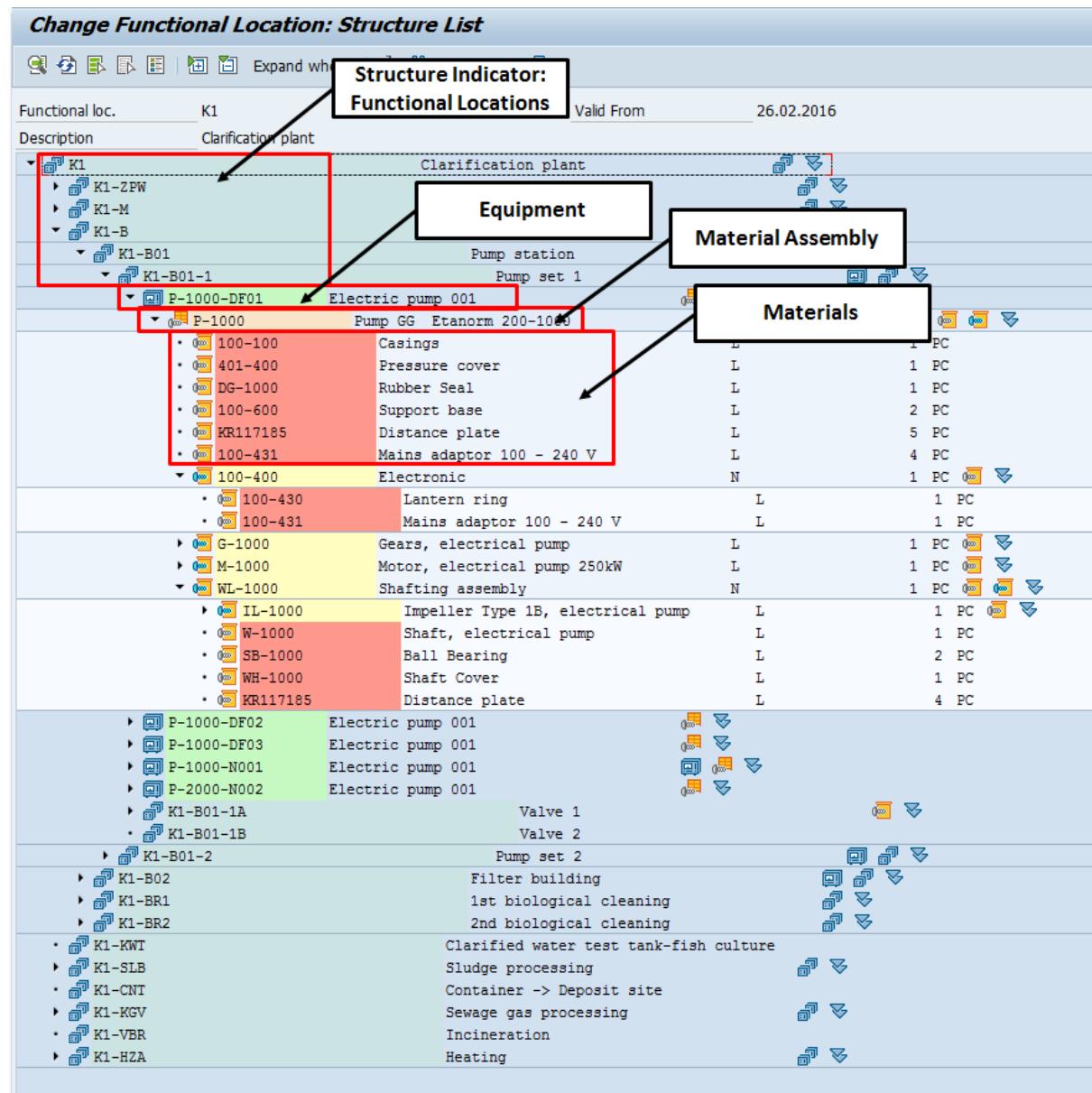


Figure 8: Example of Functional Location Structure in SAP EAM: SAP-System-Screenshot

2.2.1.2 Equipment

A piece of equipment is an individual physical object that is to be maintained as an autonomous unit. It usually represents an individual technical object (e.g., a pump, an engine, a vehicle, a server) for which maintenance operations are carried out and recorded. Examples for objects that are mapped as equipment in SAP EAM are:

- Means of production
- Means of transport
- Test equipment
- Production resources or tools
- Customer devices
- Building or property
- Systems or system parts
- Vehicles

Working with an Equipment

A piece of equipment can be installed and dismantled at **functional locations**. The installation times for a piece of equipment can be monitored from both the functional location view and the equipment view.

The following prerequisites must be fulfilled to install a piece of equipment at a functional location:

- The equipment category must permit an installation (Settings in Customizing).
- The option *Equipment Installation Allowed* must be activated in the master record for the functional location. You can further control this by using the option *Individual Installation*.

The installation location for a piece of equipment in a technical system is documented in the **usage list**, which is part of the **equipment history**. Equipment usage periods can also be displayed from the functional location view. Along with changes to the installation location, the usage list also documents changes to other fields of the master record (for example, cost center and asset). In Customizing, you can set which fields should be monitored in this way.

A piece of equipment can be linked with a **material**. If the equipment should be created using SAP MM, it can be created as material with a **serial number** to allow inventory management functions to be performed for it. When you dismantle a piece of equipment that is linked to a material, the system can automatically place it in storage. In the same way, when a piece of equipment is installed, the system automatically releases it from store inventory.

Creating an Equipment

Since *equipment* represents an individual *technical object* for which maintenance tasks can be performed, they should be defined in the SAP system when one of the following criteria is met:

- You want to be able to manage individual data for the object
- You want to be able to breakdown, planned, scheduled or preventive maintenance tasks for the object and you want to record every task
- You want to be able to collect and analyze technical data for the object over a longer period of time
- You want to be able to monitor the costs of maintenance task for the object
- You want to be able to record usage times at *functional locations* for the object

You define a piece of equipment in transaction IE01 or Fiori App *Create Equipment*. The master data record of a piece of equipment consists of the following main views that are displayed in different tabs. They are pretty similar to the master data of functional locations:

- **General:** Here, general information like the classification, object type, reference data, manufacturer, etc. is entered.
- **Location:** The physical address of the location where the equipment is installed along with the maintenance plant, where it is installed as well as additional information such as work center is entered here.
- **Organization:** This tab contains a series of interesting assignment possibilities for the ‘technical’ object *equipment* to other applications of the SAP system.

In the Account assignment section you assign the functional location to

- Company code and business area for assignment in SAP FI
- Asset master data record for assignment in FI-AA
- Account assignment objects such as cost center, WBS-Element, Orders for cost object assignment in SAP CO

In the Responsibilities area you assign the maintenance planning plant, the planner group and the maintenance work center that are responsible for this equipment.

- **Structure:** On this tab, the main information that is entered is the *functional location* or superordinate equipment in which the equipment is installed.

Additional data or links in the equipment master record can be activated by using tabs or called up by using push buttons.

Further information that the master data of a piece of equipment can contain, includes, for instance, business partners and their addresses, links to assigned documents, technical drawings and multi-lingual texts as well as measuring points and counters that represent a physical device that measures a particular parameter for the object.

Using time-based data, equipment can be monitored dynamically. This means that changes to the equipment can be tracked over a specific period of time. If the system is configured accordingly, a new time segment is created whenever a change is made to the master record. The time segment describes the equipment usage.

The screenshot shows the SAP Change Equipment: Organization screen. The 'Organization' tab is selected. The 'Account assignment' section is highlighted with a red box. Arrows point from this section to three callout boxes: 'Organizational Assignment in SAP FI', 'Assignment to an Asset Master Data Record in FI-AA', and 'Account Assignment Objects in CO'. Another red box highlights the 'Responsibilities' section, which is linked to a callout box: 'Organizational Assignment/Responsibility in SAP EAM'.

Equipment:	99990001	Category:	G Equipment/Assets																												
Description:	Conveyor 9999	<input type="button" value="Intern.note"/>																													
Status:	INST																														
Valid From:	01.01.2017	Valid To:	31.12.9999																												
<input type="button" value="General"/> <input type="button" value="Location"/> <input type="button" value="Organization"/> <input type="button" value="Structure"/>																															
Account assignment <table border="1"> <tr> <td>Company Code:</td> <td>us00</td> <td>Global Bike Inc.</td> <td></td> </tr> <tr> <td>Business Area:</td> <td>BI00</td> <td>Bikes</td> <td></td> </tr> <tr> <td>Asset:</td> <td>/</td> <td></td> <td></td> </tr> <tr> <td>Cost Center:</td> <td>NAPM1000</td> <td>/</td> <td>NA00</td> </tr> <tr> <td>WBS Element:</td> <td colspan="3"></td> </tr> <tr> <td>StandgOrder:</td> <td colspan="3"></td> </tr> <tr> <td>SettlementOrder:</td> <td colspan="3"></td> </tr> </table>				Company Code:	us00	Global Bike Inc.		Business Area:	BI00	Bikes		Asset:	/			Cost Center:	NAPM1000	/	NA00	WBS Element:				StandgOrder:				SettlementOrder:			
Company Code:	us00	Global Bike Inc.																													
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Asset:	/																														
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StandgOrder:																															
SettlementOrder:																															
Responsibilities <table border="1"> <tr> <td>Planning Plant:</td> <td>DL00</td> <td>Plant Dallas</td> <td></td> </tr> <tr> <td>Planner Group:</td> <td>P00</td> <td>Dallas Group</td> <td></td> </tr> <tr> <td>Main WorkCtr:</td> <td>MANT1000</td> <td>/</td> <td>DL00</td> </tr> <tr> <td>Catalog Profile:</td> <td colspan="3"></td> </tr> </table>				Planning Plant:	DL00	Plant Dallas		Planner Group:	P00	Dallas Group		Main WorkCtr:	MANT1000	/	DL00	Catalog Profile:															
Planning Plant:	DL00	Plant Dallas																													
Planner Group:	P00	Dallas Group																													
Main WorkCtr:	MANT1000	/	DL00																												
Catalog Profile:																															

Figure 9: Equipment Master Record: SAP-System-Screenshot

2.2.1.3 Serial Numbers

A material master record contains all data that is required for defining and managing a material. It can be used to describe a particular asset or device category. However, it does not allow for the determination of individual items of this specific material. Therefore, serial number management is used in the SAP system. Serial numbers allow tracking individual items for a given material number.

2.2.1.3.1 Material and Serial Numbers

Serial numbers are identification keys assigned to individual material items. The material number (e.g., Speedstar) only identifies the material but not each Speedstar produced. For this matter you can use serial numbers. In Inventory Management, serial numbers are used to differentiate single items in a storage location. That is, you can differentiate between 2 different Speedstars produced when processing inventory counts, for instance.

To be able to uniquely identify a material piece of equipment in terms of Inventory management, a **Serial Number Profile** must be entered in the material master either in the view **Sales: General/Plant Data** or **General Plant Data/Storage 2**. This profile defines the business operations for which serial numbers are mandatory. If assignment is performed in the view **Sales: General/Plant Data**, the profile is displayed automatically in the view **General Plant Data/Storage 2** (and vice versa).

The combination of material and serial number is unique on the client level.

The screenshot shows the SAP MM01 (Material Master Record) screen. The top navigation bar includes tabs for 'Basic data 1', 'Basic data 2', 'Sales: sales org. 1', 'Sales: sales org. 2' (which is highlighted with a red box), and 'Sales: General/Plant'. The main area is divided into several sections: 'General data', 'Shipping data (times in days)', 'Packaging material data', and 'General plant parameters'. In the 'General plant parameters' section, the 'SerialNoProfile:' field is highlighted with a red box and contains the value '0001'. Other fields in this section include 'Profit Center:', 'DistProf:', 'Neg.stocks:', 'SerializLevel:', 'IUID-Relevant:', 'Ext. Allocation:', and 'IUID Type:'.

Figure 10: Assigning Serial Number Profile: SAP-System-Screenshot

Example:

You manufacture bicycles of two different types: Speedstar and Speedstarlett. A material master record exists in the company's system for each type. For quality control reasons, the company wants to know for each bicycle delivery which customer has received which type of bicycle and which serial numbers of the bicycle type were delivered to the customer.

For this purpose, each bicycle that is produced is assigned a serial number that, together with the material number, uniquely defines it.

As you can see from the example, you can assign several serial numbers to one material number. For instance, the serial numbers from 99-01-01 to 04 are assigned to the Speedstar. Furthermore, the same serial number can appear several times for different material numbers. In the example, 99-01-01 is assigned to Speedstar and Speedstarlett. However, both are unique in the system, since you could read it like "Speedstar-99-01-01" vs. "Speedstarlett-99-01-01". Consider that you cannot assign the same serial number to the same material multiple times. For instance, the assignment "Speedstar-99-01-01" and "Speedstar-99-01-01" is not possible.

The serial numbers used in the SAP system could be company own or you could use serial numbers of suppliers or customers. However, you can use the serial number field to track any individual material item. If a material does not have any serial number assigned, you can use a number of your choice as serial number. That is, you can enter a serial number of your choice in the serial number field.

Object	Material number	Serial number
Bicycle	Speedstar	99-01-01
Bicycle	Speedstar	99-01-02
Bicycle	Speedstar	99-01-03
Bicycle	Speedstar	99-01-04
Bicycle	Speedstarlett	99-01-01
Bicycle	Speedstarlett	99-01-02
Bicycle	Speedstarlett	99-01-03
Bicycle	Speedstarlett	99-01-04

2.2.1.3.2 Equipment and Serial Numbers

There are two options for linking the equipment, material, and serial number:

- You can assign the material and serial number to an existing equipment manually.
- During a posting, the system creates the equipment and serial number automatically.

If you assign a serial number to a piece of equipment, the equipment can be managed from the point of view of inventory management. This means that you can use the material serial number to manage the equipment that is part of the Plant Maintenance (PM) from the point of view of Material Management (MM). Managing equipment in this way is desirable if, for example, a very specific object, previously managed only as equipment in a functional location, is to be dismantled and transported to the warehouse.

The assignment of the serial number takes place in the serialization data of the equipment master record. If you enter a material in the equipment master record that already has a serial number profile for the serialization of a single piece of equipment, the system displays the last serial number assigned to this material (if a serial number has already been assigned). In this way, you can connect the new serial number directly to the last assigned serial number.

Transaction IE03: Equipment TEY-08

To make this clear: A serial number can also be assigned to equipment. In that case, this is done indirectly by using a material master record created for the equipment. Thereby, the serial number specifies the serial number of a serialized material. You can use the serial number to identify individual instances of a material for individual tracking purposes.

Since you create the equipment master record for the serial number (and not the other way around), it depends on the *serial number profile* whether only the *serial data view* is visible or all views of the equipment master record. You must enter the serial number profile in the material master record for materials that need serial numbers.

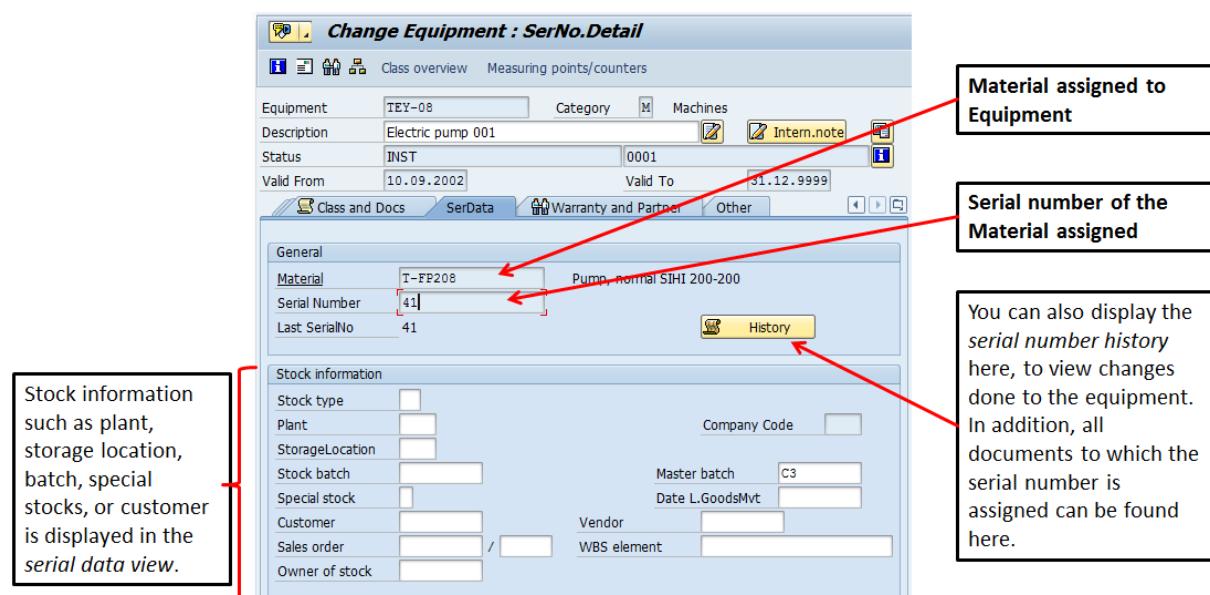


Figure 11: Equipment and Serial Number (1): SAP-System-Screenshot

Transaction IQ09: Material T-FP208

Unique combination of Serial number and Material assigned to Equipment

Material T-FP208 is assigned to multiple Equipment, each with a different Serial number

Material	Serial number	Plant	SLoc	Equipment	Description	SysStatus	Batch	PP	S
T-FP208	41			TEY-08	Electric pump 001	INST	C3	01	
T-FP208	40	1000	0001	10004654		ESTO	C3	01	
T-FP208	39	1000	0001	10004653		ESTO	C3	01	
T-FP208	38	1000	0001	10004652		ESTO	C3	01	
T-FP208	37	1000	0001	10004651		ESTO	C3	01	
T-FP208	36	1000	0001	10004650		ESTO	C3	01	
T-FP208	35	1000	0001	10004649		ESTO	C3	01	
T-FP208	34	1000	0001	10004648		ESTO	C3	01	
T-FP208	33	1000	0001	10004647		ESTO	C3	01	
T-FP208	32	1000	0001	10004646		ESTO	C3	01	
T-FP208	31	1000	0001	10004645		ESTO	C3	01	
T-FP208	30	1000	0001	10004644		ESTO	C2	01	
T-FP208	29	1000	0001	10004643		ESTO	C2	01	
T-FP208	28	1000	0001	10004642		ESTO	C2	01	
T-FP208	27	1000	0001	10004641		ESTO	C2	01	
T-FP208	26	1000	0001	10004640		ESTO	C2	01	

Figure 12: Equipment and Serial Number (2): SAP-System-Screenshot

You can manage the relationship between the material and equipment as follows:

- You can synchronize the equipment number and the serial number with each other.
- You can synchronize the material coupled with the equipment with the material in the **Construction Type** field of the equipment (Structure tab page).

The standard display of the **Serial Data** view in the equipment master record can be preset in the Customizing settings for the equipment category. If this view is not activated in Customizing, the tab page can be displayed afterwards.

2.2.1.4 BoMs in Plant Maintenance

You already know BoMs from the Material Management and Manufacturing Execution teaching unit. A maintenance bill of material (BoM) is a complete, formally structured list of the components making up a technical object (functional location, equipment) or an assembly. The list contains the object numbers of the individual components together with their quantity and unit of measure. The components can be stock or non-stock spares or assemblies, which in turn can be described by using maintenance BoMs.

There are three categories of maintenance BoMs in the SAP system: material BoM, equipment BoM, and functional location BoM

The categories of maintenance BOMs are as follows:

- Material BOM
- Equipment BOM
- BOM for functional location

The maintenance bill of materials contains, in contrast to a common BoM, only maintenance-relevant items. Moreover, the maintenance BoM has three important functions:

- **Structuring of the object:** The structure of an object from a maintenance point of view should be displayed as clearly as possible.

- **Spare parts planning in the order:** If a *technical object* features a BoM, the BoM can be used for planning spare parts during the execution of a planning or maintenance order.
- **Spare parts planning in the task list:** Spare parts can be planned in the task list according to the bill of materials.

Using maintenance BoMs allows you to describe the structure of a technical object, to specify exactly where maintenance tasks are performed and to assign spare parts to a technical object. Using maintenance BoMs presents the following advantages:

- **Materials planning** (when using maintenance task lists): The use of Maintenance BoMs is advantageous for material planning because you can perform material planning when creating a maintenance task list. The link between the task list and the maintenance BoM is created as follows:
 - o Using the technical object BoM for maintenance task lists for technical objects.
 - o Using the assembly in the header for general task lists.
 The link to maintenance BoM enables you to assign materials that have already been planned for the technical object or the assembly to the individual operations in the task list. You can use the structure list or the structure graphic to do this. As both display options provide a detailed overview of all the materials of the BoM, material planning is simplified considerably.
- **Materials/spares planning** (when using maintenance orders): Maintenance bills of material support you during materials or spares planning by providing you with an overview of all materials/spare parts that could be required in the maintenance order. This enables you to assign to the order all the materials you require and makes materials/spares planning considerably easier.
- **Locating malfunctions** (when using maintenance notifications): Maintenance bills of material support you when locating malfunctions by providing you with an overview of all components that make up a technical object. From this overview, you can easily select the object for which you want to create a malfunction report. This enables you to locate the malfunction in the technical object more precisely.

Example of a Material BoM

Material BoMs are used in maintenance if several similarly constructed objects are supposed to be maintained. Thus, you do not have to create an own BoM for each *technical object*. It is sufficient to create one single BoM, which is then assigned to the *technical objects*. Accordingly, you avoid redundancies in BoM usage.

