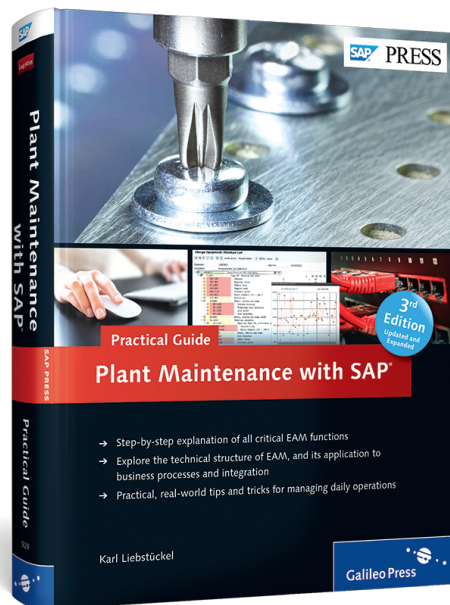


Karl Liebstückel

Plant Maintenance with SAP® — Practical Guide



Galileo Press 

Bonn • Boston

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Preface to the Third Edition

Dear Readers,

This is the third edition of the maintenance manual, and, as you may have noticed, its title was slightly modified this time to *SAP Plant Maintenance—Practical Guide*. Are you wondering why it was modified?

Due to the positive experience with other applications, SAP PRESS has decided to publish a second book for area of Plant Maintenance, *Configuring SAP Plant Maintenance* which will be released in the summer of 2014. There, you will find all the appropriate answers to your questions related to the implementation and customization of EAM. While these aspects were dealt with only briefly in the previous two editions of this book, they are discussed in the appropriate breadth and depth in *Configuring SAP Plant Maintenance*.

Consequently, the previous Chapter 9 of *SAP Projects in Plant Maintenance* and all the more detailed information on Customizing settings will be moved from the previous edition to the new EAM Configuration book.

They are now replaced by the following new sections:

- ▶ Linear Asset Management
- ▶ Production of spare parts
- ▶ Integration with SAP Environment, Health, and Safety Management (EHS Management)
- ▶ SAP NetWeaver Business Client as the new user interface
- ▶ SAP Work Manager and SAP Rounds Manager as new mobile solutions
- ▶ SAP HANA as the new database
- ▶ Additional information on usability (user acceptance, table controls, action box)

In addition, all enhancements from Enhancement Packages 5 and 6 (a few even from Enhancement Package 7) were included—and there were quite a few.

Finally, you will find a supplementary fold-out map (a “reference card”), which includes the most important maintenance transactions. If you were an SAP R/2 user, you know it from RM-INST and have sorely missed it in SAP R/3 and SAP ERP. You now have one again! You will also find a document with all transactions for download at <http://www.sap-press.com/H3316>.

I now hope you enjoy reading this manual, and good luck in your SAP maintenance projects.

Yours,

A handwritten signature in black ink, appearing to read "J. Lubinski". The signature is written in a cursive, flowing style with a large initial "J" and a long, sweeping underline.

Preface to the First Edition

The ongoing technicalization of production, combined with the continually increasing automation of production processes, means that the availability of production facilities and the quality of production are exerting an ever-increasing influence on the success of enterprises. The maintenance of technical systems has a direct effect on the competitiveness of modern enterprises and makes an important contribution to financial results. Plant maintenance does not just involve ensuring that technical systems are in working order and available; it also has to do with other aspects of operating technical systems, such as plant safety, product quality, and environmental protection.

Modern maintenance operations, therefore, are much more than simply maintenance and repair teams, as they represent a comprehensive asset management concept that is incorporated into the processes along the entire lifecycle of technical systems, from procurement to operations, plant rebuilds and modernization, to reinvestments.

Furthermore, the demands made of plant maintenance teams have evolved over time, such that modern asset management technology is now essential. The increasing proportion of complex technical systems and the growing popularity of electronic components and assemblies are creating increased demand for specialists in areas such as electronics and information technology, alongside the traditional setups. In many cases, there is a need for external experts who collaborate as service providers and service partners with enterprises' own in-house plant technicians and take care of the entirety of technical systems in companies.

