Representing and Structuring Technical Systems

The first requirement of an DP-supported maintenance system is a representation of the operational systems and their structures.

Object- and Function-related Systems

The PM System allows you both to control systems management according to functional, locational or process-oriented criteria and to manage the individual inventoried maintenance resources. This enables the planning, execution and analysis of the maintenance work both by inventoried object, known as pieces of equipment, and by functional unit, known as the functional location.

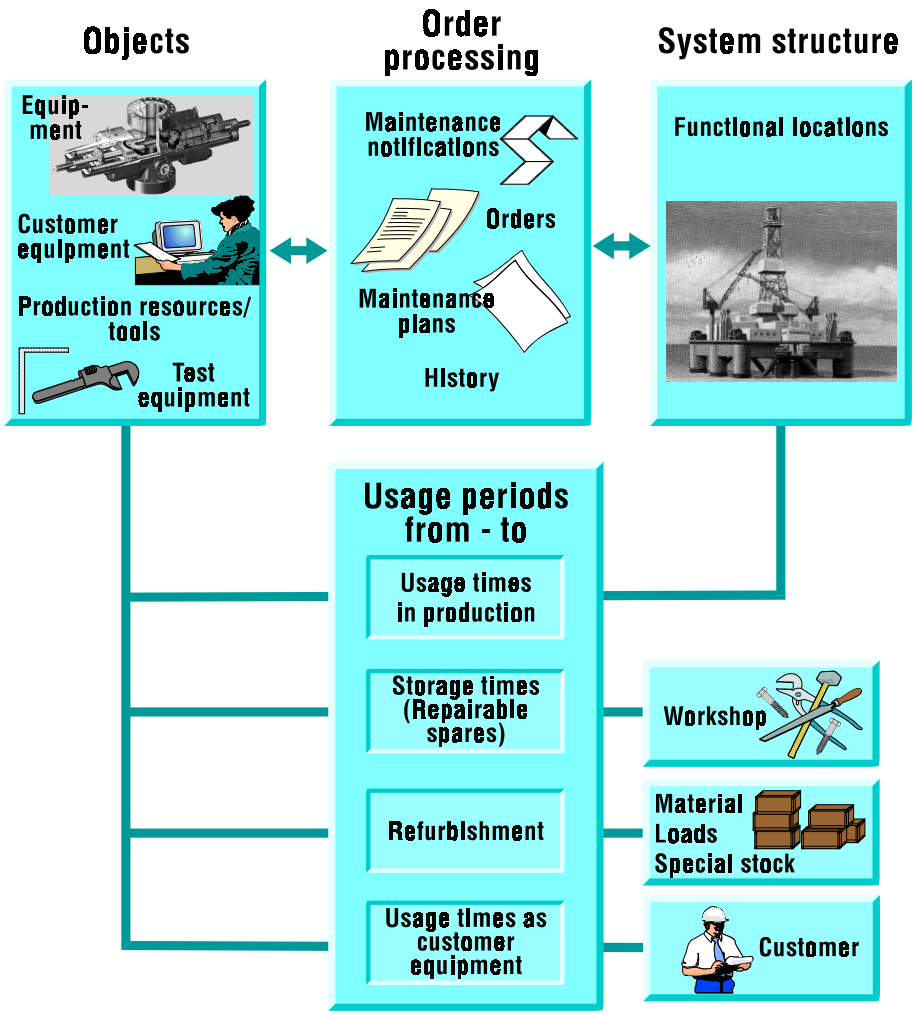

Figure 3-1: Object and Function-related Processing of Maintenance Tasks

There is an unlimited number of levels in a systems structure in the PM System.

Using the install/dismantle functions, the individual pieces of equipment are allocated during a period of time to a functional location, thus providing the answers to the following questions:

- which pieces of equipment were installed at a functional location, that is, in a functional unit?
- at which functional units was a piece of equipment installed during a particular period?

Example The following example demonstrates the two perspectives:

Two clarification plants each have pumping stations, at which various pumps, that are traced as individual pieces of equipment, are installed during a period of time.

The functional locations 'Clarification plant 1 - Pumping station A' and 'Clarification plant 2 - Pumping station A' represent the functional locations.

The individual inventoried pumps 1234, 6177, 8181 and so on are installed in the course of their usage period, dismantled again, possibly put into spares storage or repaired in internal or external workshops. All these stages are represented by equipment usage segments, forming the object and function-related location history.