A material BoM is a BoM for a particular material that is at first created independently of a *technical object*. To do this, complete the following steps:

- creation of material
- creation of material BoM for the material

The BoM can then be assigned to one or to several *technical objects* (equipment or *functional location*). The assignment(s) can be carried out via the **structure view** in the master record of the corresponding *technical object*. The number of the corresponding material is entered in the **construction type** field. The following figure illustrates this for the Equipment P-1000-DF01 and the Construction Type P-1000.

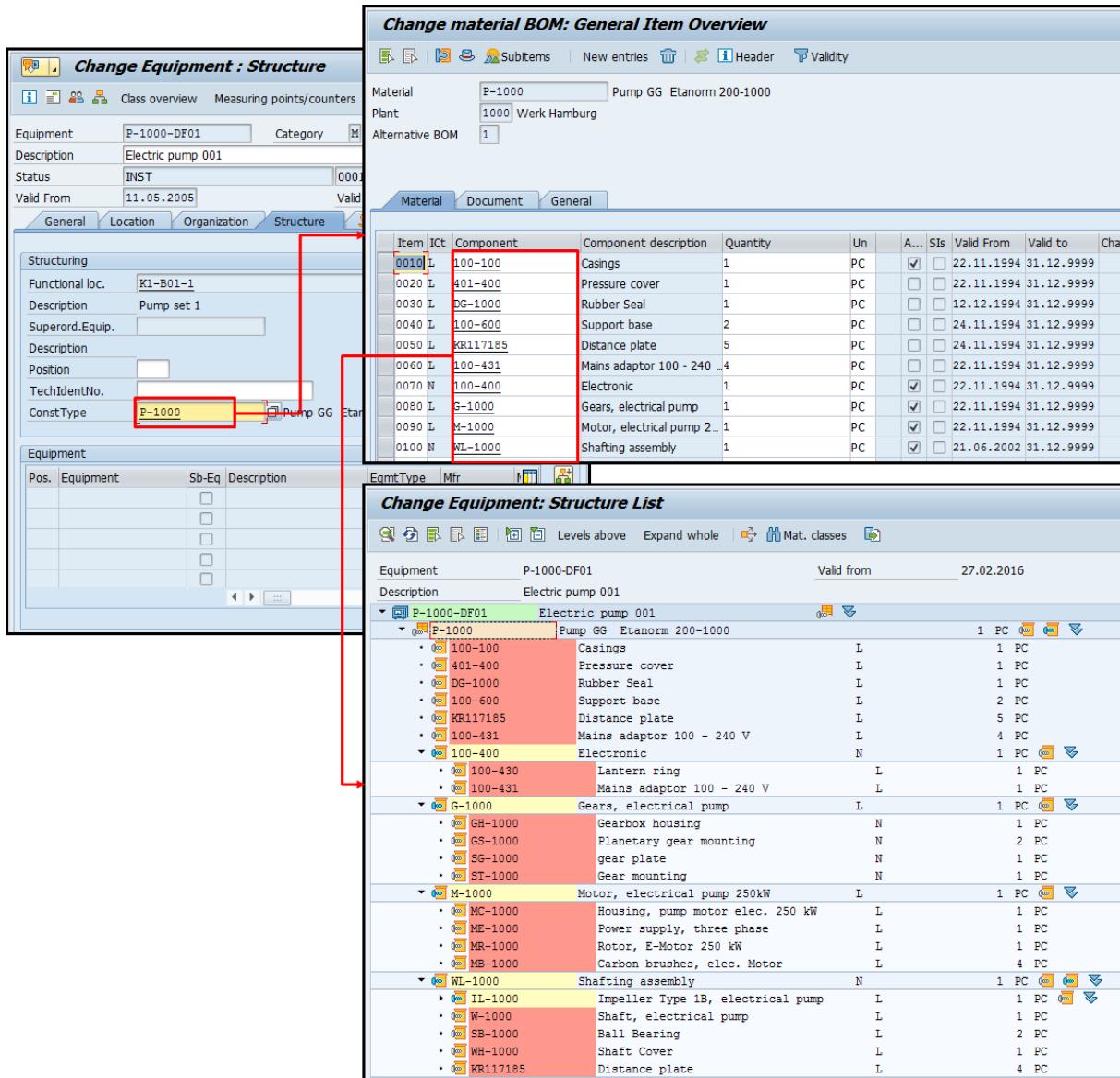


Figure 13: BOMs in EAM: SAP-System-Screenshot

2.2.2 Integrating of EAM with other SAP Applications

As already mentioned SAP EAM looks at fixed assets from a technical point of view. In the accounting applications of the SAP system – namely SAP CO and SAP FI – assets also play an important role. In this chapter we will briefly discuss the integration between SAP EAM technical objects and fixed assets in SAP FI as well as cost assignment objects in SAP CO.

2.2.2.1 Assets in SAP FI and SAP EAM

Several pieces of equipment (or functional locations) can be assigned to a fixed asset in SAP FI-AA. However, a piece of equipment (or functional location) can belong only to one asset. Up to SAP ERP release 4.6C the link between SAP EAM technical objects (primarily equipment) and fixed assets in the Financial Accounting application was established by entering the asset number from SAP FI-AA in the master data record of the particular equipment (or functional location). This feature is still available in the SAP system, as mentioned before and also highlighted in the following figure.

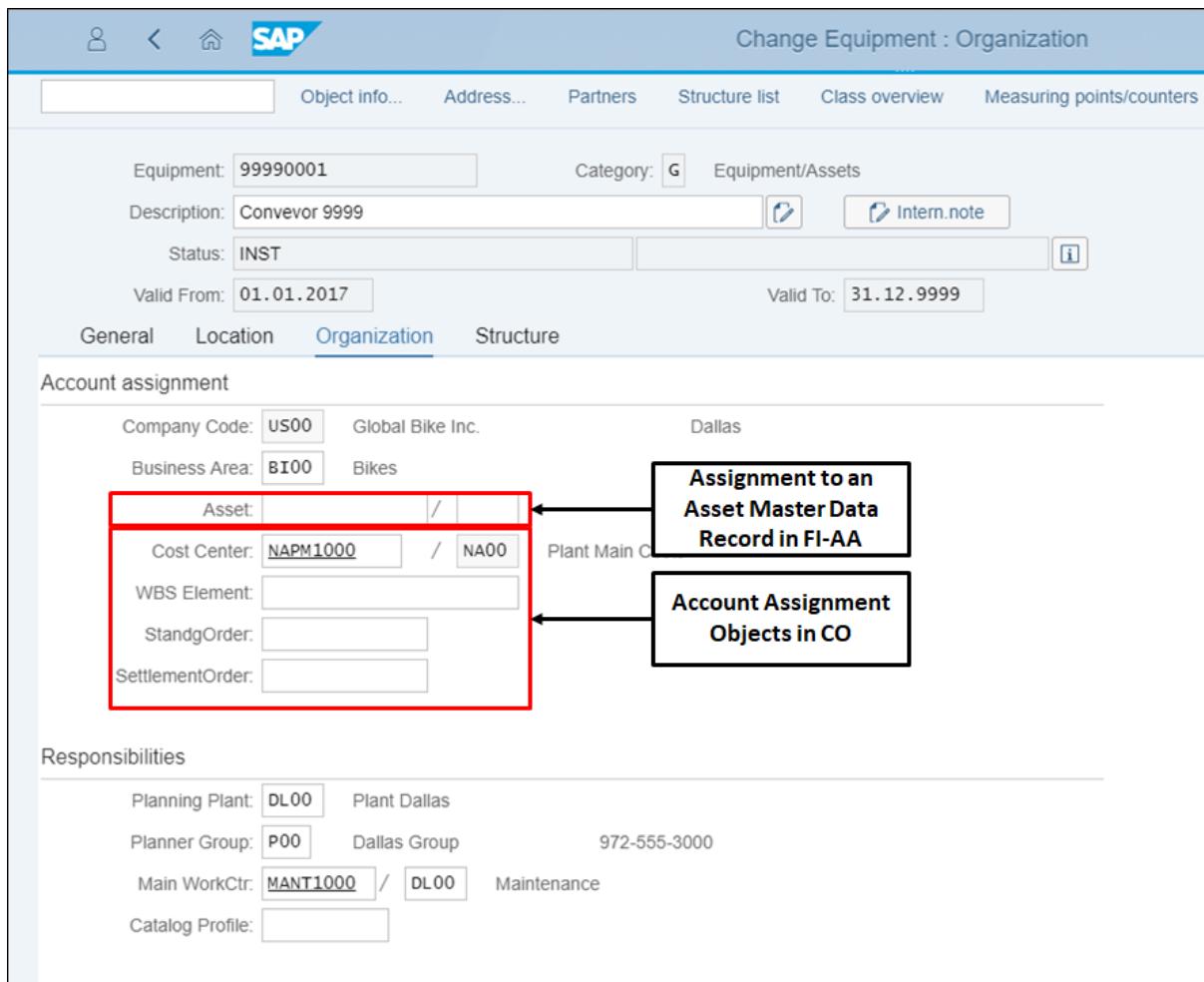


Figure 14: Assignment between Fixed Asset and Technical Object: SAP-System-Screenshot

As of SAP ERP release 4.6C, the integration between SAP FI-AA and plant maintenance (SAP PM) is ensured by the system. Therefore, the SAP system can be set up to automatically create or change a piece of equipment whenever a fixed asset is created or changed. If the system is set accordingly, the creation of a fixed asset, for instance, leads to a simultaneous creation of a piece of equipment in SAP EAM and transfers the values of particular master data fields, such as the company code and the inventory number into the equipment master data record. If the master data in the equipment or fixed asset is changed later on, the system automatically updates the corresponding fields in the equipment master data record or the other way around in the fixed asset.

It is also possible to set up workflow that informs particular persons in charge (e.g. responsible employee in SAP PM) when assets are created or changed.

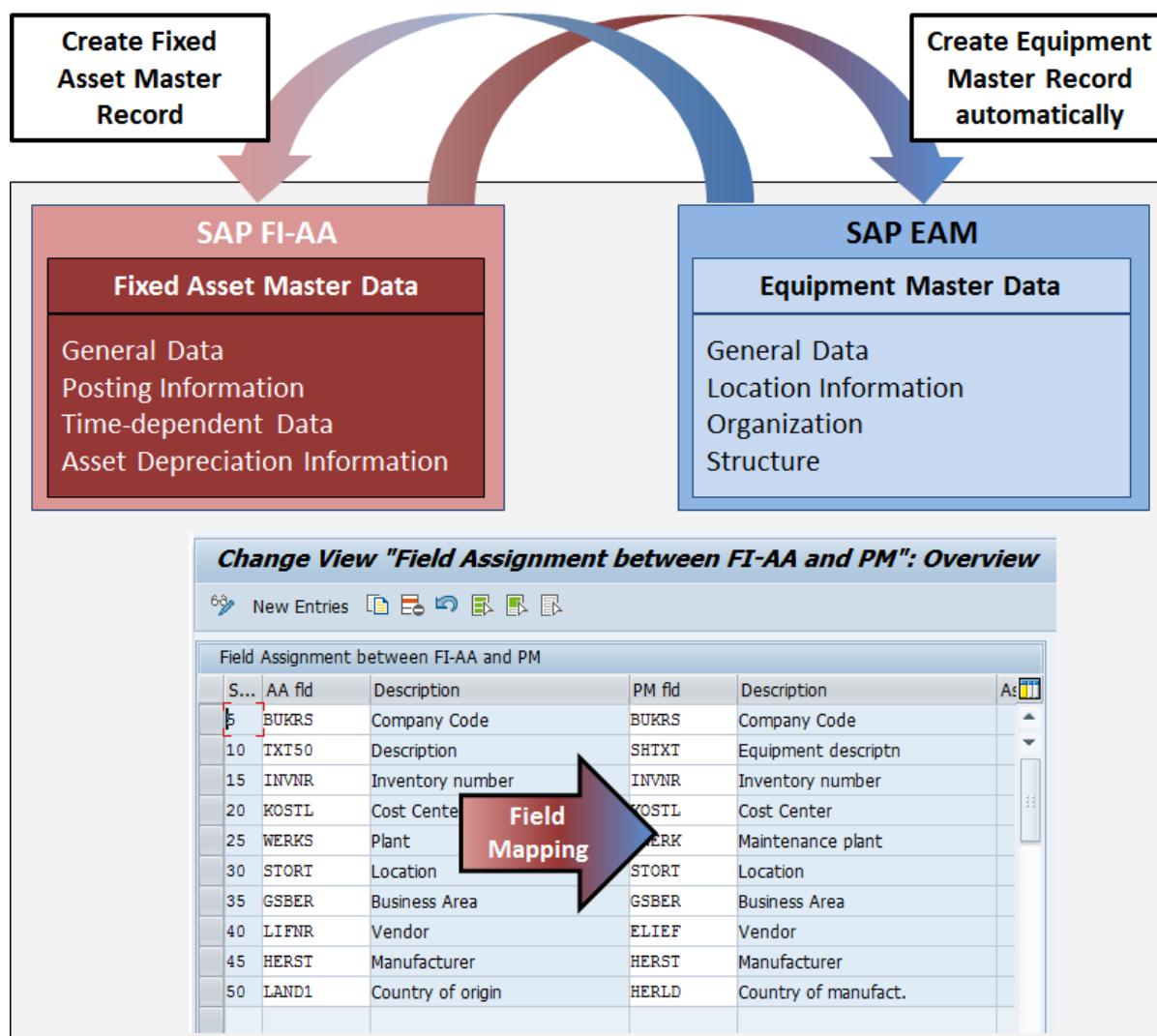


Figure 15: Integration of Asset and Equipment Master Records: SAP-System-Screenshot

2.2.2.2 Internal Orders, Fixed Assets, and Enterprise Asset Management

As mentioned afore, a piece of equipment (or functional location) can also be assigned to an account assignment object (cost center, internal order, etc.) in SAP CO. This can be done in the fixed asset master data record as well as in the master data record of the technical object.

Account Assignment to Internal Orders

Specifically, internal orders are often used as account assignment objects when fixed assets respectively technical objects (equipment or functional locations) are acquired and introduced to the SAP system. Thereby, the internal order serves as a temporary cost collector that receives all or a percentage of the planned and actual costs as well as commitments that refer to the assigned fixed asset. This includes:

- Purchasing or construction costs
- Installations, maintenance, and repair costs
- Depreciations
- Retirement

Settlement of Internal Orders and Assets

When the particular temporary activity that is represented by the internal order is accomplished, all costs that were collected on the internal order are settled and transferred to the fixed asset master data record during period-end activities (order settlement in transaction KO88). As a result of the settlement, the internal order is balanced and can be closed.

From the point of view of the fixed asset all relevant costs are received and represent the entire acquisition costs of the asset. In the Asset Explorer (FI-AA) all values of the fixed asset, including acquisition and production costs (APC) values and depreciation, are then displayed in various forms and summarization levels. The plan and the posted values are displayed and can be analyzed.

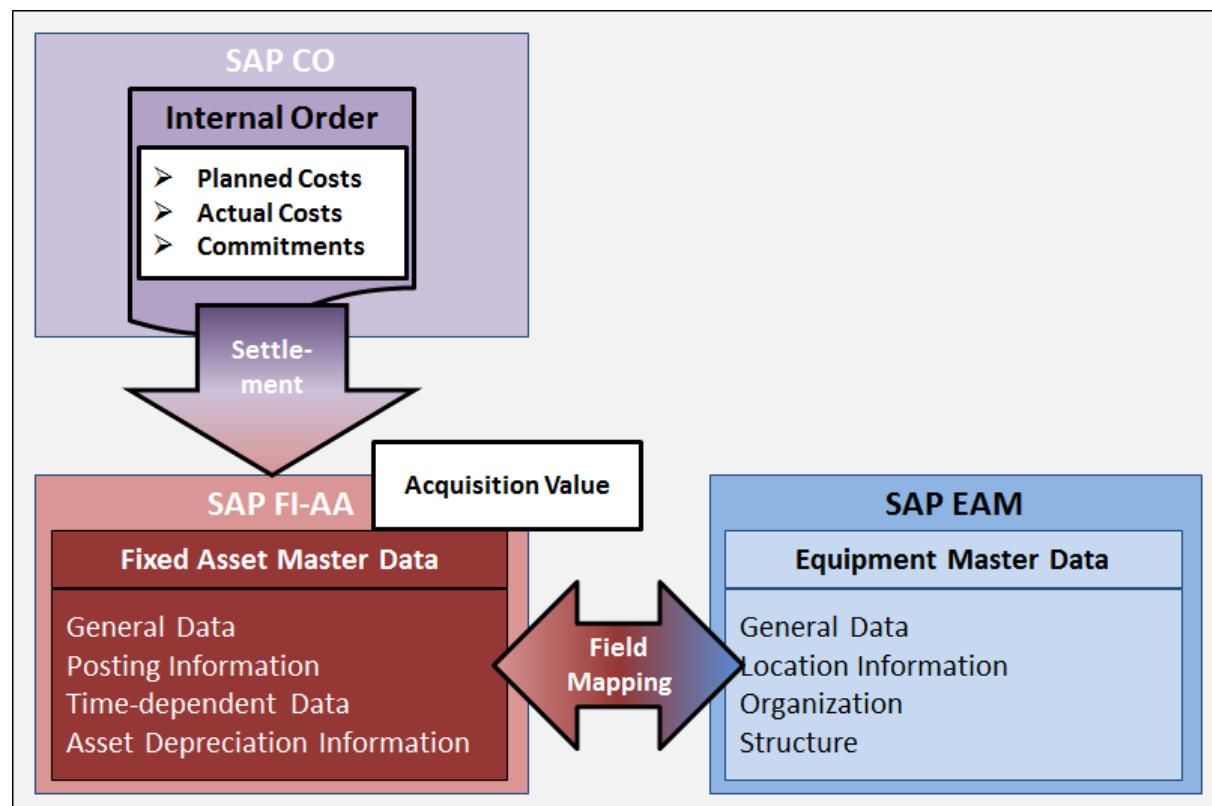


Figure 16: Internal Orders, Fixed Assets, and Enterprise Asset Management

2.3 Practice: Master Data in Plant Maintenance



PRACTICE

After you improved the bicycle division of GBI, the management presented your new tasks. You were promoted within the company and you are now in charge of Enterprise Asset Management. Your tasks include working in managing technical systems and in the service department of the GBI. The GBI operates, among others, packing plants for bikes package. Your first task is to take care of the company's division packing plants. Therefore, focus on the structures of these *technical objects*.

The *Functional Location* is used to represent complex technical systems of a company such as departments for welding engine - and vehicle parts. The representation is based on a hierarchical collection of *technical objects*, which are defined by structure indicators. The company maintains an equipment master record to uphold movement data for the individual business objects such as pumps, engines, welding machines. You are part of the project team and you need to be familiar with the structure and the functional of the *technical objects* in maintenance.

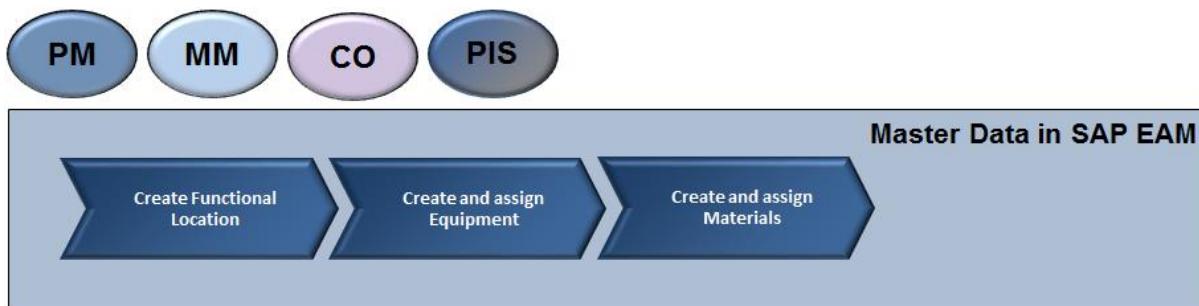
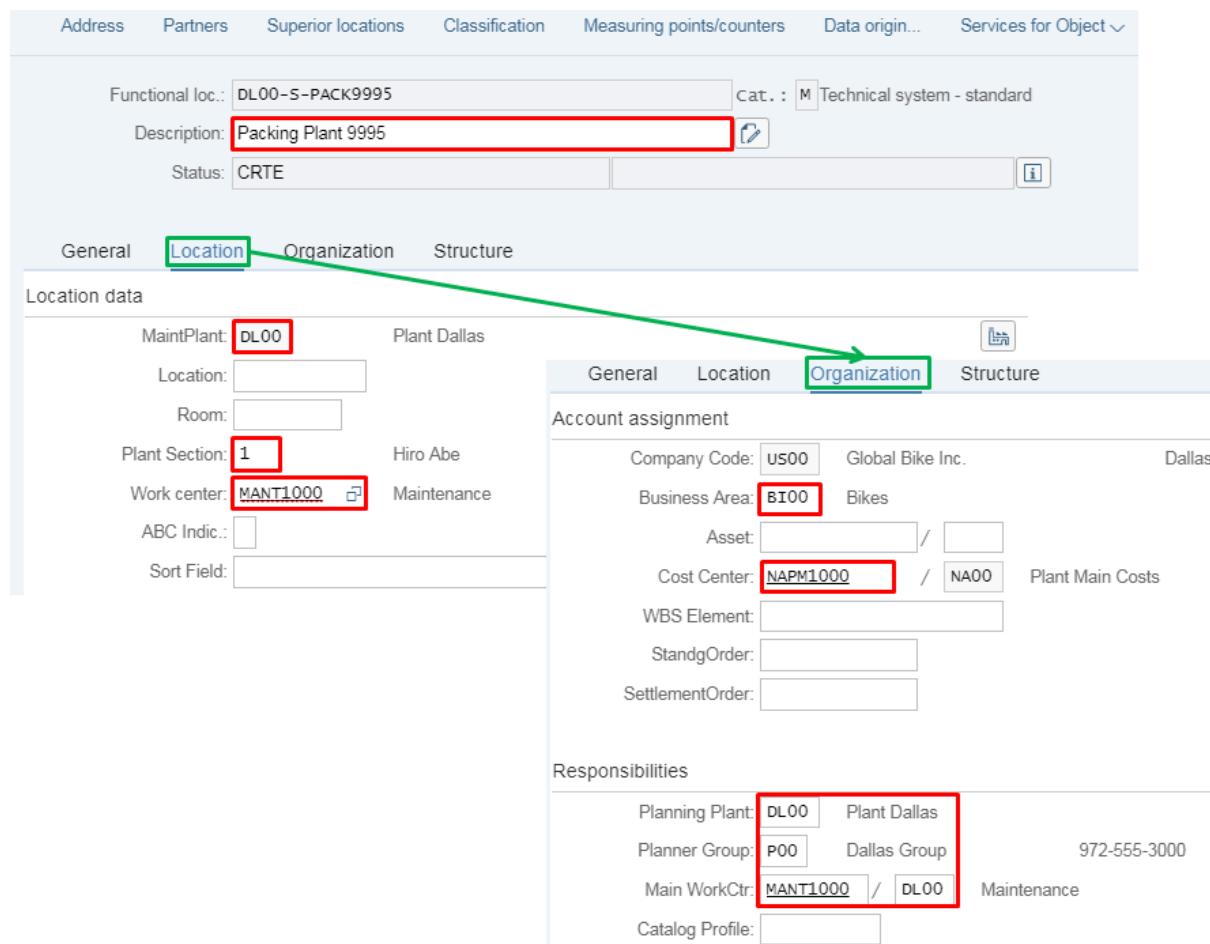


Figure 17: Process Overview: Master Data in Plant Maintenance

2.3.1 Create Functional Location

First, you want to create your functional location. Therefore, scroll down to the tile group **Script 7 – Enterprise Asset Management** and open the app **Create Functional Location**.