These developments mean that maintenance management systems must be able to deal with the changing circumstances in asset management, provide flexibility when it comes to the structuring of technical systems, and work with the different work processes of both internal and external maintenance teams.

The topic of *plant maintenance* was an important focus of SAP as far back as the early years of application development. Right from the start, SAP was aware of the need for a comprehensive definition of asset management and therefore extended its focus beyond the basic topics of inspection, maintenance, and repair. Processes such as building a new plant or modernizing an existing one, calibrating test equipment, and refurbishing repairable spares were taken into account in the development of a comprehensive asset management solution.

Maintenance processes in their various forms are now part of a variety of industries. In addition to the repair, inspection, and maintenance processes that are common to several industries, there are also company-specific elements and special requirements unique to individual industries. These can include special approval procedures (such as the work clearance procedure for power generators), complex maintenance planning techniques (such as those in aircraft maintenance), and project-based plant maintenance (large-scale revision).

With *Enterprise Asset Management*, SAP has developed a flexible asset management and maintenance system that has proved its value in numerous installations in a wide variety of industries worldwide. Asset management is also a permanent part of the *Solution Maps* of the various asset-intensive industries. Following on from this, the concept of an asset as a resource in the form of Enterprise Asset Management (EAM) is also part of the overall *Enterprise Resource Planning* (ERP) system.

This book introduces readers to the wide range of potential uses of asset management within the SAP system. Thanks to his role right from the start as a consultant on a wide range of customer projects in various industries, the author has extensive SAP experience and has influenced and was actively involved in the development of the SAP *Plant Maintenance* solution. Thus, he is able to offer a plethora of useful, first-hand information in this manual.

I hope this book will give you the ideas and information you need and that you can implement them successfully in your own projects.

Rolf Peter Westhues

Former Vice President, SAP AG

This chapter provides information about the essential elements for maintenance processing in the SAP system: the general organizational units, maintenance-specific organizational units, and work center.

3 Organizational Structures

The definition of organizational structures covers the following areas: the general SAP organizational units (for example, controlling area, company code, plant, and storage location), definition of maintenance-specific organizational units (for example, location or plant section), and finally, definition of maintenance work centers (for example, mechanical workshop, electrical workshop, measurement, and control).

3.1 SAP Organizational Units

The organizational units form the basis of all master data and business processes in SAP ERP. In the following sections, you will learn about the most important organizational units from a maintenance perspective.

Organizational Units in the SAP Project

Note: If you implement EAM, the general organizational units in the SAP system (for example, the company code, controlling area, and plant) are usually already defined. This is because they were defined when other applications (such as CO, MM, and so on) were implemented. Therefore, you can influence the design only if EAM is implemented from the outset or if you define separate organizational units from a pure maintenance perspective.

[+]

3.1.1 The Plant from a Maintenance Perspective

The plant is undoubtedly the most important organizational unit for plant maintenance. It fulfills several maintenance functions:

Functions of the plant

- ▶ A plant is responsible for planning maintenance activities. In this context, this plant is known as a *planning plant*. To convert a plant to a planning plant, you use the Customizing function MAINTAIN PLANNING PLANT.
- ▶ All technical objects to be maintained are physically located in a plant (functional location, equipment, serial number). Here, this plant is known as a *maintenance plant*. A plant becomes a maintenance plant if you create a technical object there. To assign the planning plant responsible for the maintenance plant, you use the Customizing function ASSIGN MAINTENANCE PLANNING PLANT.
- ▶ You require a plant with a storage location in which you can store spare parts.
- ▶ Furthermore, some technical objects (serial numbers) can be stored in a plant with a storage location.

3.1.2 Maintenance-Specific Organizational Units

Maintenance plant-specific or planning plant-specific?

Additional maintenance-specific organizational units (either maintenance plant-specific or planning plant-specific) play an important role within a plant (see Figure 3.1).