Elements in Systems Structuring

Structuring Rules

Structure Indicator

In order to represent structuring rules on a global basis, for example, the indicator system for power plants, the indicator system according to DIN 6779, or company-specific rules for structuring system identification numbers, the PM System allows you to define structure indicators, which define the depth and type of structure of a numbering system.

Reference Functional Locations

To simplify the creation and maintenance of master data, companies that have several systems in use belonging to a particular category, can build a reference functional system structure which is represented by reference functional locations.

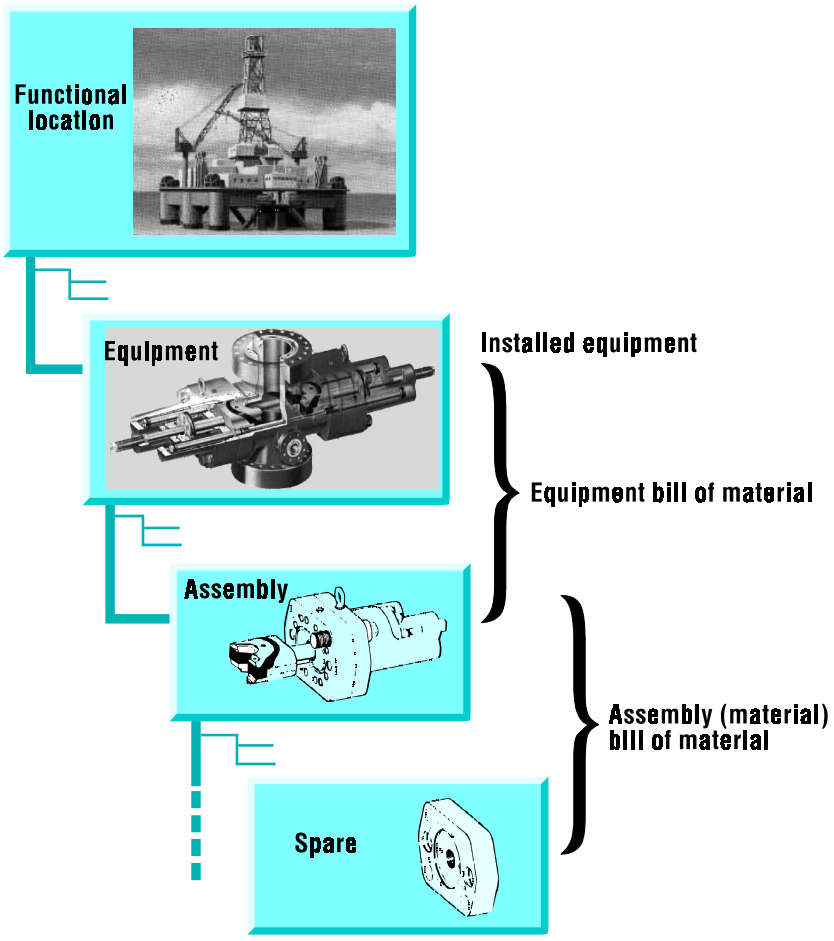

Figure 3-2: Structuring Functional Locations and Pieces of Equipment

Functional Locations Equipment

The individual operational systems are represented by functional locations and pieces of equipment. These are further subdivided into assembly, part and spares structure using PM bills of material.

To summarize, the following elements make up systems structuring:

- Structuring rules - Structure indicator
- Technical systems - Functional locations
- Individual technical system - Piece of equipment
- Assembly / spares structure - Equipment bill of material
- Assembly - Material “assembly”
- Spare - Material

These elements may be used individually or in combination for structuring purposes, depending on the complexity of the system and the technical requirements.

Functional locations, pieces of equipment and assemblies can themselves incorporate several hierarchy levels and enable a flexible means of representing technical structures, without limiting the depth of the structure.

Functional Locations

Operational systems are structured by means of functional locations according to functional, process-oriented or location criteria.

Variable Systems Structuring

The depth and type of structure are determined by structure indicators. Since the requirements placed upon the type of systems structuring in a company invariably differ for the various business areas, as many structures as required may be used in parallel within a company.