1. Choose **DL00-S-PACKxxxx** as name for your **Functional Location**.
2. Enter **DL00** in the **Structure Indicator** field and **M (Technical system-standard)** as **Functional Location Category**.
3. Press **Enter**.
4. Once in the **Master Data** Screen, enter **Packing Plant xxxx** as **Description**.
5. Now, choose the following assignments in the corresponding tabs. In the **Location** tab, select **DL00** as **MaintPlant**, **I** as **Plant Section** and **MANT1000** as **Work center**.
6. Confirm with **Enter**.
7. Switch to **Organization** tab. In **Account Assignment** area, select **BI00** as **Business Area** and **NAPM1000** as **Cost Center**. In **Responsibilities** area, select **P00** as **Planner Group** and **MANT1000** as **Main Work Center**.
8. Press **Enter** and confirm any system notifications.



The screenshot shows the SAP Functional Locations Master Data screen. The top navigation bar includes tabs for Address, Partners, Superior locations, Classification, Measuring points/counters, Data origin..., and Services for Object. Below the navigation bar, there are fields for Functional loc.: DL00-S-PACK9995, Description: Packing Plant 9995, and Status: CRTE. A note indicates Cat.: M Technical system - standard.

The main content area has tabs for General, Location (highlighted with a green border), Organization (highlighted with a green border and has an arrow pointing to it from the Location tab), and Structure. The Location data section contains fields for MaintPlant: DL00, Location, Room, Plant Section: 1, Work center: MANT1000, ABC Indic., and Sort Field. The Organization section contains fields for Company Code: US00, Business Area: BI00, Asset, Cost Center: NAPM1000 (highlighted with a red border), WBS Element, StandgOrder, and SettlementOrder. The Responsibilities section contains fields for Planning Plant: DL00, Planner Group: P00, Main WorkCtr: MANT1000 (highlighted with a red border) / DL00, Catalog Profile, and a phone number: 972-555-3000.

Figure 18: Functional Locations Master Data: SAP-System-Screenshot

9. **Save** and note the name of your functional location in your data sheet. Finally, press **Exit**.

Functional Location:

2.3.2 Create and Assign Equipment

Now you are going to create your own equipment. For the packing process, a conveyor is used to pack the bicycles. Therefore, scroll down to the tile group **Script 7 – Enterprise Asset Management** and open the app **Create Equipment**.

1. Enter **xxxx00001** in the **Equipment** field, **01.01.current year** as **valid date** and **G (Equipment/Assets)** as **Equipment category**. Confirm with **Enter**.
2. In the **General Data** screen enter **Conveyor xxxx** as **Description**.
3. Go to the **Location** tab. Choose **DL00** as **MaintPlant** and **Dallas TX** (use the F4-help) as **Location**. Then select **MANT1000** as **Work center**, **C** as **ABC indicator** and **1** as **Plant Section**.
4. Confirm with **Enter**.

Equipment: 99950001 Category: G Equipment/Assets

Description: Conveyor 9995 Intern.note

Status: AVLB Valid From: 01.01.2017 Valid To: 31.12.9999

General Location Organization Structure

Location data

MaintPlant:	DL00	Plant Dallas
Location:	DALLAS TX	GBI MFG
Room:		
Plant Section:	1	Hiro Abe 972-555-3000
Work center:	MANT1000	Maintenance
ABC Indic.:	C	Relatively unimport.
Sort Field:		

Figure 19: Location Equipment Tab: SAP-System-Screenshot

5. Switch to **Organization** tab. In **Account Assignment** area, select **BI00** as **Business Area** and **NAPM1000** as **Cost Center**. In **Responsibilities** area, select **P00** as **Planner group** and **MANT1000** as **Main Work Center**.
6. Press **Enter** and confirm any system notifications.
7. Go to the **Structure** tab to install your equipment in your created functional location.
Choose **your functional location** in the **Functional loc.** field (you have to use the button). Press **Enter** and confirm any system notifications.
8. Once installed, check that the state of your equipment changes from available (AVLB) to installed (INST).

Equipment: 99950001 Category: G Equipment/Assets

Description: Conveyor 9995 Intern.note

Status: AVLB Valid From: 01.01.2017 Valid To: 31.12.9999

General Location Organization Structure

Equipment: 99950001 Category: G Equipment/Assets

Description: Conveyor 9995 Intern.note

Status: INST Valid From: 01.01.2017 Valid To: 31.12.9999

General Location Organization Structure

Structuring

Functional loc.:	DL00-S-PACK9995
Description:	Packing Plant 9995
Superord.Equip.:	

Figure 20: Equipment Status: SAP-System-Screenshot

9. **Save** your equipment and note the name of your equipment in your data sheet. Finally, press **Exit**.

Equipment:

Check whether your equipment is assigned to your functional location. Therefore, scroll down to the tile group **Script 7 – Enterprise Asset Management** and open the app **Display Functional Location**.

10. Visit the **Structure** tab and check that your equipment **xyyy00001** is assigned to your functional location. Then, press **Exit**.

The screenshot shows the SAP Display Functional Location dialog. At the top, there are input fields for Functional loc.: DL00-S-PACK9995, Description: Packing Plant 9995, and Status: CRTE. To the right, a category selection shows Cat.: M Technical system - standard. Below this, a tabs bar has 'Structure' selected. Under the 'Structuring' section, there are fields for StrIndicator: DL00 (with GBI Dallas Plant as a tooltip), SupFunctLoc.: (empty), Position: (empty), RefLocation: (empty), and two checkboxes for InstallSpecs: Equi-installation allwd (checked) and Single installation. A 'ConstType:' field is also present. In the bottom section, titled 'Equipment', there is a table with columns: Pos., Equipment, Sb-Eq, Description, EqmtType, Mfr, Model no., TechID, and Sort Fld. A row for '99950001' is highlighted with a red border.

Figure 21: Functional Location Structure Tab: SAP-System-Screenshot

2.3.3 Create and Assign Materials

Your conveyor consists of different materials. You are going now to create, maintain and assign them to your equipment.

2.3.3.1 Create Materials

First of all, you need to create three materials: conveyor, belt and motor.

The conveyor is a raw material, which is procured externally. Correspondingly, it is the first material maintained from a materials management/purchasing point of view. On the other hand, this material is not produced within the company and, thus, does not need the view work scheduling.

Scroll down to the tile group **Script 7 – Enterprise Asset Management** and open the app **Create Material**.

1. You are now in the **Create Material** dialog. Enter **Conveyor-xyyy** as **Material**. Select **Mechanical engineering** as **Industry sector** and **Raw materials** as **Material type**. Confirm with **Enter**.

2. The next step is **view selection**. The selection of views is necessary to enable the creation of detailed material records in different departments. Please select the following lines:

- ***Basic Data 1***
- ***Basic Data 2***
- ***Purchasing***
- ***MRP 1***
- ***MRP 2***
- ***MRP 3***
- ***MRP 4***
- ***Accounting 1***
- ***Costing 1***

Confirm the dialogue with .

3. The following dialogue comprises information about the organizational unit, for which you are supposed to create the material:

- **Plant** *DL00 (Dallas)*
- **Storage Location** *FG00 (Finished Goods)*
- Complete the dialog with *Enter* or .

4. In **Basic data 1**, enter the following data in the specified fields:

- **Material Description** *Conveyor xyyy*
- **Base Unit of Measure** *EA*
- **Material group** *RAW (Raw materials)*
- **Gross weight** *200 KG*
- Proceed to the next view by *Enter*.

5. Since you do not need to enter any data in the **Basic data 2** view, proceed to the next view by pressing *Enter*.

6. In the **Purchasing** view, you assign the material to the **Purchasing Group** of *N00 (North America)*. Check that **Material Group** is *RAW* and *EA* the **Base Unit of Measure**. Press *Enter*.

7. In the next view **MRP 1**, enter the following data:

- **MRP Type** *PD (Material Requirements Planning)*
- **MRP controller** *000 (DL MRP Controller)*
- **Lot Sizing Procedure** *EX (Lot-for-lot order quantity)*
- Press *Enter*.

8. In the **MRP 2** dialog, enter the following data:

- **Procurement type** *F (External Procurement – field is not editable!)*
- **Prod.stor.location** *FG00*
- **Storage loc. for EP** *FG00*
- **Planned Deliv. Time** *0 days*
- **SchedMargin key** *001*
- Press *Enter* and confirm any system notifications.

9. Next, you see the **MRP 3** view. Enter:

- **Availability check** *02 (Individual requirements)*
- Press *Enter*.

10. You do not need to enter any data in the **MRP4** view. Thus, skip that view with *Enter*.

11. Within the **Accounting 1** view, enter:

- **Price Control (Prc.Ctrl)** *S (Standard price)*
- **Standard Price** *1500*
- **Valuation Class** *3000 (raw material)*

12. Press *Enter* and confirm any notification.

13. In the **Costing 1** view, check the -box **Material origin** and **With Quantity Structure**.

14. **Save** the newly created material by pressing the **Save** button. The system displays a message confirming that the material was created. List the name of your material on your data sheet.

Material Conveyor:

15. Leave the view by pressing *Exit*.

For routine reasons, the belt and the motor are almost identical to the already created conveyor. The SAP S/4HANA system facilitates creation, as you may use the master data of the already created frame as **reference**.

The belt and motor are procured from contractors as well. To create the materials, scroll down to the tile group **Script 7 – Enterprise Asset Management** and open the app **Create Material**.

1. You are now in the **Create Material** dialog. Enter the following data:

- **Material** *Belt-xxxx*
- **Industry sector** *Mechanical engineering*
- **Material type** *Raw materials*
- **Copy from** your material *Conveyor-xxxx*
- Press *Enter*.

2. In the next step, select the following **views**:

- **Basic Data 1**
- **Basic Data 2**
- **Purchasing**
- **MRP 1**
- **MRP 2**
- **MRP 3**
- **MRP 4**
- **Accounting 1**
- **Costing 1**

Confirm the dialogue with .

3. The following dialogue comprises information about the organizational unit, for which you are supposed to create the material. Since you want to copy from a reference, you must enter **plant DL00** and **material storage FG00** and additionally enter the **same data** (since the material master of the reference was also created for these organizational units) in the corresponding fields on the right hand side below the reference.

- **Plant** *DL00 (Dallas)*

- **Storage Location** *FG00 (Finished Goods)*
- **Copy from Plant** *DL00 (Dallas)*
- **Copy from Storage Location** *FG00 (Finished Goods)*
- Complete the dialog with *Enter* or .

Subsequently, you can see that the system fills in all required data from the reference in the current material master of **Belt-xxxx**. Click through all views pressing *Enter* to confirm them. Please pay attention to your manual entries in the **Material description** and **Standard price** fields.

4. **Basic data 1** view: **Material Description** *Belt xxxx* – press *Enter*
Gross weight *30 KG*
5. **Basic data 2** view: no changes – press *Enter*
6. **Purchasing** view: no changes – press *Enter*
7. **MRP 1** view: no changes – press *Enter*
8. **MRP 2** view: no changes – press *Enter*
9. **MRP 3** view: no changes – press *Enter*
10. **MRP 4** view: no changes – press *Enter*
11. **Accounting 1** view: **Standard price** *500* – press *Enter* and confirm any notification
12. **Costing 1** view: no changes
13. Save by pressing the **Save** button and note the name of your material in your data sheet.

Material Belt:

14. Leave the view by pressing *Exit*.

Finally, create the material motor. Therefore, scroll down to the tile group **Script 7 – Enterprise Asset Management** and open the app **Create Material**.

1. You are now in the **Create Material** dialog. Enter the following data:
 - **Material** *Motor-xxxx*
 - **Industry sector** *Mechanical engineering*
 - **Material type** *Raw materials*
 - **Copy from** your material *conveyor-xxxx*
 - Press *Enter*.
2. In the next step, select the following **views**:
 - **Basic Data 1**
 - **Basic Data 2**
 - **Purchasing**
 - **MRP 1**
 - **MRP 2**
 - **MRP 3**
 - **MRP 4**

- Accounting 1

- Costing 1

Close the dialogue (click  or press *Enter*).

3. Since you want to copy from a reference, you must enter **plant DL00** and **material storage FG00** and additionally enter the same data in the corresponding fields on the right hand side below the reference.

- Plant	DL00 (Dallas)
- Storage Location	FG00 (Finished Goods)
- Copy from Plant	DL00 (Dallas)
- Copy from Storage Location	FG00 (Finished Goods)
- Complete the dialog with <i>Enter</i> or  .	

Subsequently, you can see that the system fills in all required data from the reference in the current material master of **Motor-xxxx**. Click through all views pressing *Enter* to confirm them. Please pay attention to your manual entries in the **Material description** and **Standard price** fields.

4. **Basic data 1** view: **Material Description** **Motor xxxx** – press *Enter*
5. **Basic data 2** view: Gross weight **50 KG**
6. **Purchasing** view: no changes – press *Enter*
7. **MRP 1** view: no changes – press *Enter*
8. **MRP 2** view: no changes – press *Enter*
9. **MRP 3** view: no changes – press *Enter*
10. **MRP 4** view: no changes – press *Enter*
11. **Accounting 1** view: **Standard price** **1000** – press *Enter* and confirm any notification
12. **Costing 1** view: no changes
13. Save by pressing the  button and note the name of your material in your data sheet.

Material Motor:

14. Leave the view.

2.3.3.2 Create Bill of Materials

The material conveyor consists of one motor and one belt. Now you are going to create a BoM to define this structure. Therefore, scroll down to the tile group **Script 7 – Enterprise Asset Management** and open the app **Maintain Bill Of Material**.

1. Click on the **Create BOM** button and enter the following data:
 - **Material** **Conveyor-xxxx**
 - **Plant** **DL00 (Dallas)**
 - **BoM Usage** **4 (Plant Maintenance)**
 - Continue by clicking **OK**.

You know from the scenario description that the conveyor consists of the following stock-item materials: Belt-xyyy and Motor-xyyy.

2. Now, you are in the *Maintain bill of Material* view. Since your BOM contains two items, you have to press  (Add) twice, first. Enter the following data:

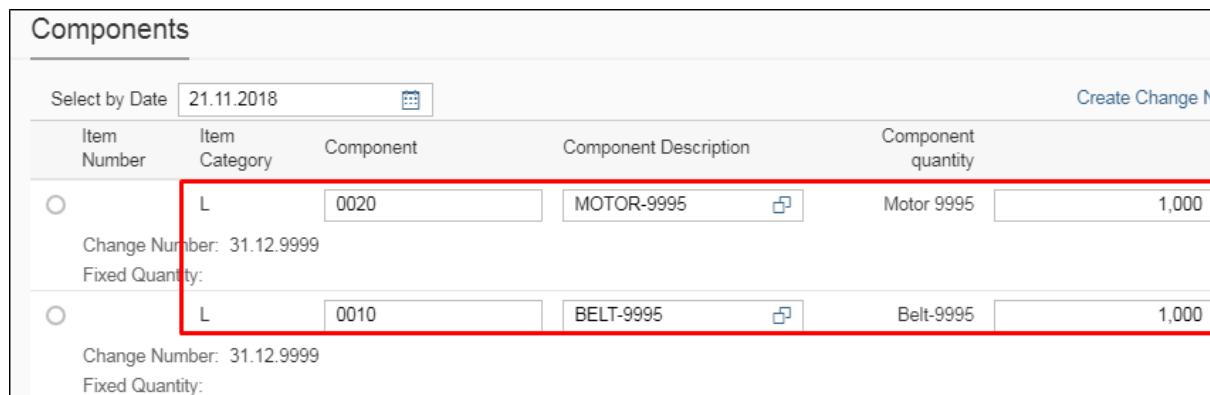


NOTE

If necessary, increase the width of the **Item Category** column to enter the entry **L**.

Item	ICt	Component	Quantity
0010	<i>L (Stock Item)</i>	<i>Motor-xyyy</i>	<i>1</i>
0020	<i>L (Stock Item)</i>	<i>Belt-xyyy</i>	<i>1</i>

3. Confirm with **Enter**.



Select by Date	21.11.2018	Change Number	Create Change No	
Item Number	Item Category	Component	Component Description	Component quantity
<input type="radio"/>	L	0020	MOTOR-9995	Motor 9995 1,000
Change Number: 31.12.9999 Fixed Quantity:				
<input type="radio"/>	L	0010	BELT-9995	Belt-9995 1,000
Change Number: 31.12.9999 Fixed Quantity:				

Figure 22: BoM Creation: SAP-System-Screenshot

4. **Save** your entries.
5. You receive a notification that Material BOM was saved.
6. Now, display the BoM explosion. Therefore, scroll down to the tile group **Script 7 – Enterprise Asset Management** and open the app **Display Multilevel BOM Explosion**.
7. Enter the material **Conveyor-xyyy** and plant **DL00 (Dallas)**. BoM Application is plant maintenance **INST**.
8. Click on **Execute** and confirm the system notification. You can now see the BoM in list form.
9. Finally, press **Exit** twice.

2.3.3.3 Assign BoM to the Equipment

Now to assign your BoM to your equipment. Therefore, scroll down to the tile group **Script 7 – Enterprise Asset Management** and open the app **Change Equipment**.

Open your equipment, go to the **Structure** tab and choose **Conveyor-xyyy** as **Construction type**. Press **Enter** and **Save**. Then, click on **Exit**.

Check your technical objects. Therefore, scroll down to the tile group **Script 7 – Enterprise Asset Management** and open the app **List Functional Locations**.

Enter **DL00** in the **Planning Plant** field and press *Execute*. Search your functional location and double click on it. In the *Display Functional Location: Master Data* screen, press the **Structure list** button (**Structure list**) to display your technical objects. Select **Expand whole** or **More → Expand whole**.

Functional loc.: DL00-S-PACK9995		Valid From: 06.11.2017
Description: Packing Plant 9995		
<input type="checkbox"/>	DL00-S-PACK9995	Packing Plant 9995
<input type="checkbox"/>	99950001	Conveyor 9995
<input type="checkbox"/>	CONVEYOR-9995	Conveyor 9995
<input type="checkbox"/>	MOTOR-9995	Motor 9995
<input type="checkbox"/>	BELT-9995	Belt 9995

Figure 23: Functional Location Structure: SAP-System-Screenshot

Now that you are familiar with the technical objects of the GBI group, take a look at the maintenance process. Theory is first.

3 Business Processes in Enterprise Asset Management

The following section provides insight into the maintenance process in SAP EAM. This teaching unit is in parts based on Dahrog (2016), Liebstückel (2013), Liebstückel (2014), Liebstückel (2015) as well as the SAP Online Library and SAP UA (2012).

3.1 Theory: Maintenance Process in SAP EAM



THEORY

A company's assets – e.g., facilities, technical systems, cars, etc. – require maintenance on a regular basis. Maintenance processing encompasses all the activities necessary to maintain a company's facilities or facilities of customers that are managed by a company. The maintenance process comprises several levels, which do not necessarily all have to be implemented in full.

For instance, it is possible to process a repair of a facility by using many planning stages such as preliminary costing, work scheduling, material provision, resource planning and permits. However, it is also possible to react immediately to events that cause production shutdown and to generate the required orders and shop floor papers with the minimum of entries in the shortest possible time. In the following we will discuss the central steps in the maintenance and repair process and the documents that are involved in this process.

3.1.1 Maintenance Process

The maintenance process deals with the technical maintenance and repair of technical objects. The corrective maintenance process involves the creation and release of a maintenance order in one work step after a malfunction has been reported (e.g., by an employee in production). Depending on the modeling of the process, the creation of the notification can be performed via SAP GUI (transaction), web browser (SAP Fiori app) or via a mobile device. Depending on the organization, this step is carried out by a supervisor or by a central maintenance planner.

Thereby, the maintenance planner has several options:

- Create a notification first, then add an order
- Create an order directly with combined notification
- Create an SAP Fiori-based malfunction report, which creates notification and order in one step

The malfunction is corrected by a maintenance work center and the maintenance order is then confirmed either by an employee of the performing work center, the maintenance supervisor, or the maintenance planner. Eventually, either the supervisor or the maintenance planner completes the order.