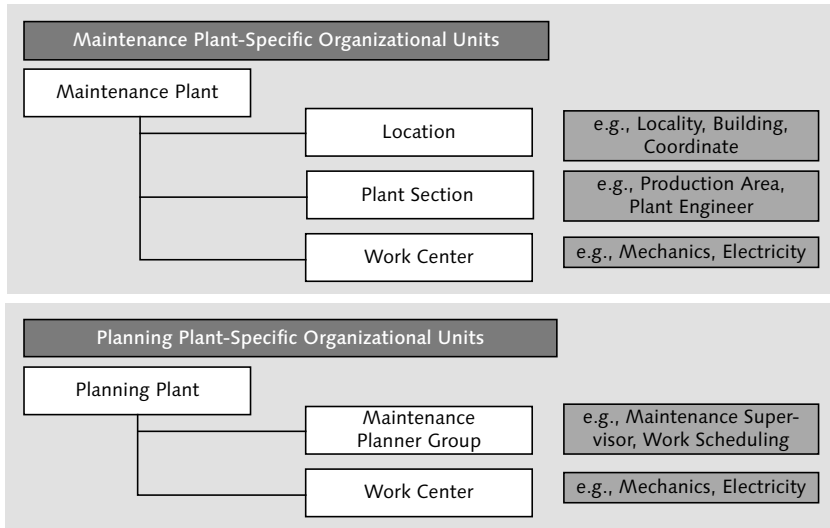


Figure 3.1 Maintenance Plant and Planning Plant

Technical objects (functional location, equipment) also contain all of the maintenance plant–specific and planning plant–specific data, which is then copied to notifications and purchase orders. This data is explained in more detail next.

Work centers perform maintenance tasks or are responsible for such tasks. Work centers relate to either the planning or maintenance plant (see Section 3.2).

Work center

A planner group is responsible for planning maintenance tasks and also relates to a planning plant. You maintain planner groups using the Customizing function `DEFINE PLANNER GROUPS`.

Planner group

Using Planner Groups

[+]

You set up maintenance planner groups, for example, if you want to map work scheduling or individual maintenance planners known by name.

You use a label to indicate the physical location of a technical object. A location is always defined with reference to a maintenance plant; you maintain locations using the Customizing function `MAINTAIN LOCATION`.

Location

Naming Locations

[+]

In practice, either building numbers (for example, F141 or WDF21) or, if they exist, plant coordinates (for example, A01 or K15) have become commonly used locations.

You define the responsibilities for the operation of the (production) plant as the plant section; you maintain plant sections using the Customizing function `DEFINE PLANT SECTIONS`.

Plant section

Responsibilities for the Plant Section

[+]

In practice, either the plant engineer responsible for the technical system or the production area belonging to the technical system is commonly used as a plant section.

3.1.3 Other General Organizational Units

In addition to the maintenance-specific organizational units, there are other general organizational units that are also relevant for EAM.

Company code You assign a plant to the company code (see Figure 3.2). The company code is the smallest organizational unit for which a complete, self-contained set of accounts can be drawn up for the purposes of external reporting ("the company"). This involves recording all relevant transactions and generating balance sheets and profit and loss statements.

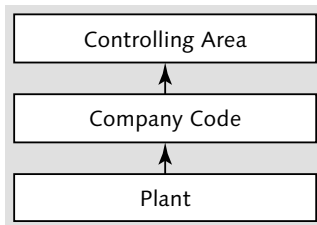


Figure 3.2 General Organizational Units

When you assign a technical object to a maintenance plant, you also automatically assign its company code in the background.

Controlling area The controlling area is an organizational unit within a company for which a self-contained cost accounting can be performed. A controlling area may include one or more company codes.

When you assign a technical object to a maintenance plant, you not only create its company code, but also determine its controlling area. Similarly, when you assign a work center to a plant, you also assign its controlling area.



Controlling Areas Involved

From a plant maintenance perspective, it is always favorable if the controlling area of the technical object and the controlling area of the work center are identical.

You may now be wondering why this is favorable. This will be explained in the next section.

3.1.4 Plant-Specific and Cross-Plant Maintenance

For business processes in plant maintenance, you need to differentiate between order planning and execution in the same plant and order planning and execution in different plants.

Plant-Specific Maintenance

In practice, you most frequently encounter a situation in which the maintenance requirement is planned in the same plant in which it originates, the purchase orders are fulfilled by workshops in the same plant, and the spare parts are stored within the same plant. In Figure 3.3, this plant is known as Plant 1000. The following applies here: maintenance plant = planning plant = plant with spare parts storage.