Example

For example, a production structure for a cable manufacturing line in a company with several plants can be divided into four levels with the following structure:

XXXX	Plant / Production area
XXXX-XXX	System
XXXX-XXX-XX	Sub-area
XXXX-XXX-XX-XXX	Functional unit

An infrastructure setup, by contrast, such as for example a clarification plant, may have the following structure:

AN	System
AN-A	Area
AN-ANN	Sub-area
AN-ANN-N	Function
AN-ANN-NA	Sub-function
AN-ANN-NA / N	Item

This system structure can be represented using the following structuring rules:

Edition mask:	AN	-A	NN	-N	A	/N
Hierarchy levels:	1	2	3	4	5	6
Example						
Functional location no.:	K00	-B	02	-2	A	/1

The following functional location numbers can be used for the clarification plant, based upon the functional location structure:

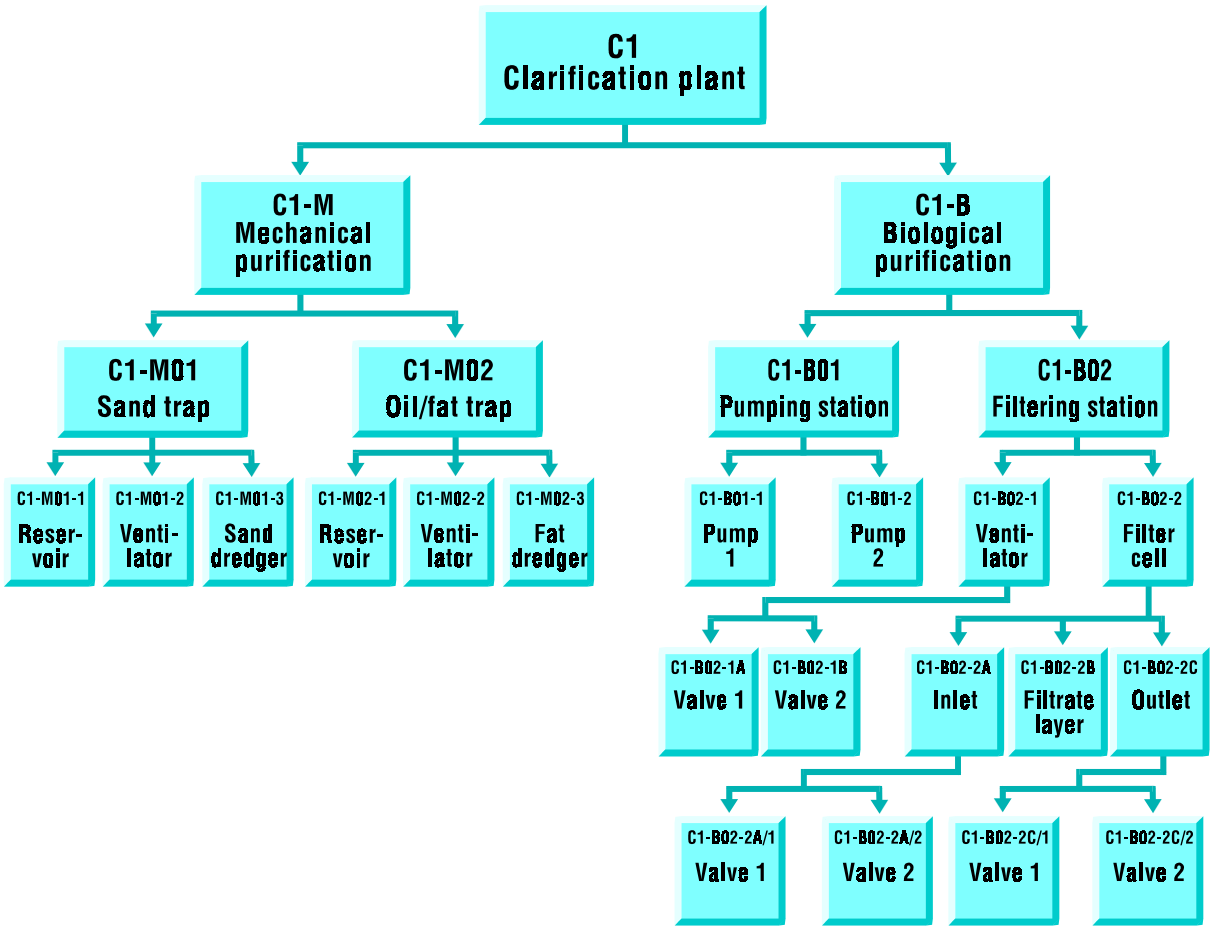

Figure 3-3: Operational System Structure Using Functional Locations

Free Hierarchy Definition

Indicator systems involving a generic naming system are often used in industry to indicate the hierarchy level and hierarchy branch. SAP also uses this method, but offers the additional option of forming hierarchies with a deviant structure.

The PM System allows you to represent these structures in graphic form and move within them dynamically. You can also call up current information on the technical objects at any time from the overviews (master record data,

current order situation, next maintenance schedules, and so on). You can change data as well as displaying it (Change master records, create orders, and so on).