The standard procedure could encompass the following steps:

- **Step 1 - Notification:** In case of a malfunction or if a requirement for maintenance work (either periodically scheduled or on short notice) arises, the affected department can create a maintenance notification in the SAP system. In the notification information about the specific case and the concerned technical object are entered. Maintenance planner can search and process notifications by using the notifications list.
- **Step 2 - Planning:** In the planning step, the maintenance planner creates maintenance orders based on the requirements listed in the notification. An order contains the tasks

to be executed and the required materials (spare parts) as well as any utilities that may be necessary such as tools or measurement devices.

- **Step 3 - Control:** In the control step, the order is checked in many ways (e.g., availability checks, capacity checks) that are important for the subsequent order release. If no serious problems occur (e.g., a spare part is not available at a desired date), the order is put into process. Generally, the shop papers are printed in the same step.
- **Step 4 - Execution:** This step encompasses the execution of the maintenance operations that are described in the maintenance order on the specified technical object. The materials required for order execution are withdrawn from the warehouse with reference to the order. Unplanned withdrawals, i.e., withdrawals of materials not being reserved through the order, are also possible.
- **Step 5 - Completion:** The completion step contains the following partial steps: *time confirmation* (entering actual worked times), *technical confirmation* (completion of *technical results*) and *technical completion*. Order settling by the Controlling department can be carried out at the same time.

Reporting/History: All data created and changes applied on the technical objects during maintenance processing are stored in the objects history and can be analyzed by using the Plant Maintenance Information System (PM-IS)

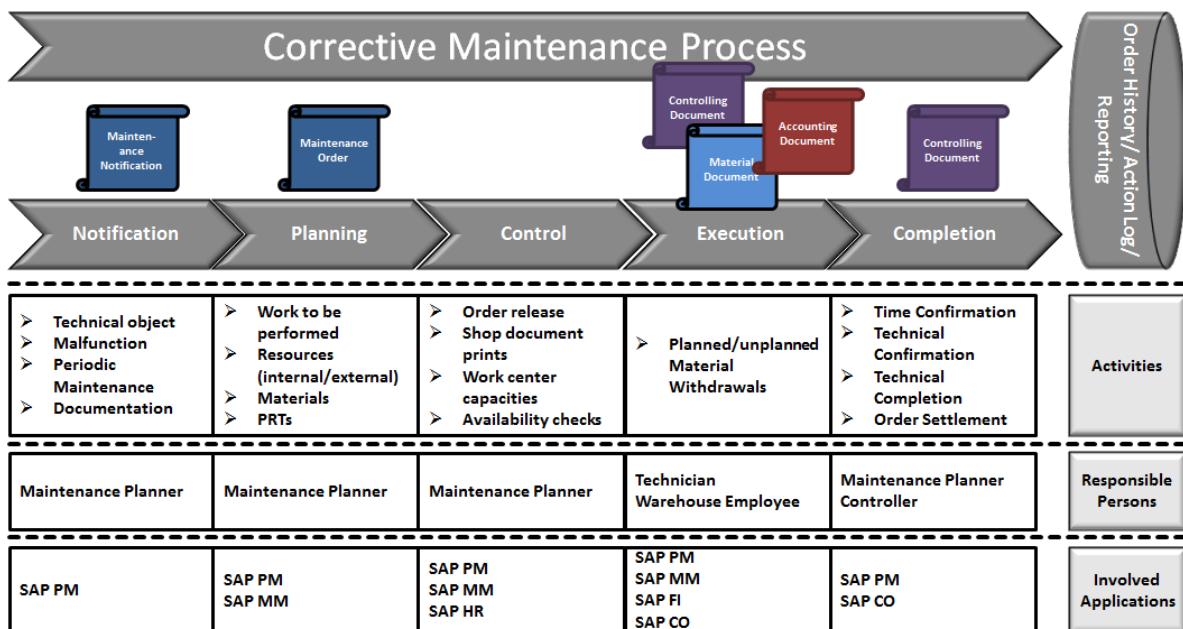


Figure 24: Corrective Maintenance Process

The five phases of this business process can be controlled and partly automated by using **SAP Workflows** functionality. SAP Business Workflow is a standard functionality in SAP systems, which allows representing business processes in the SAP System and running them (repeatedly) by using the workflow system. Thereby, a "Workflow Management System" can control and process particularly structured processes and send the tasks that need to be performed to the responsible employees. Workflows

- comprise a series of activities
- often recur in the same or similar forms

- involve several people or groups of people
- require a high level of coordination

In the SAP standard, various standard workflows (workflow models and tasks) are provided for Enterprise Asset Management (PM component). These workflows can be activated and configured or be used in their standard version. They can also be adapted and expanded according to customer requirements.

From reactive to predictive Maintenance with SAP S/4HANA

With the machine learning capabilities of SAP S/4HANA, machine data can be used to gain better business insight and better collaboration across the supply chain to help companies improving their maintenance strategies from a reactive to a proactive approach.

- From **reactive** to **preventive**: In the past, maintenance of technical systems was reactive, meaning that companies waited till a machine failed before maintenance measures were undertaken. Since machine failures and production stops are awfully expensive, many companies have moved from a reactive to a preventive maintenance strategy which includes maintenance of machines at specific periods and regular intervals based on observations of abnormalities. By further applying a condition-based strategy, workers can continuously record usage or equipment deterioration by inspections and observe the status of assets. By reacting to predefined conditions and events, worn parts can be repaired or replaced intime before they cause system failures.
- From **preventive** to **predictive**: The next maturity level involves implementing a predictive maintenance strategy which also considers device and sensor data from the machine to enable optimized maintenance and service schedules as well as more precise failure predictions. For leveraging sensor data, it is mandatory to establish technologies to connect the business information with sensor data from the device (Internet of Things (IoT)).

3.1.2 Step 1: Maintenance Notification

When a malfunction or exceptional situation occurs for a technical object, you create a **notification** in maintenance processing in order to describe the exceptional technical condition, request the maintenance department to perform a necessary task and to document work that has been performed. Thereby, you can record maintenance tasks completely with the help of a maintenance notification and make these documentations available for analysis in the long term. You use maintenance notifications mainly for preliminary planning and execution of tasks.

The notification document is created in transaction IW21 or Fiori App *Create Notification* and is structured in different areas and tabs that contain all the necessary data for planning and preparing the maintenance work that needs to be accomplished:

- **Header Data:** Each maintenance notification contains **header data** that apply to the entire notification document. The information in the header data is used for identification and managing the maintenance notification.
- **Notification Items:** **Notification items** are the positions within a maintenance notification document. They are used to describe a problem, a malfunction or an activity that needs to be performed for a technical object in detail. A notification document can

contain multiple items. Within the framework of a notification item, you can use **activities** and **tasks** to describe the work that needs to be performed and the work that already was performed for an item:

- A **task** describes an activity that has been planned to perform for an object or an activity that is pending and arises only after a maintenance task has been accomplished, e.g. a report that is to be created. In contrast to an activity, tasks have not been performed, yet. They emphasize the planning and organizational aspects of a notification. Using tasks, you can plan the way in which various persons work together to process the notification and perform the activities within a specified period of time. For instance, if order processing is not active yet, different persons can be planned for processing the notification and monitor the execution of activities for specific periods of time. Cost monitoring, materials requirements planning or capacity planning is, however, not possible for this processing type.

You can enter the following data for each task:

- key for the task to be performed and a brief instruction of how the work is to be performed
- planned start and end of the task
- task status

A task can relate both to the notification header as well as to the individual items. They can have different statuses.

- An **activity** documents the work performed on a technical object in the framework of a notification. In contrast to the task, the activity describes what has already been done in order to solve problem. You can enter the following data for each individual activity:

- key for the activity that was performed and a short text that can be changed individually
- start and end of the activity
- quantity factor for the activity

Activities are especially important for inspections, since they prove that certain tasks have been performed and accomplished. An activity can relate both to the header of a notification as well as to the individual items.

The screen for creating and changing notifications is configurable by means of system customizing. It is possible to adjust the number of tabs and the entry fields as well as values according to a company's requirements.

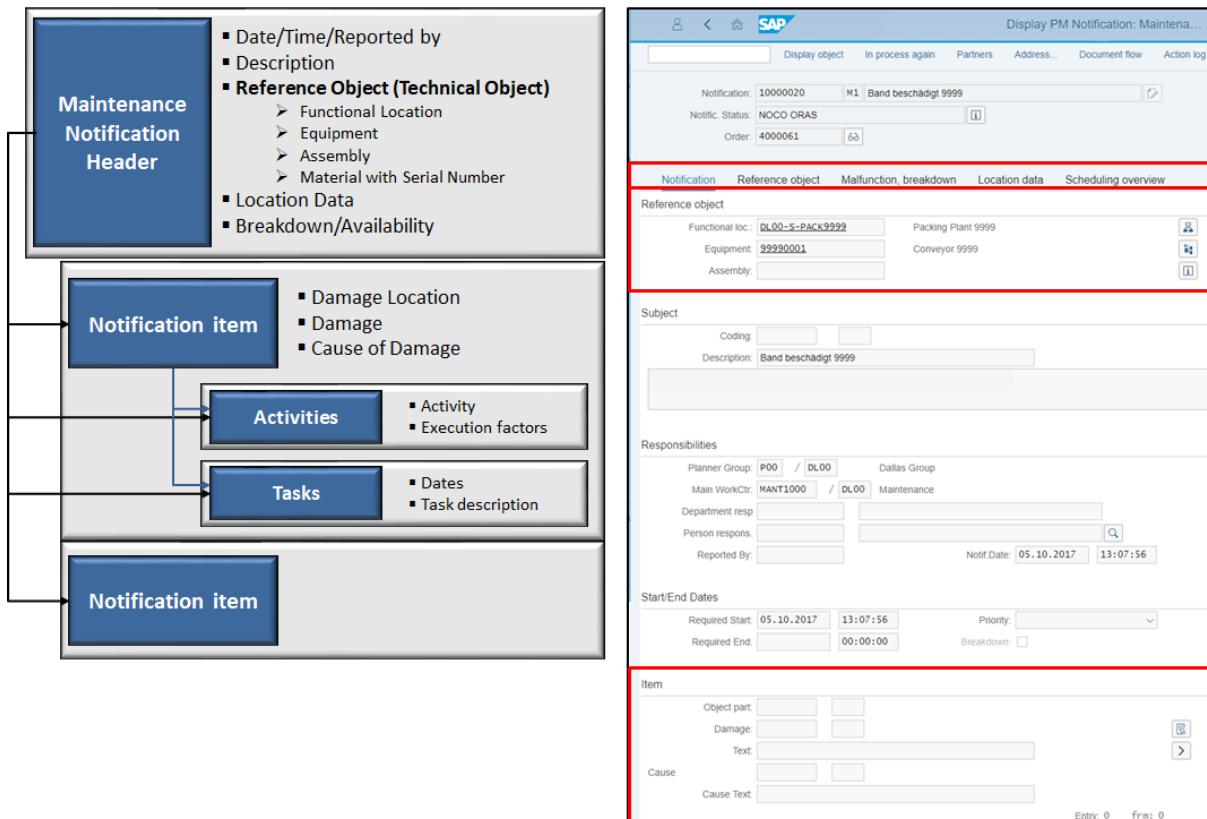


Figure 25: Maintenance Notification: SAP-System-Screenshot

Reference Objects in the Maintenance Notification

All notification types can be created for both types of technical objects, a functional location as well as a piece of equipment, both; with, or without an assembly. It is also possible to create a notification for a material with a serial number. The object hierarchy corresponds to the sequence specified in the notification. For example, if a maintenance notification is created for an assembly on a piece of equipment, which is assigned to a functional location, the system transfers all relevant data for the piece of equipment and the functional location into the notification document.

However, a notification can also be created without referencing an object. This is often the case, if the malfunction report refers to an object that is not managed in the system under a particular number or if a maintenance request refers to a new object that is supposed to be provided for investment program.

A view for the reference object can be chosen for an individual notification or for a notification type as follows:

- Functional location + equipment + assembly (standard setting)
- Functional location + equipment + assembly (for functional locations with exactly one piece of equipment installed, the equipment is set automatically)
- Functional location
- Equipment (with or without assembly)
- Material number + serial number (with or without equipment number)
- Without entering a reference object

3.1.3 Step 2: Planning

In the planning step of the maintenance process, maintenance orders are created. This is generally done based on the requirements listed in notifications. The maintenance orders, thereby, copy information from the notification and contain the tasks to be executed on a technical object as well as the materials and tools required to perform these tasks.

3.1.3.1 Creation of Maintenance Orders

When creating a maintenance order, five different cases can be distinguished:

1. The maintenance order is created directly (e.g., breakdown order) without referencing a notification. This is done in transaction IW31.
2. The maintenance planner (person responsible) creates a maintenance notification in e.g. transaction IW21, for a specific issue (thus, not centrally) and then creates the maintenance order from the maintenance notification.
3. Multiple maintenance notifications are combined into one or more objects within a maintenance order.
4. An activity report for an existing maintenance order is created subsequently as a *technical confirmation*.
5. A maintenance order is generated automatically from a maintenance item by the maintenance plan.

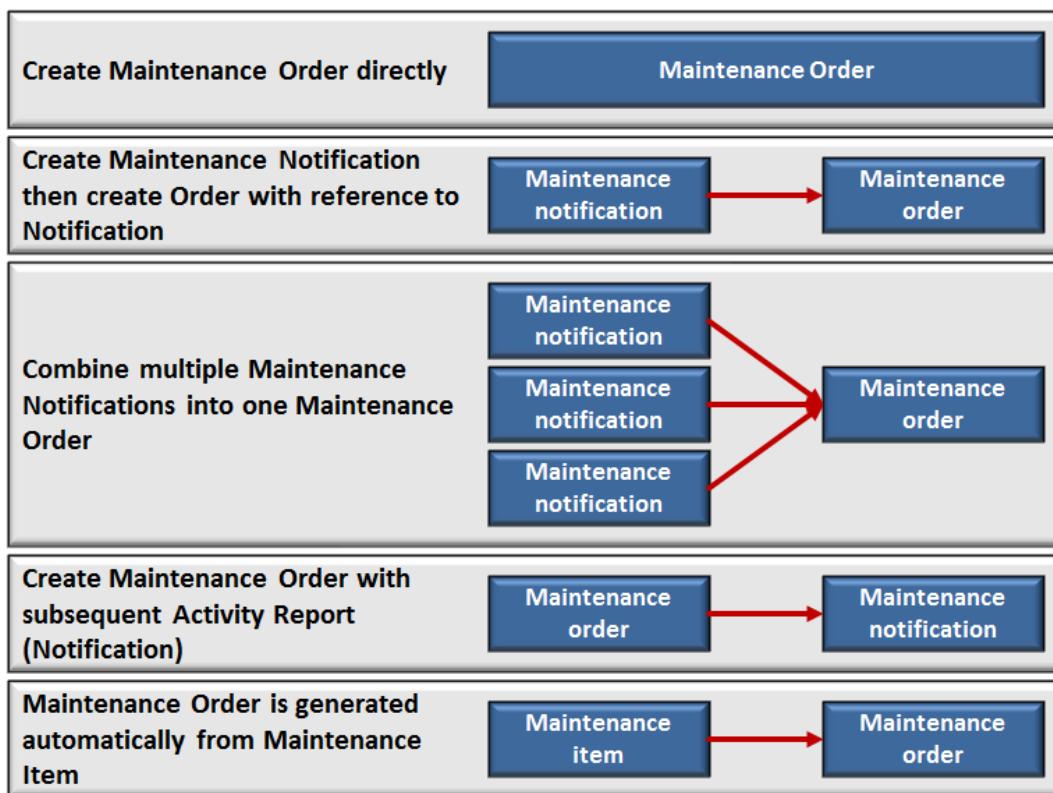


Figure 26: Creation of Maintenance Orders

3.1.3.2 Elements of the Maintenance Orders

Like the maintenance notification – or any other document type in the SAP system – a maintenance order consists of several different areas:

- The **header data** contains information that is valid for the entire maintenance order document. This data is used for identifying and managing the maintenance order. Amongst others, the header data includes the number, the description and the type of the maintenance order, the scheduled dates for processing the order, the priority of the individual tasks, the creator of the order, the last person modifying the order, etc.
- The **object list** contains the objects that are to be processed with the maintenance order. This can include functional locations, equipment, assemblies, or serial numbers. The object list is used, if the same activity is supposed to be carried out for several objects of the same type.
- The **orders operation** describes tasks that are supposed to be performed for the maintenance order. The operation includes time, work center and other controlling information for an individual maintenance task. In the operation text, you can describe how the work should be done. It also states who performs them with what guidelines.
- The **material list** (component list) contains the spare parts that are necessary to process the order. For instance, if a specific part of a technical object (such as a processor in a server) needs to be replaced, the processor is a spare part.
 - o You can assign any number of material components to an operation.
 - o A component can be a spare part or repairable spare or describe an activity.
 - o The material that you schedule for an order is reserved in the warehouse.
 - o As soon as the order is released, the materials can be withdrawn from the warehouse and delivered to the customer.
- **Production resources/tools** are resources such as tools, protective clothing, measurement and calibration devices, NC programs, drawings etc. that are required to perform the activities within the order processing but which are not consumed (used up) as it is the case with e.g., materials (spare parts). You can represent PRTs by using one of the following: Material master record, Document master record, Master record for other PRTs, Equipment master record.
- Any order in the SAP system contains a **settlement rule**, which determines how the costs of the order are distributed to their final destination (account assignment objects such as cost center, customer, technical object) within Controlling. By default, the recipients of the costs are determined from the master data records of the technical objects that are referenced in the order. However, these default recipients can be overwritten when the first settlement rule for the order is maintained.
- The **costs** view encompasses values for use of materials, work hours, etc., which are required to execute maintenance tasks. Costs are distinguished in estimated, planned, and actual costs broken down to individual value categories of the order. In addition to an overview page, a technical view and a controlling view for the costs are available:
 - o You can enter estimated costs manually for an entire order.
 - o Planned costs are calculated automatically by the system during order planning.
 - o Actual costs for goods issues and goods receipts are calculated automatically by the system whilst the order is being executed. The actual costs for the work performed can only be calculated once the work has been confirmed.

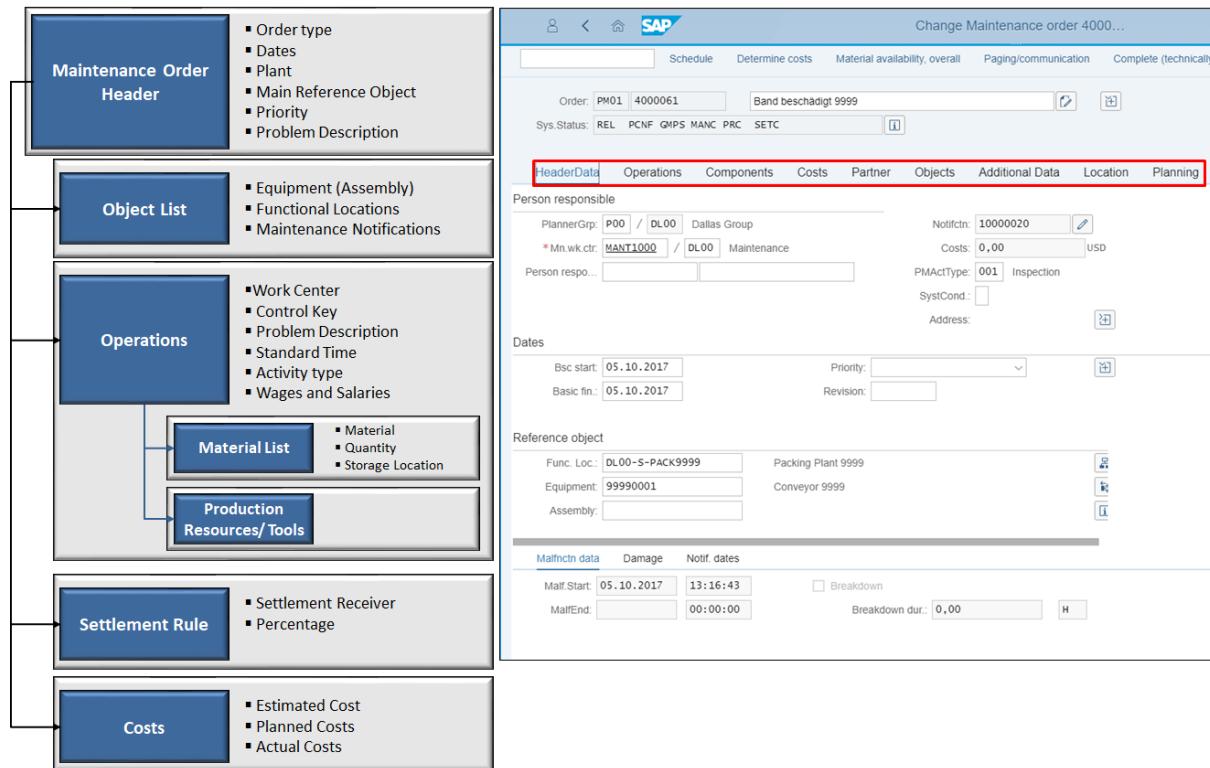


Figure 27: Elements of the Maintenance Orders: SAP-System-Screenshot

3.1.3.3 Object List

A maintenance order can contain more than one object. For instance, multiple objects could be entered in a maintenance order upon creation or multiple different notifications could be merged into one maintenance order and processed with this one order. In these cases, the object list plays a central role.