Requirements, planning, and execution in the same plant

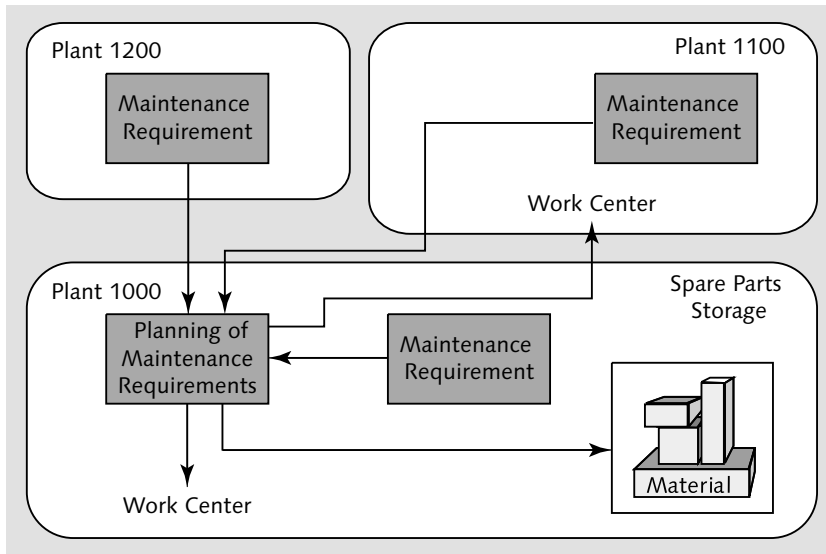


Figure 3.3 Plant and Plant Maintenance

Cross-Plant Maintenance

In addition to plant-specific maintenance, other situations are also to be found:

Requirements and execution in different plants

- ▶ In a plant (here, for example, 1200), there is a requirement because a technical system is to be maintained there (that is, in the maintenance plant), but all other functions (planning, order execution, spare parts storage) are the responsibility of another plant (here, for example, 1000).
- ▶ There is a requirement in a plant (here, for example, 1100), and additional sub-functions (order execution) are also the responsibility of this plant, but other sub-functions (order planning, spare parts storage) are the responsibility of other plants (here, for example, 1000).

Cross-plant maintenance is not problematic if the maintenance plant of the technical object and the plant of the executing work center have the same company code.

The same applies if the plants have different company codes but the same controlling area. This is also a typical scenario.

Different
controlling areas

It becomes problematic when the plants belong to different controlling areas. This is not a typical scenario, but results in a customer/supplier relationship. In this case, the maintenance plant (customer) should trigger purchase orders. At the work center plant (supplier), a customer order is triggered for which a billing document is then created. The billing document is entered, in turn, as an incoming invoice in the maintenance plant. This is a very tedious process overall. How can you simplify it?

[+]

Plants in Different Controlling Areas

If you use cross-plant maintenance and the plants are in different controlling areas, the following procedure is recommended:

- ▶ Create a cost center for the actual maintenance plant in the work center plant.
- ▶ Assign all technical objects to the work center plant as a maintenance plant and its cost center.
- ▶ Process all maintenance orders in the work center plant.
- ▶ Manually perform periodic billing documents (for example, monthly) from the work center plant at the expense of the customer maintenance plant and for the benefit of the cost center.

This approach avoids creating purchase orders and sales orders, creating individual billings, and posting individual incoming invoices.

3.2 Work Centers

From a maintenance perspective, a work center represents either an individual person (for example, the engineer M. Huber) or a workshop, thus a group of persons. The following workshops are often found in practice:

Definition and basic principles

- ▶ Mechanics
- ▶ Electrics
- ▶ Measurement and control technology
- ▶ Machine center
- ▶ Welding shop
- ▶ Paint shop
- ▶ Cleaning team
- ▶ Building services engineering

No Individual Persons as a Work Center

[+]

Avoid using individual persons as a work center. You could jeopardize your chances of capacity planning. Furthermore, work center data requires a great deal of maintenance. For person-specific responsibilities, it is better to use partner functions (see Section 4.2.9).

If you, nevertheless, record work centers for each person, please note the legal regulations for each country. In Germany, for example, you can do this only if you have given your employee representatives a written company agreement in which, among other things, you state that the information will not be used to compare employee performance.