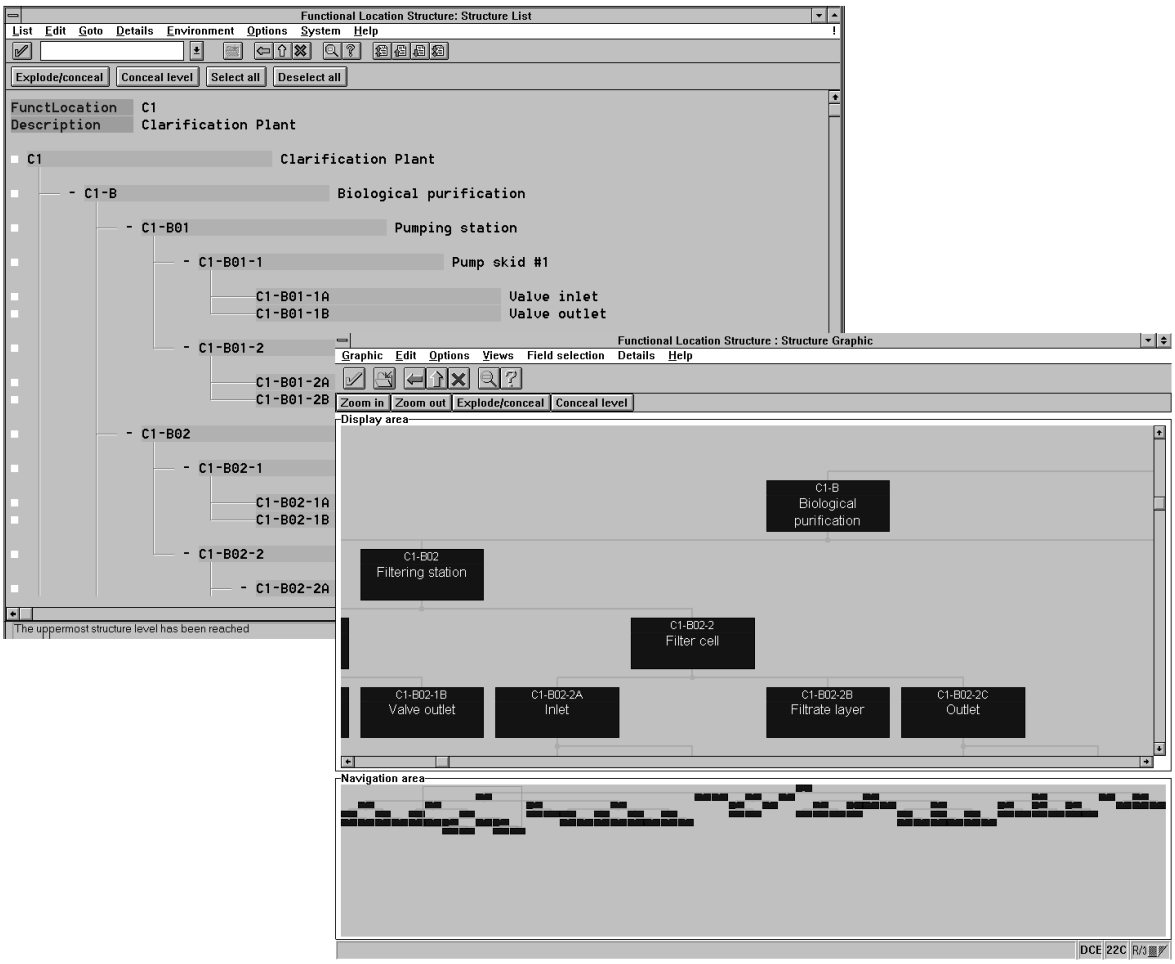

Figure 3-4: Functional Location Structure List/Structure Graphic

Functional Location Master Data

The master data of a functional location includes information regarding locations, accounting, and PM planning data, in addition to the structuring data. Additional information can be stored using the word processing function and the classification system. The pieces of equipment installed at a particular functional location are documented over a period of time by means of the equipment usage.