The object list is an integral part of a maintenance order and can compile multiple notifications and also assign several technical objects to one order. Two features are available for the object list:

- an object list in which you can enter technical objects (equipment, functional locations, assemblies) and notifications
- an object list in which you can enter objects, which are identified by a combination of material and serial numbers and notifications

Which of these two versions is used in the order depends on:

- the choice of reference object in the notification/order
- the view setting for the reference object frame in the notification/order

You can group together several notifications that can be processed together by using a "worklist for notifications" for a maintenance or service order. In this case, the notifications are also included in the object list of the order. When assigning notifications to an order via the object list, the first notification appears in the order header in the "notification" field. The first notification is indicated as header notification. Header notification and all other notifications in the object list can also be separated from the order again.

Even if no reference object has been entered for the order on the header data screen, you can still assign technical objects, notifications or objects, which are identified by a combination of material and serial numbers, to the order in the object list.

Operations in an order that have not been assigned to an object in the object list can be assigned or existing assignments can be changed.

The object list does not "control" the order. This means that the work to be performed is not adjusted, the history is not updated and there is no cost distribution.

Using the customer exit IWO10027, you can assign the order costs *proportionately* to the objects included in the list.

P...	Sort	Serial No.	Material	Material description	Equipment	Equipment descriptn	Functional loc.	FunctLocDescrip.	Notification
			9999999999	Conveyor 9999			DL00-S-PACK9999		10000020

Figure 28: Object List in Maintenance Order: SAP-System-Screenshot

3.1.3.4 Material Planning

Material planning is a central task in the maintenance process. When a technical object is maintained, repaired or replaced, spare parts might be required when the work is performed on the technical object. Spare parts, repairable spares, and other materials required for a maintenance order or even activity types can be assigned as components to the operations in the maintenance order. Materials can also be BoM components of the referenced technical objects or freely assigned materials.

Thereby, any number of material components can be assigned to an operation. When a maintenance order is created that has a material assigned and scheduled for an operation (so called *planned material withdrawal*), then the material is reserved for the order in the warehouse (Inventory Management). Upon order release, the materials can be withdrawn from the warehouse and used in the maintenance process or delivered to the customer (in case of customer service orders). The following conditions apply for planned material:

- For stock material, the system generates a reservation.
- For non-stock material or where external services are involved, the system generates a purchase requisition for external procurement.

Process Flow for Stock Material Usage

The following figure illustrates the process flow for stock materials required in a maintenance order. Note that only the first step "Order Creation (Material Planning)" (or if manually executed the second step, too) is part of the Planning step of the maintenance order process. The subsequent steps are carried out in later process steps.

1. **Order Creation (Material Planning):** During order creation, required materials are assigned to the operations of the maintenance order and planned for withdrawal. If the planned materials for the maintenance order are available in stock, a reservation in the warehouse can be carried out automatically. In the system's Customizing, you can define the point in time at which the reservation for the stock material is set. You can determine for each order type, whether a material reservation is carried out immediately (upon saving the order) or at the time of order release.
2. **Availability Check:** When assigning components in the order, you can manually call up an availability check. At the time of order release, an automatic availability check is executed. However, the order can also be released if availability for the assigned materials is not given.
3. **Order Release (Material Reservation):** If the planned materials for the maintenance order are available in stock, a reservation in the warehouse is carried out. Depending on customizing settings, an order type can execute material reservation immediately (upon creation/ material assignment) or at the time of order release.
4. **Goods Issue (Material Withdrawal from Stock):** In combination with the maintenance order papers, the material provision list as well as the material withdrawal documents can be printed:
 - Planned goods issues are entered with reference to the reservation (reservation number).
 - Unplanned goods issues are entered with reference to the order number.
 - Goods issues that are posted with reference to a maintenance order, appear in the document flow of the order.
5. **Technical Completion**

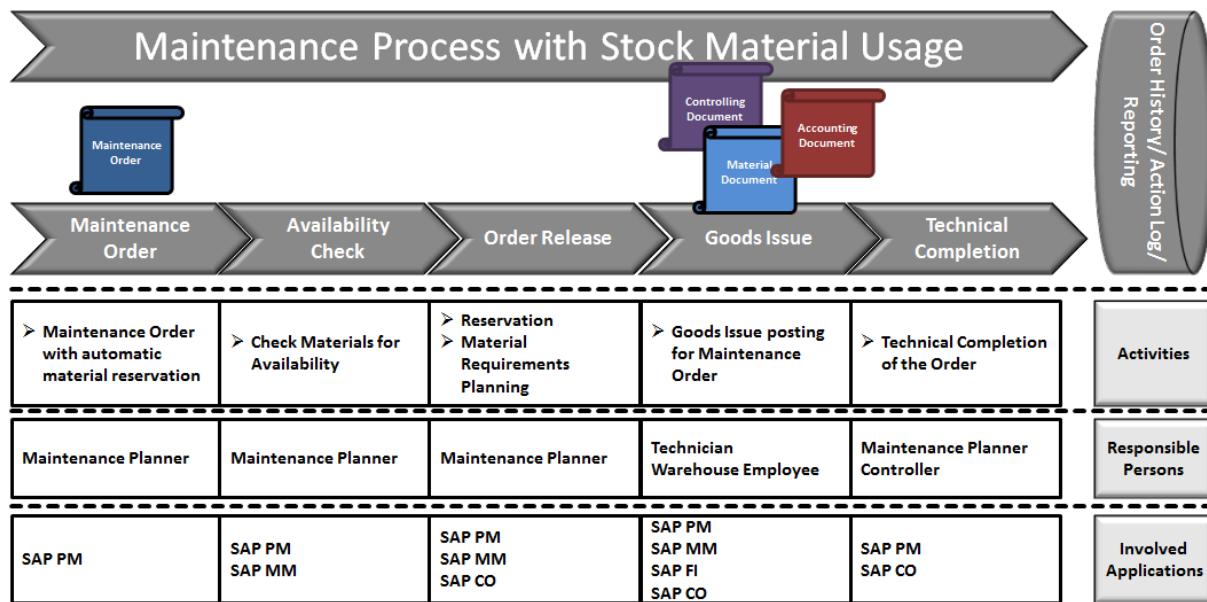


Figure 29: Process Flow for Stock Material Usage

Process Flow for Non-Stock Material Usage

If a company does not keep stocks for spare parts and materials required for maintenance processes, these materials must be procured from a vendor by the purchasing department, when

the requirements arise. From the point-of-view of Plant Maintenance, material procurement is a support process that integrates Plant Maintenance with **Purchasing** (Materials Management). The following figure illustrates the process flow for materials required in a maintenance order that are not available on stock. Note that only the first step "Planning materials" (or if manually executed the second step, too) is part of the Planning step. The subsequent steps are carried out in later process steps.

1. **Order Creation (Material Planning):** During order creation, required materials are assigned to the operations of the maintenance order and planned for withdrawal. If the planned materials for the maintenance order are not available in stock, a purchase requisition is created automatically. In the system's Customizing, you can define the point in time at which the purchase requisition for the material is created. You can determine for each order type, whether a purchase requisition is created immediately (upon saving the order) or at the time of order release.
2. **Availability check:** When assigning components in the order, you can manually call up an availability check. At the time of order release, an automatic availability check is executed. However, the order can also be released if availability for the assigned materials is not given.
3. **Order Release (Purchase Requisition Creation):** If the planned materials for the maintenance order are not available in stock, a purchase requisition is created. Depending on customizing settings, an order type can execute purchase requisition creation immediately (upon creation/ material assignment) or at the time of order release.
4. **Purchase Order:** In purchasing (MM), purchase orders are created with reference to the previously created purchase requisitions and sent to a vendor. The purchase order items are assigned to the maintenance order operations. When the order is released, incoming deliveries of the material (goods receipts) will be entered with reference to the purchase order. Since the purchase order is created with reference to the maintenance order (account assignment) the goods receipt that are posted against the purchase order are accounted on the maintenance order.
5. **Goods Receipt:** Goods receipts can be entered with reference to the purchase order after the order has been put in process (released). The account assignment of the purchase order to the maintenance order instigates the posting to the maintenance order. Thus, when upon delivery goods receipts are entered with reference to the purchase order, the maintenance order is directly debited with the costs of the purchase order. The goods receipts entered appear in the document flow of the order.
6. **Technical Completion and Invoice:** When the invoice is received, any invoice differences are automatically credited to or debited from the maintenance order. The invoice can be created even after the order was technically completed.

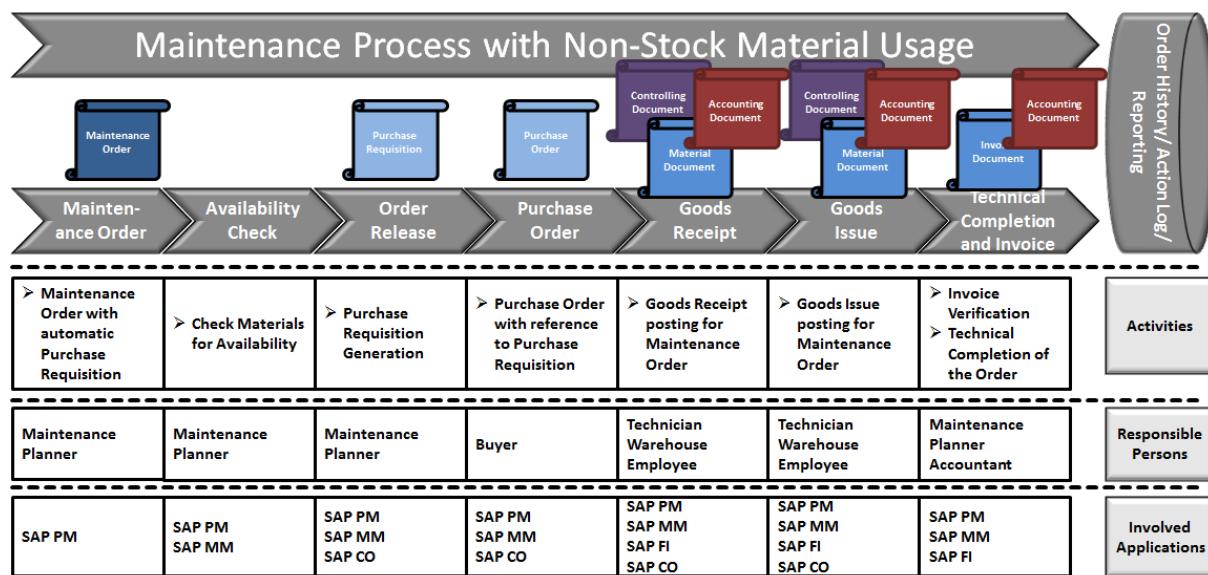


Figure 30: Process Flow for Non-Stock Material Usage

Material Planning using Internet Catalog

Planning materials for a maintenance order can also be carried out on the basis of an **Internet catalog** as well as on direct material assignment and the use of BoMs.

If an **Internet Catalog** is implemented in SAP MM, you can access it directly from components screen of the **purchase order document** to enter the materials to be procured. You can also access the Internet Catalog directly from the *material assignment* tab in the **maintenance order**. Thereby, you can also select the material to be procured from the BOM assigned to the maintenance order and then navigate directly to the Internet catalog, where you can select the materials to be ordered.

In order to be able to access an external Web catalogs from an order's components screen, you must set up the **OCI** (Open Catalog Interface). This can be set up for the order type and planning plant in Customizing.

If the component **SAP Enterprise Buyer** is implemented in the SAP system, catalog access, and in some cases, the entire purchasing procedure, can be processed by using Enterprise Buyer (previously known also as EBP – Enterprise Buyer Professional).

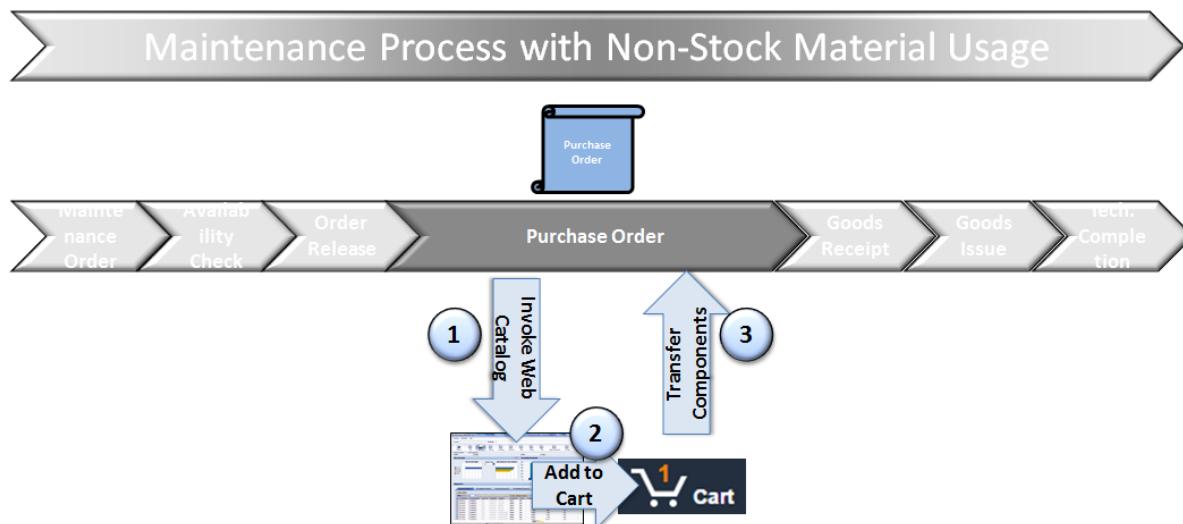


Figure 31: Material Planning using Internet Catalog

3.1.4 Step 3: Control

In the control step, the order is checked in many ways (e.g., availability checks, capacity checks) that are important for the subsequent order release. If no serious problems occur (e.g., a spare part is not available at a desired date), the order is put into process. Generally, the shop papers are printed in the same step.

Order Release

When you have finished planning with all the necessary specifications, you can release the order. Only then can the employees on site start the activities described.

When releasing a maintenance order, the system checks the availability of materials and production resources/tool as well as the required permits. The release of a maintenance order is the latest point in time where material reservations become relevant to material planning. Materials can be withdrawn and purchase requisitions can be created.

The following actions can only be carried out when the order was released:

- Material reservations are effective and can be withdrawn from stock.
- Shop papers can be printed.
- Goods movements (goods receipts and goods issues) can be posted against the order
- Time confirmations can be entered for the maintenance order
- Tasks can be completed (technically)

It is possible to release a maintenance order at the time of its creation. This option is only available for maintenance orders that are automatically created by the system (e.g., orders created by using maintenance plans). In order to release these orders immediately when they are created the ***release immediately*** flag must be set in the system's Customizing for the particular order types.

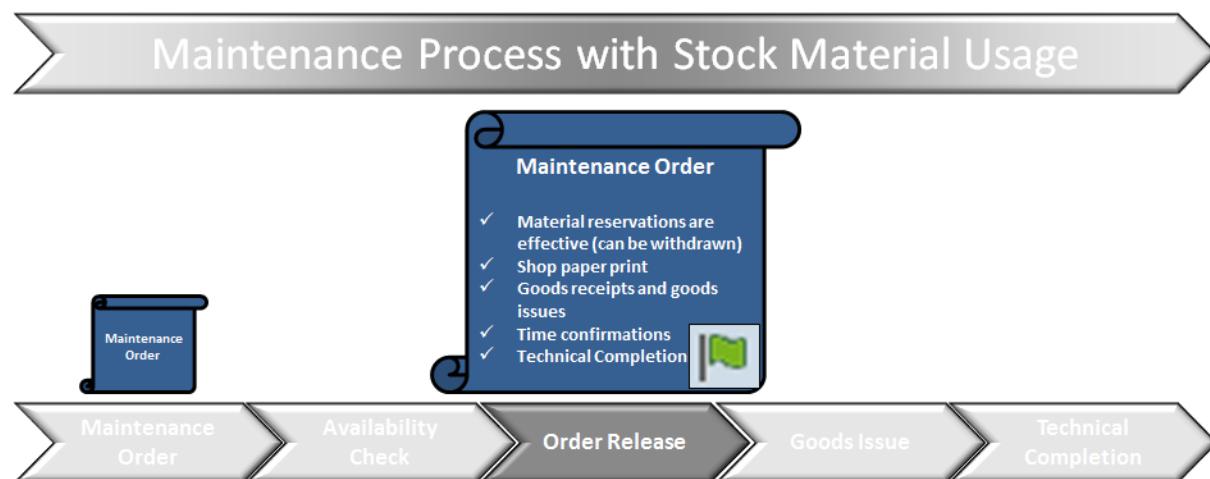


Figure 32: Order Release

3.1.5 Step 4: Execution

In this phase, the maintenance operation is carried out on site. You use the function for processing an order after you have completed the control phase. This process step generally contains only the material withdrawal for maintaining or repairing a technical object, since the withdrawal takes place during the time between order release and order completion.

Workers withdraw materials from the warehouse with reference to the order to execute the maintenance operations described in the maintenance order. There are two types of material withdrawals:

- **planned withdrawal** of stock material
- **unplanned withdrawal** of stock material (withdrawals of materials not being reserved by the order)

Moreover, materials can be procured externally. The goods movements for a maintenance order are displayed in the document flow of the order. Using the material where-used list (IW13), you can check which material withdrawals were planned and unplanned.

Of course, in this step, all the works, (operations/activities), are executed by the employees. However, from the point of view of the system, all activities performed become relevant when they are completed and, thus, entered in the system. Operation/Order completions are carried out in Step 5.

3.1.6 Step 5: Completion

Once the maintenance work has been performed on the technical object, the order can be completed. Completion confirmation is part of order monitoring and documents the status of the processing of operations and sub-operations for a maintenance order (or service order). In this process step working times are recorded, the activities performed can be entered in the notification, and measurement readings for the reference object are entered.

Completion of a maintenance order includes:

- **Time confirmation** for the actual work times performed
- **Technical confirmation** for completion of technical results
- **Technical completion** for closing the order from a technical point of view
- **Order settlement** by the CO department for posting the costs to the cost recipients

3.1.6.1 Order Confirmation

In order confirmation, the employee that accomplishes the maintenance tasks enters the activities performed and the working times required into the confirmation of the maintenance order. Furthermore, technical completion and capturing measurement values takes place in this step.

3.1.6.1.1 Confirmation of Times and Activities

The employee has four different options to capture **times** in a maintenance order confirmation in the SAP system:

- individual entry of times for each order operation
- collective entry using direct entry or an operation list
- entry using the cross-application time sheet (CATS)
- *overall completion confirmation*: times, activities, measurement values, etc., are entered on a collective screen

You can confirm the following time data:

- who processed the operation/sub-operation

- how long the work took and the period in which it occurred
- what activity was performed
- how much longer work must continue
- when is the operation expected to be completed
- whether the work for this operation/sub-operation is completed
- whether the reservations still outstanding should be cleared
- a free text

The **activities** performed in a maintenance order can be entered and confirmed in the following ways:

- You can enter activities as maintenance notification with the notification type ***activity report*** and assign them to the corresponding maintenance order.
- You can enter a confirmation text when capturing time confirmations. However, texts are not as easy to structure and analyze later on as activity reports.

When you create an **activity report**, you have already performed an activity. You want to document this activity using an activity report. An activity report describes maintenance or service activity already performed, or one that was not the result of a malfunction or damage. It simply provides technical documentation of which activities were performed when and with what results. Activity reports are, therefore, used for the technical confirmation of maintenance or service activities. A typical activity report, for example, is the inspection findings, since it describes the results of an inspection to test the actual condition of the object. In most cases, the inspection task is based upon an inspection order. Typical examples of the activities documented in activity reports are "Fill up oil", "Check pressure" or "Tighten screws".

Measurement values that are collected during the maintenance operations can be entered as measurement notifications for the reference object.

Times Confirmation

- ✓ Individual entry
- ✓ Collective entry
- ✓ Time sheet (CATS)
- ✓ Overall Completion Confirmation



Activity Confirmation

- ✓ Activity reports
- ✓ Overall Completion Confirmation
- ✓ Confirmation texts



Measurements/Counter Readings

Figure 33: Order Confirmation: Times/Activities

3.1.6.1.2 Technical Confirmation

Technical data is very important for the customer service and maintenance of technical objects. This is particularly the case if evaluations are to be created concerning customer service or maintenance. Technical data can provide information about:

- cause of damage
- exact damage location on the object
- work/activities performed and findings
- machine breakdowns
- system availability during and after the task

You can confirm technical data for different parts of the order. Depending on the type of entry, you can:

- enter notification data valid for the whole order
- enter notification data valid for the operation
- enter notification data for an object in the object list
- assign notifications to the order and confirming data

The data from the notification is entered into the notification history when you close the notification. It is part of the history and contains data for each technical object on damage, malfunctions, causes, findings and the tasks performed.

3.1.6.1.3 Overall Completion Confirmation

Using an overall completion confirmation, you cannot only confirm working times, but also all relevant details concerning an order on a single screen. The screen layout can be configured according to the individual requirements of the users.

Thereby, in addition to the work time required, you can confirm other data such as materials used, information about damage, the work and services performed (tasks, activities) or measurement and counter readings. You also have the option of confirming an *inspection round* within the overall completion confirmation. If an activity has a technical object and the corresponding counter (as PRT) assigned, you can also record the counter readings (or measurement values) for the activity along with the actual times.

In summary, overall completion confirmation provides a single screen for

- confirming working times
- confirming materials used
- confirming the work performed (activities, tasks and services)
- information about damage
- confirming measurement documents (measurement values and counter readings)

Thus, with the overall completion confirmation, time confirmations and *technical confirmations* can be processed in the same way.