In plant maintenance, work centers are used as the following:

- ▶ Main work center in the equipment master record and functional location master record
- ▶ Main work center in a maintenance item
- ▶ Main work center in the header of a maintenance task list
- ▶ Executing work center in the operations of a maintenance task list
- ▶ Main work center in the notification

- ▶ Main work center in the order header
- ▶ Executing work center in the operations of an order

[+]

Need for Work Centers

Work centers are the individual master records that you must create in order to use EAM. You can implement business processes, for example, without technical objects (functional locations, equipment, and so on), but not without work centers.

Creating a Work Center

You use Transaction IRO1 to maintain work centers. Here, you first assign a work center number and then assign the work center to a plant.

[+]

Choice of Work Center Numbers

Frequently, you have to specify the work center in EAM processing. Therefore, you should keep work center numbers as short as possible (for example, M for mechanical workshop, E for electrical workshop, and so on).

Basic data The work center contains essential information for EAM processing (see Figure 3.4). Work centers contain basic data. You maintain this data on the BASIC DATA tab.

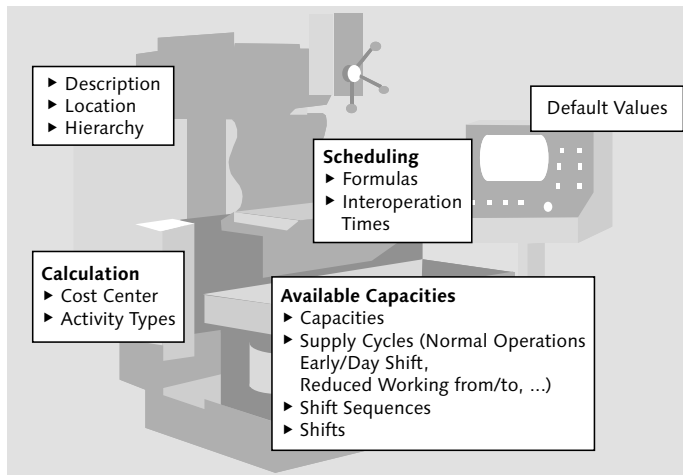


Figure 3.4 Contents of a Work Center

Characteristics of the Task List Usage

[+]

When maintaining basic data for a work center, make sure you set the task list usage to 004 (maintenance tasks lists) or 009 (all task list types) so that the work center can be used in EAM processing.

Furthermore, the standard value key must be set to SAP0, so that standard values such as setup times or machine times are not required later.

Work centers contain default values that are copied into the operations or referenced when creating maintenance task lists and maintenance orders. Referencing means that the data cannot be changed in the maintenance task list. You maintain default values on the **DEFAULT VALUES** tab. The most important default value is the control key, via which you can subsequently control the following, in order:

Default values

1. Whether the operation should be part of costing
2. Whether the operation should be scheduled
3. Whether the operation should generate capacity requirements
4. Whether a confirmation is expected for the operation
5. Whether the operation should be processed externally
6. Whether service specifications should be set up in the operation

You maintain the control key in Customizing using the function **MAINTAIN CONTROL KEY**.

Using the Control Key

[+]

Using the control key, you can control, in detail, the business functions that an operation should have (cost, print, confirm, assign externally, schedule, and so on).

You require at least two control keys: one key for internal processing and one key for external processing; the use of another control key depends on the respective needs.

You should always define the control key in the work center as a default value so that you do not always have to manually enter it in the maintenance task list and maintenance order.

Scheduling data Work centers contain scheduling data required for lead time scheduling. You maintain scheduling data on the SCHEDULING tab (see Figure 3.5).

Execution time	
Setup formula	<input type="text"/>
Processing formula	<input type="text"/>
Teardown formula	<input type="text"/>
Other formula	SAP004  Proj: Durat.Int.proc

Figure 3.5 Scheduling

[+]

Formula for the Duration of Internal Processing

If you want to schedule the purchase orders later, your work center requires a formula in the field DURATION OF INTERNAL PROCESSING. This must point to the DAUNO field—that is, to the duration from the operation. The formula SAP004 is defined in the standard SAP version.

You can check or define the formula for the duration of internal processing using the Customizing function DEFINE FORMULA PARAMETERS FOR WORK CENTERS.