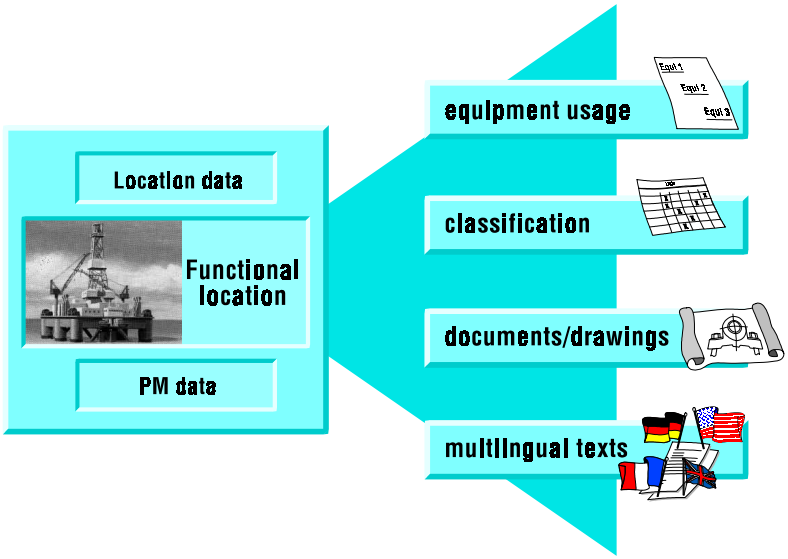

Figure 3-5: Contents of a Functional Location Master

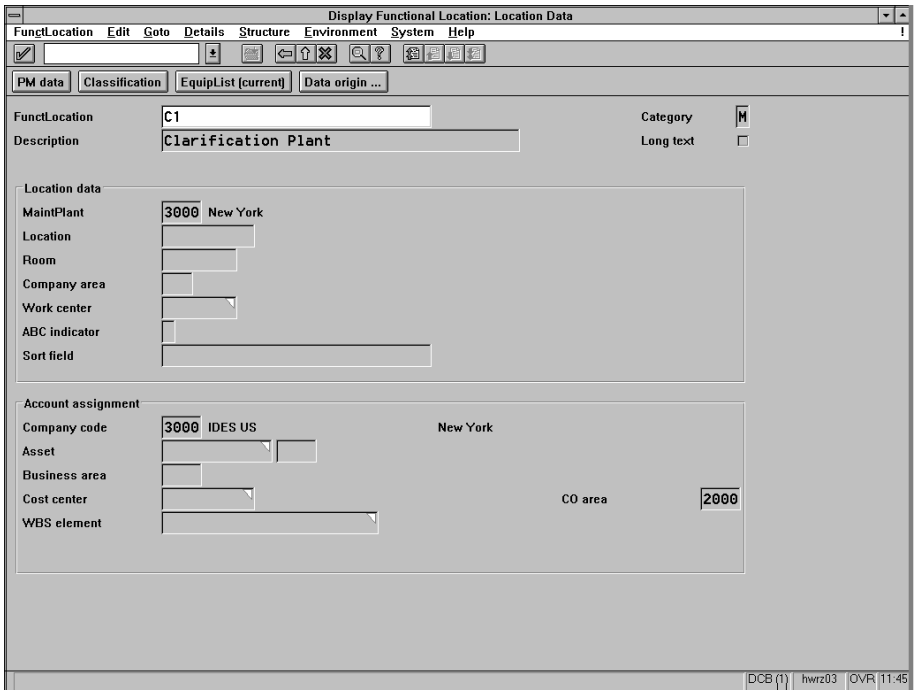

Figure 3-6: Functional Location - Location Data

Reference Functional Locations

Representing Reference System Structures

If several individual systems exist belonging to the same category, the system category is represented by a reference structure for those functional locations. The reference functional location is defined using the same structure indicator as the functional locations. It contains the same data fields as the functional location, with the exception of the location data, which is not maintained. You can create a technical system with full or partial reference to this system category in a single step; all the structural information and data is copied.