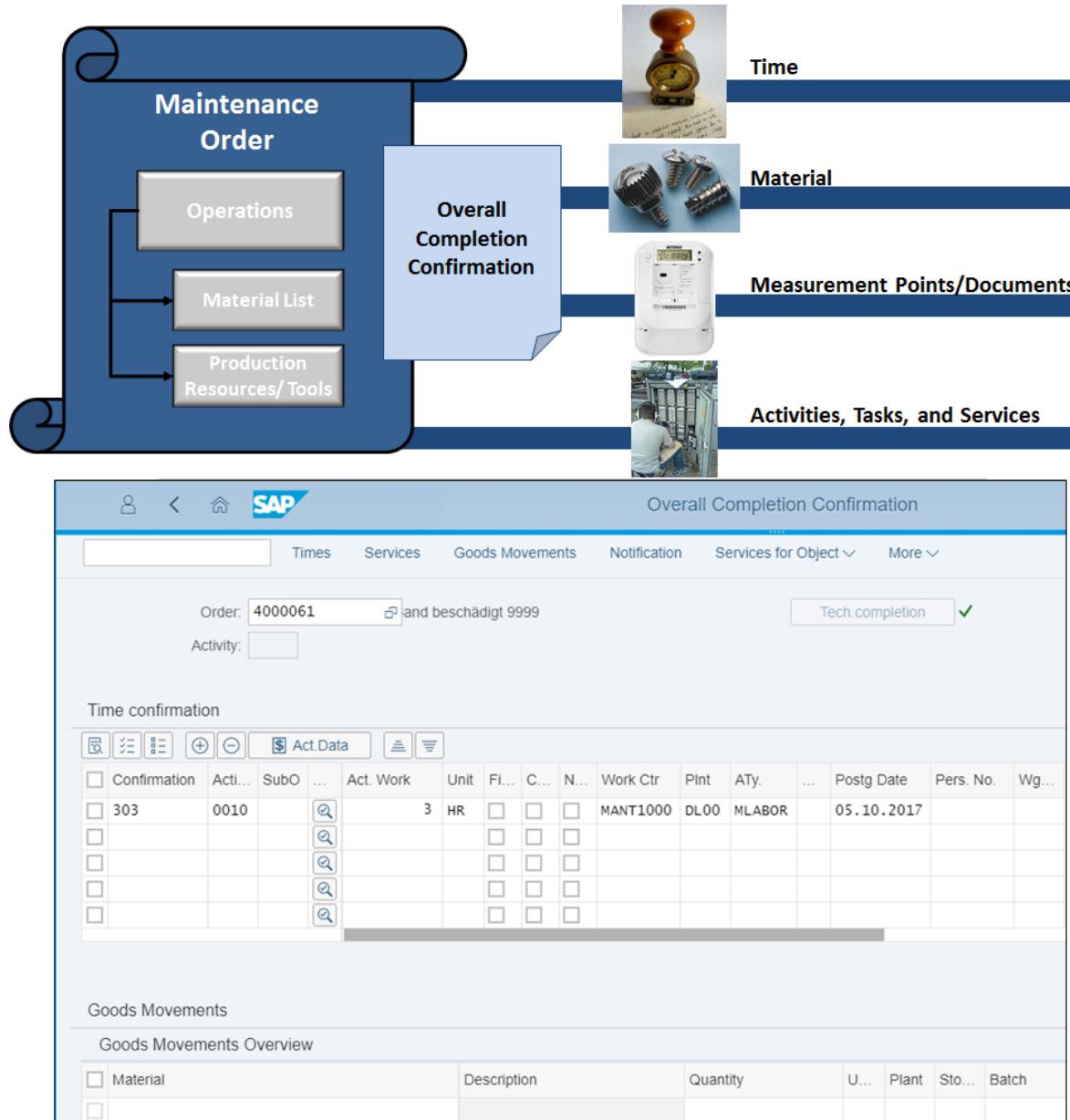


Figure 34: Overall Completion Confirmation: SAP-System-Screenshot

3.1.6.1.4 Order Status in the Confirmation Process

Upon entering confirmations for individual operations/sub-operations of a maintenance order, the system automatically assigns the **PCNF** (partially confirmed) status to these operations/sub-operations, given that no settings were made in customizing that a final completion confirmation should be proposed automatically. Once all operations/sub-operations of a maintenance order are confirmed, the order itself receives the status **CNF** (finally confirmed). It is possible that a confirmation is assigned to the wrong operations/sub-operations or that confirmations are entered with incorrect data. Therefore, confirmations can always be reversed if required.

3.1.6.2 Technical Completion

There are two options for carrying out the technical completion of a maintenance order:

- complete the maintenance order and notification separately
- complete the maintenance order together with assigned notification

For completing the maintenance order and the original notifications together, there must be no outstanding tasks on any of the notifications assigned to the order. In case any outstanding tasks (status **OSTS**) in a notification exist, the notification cannot be completed. The tasks must first be marked as finished. The order belonging to the notification can however be completed, as the outstanding tasks must not necessarily belong to the order performed (in certain circumstances, a new order may be required for this).

All notifications with outstanding tasks can be identified easily from their status (**OSTS**) and then processed.

After executing the *technical completion*, the maintenance order receives the status **TECO** (technically completed). This means that the maintenance work required in this order is completed.

After that, only the following changes can be made to a maintenance order:

- The maintenance order can be locked or unlocked
- The deletion flag can be set for the maintenance order
- Goods movements that are still outstanding and confirmations and invoice receipts can be entered.
- You can still change the settlement rule. If there is no settlement rule maintained for the maintenance order, the system creates it automatically. If this is not possible due to missing data, the system prompts you to maintain the settlement rule.
- The order still can receive costs. For example, you can assign costs from invoice receipt for delivered or consumed goods or costs from delayed time confirmations.

All **purchase requisitions** without corresponding purchase order that still exist in the system for the maintenance order are marked with a deletion flag as soon as the TECO status is set. All open reservations and capacities for the maintenance order are closed.

When executing the technical completion, a **reference date** and time must be entered. This depends on what periods are assigned to the order in the Plant Maintenance Information System (PMIS). However, the reference date does not affect the determination of location- and account assignment data. Location- and account assignment data are determined at the time of order creation and are copied to the order. For example, if the cost center of the equipment changes during processing the order, the order can be updated by using the *update reference object data* function (right mouse button) when required.

The *order data* and the data from the *maintenance notifications* and *usage histories* are available from the maintenance order **history** and can be used for evaluation past work and for planning future work.

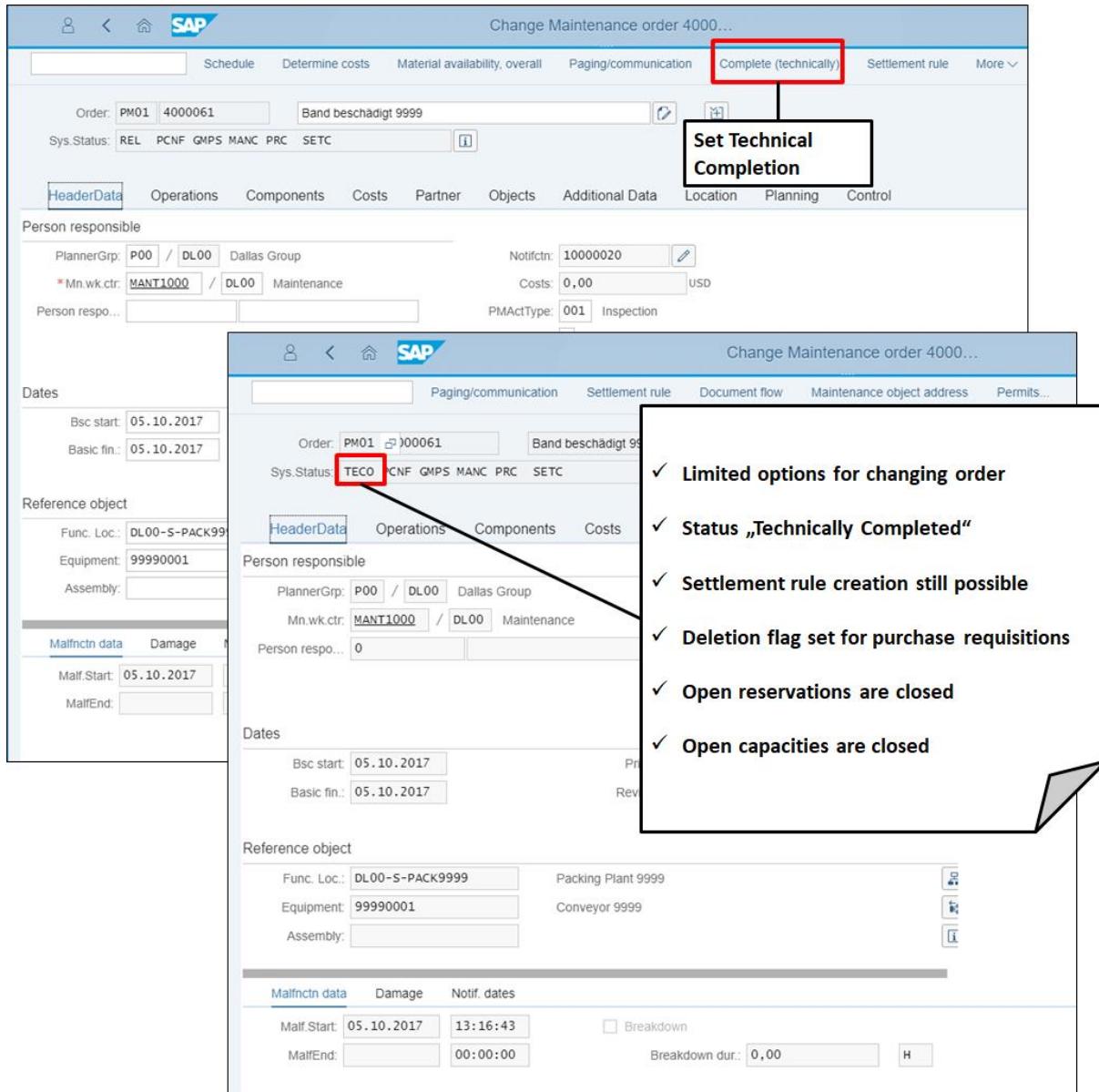


Figure 35: Technical Completion of Maintenance Order: SAP-System-Screenshot

Reverse Technical Completion

If necessary, the status TECO (technically completed) can be reversed. After that, the order receives the status that it had prior to *technically completed*, which in most cases is REL (Released). In addition, capacity requirements and reservations that were cleared due to the technical completion are recompiled and deletion flags set on previously open purchase requisitions, which were not converted to purchase orders, are reset.

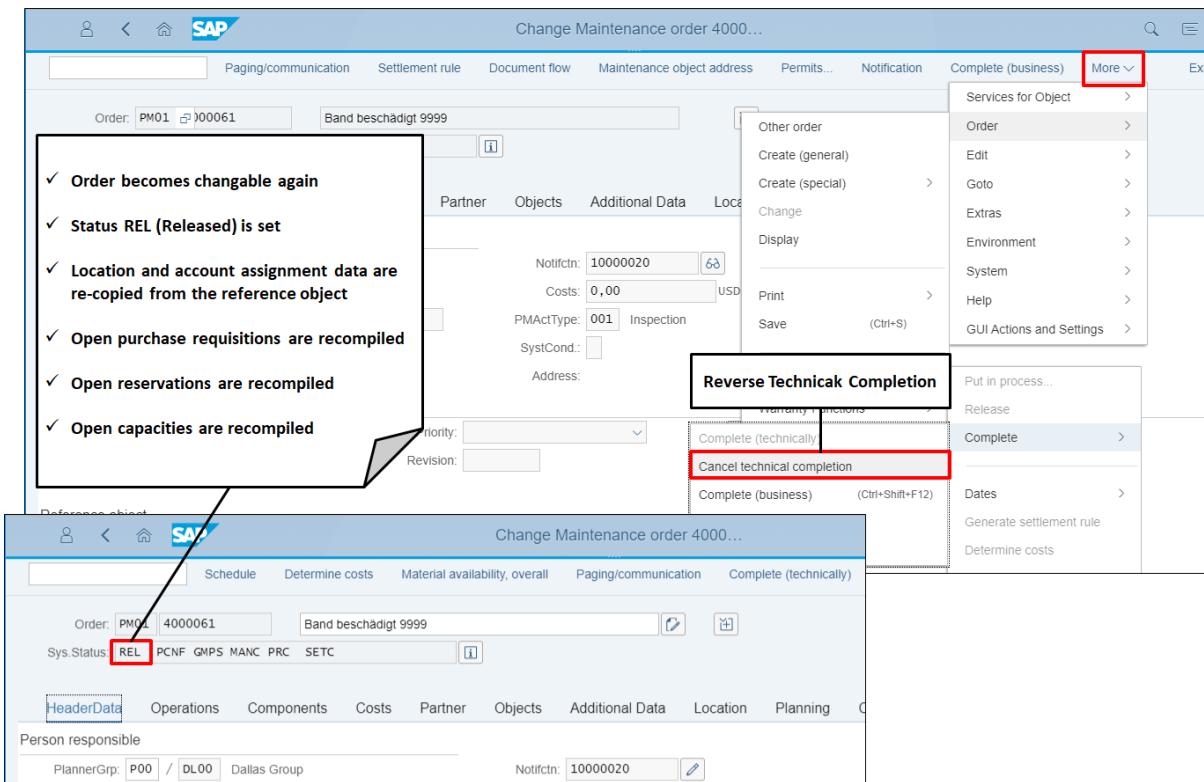


Figure 36: Reverse Technical Completion of Maintenance Order: SAP-System-Screenshot

Technical Completion of Maintenance Notifications

You can also complete a maintenance notification separately from the maintenance order. Before a maintenance notification can be completed, the following must be checked:

- All data, which refers to the reference object for the maintenance notification, is available and correct.
- All the relevant item data is available and correct.
- All the relevant task data is available and correct.
- All tasks have been completed or released; there are no more outstanding tasks.
- All technical data related to the breakdown and availability of the technical system is available and correct.

When you complete a maintenance notification, the following occurs:

- Reference date and -time determine what periods are assigned to the notification in the Plant Maintenance Information System (PMIS).
- The maintenance notification is locked for changes, which means that you can no longer change notification data.
- The notification is assigned to the status NOCO (Notification completed).

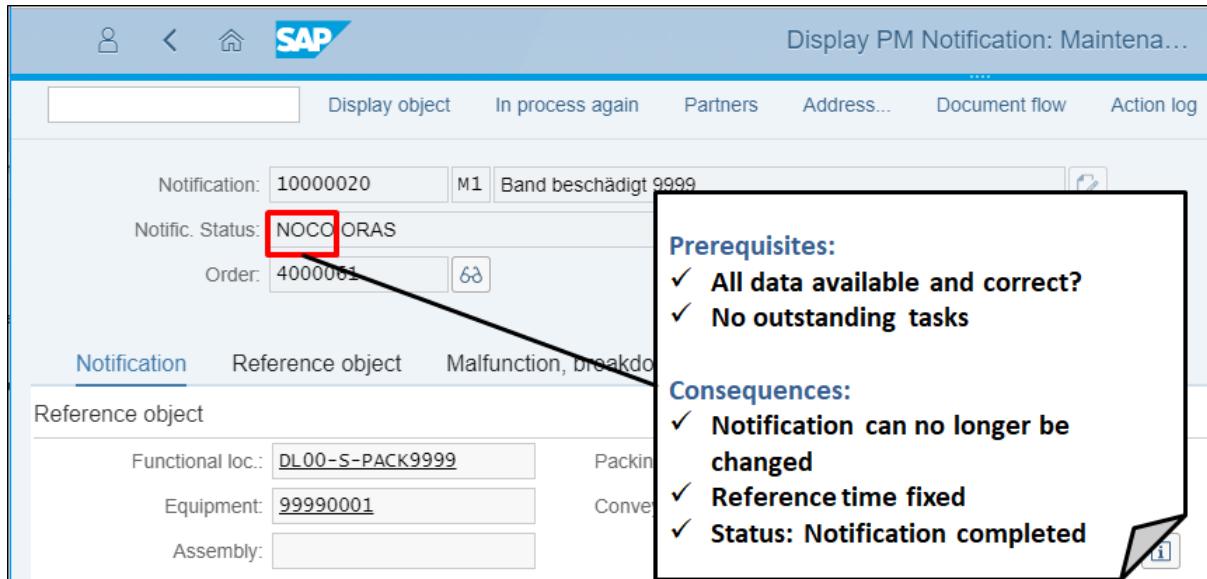


Figure 37: Technical Completion of Maintenance Notification: SAP-System-Screenshot

3.1.6.3 Integration with Management Accounting (SAP CO)

Plant Maintenance and the maintenance processes are – like most processes in the SAP system – fully integrated with the Controlling application; sub-processes of the internal accounting system such as **Costing** and **Settlement** are integrated with order planning.

On the one hand, the integration of the costing functions in the maintenance order allows calculating the costs for personnel and materials at any phase in a maintenance order. This includes plan, target and actual costs. On the other hand, it is possible to run cost analyses based on the (automatically) calculated costs and the actual costs incurred on the maintenance order. The expected costs of a maintenance order can, thereby, be displayed in two different ways:

- at cost element level (controlling view)
- at value category level (maintenance view)

In customizing, the cost elements are assigned to the value categories.

When internal maintenance operations are performed by maintenance work centers and confirmed in a maintenance order, then the completion confirmation triggers an internal activity allocation between the cost center (that is assigned to the performing work center) and the plant maintenance order. The actual costs that incur in the maintenance process are calculated by multiplying the recorded work time with the activity price and debited on the maintenance order. Thus, the maintenance order is the temporary cost collector (account assignment object).

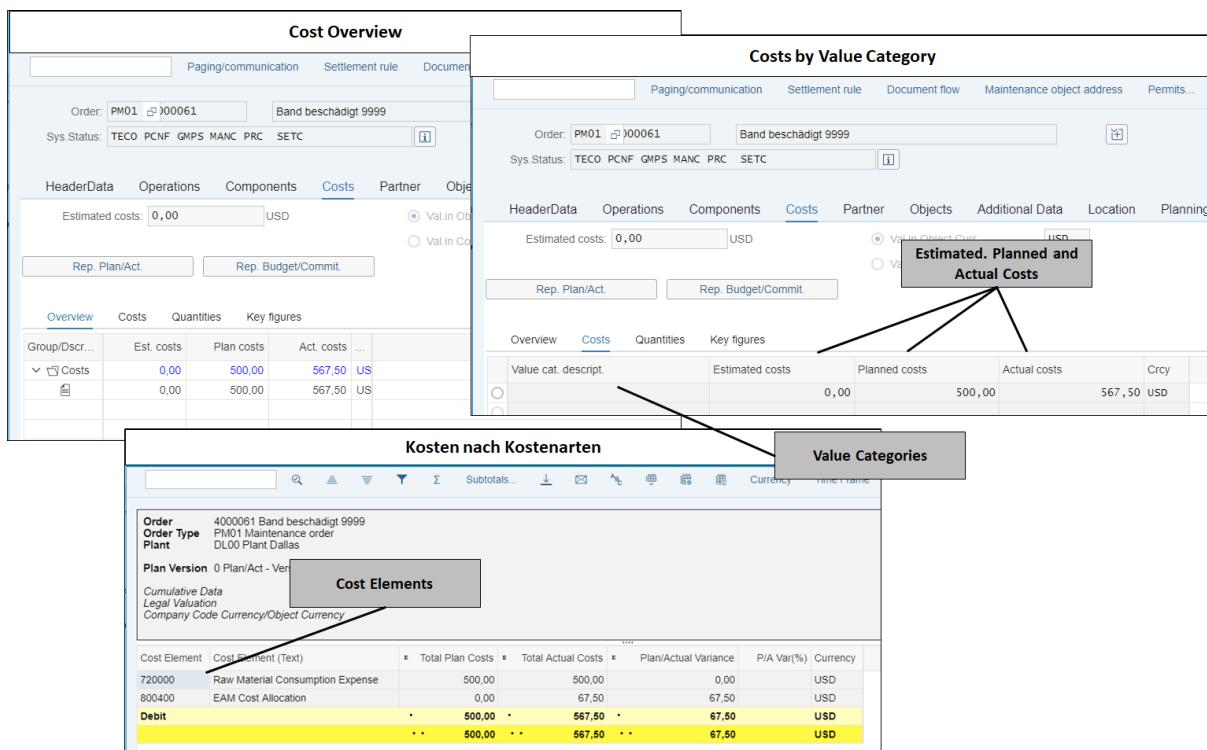


Figure 38: Cost Analysis in the Maintenance Order: SAP-System-Screenshot

The next step in completing the maintenance order is the settlement of the order costs to the final cost recipients. In order settlement, it is ensured that cost allocation and tracking adhere to the allocation-by-cause principle. Thereby, the following questions are answered:

- Is the order really the originator of the costs?
- What is the role of the maintenance object or maintenance requester?

Depending on the type of task, the order is settled to its actual originator and credited with the costs of resources consumed. Order costs are borne by another receiver, which is also a cost accounting object. This can, for example, be the cost center of the maintenance object or the organizational unit that requested this work to be executed. Therefore, the order is merely a collector of all costs incurred during the planning and execution phases with the purpose of tracking them from a cost-related perspective.

For instance, the routine maintenance tasks that are performed during technical administration of a specific technical object are generally settled to the cost center that is assigned to this object (in the master data of the technical object). To perform technical administration of the object, the corresponding cost center must be specified as the receiver in the settlement rule for the order.

During the order processing, all costs incurred for the maintenance of the object specified in the maintenance order are posted (debited) as actual costs to the maintenance order. Thus, the maintenance order collects all the costs that result from planning and consuming resources of the company (workers, machines, electricity, administration, etc.) for maintaining the technical object.

During order settlement (transaction KO88) these actual costs are passed on to the cost center that is assigned to the technical object. The technical object's cost center is debited with these

costs and, at the same time, the costs are credited to the maintenance order. The balance of actual costs for the order after complete settlement equals zero while the actual cost on the cost center is greater than zero.