Available capacity Work centers contain available capacity data required for capacity planning. Available capacity specifies which service provides capacity for each work day. A capacity is always assigned to a work center and, in plant maintenance, generally expressed in hours per week. The capacity data is maintained on the CAPACITIES tab (see Figure 3.6).

Overview	
Capacity category	002 Labor
Pooled capacity	<input type="text"/> Mechanical Crew for M
Setup formula	<input type="text"/>
Processing formula	<input type="text"/>
Teardown formula	<input type="text"/>
Other formula	SAP008 Proj:Reqmts int.prcg
Distribution	<input type="text"/>
Int. dist. key	<input type="text"/>


Figure 3.6 Capacities

Formula for the Requirements of Internal Processing

If you subsequently want to execute capacity planning for your work center, your work center requires a formula in the field REQUIREMENTS OF INTERNAL PROCESSING. This must point to the ARBEI field—that is, the work from the operation. By default, this is the SAPO08 formula.

You can check or define this using the Customizing function DEFINE FORMULA PARAMETERS FOR WORK CENTERS.

[+]

In the work center, the available capacity is maintained on the CAPACITIES tab by choosing the  Capacity button. Figure 3.7 shows which information you can specify for the available capacity.

Standard available capacity			
Start	08:00:00		
Finish	17:00:00	Capacity utilization	75
Length of breaks	01:00:00	No. of indiv. cap.	8
Operating time	6.00	Capacity	48.00 <input type="text" value="HR"/>

Figure 3.7 Available Capacity

Most details you must enter, for example, in the fields WORK START, WORK FINISH, LENGTH OF BREAKS, and NUMBER OF INDIVIDUAL CAPACITIES (number of craftsmen) are not critical and are easily determined.

If you work in different time periods with different staff assignments, you can maintain intervals. You can also define multilayer models.

The rate of capacity utilization is critical: this specifies (as a percentage) the portion of gross capacity available to the craftsmen (net) for planned purchase orders. The following must be subtracted from 100%:

- ▶ Additional, necessary personal time (toilet breaks, unplanned breaks, work meetings, and so on)
- ▶ Illness
- ▶ Leave
- ▶ Unplanned purchase orders

The proportion of unplanned purchase orders can be only very roughly estimated and, thus, is a very critical factor in maintenance.



Rates of Capacity Utilization in Practice

Without considering unplanned purchase orders, a rate of capacity utilization of between 65% and 75% is most common in practice.

When considering unplanned purchase orders, there are two possibilities:

- ▶ You consider them in the rate of capacity utilization; then, the rate of capacity utilization is reduced according to your proportion of unplanned purchase orders to a value between 30% and 50%.
- ▶ You reserve some personnel beyond the number of individual capacities specified in the available capacity (that is, the number of craftsmen) and deploy them only for unplanned purchase orders, so that the data specified in the available capacity is available only for planned purchase orders.

Costing Work centers contain costing data that enables you to cost operations; it is maintained on the COSTING tab (see Figure 3.8).

Validity						
Start date	11/21/1994	End Date	12/31/9999			
Link to cost center/activity types						
Controlling Area	2000	CO N. America				
Cost Center	4300	Plant Maintenance				
Activities Overview						
Alt. activity descr.	Activity Type	Activity Unit	R...	Form...	Formula description	☰
▼			<input type="checkbox"/>			■
▼			<input type="checkbox"/>			
▼			<input type="checkbox"/>			
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▼			<input type="checkbox"/>			▼
			< > ...			
ActType Int.Proc.	1410	Repair Hours	<input type="checkbox"/>	SAP008	Proj:Reqmts int.prcg	

Figure 3.8 Costing

Prerequisites for Costing

[+]

If you subsequently want to perform costing for your work center, your work center requires the following:

- ▶ A cost center
- ▶ An activity type
- ▶ A formula in the field `REQUIREMENTS FOR INTERNAL PROCESSING`. This must point to the `ARBEI` field—that is, the work from the operation. By default, this is the `SAP008` formula.

You can check or define this using the Customizing function `DEFINE FORMULA PARAMETERS FOR WORK CENTERS`.

Section 6.2.8 provides information on how to define the associated Cost rate in Controlling.

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