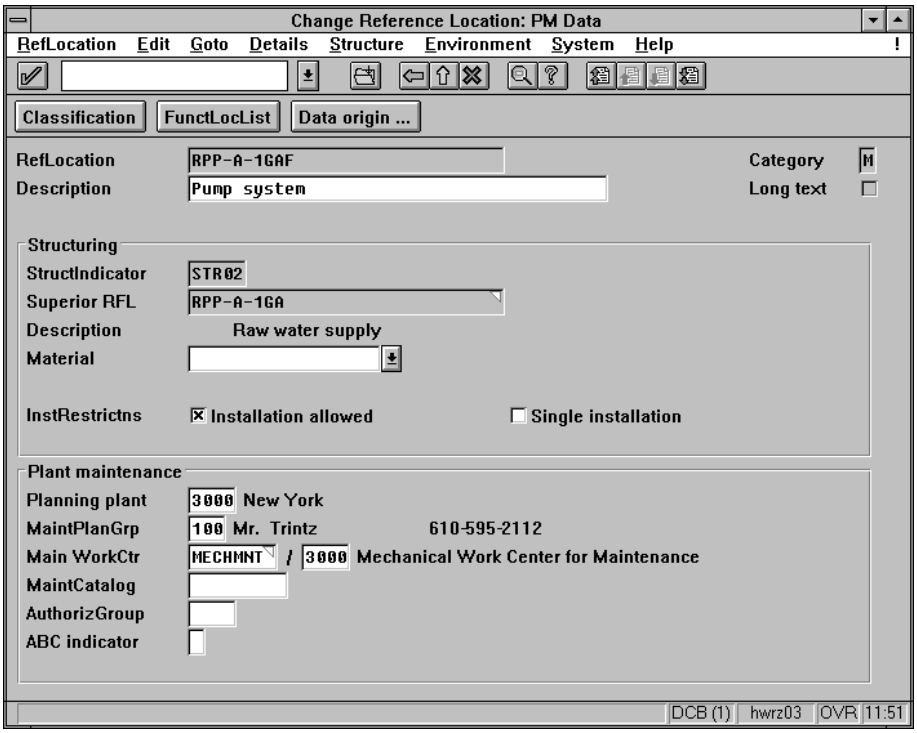

Figure 3-7: Reference Location - PM Data

The relationship between the structure indicator, reference location and the functional location is illustrated in the following figure:

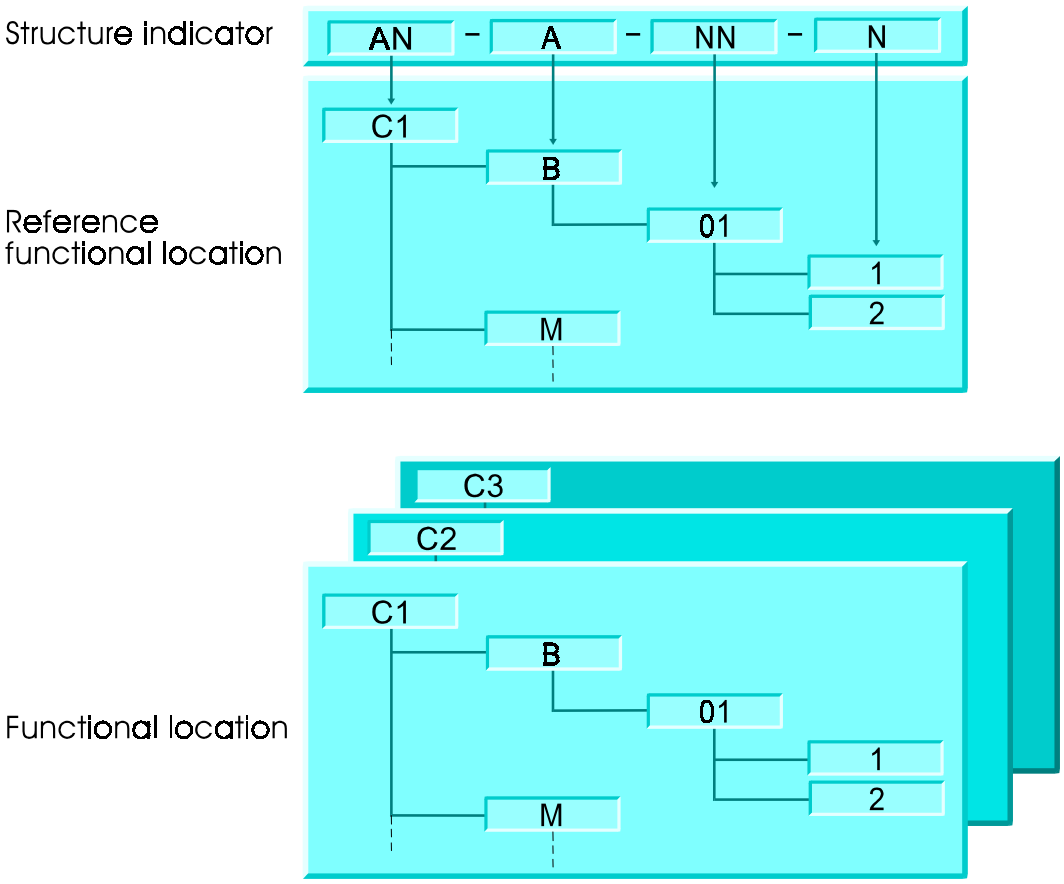

Figure 3-8: Using Reference Functional Locations when Creating Functional Locations

Data Transfer in Functional Locations and Reference Locations

The advantage of hierarchically structuring an operational system is that the data at a high-level node can to some extent be maintained centrally and the relevant information passed down to the lower levels.