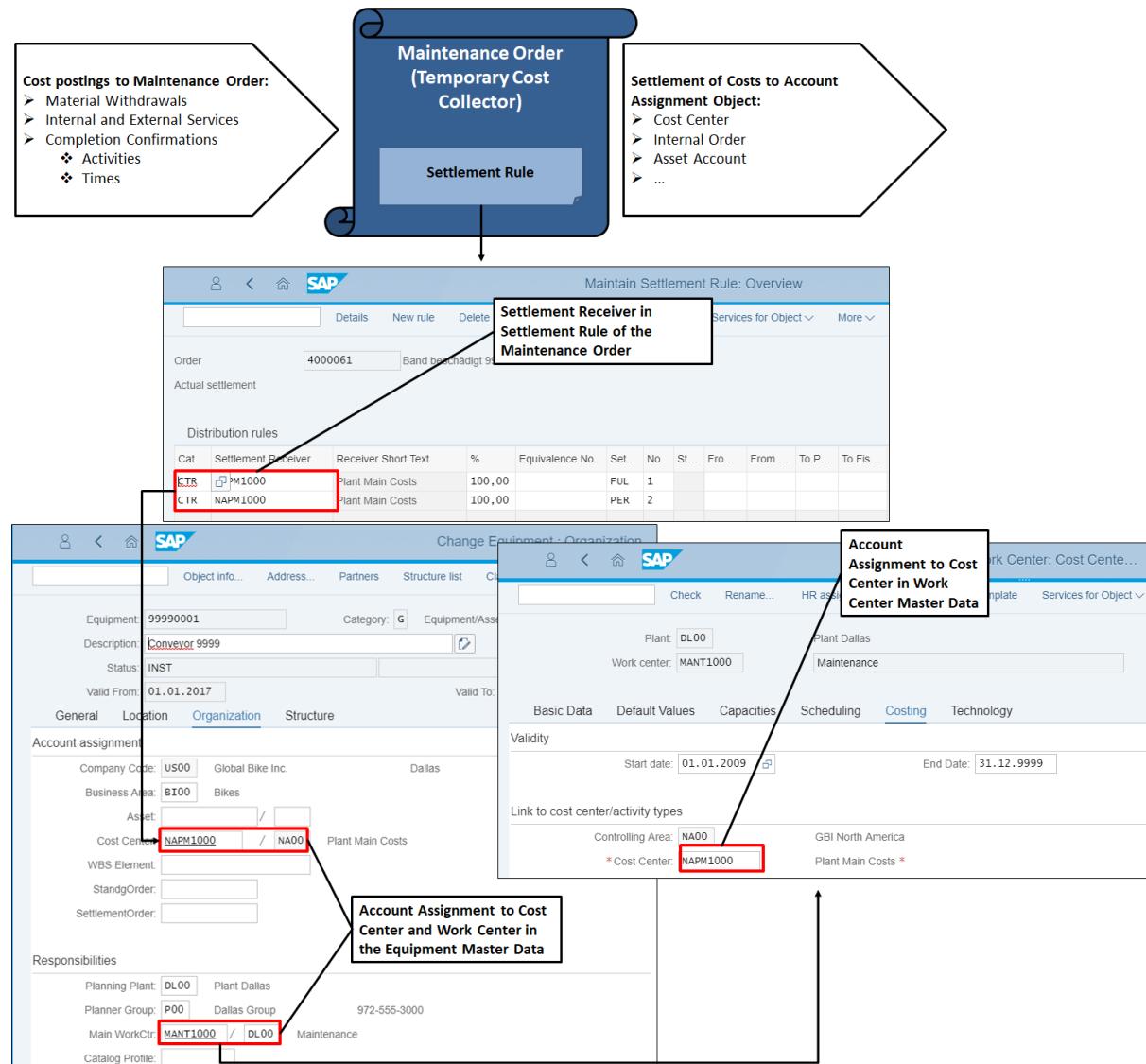


Figure 39: Maintenance Order Settlement: SAP-System-Screenshot

3.2 Practice: Maintenance Process in SAP EAM

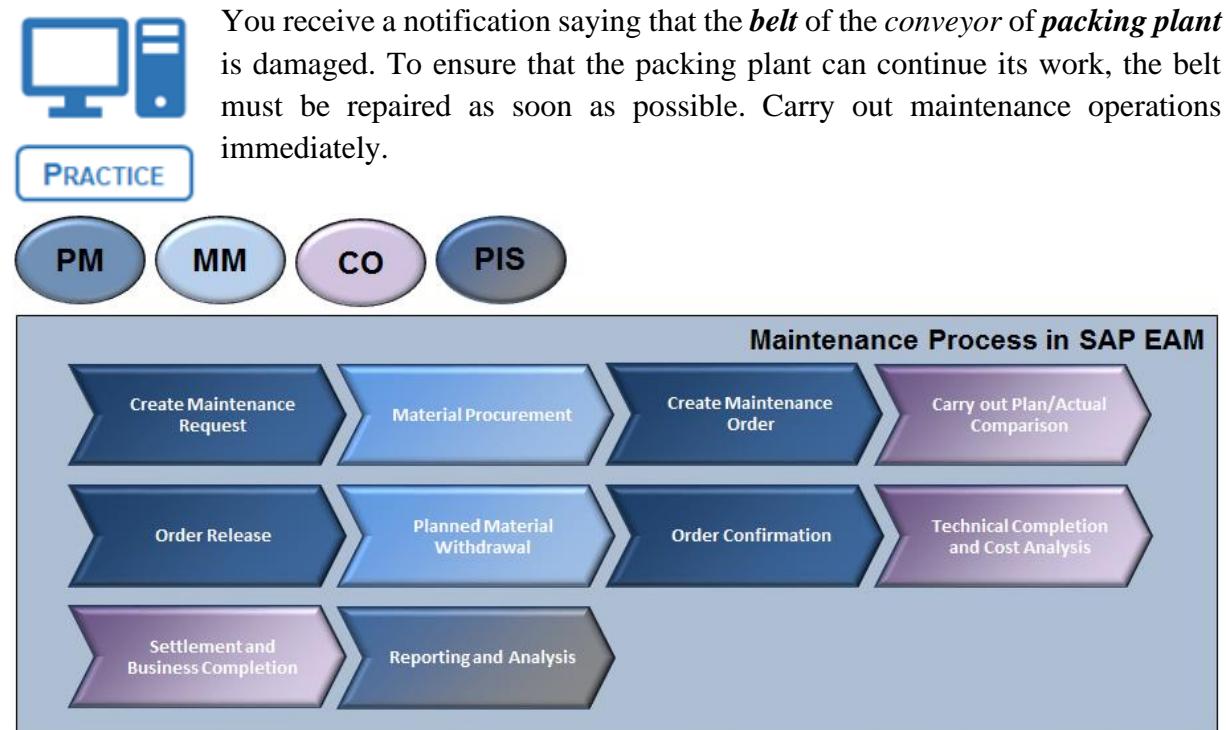


Figure 40: Process Overview: Maintenance Process in SAP EAM

3.2.1 Create Maintenance Request

The corrective maintenance process commences with the maintenance request. Create a maintenance request by scrolling down to the tile group **Script 7 – Enterprise Asset Management** and opening the app **Create PM Notification**.

1. Enter the reason for the maintenance request into the **description** field (right next to the notification): **belt broken xyyy**
2. Enter the equipment **xyyy00001** as reference object into the **Equipment** field.
3. Press **Enter**. The system automatically fills in the **functional location, planner group, responsible work center**, and etc. fields by using data from the master record of the **technical objects** (in this case: of the equipment).

Notification:	%000000000001	M1 belt broken 9995													
Notific. Status:	OSNO														
Order:															
Notification Reference object Malfunction, breakdown Location data Scheduling overview Items															
Reference object <table border="1"> <tr> <td>Functional loc.:</td> <td>DL00-S-PACK9995</td> <td>Packing Plant 9995</td> <td></td> </tr> <tr> <td>Equipment:</td> <td>99950001</td> <td>Conveyor 9995</td> <td></td> </tr> <tr> <td>Assembly:</td> <td colspan="3"></td> </tr> </table>				Functional loc.:	DL00-S-PACK9995	Packing Plant 9995		Equipment:	99950001	Conveyor 9995		Assembly:			
Functional loc.:	DL00-S-PACK9995	Packing Plant 9995													
Equipment:	99950001	Conveyor 9995													
Assembly:															

Figure 41: Create Maintenance Request: SAP-System-Screenshot

4. Choose **Save** and list the number of your maintenance request on your data sheet.

Maintenance Request:

Leave the transaction by pressing **Exit** and answer the question **after** saving with **No.**

3.2.2 Create Maintenance Order

Now that the notification is entered as maintenance request, you can turn the request into a **maintenance order** to start operations at the conveyor. Therefore, scroll down to the tile group **Script 7 – Enterprise Asset Management** and open the app **Change PM Notification**.

1. Enter the **number** of the notification you just listed (**Maintenance Request**) and choose **Enter**.
2. In the next step of the corrective maintenance process, you will create a maintenance order with order type **PM01**. You will convert the notification you created in the previous task into an order with the transaction to change a notification. Therefore, choose in the upper area the **Create** button () next to the **Order** field.
3. Check the entries:
 - **Order Type** **PM01**
 - **Planning plant** **DL00**
 - **Business Area** **BI00**
 - **Responsible work center** **MANT1000/DL00**
 - Confirm your entries.

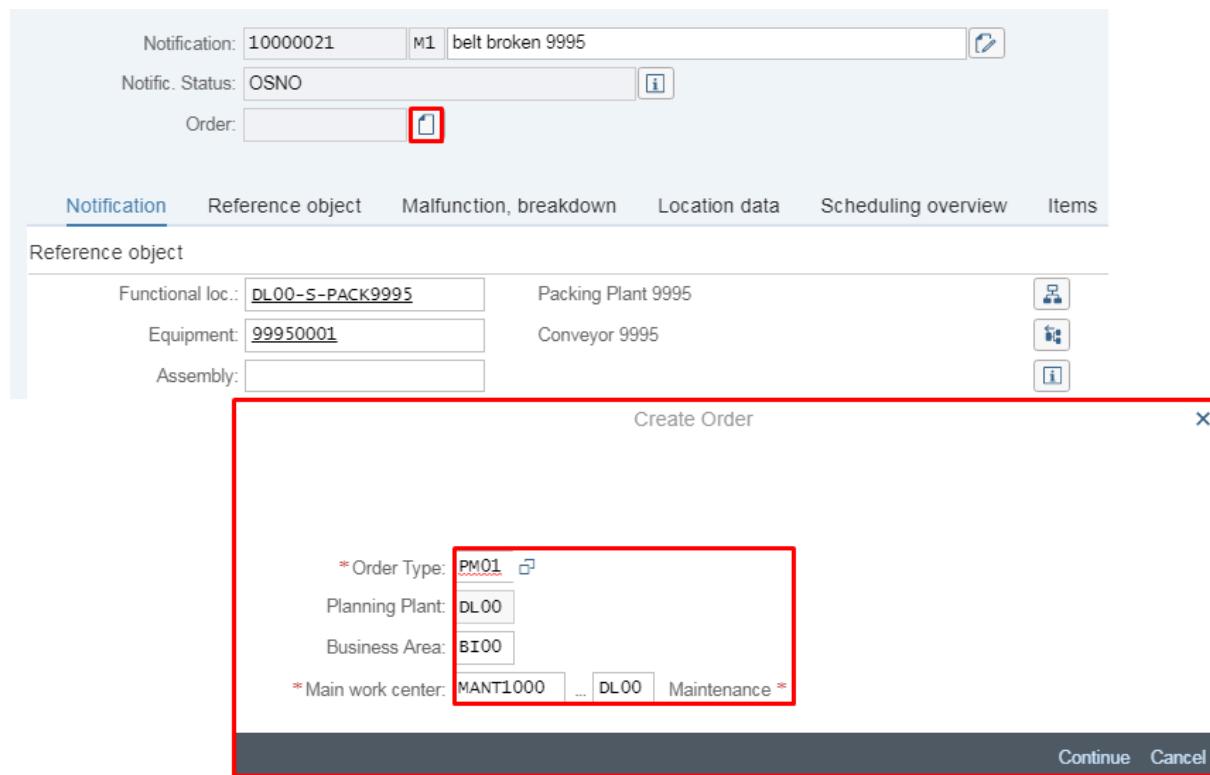
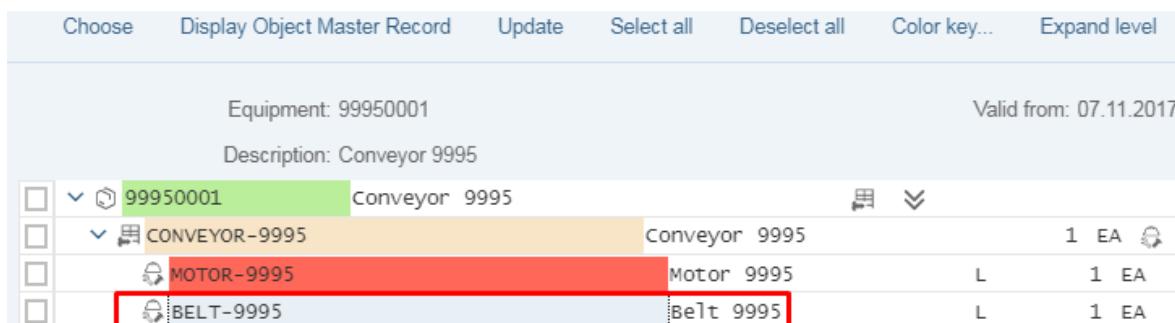


Figure 42: Create Maintenance Order: SAP-System-Screenshot

4. The request is now converted into an order. The order status is set to create (**CRTD**).

Since the belt is damaged, you need to install a new belt.

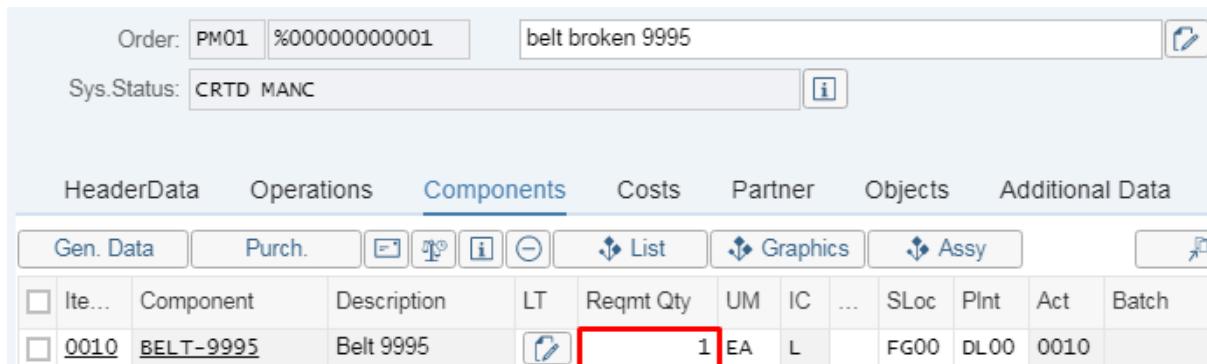
5. Therefore, assign the material **Belt-xyyy** from the BoM to the order by clicking the **Components** tab and then clicking the *list* button () on the bottom part of the screen. Thus, you branch to the structure list of the piece of equipment **xyyy00001**.
6. Expand the node of construction type **Conveyor xyyy** and select the row with the material name **Belt xyyy**. Double-click on the material. Skip with the messages with **Enter**.



Equipment: 99950001							Valid from: 07.11.2017
Description: Conveyor 9995							
<input type="checkbox"/>	99950001	Conveyor 9995					
<input type="checkbox"/>	CONVEYOR-9995		Conveyor 9995		1 EA		
<input type="checkbox"/>	MOTOR-9995		Motor 9995	L	1 EA		
<input type="checkbox"/>	BELT-9995		Belt 9995	L	1 EA		

Figure 43: Select Material: SAP-System-Screenshot

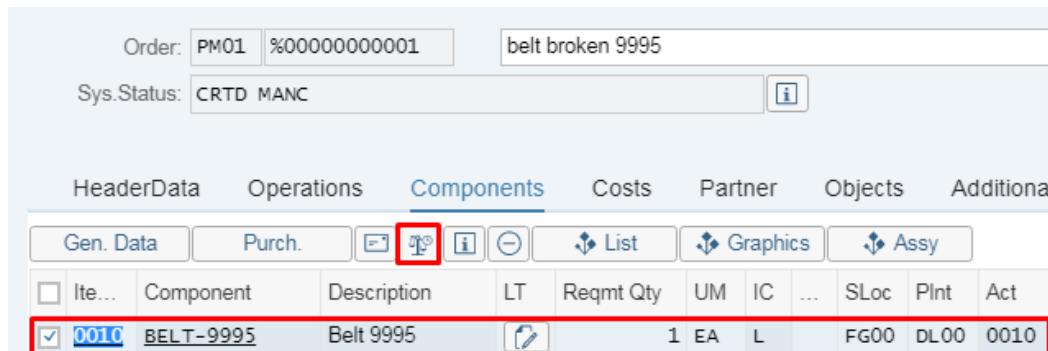
7. Thus, the material is transferred to the maintenance order. Since you require only one belt, change the **quantity** to **1**.



Order: PM01 %000000000001		belt broken 9995										
Sys.Status: CRTD MANC												
HeaderData		Operations		Components		Costs	Partner	Objects	Additional Data			
Gen. Data	Purch.											
<input type="checkbox"/>	It...	Component	Description	LT	Reqmt Qty	UM	IC	...	SLoc	Plnt	Act	Batch
<input type="checkbox"/>	0010	<u>BELT-9995</u>	Belt 9995		1 EA	L			FG00	DL00	0010	

Figure 44: Plan Components: SAP-System-Screenshot

8. Execute an availability check to ensure sufficient stock of the component to cover the required quantity. Therefore, select the line with the component (belt) and choose the **Check Material Availability** () symbol from the bottom of the screen.



Order: PM01 %000000000001		belt broken 9995										
Sys.Status: CRTD MANC												
HeaderData		Operations		Components		Costs	Partner	Objects	Additional			
Gen. Data	Purch.											
<input type="checkbox"/>	It...	Component	Description	LT	Reqmt Qty	UM	IC	...	SLoc	Plnt	Act	
<input checked="" type="checkbox"/>	0010	<u>BELT-9995</u>	Belt 9995		1 EA	L			FG00	DL00	0010	

Figure 45: Check Material Availability: SAP-System-Screenshot

9. Since there is no material on stock (you will take care of it later), you do not receive an availability confirmation but only a conformation proposal. Click on [Continue](#).
10. **Save** the maintenance order and list the order number. Finally, press **Exit**.

Maintenance Order Number:

3.2.3 Carry out Plan/Actual Comparison

You want to carry out a plan/actual comparison to receive a detailed cost analysis. Therefore, scroll down to the tile group **Script 7 – Enterprise Asset Management** and open the app **Change PM Order**.

1. Enter your **maintenance order number** and confirm with **Enter**.
2. Choose **More → Extras → Cost reports → Planned/actual comparison** from the menu (if necessary, select your maintenance order within the popup and press **Continue**).).
3. What are the costs for material consumption (cost element 720000 raw materials)?

Costs Raw Materials:

3.2.4 Order Release

Now that preparations for the order are completed, you can release the order so that the worker in charge can execute it.

1. From the **Planned/Actual comparison** view, return () to the previous step.
2. Choose **release order** by selecting **Release**. The system status changes to **released** (REL).
3. **Save** the order and finally, press **Exit**.
4. Now go to the **Stock/ Requirements List** (App **Monitor Stock/Requirements List**). Your released order should have reserved the material required for the maintenance work.

Material: <u>BELT-9995</u>	
Belt 9995	
MRP area: <u>DL00</u>	DC Dallas
Plant: <u>DL00</u>	MRP type: <u>PD</u>
Material type: <u>ROH</u>	
...	Date
	07.11.2017
	Stock
	07.11.2017 OrdRes 000004000062
	1- 1- FG00

Figure 46: Order Reservation: SAP-System-Screenshot

3.2.5 Material Procurement

Since you just create the material **Belt-xyyy**, you do not have material in the stock. Therefore, you need to accomplish a procurement process for the material **Belt-xyyy**. You have already done this process on the Procurement lecture, check it if you need more indications.

3.2.5.1 Create Purchase Order

First of all, you need to create a purchase order. Therefore, scroll down to the tile group **Script 7 – Enterprise Asset Management** and open the app *Create Purchase Order*.

1. Enter your vendor from Lecture 1.
2. In the Item Header area (if necessary, press the  Header button) enter the following data:
 - Purchasing Organization **US00**
 - Purchasing Group **N00**
 - Company Code **US00**
3. If not opened already, press the button  Item Overview to display the item overview area.
4. Enter the following data in the **first** line of the item overview:
 - A (Account Assignment Category) **F (Order)**
 - Material **Belt-xyyy**
 - PO Quantity **1**
 - Delivery Date **current date + 1 week**
 - Net Price **500**
 - Currency **USD**
 - Plant (Plnt) **DL00** (scroll to the right)
 - Confirm with **Enter**
5. The system issues an error message (*Account 720000 requires an assignment to a CO object*) and goes automatically to the **Account Assignment** tab. Within the **Order** field, enter the **number of your maintenance order** and confirm with **Enter**. Confirm any warning messages.
6. **Save** your created purchase order and list the number of the purchase order on your data sheet. Leave the view by pressing **Exit**.

Purchase Order (Belt):

3.2.5.2 Goods Movements Process

Now, you will deal with the goods receipt and goods movement concerning the material of belt-xyyy. We assume that your vendor has completely delivered the ordered material. Thus, you have to post goods receipt now. Therefore, scroll down to the tile group **Script 7 – Enterprise Asset Management** and open the app *Post Goods Movement*.

1. You want to post a goods receipt for the purchase order you created earlier. Therefore, on the upper part of the screen select **Goods Receipt** from the left drop-down menu and

select **Purchase Order** from the right drop down menu. Enter your **purchase order number** for *Belt-xxxx* in the field on the right hand side of the drop-down menu. Press *Enter*.

2. The system now fills in the position data for your order.
3. Enter in the **Document Date** and **Posting Date** fields the *current date* and in the **Delivery Note** field * (an asterisk).
4. Set the flag **Item OK** at the **bottom of the screen**.
5. Next, click the field with the number **1** () on the first line **and** set the **OK-flag** in position line, as well.
6. **Save (Post)** the document and list the document number from the status bar.

Document Number Goods Receipt (Belt):

To check the impact of posting goods receipt, check the stock overview once again. Therefore, scroll down to the tile group **Script 7 – Enterprise Asset Management** and open the app **Stock Overview**.

Enter material **Belt-xxxx** and plant **DL00**. Choose **Execute**. As you can see, the belt is still not available on stock although you have ordered and posted goods receipt for the material. This is due to the fact that you have assigned your maintenance order to your purchase order and the belt was directly consumed as consumable material (like your 10 gearings in script 1).

3.2.5.3 Verify Vendor Invoice and Carry Out Payment

Now that your order was delivered to the warehouse, you need to clear the vendor claim. First, the vendor sends you an invoice with reference to your purchase order. The vendor's invoice amounts to 500 USD and you as an employee of logistics use logistics invoice verification to enter the invoice. Therefore, scroll down to the tile group **Script 7 – Enterprise Asset Management** and open the app **Create Supplier Invoice**.

1. If you are prompted to enter a company code, provide **company code US00**.
2. Enter the following in the **Basic Data** tab:

- Invoice date	<i>current date</i>
- Posting Date	<i>current date</i>
- Amount	500
- Calculate tax	<i>select</i>
- Tax Code	XI –Input Tax
3. Within the **PO Reference** tab, choose the entry **Purchase Order/Scheduling Agreement** from the drop-down menu. Enter your **purchase order number** (see data sheet) in the field right next to it. Confirm your entries pressing *Enter*. The system automatically fills in the purchase order items and computes the tax amount.

The screenshot shows the SAP Invoice Verification interface. A red box highlights the 'Purchase Order/Scheduling Agreement' dropdown and the document number '4500000033'. Another red box highlights the 'Amount' field containing '500,00'. A third red box highlights the 'Tax Amount' field containing '0,00'. A fourth red box highlights the 'USD' currency selection and the 'Calculate Tax' checkbox. A red arrow points from the text 'Double-click on this icon to display the error message' to a small red error icon located next to the 'Balance: 0,00 USD' field.

Figure 47: Invoice Verification: SAP-System-Screenshot

- As you can see, your document still contains an error. Double-click on the error icon to receive the error message.



If there is no error icon (red) next to Balance, you can skip the next point and continue by selecting Post.

NOTE

- Enter **TX0000000** as **Jurisdict.Code** and confirm with **Enter**.
- Finally, switch to the **Payment** tab and make sure that **current date** is set as **BaselineDt**.
- Press **Post** and write down the document number. Leave the view by pressing **Exit**.

Invoice Document Number (Belt):

Now, create your own payment run. You can select the vendor (supplier) to create the payment. Therefore, scroll down to the tile group **Script 7 – Enterprise Asset Management** and open the app **Manage Automatic Payments**.

- Click on **+** in order to create new data.
- Then, enter **current date** as **Run Date** and **Qxyy** as **Identification**. Confirm by selecting **Create**.

The payment run selects all the documents of your vendor in the company code US00 until the next month. All the payments in this run will be carried out using the payment method C. You must also enter the posting date of the next payment run, this way, the system should decide whether the payment is performed in this payment run or can wait until the next payment run in a month.

- Within the **Parameter** view, enter the following data:

- Posting Date	<i>current date</i>
- Company Code	<i>US00</i>
- Supplier	<i>your Vendor number</i>
- Docs Entered Up To	<i>current date</i>
- Next Payment Date	<i>current date + 1 month</i>
- Payment Method	<i>C</i>

4. **Save.**

The second step is to prepare the payment run, for that the system has to create a payment proposal. Based on the used parameters the system will search all the open items that need to be paid. In your case, you will just see an outstanding item of your vendor.

5. Next, select **Schedule → Proposal**.
6. Enter current date as start date, select **Start Immediately** and confirm by selecting **Schedule**.
7. Enter *Qxyyy* as **Identification** and press **Go**. As you can see, 1 processed proposal is displayed.
8. Click on *Qxyyy* and then, select **Schedule** to schedule the payment.
9. Select **Start Immediately** and click on **Schedule**.
10. Leave the view.

3.2.6 Order Confirmation

The worker renewed the belt and, thus, the order is completed. Next, he must enter this into the system by confirming the order. To enter the confirmation, scroll down to the tile group **Script 7 – Enterprise Asset Management** and open the app **Overall Completion Confirmation**.



If you should receive the message "Customizing incorrectly maintained", then you can ignore it.

NOTE

1. Choose **More → Extras → Settings** from the menu.
2. Enter profile **1**. The entered profile controls the structure of the confirmation screen. Choose **Save**.
3. Enter your **order number** into the order field and press **Enter**.
4. It took the worker 2 hours; correspondingly, you have to debit the order with 2 hours. The working times are entered on the **time confirmation** screen. Moreover, enter that the order is confirmed overall, thus, open reservations (e.g., for materials) are deleted and there is no additional work left:

- Actual Work	<i>2</i>
- Unit	<i>HR (hours)</i>
- F (Final Confirmation)	<i>select</i>
- C (Clear Open Reservation)	<i>select</i>
- N (No Remain Work)	<i>select</i>

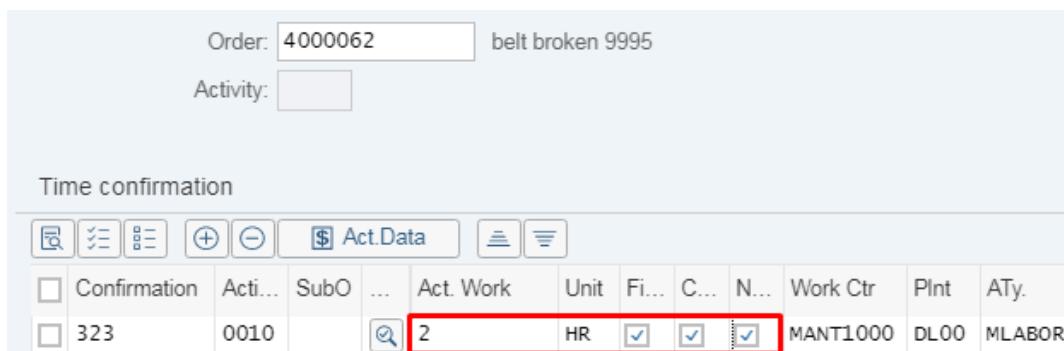


Figure 48: Carry out Confirmation: SAP-System-Screenshot

5. Save the confirmation of the order. Confirm with *Enter* the possible messages and press *Exit*.

3.2.7 Technical Completion and Cost Analysis

The work for the conveyor is completed. Therefore, you have to complete both the order and the notification technically. With this,

- reservations in the system for the order are cleared (e.g., materials or capacities),
- open purchase requisitions get a deletion flag, since they are no longer required and
- changes to the order are no longer permitted.

If required, this status can be reversed. Carry out the *technical completion* by scrolling down to the tile group **Script 7 – Enterprise Asset Management** and opening the app **Change PM Order**.

1. Enter your **maintenance order number** and confirm with *Enter*.
2. Choose **More → Order → Functions → Complete → Complete (technically)** (if necessary, select your maintenance order within the popup and press *Continue*).
3. Make sure that the **Complete notifications** checkmark is set in the **Complete** dialog. By setting this flag, the *maintenance notification* is also completed technically.
4. Confirm with *Continue*.
5. Open your **maintenance order** again.
6. The order status changed to TECO (*technically completed*).
7. Press **Document Flow** (or **More → Document Flow**) to see the document flow.

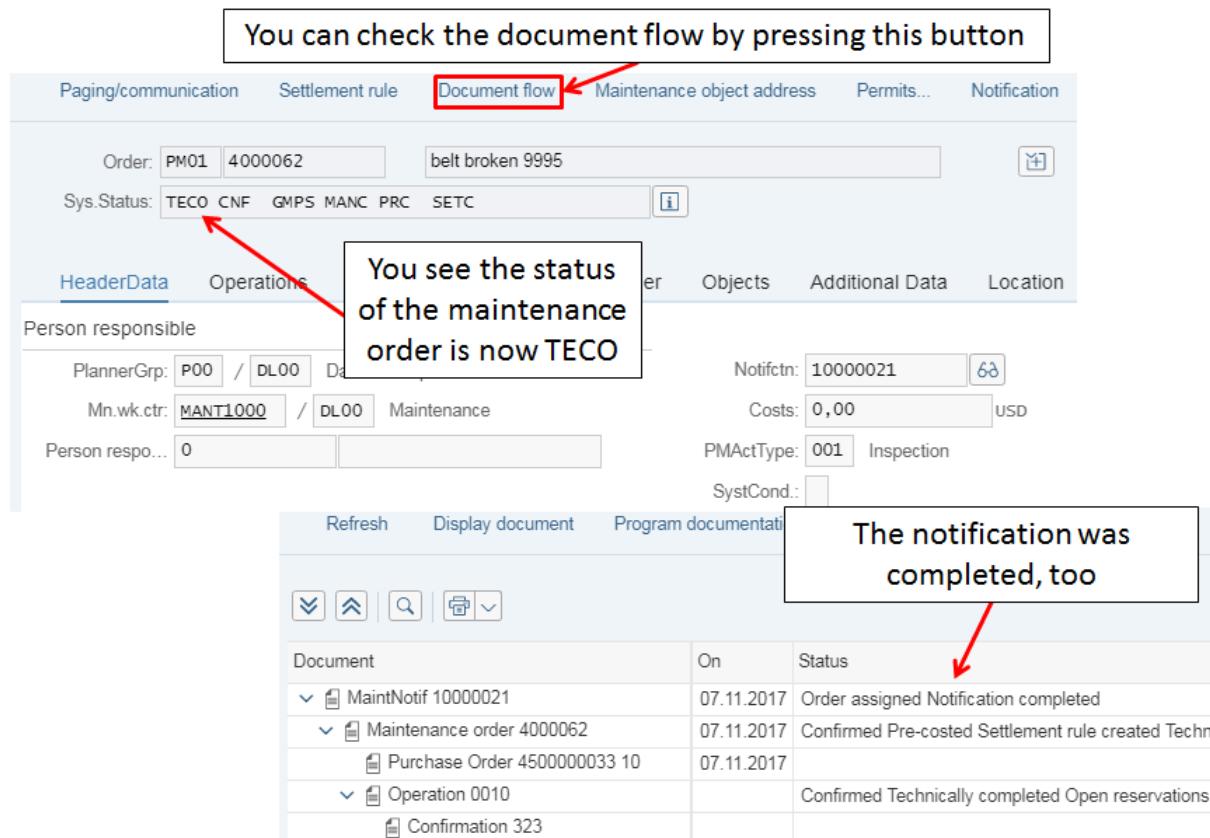


Figure 49: Technical Completion/ Document Flow: SAP-System-Screenshot

8. Press to turn back to the previous view and complete the maintenance order from business perspective. Therefore, select **More → Order → Functions → Complete → Complete (business)** (if necessary, select your maintenance order within the popup and press **Continue**).
9. You should get an error message. Display the **Log**. What does the error message say?

Error message Business Completion:

10. **Do not** leave the transaction!

3.2.8 Settlement and Business Completion

Before the maintenance order can be completed from business point of view, you need to settle the costs of the order and, thus, balance it out.

3.2.8.1 Settlement Rule

Check how the costs of the maintenance order are settled.

1. Select **More → Goto → Settlement rule** (if necessary, select your maintenance order within the popup and press **Continue**).
2. What is the Account Assignment Category (**Cat**) of the settlement rule?

Category Settlement:

3. Who is the cost receiver?

Cost Receiver:

4. **Save** the order and leave the transaction.

3.2.8.2 Settle Order Costs

Settle the costs. Therefore, select the app **Ac...**

You already know how to settle costs of a controlling object in SAP CO. You did that for your production order in teaching unit 2 and for your internal order in teaching unit 6. You can find the necessary app within the tile group **Script 7 – Enterprise Asset Management**.

Settle the costs **on your own!**

3.2.8.3 Business Completion

After you have settled the costs, the costs (Cost report Planned/Actual) should have a balance of 0 in the *Total actual costs* column.

Now, you can accomplish the business completion.

1. Accomplish the business completion for your **maintenance order on your own (any warning messages can be confirmed with Enter)**!
2. After Business Completion is accomplished, the status should be **Closed (CLSD)**.

The screenshot displays the SAP system interface for Business Completion. At the top, the order number PM01 4000062 is shown, along with the description 'belt broken 9995'. The system status is listed as CLSD (Closed), which is highlighted with a red box. Below this, there are tabs for HeaderData, Operations, Components, Costs, Partner, Objects, Additional Data, and Location. The HeaderData section shows the order details: PlannerGrp P00 / DL00 Dallas Group, Mn.wk.ctr: MANT1000 / DL00 Maintenance, and Person resp... 0. To the right, Notifcfn: 10000021 (with a red box around the number 63), Costs: 0,00 USD, PMActType: 001 Inspection, and SystCond: are displayed. The Cumulative Data section includes Legal Valuation and Company Code Currency/Object Currency. The detailed cost report table at the bottom shows the following data:

Cost Element	Cost Element (Text)	Total Plan Costs	Total Actual Costs	Plan/Actual Variance	P/A Var(%)	Currency
720000	Raw Material Consumption Expense	500,00	500,00	0,00		USD
800400	EAM Cost Allocation	0,00	22,50	22,50		USD
Debit		500,00	522,50	22,50		USD
800500	EAM Settlement	0,00	500,00-	500,00-		USD
800500	EAM Settlement	0,00	22,50-	22,50-		USD
Settlement		0,00	522,50-	522,50-		USD
		500,00	0,00	500,00		USD

Figure 50: Business Completion: SAP-System-Screenshot

3. Leave the view.

3.2.9 Reporting and Analysis

You want to execute a standard report including all maintenance orders of the past year (including your own maintenance order).

Execute Standard Report

To call up the standard report, choose within the tile group **Script 7 – Enterprise Asset Management** the app **Change PM Orders**.

1. Select the order status **Outstanding**, **In process**, **Completed** and **Historical**. Thus, all orders in the system are displayed.
2. Enter the period from **01.01.of the current year** until **the last day of the year**.
3. Choose **Execute**.

The screenshot shows the SAP Change PM Orders interface. At the top, there is a section for 'Order status' with four checkboxes: 'Outstanding' (checked), 'In process' (checked), 'Completed' (checked), and 'Historical' (checked). Below this is a section for 'Order selection' containing various filter fields: Order (text box), Order Type (text box), Functional Location (text box), Equipment (text box), Material (text box), Serial Number (text box), Addit. device data (text box), Notification (text box), Main work center (text box), Plant for WorkCenter (text box), Period (text box with value '01.01.2017'), and two columns of 'to:' fields with associated copy icons. The 'Period' field and the 'to:' fields for the first three rows are highlighted with red boxes.

Figure 51: Maintenance Order List (1): SAP-System-Screenshot

4. You receive a list containing all maintenance orders of the current year.



NOTE

The example in the following screenshot only shows a few orders as only these orders were created at the time of writing this teaching unit. In your case a high number of orders might be displayed depending on how many students have already finished this practice unit.

	S	Order	Type	Bsc start	Description
		4000020	PM01	17.06.2017	Band beschädigt 9990
		4000022	PM01	13.07.2017	
		4000040	PM01	01.09.2017	Band beschädigt 9999
		4000061	PM01	05.10.2017	Band beschädigt 9999
		4000062	PM01	07.11.2017	belt broken 9995

Figure 52: Maintenance Order List (2): SAP-System-Screenshot

You want to display *planned* and *actual costs* in the report and sort the orders in descending order, according to their order numbers.

- Therefore, press the *current* () button. On the right hand side, choose **Total planned costs** and **Total actual costs** (hold down the shift key when you want to select both).

Choose *Show Selected Fields* () and then *Transfer*.

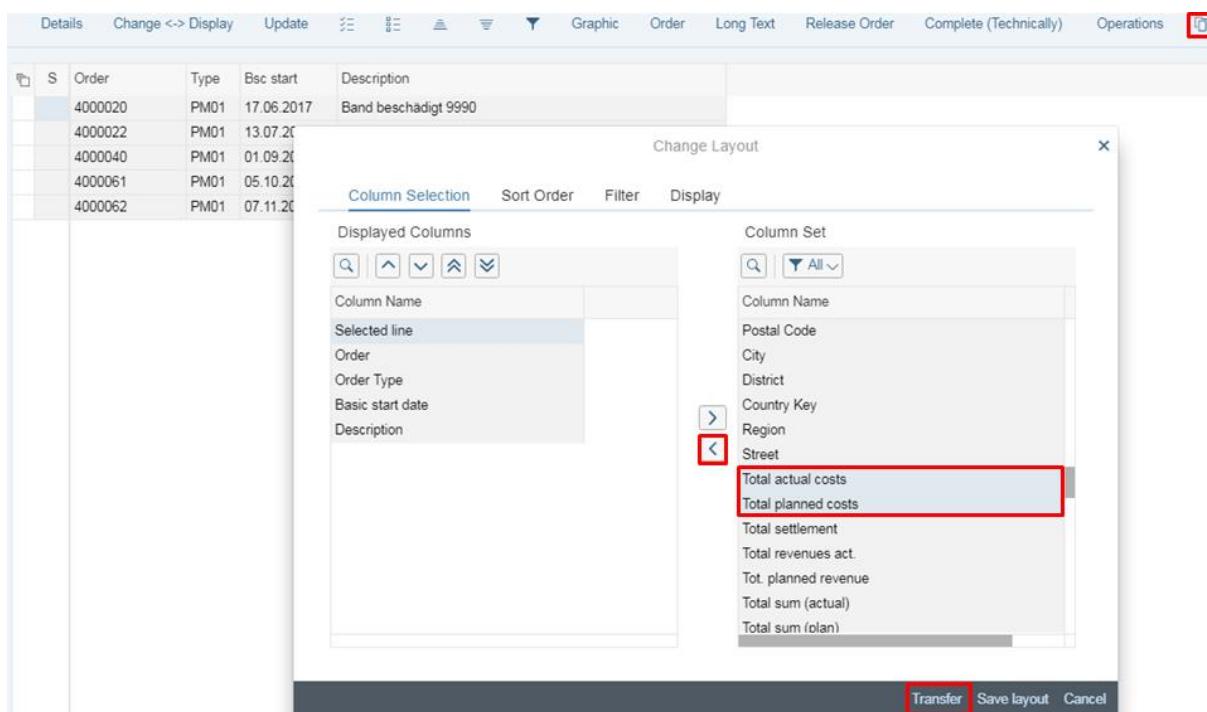


Figure 53: Column Selection: SAP-System-Screenshot

- You want to display the order details for the maintenance order that you created, but you are not sure about the order number. To identify your order, you can add the field *entered by* to your report. Choose again and add the **Entered by** column to your report. Confirm the modification.
- To *sort* the orders *in descending order*, mark the **order** column and then select the *Sort in Descending Order* () symbol.

The screenshot shows a SAP system interface with a toolbar at the top containing 'Details', 'Change <-> Display', 'Update', and various icons. Below the toolbar is a table with two sections. The first section has columns: 'Order' (with a dropdown arrow), 'Type', 'Bsc start', and 'Description'. The second section, which is highlighted with a red box, has columns: 'Total actual costs', 'Total planned costs', and 'Entered By'. Data rows are present in both sections.

	S	Order	Type	Bsc start	Description	Total actual costs	Total planned costs	Entered By
		4000062	PM01	07.11.2017	belt broken 9995	522,50	500,00	WIP9-995
		4000061	PM01	05.10.2017	Band beschädigt 9999	567,50	500,00	MASTER_G
		4000040	PM01	01.09.2017	Band beschädigt 9999	522,50	500,00	WIP9-999
		4000022	PM01	13.07.2017		0,00	0,00	MASTER
		4000020	PM01	17.06.2017	Band beschädigt 9990	522,50	500,00	WIP9-990

Figure 54: Sort List with Additional Columns: SAP-System-Screenshot

8. Display the details concerning your order. Therefore, select your order by double-clicking on the order number.

Can you change your maintenance order? Why not?

9. Close the report.

Data Sheet

*Congratulations! You completed the **Enterprise Asset Management** case study.*

The subsequent case studies are based on the results of this case study. In case your data differs from the description in the script, please contact your tutor prior to processing another case study.

Finally, please **submit the carefully completed data sheet** to your tutor (use support email address from the welcome mail) for the case study **Enterprise Asset and Customer Service Management**.

Please comply with the naming rules. Non-compliant data sheets will not be accepted; i.e., rename the document that you downloaded from this course's download area as follows:

07-Asset_Management-xyyy-zzz-lastname.doc

Thereby, you need to replace **xxxx** with your user number **without** the “**WIP**“ and without the hyphen (**WIPx-yyy**) and replace **zzz** with the number of the client you are working on.

Example:

Your name is **Max Mustermann**, you are working on **client 700** and your **user number is WIP9-999**. Then, name the document as follows:

07-Asset_Management-9999-700-Mustermann.doc

List of Literature

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SAP University Alliances (2012): Introduction to SAP ERP – Global Bike Inc. Version 2.11