Being able to refer to reference structures at the same time means that you only need to specify category-specific data once for each category and pass on this category-specific information to the corresponding individual locations by horizontal transfer.

This method ensures that the data elements can always be structured and maintained, despite the frequently high number of individual functional locations. At the same time, exceptional information can still be maintained separately for individual cases.

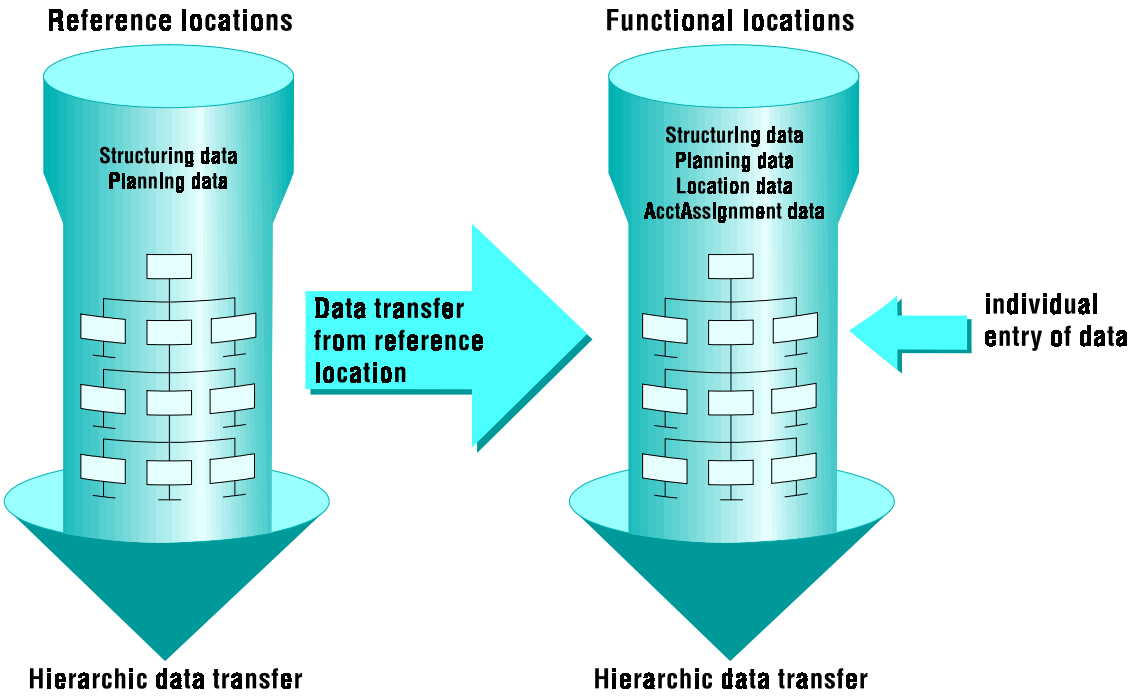

Figure 3-9: Data Transfer of Superior Locations and Reference Locations

PM processing can be carried out exclusively by means of functional locations. Equipment management can be referred to if additional information regarding the operational systems is required.

Equipment

The objects in a company that are managed as individual, solid objects are defined in the PM System as pieces of equipment. These can include various types of serialized objects, such as:

Categories

- production equipment
- production resources and tools
- test and measurement equipment
- transport equipment
- customer equipment

The differentiation by equipment category can be adjusted using the customizing function to suit individual customer requirements.

You should always create an equipment master record if

Equipment Usage

- individual data is to be managed for the object (for example, year of construction, warranty periods, usage sites)
- maintenance tasks are to be carried out for the object, either regular, planned or resulting from damage
- a record is to be kept of the maintenance tasks carried out for the object (for example, for insurance or compulsory annual inspection purposes)
- technical data on the object is to be collected and evaluated over a long period of time
- the costs of maintenance tasks are to be monitored for the object
- records of usage time at functional locations are required for the object

The pieces of equipment are controlled by an internally or externally allocated number, which identifies each piece of equipment during its entire life, irrespective of where it is being used. This means of equipment identification ensures that even when it is moved to a different maintenance plant, or if it is let or hired to a customer, a piece of equipment always retains its specific data including its overall history.

Usage Times

The usage times of a piece of equipment are documented in the form of usage time segments, which ensure a complete record of every stage from the time the piece of equipment is purchased through to the time it is scrapped.

Data on the person reponsible for planning and account assignment data is documented in the usage times in addition to location data, for example:

- production
- storage
- customer

Furthermore, the equipment master reflects the status changes of a piece of equipment, for example:

- planned
- undergoing testing
- in productive use
- broken down
- scrapped

The status can be freely defined by the user using the customizing function.

Word Processing

Short and long texts can be maintained for the piece of equipment in several languages. You can use texts both for describing equipment and as internal notes.

Classification

Using the classification system, pieces of equipment can be supplemented with technical characteristics. The SAP System supports a form of classification known as multiple classification.

Equipment Master Record

An equipment master record is structured as follows:

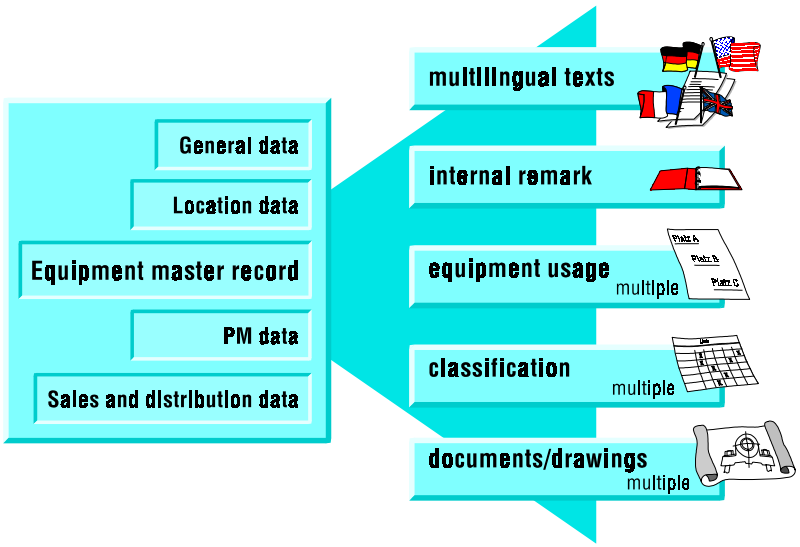

Figure 3-10: Contents of an Equipment Master Record

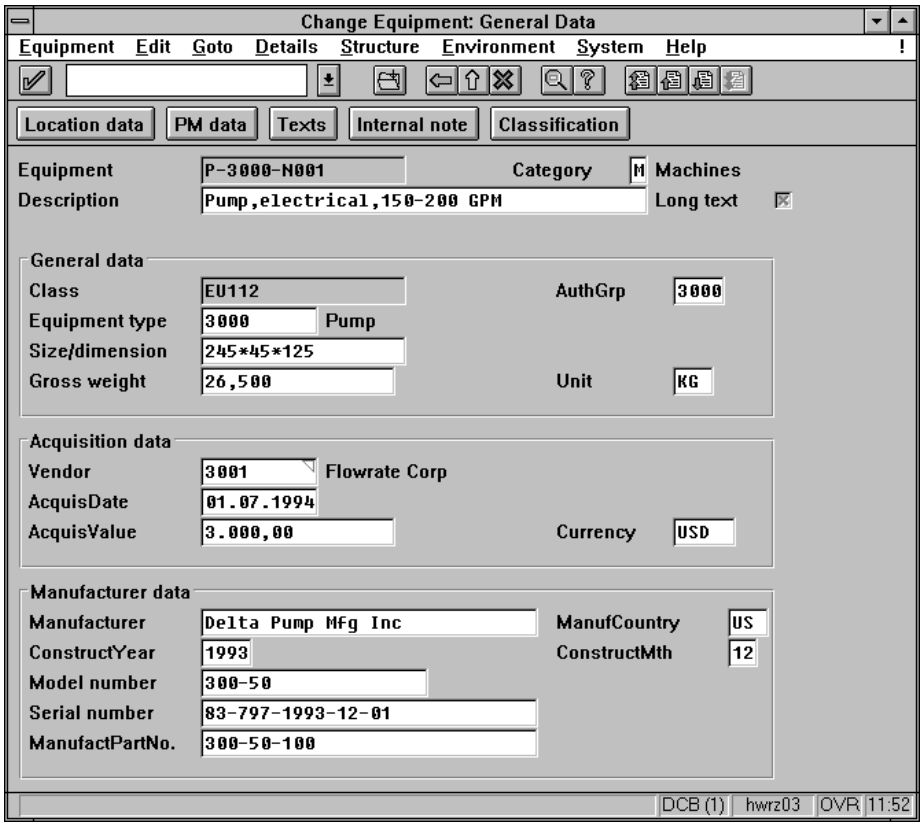

Figure 3-11: General Equipment Master Record Data

next chapter