



HOME

User Manual

DELMIA Process Engineer®

Manufacturing Concept - Application



Foreword

This manual provides an introduction to the basic operations and functions of the Manufacturing Concept program module.

While developing these functions we have made every effort to create a clearly organized, easy-to-understand program structure.

A user-friendly interface as well as a clear menu guide will enable you to quickly learn how to operate the program and to get familiar with its functions so that you can carry out your planning tasks in a quick and reliable way.

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1. Introduction

This manual explains how to use the Process Engineer Manufacturing Concept and menu guidance's for your planning purposes.

1.1 How to Use this Manual

This manual enables you to get familiar with the operation and functions of the manufacturing concept. This manual briefly describes:

- The menus provided by the Manufacturing Concept
- How to execute menu functions and how to navigate in views



Note

When handling the manufacturing concept functions, please remember that there is a general introduction to the Process Engineer in the Basic Manual.



Click [General Introduction](#) to access the manual.

1.2 Documentation Conventions and Symbols

The symbols used in this manual are intended to provide you with keys to the contents in an immediately understandable manner.



This symbol is used to introduce key concepts that are covered in the sections immediately following this symbol. As a result, this symbol most frequently appears at the beginning of chapters or sections.



Note

*This symbol is used to mark notes, which provide you with additional information you need to have for further work. You will either find the Note sign at the beginning of a chapter or in a particular text passage in the chapter. Texts bearing this sign are additionally marked with **Note**. The text is always in italics.*




Caution

*This symbol indicates that the text that follows describes particular circumstances that you must avoid to avoid potential errors with the operation of the program or harm to data. You will either find the Caution sign at the beginning of a chapter or near a particular text passage in the chapter. Texts that are introduced by this sign are additionally marked with **Caution**. The text is always in italics.*

Example

This symbol marks examples which serve to illustrate a certain situation.

- 1) This symbol marks the individual operational steps involved in a particular operating instruction. Operating instructions describe operational steps, for example, how to open a menu or execute a function.
- This symbol marks listed subjects. The symbol for listed subjects can be either used to structure a continuous text or to list main subject keywords.
- This symbol marks list inside a bulleted or numbered list.
-  This symbol marks cross reference information that is available in another manual.

1.3 Functions described in the Process Graph Manual

The following functions are available (as of Version PE 5.11) for both the Manufacturing Concept and the Process Graph. The descriptions can be found in the [Process Graph Manual](#).

1.3.1 Displaying Relations in Color

Relations between the individual resources can be highlighted in different colors. The colors to be used for displaying relations are set at the time of configuration and can be any colors you like.



For more information, *please refer to the* [Process Graph Manual](#).

1.3.2 Displaying Filtered Resources

Relations and resources from filtered projects can be displayed in the Manufacturing Concept. Code rules that are set as a filter when a project is opened are assigned to the resources. To display filtered resources, you must check-mark the **Show filtered symbols in graph** entry in the Process Engineer settings.



For more information, *please refer to the* [Process Graph Manual](#).

1.3.3 New Properties Dialog for Connecting Lines

Connecting lines link resources. A new properties dialog is available for editing connecting lines and can be used to enter informational data for planning a connection between resources.



For more information, *please refer to the* [Process Graph Manual](#).

1.3.4 Manufacturing Concept Display Product and Process Links

In Version PE 5.12, all relations (product, resource, and process) which are linked to the respective resource are displayed in the Linked Objects dialog for

all plan types in the Manufacturing Concept. *Please refer to the [Manufacturing Concept Display Product and Process Links](#).*



For more information, *please refer to the [Process Graph Manual](#).*

1.3.5 Execute Evaluations via Script

In Version PE 5.12, the context function Evaluate in Manufacturing Concept is excluded. As of this version evaluations are created via scripts. Based on other scripts (VBscript, Javascript), you can create individual scripts in which the precise data that you need for an evaluation are ascertained. *Please refer to the [Execute Evaluations via Script](#).*



For more information, *please refer to the [Process Graph Manual](#).*

1.3.6 Step Value in the Manufacturing Concept

The step value is preset directly for the plan type in the toolbar with the function PE 5.12. *Please refer to the [Step Value in the Manufacturing Concept](#).*



For more information, *please refer to the [Process Graph Manual](#).*

1.3.7 Deleting Resources in the Process Graph

In Version PE 5.12, existing relations between processes are automatically recreated after a process is deleted; relations between the processes do not need to be manually created as in previous versions of the Process Engineer. There must be at least three processes in the process line.



For more information, *please refer to the [Process Graph Manual](#).*

1.3.8 Inserting Resources between Existing Relations

In Version PE 5.12, existing relations between resources are automatically recreated after a resource is inserted; relations between the resources do not need to be manually created as in previous versions of the Process Engineer. There must be at least two resources in the resource line.



For more information, *please refer to the [Process Graph Manual](#).*

1.3.9 Changing the Plantype in the Process Graph

The plan types can be changed directly in the Manufacturing Concept with the context function **Change plan type** - this context function is also available in the PPR Navigator and in the open process view for the respective plan types.



For more information, *please refer to the [Process Graph Manual](#).*

1.3.10 Premises at Same Time

In Version PE 5.12, plantypes of the same kind can be assigned in the Process Graph **PoT Curves** by using the context function **Premises at same time**.

This new function is also available in the Manufacturing Concept for editing resources. With this function, **wage groups** and **shift models** are assigned to the same plantypes (i.e. resource plantype) in the Manufacturing Concept.



For more information, *please refer to the* [Process Graph Manual](#).

1.3.11 Show Print Area for Graph

Using **Show print area** you can view the print area of a graph.



For more information, *please refer to the* [Process Graph Manual](#).

1.3.12 Copying Objects between Graphs

Selected objects, resources or processes can be copied between graphs of the same type using the context function **Copy graph** and **Paste graph**.



For more information, *please refer to the* [Process Graph Manual](#).

1.4 New Functions in Manufacturing Concept







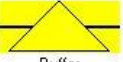

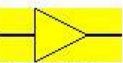


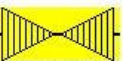


No new functionality has been added for this release.

2. Manufacturing Concept Representation

2.1 Signs and Symbols

The [Table 1](#) depicts the symbols used in manufacturing concept.

Table 1: Symbols in Manufacturing Concept

Symbols	Description
 Machine	This symbol enables a “value-adding resource”. Value-adding resources may include, for example, machines, assembly stations, or manual workstations.
 Machine (non val)	This symbol enables a “non value-adding resource”. Non value-adding resources, for example, may include cleaning systems or a device to plaster components.
 Testmachine	This symbol activates resources that are required to check parts.
 New Machine	A resource marked with two crossing diagonal lines means that this resource has been deactivated and is thus irrelevant for the current planning processes. However, such resources can be re-activated at any time.
 Text	Click this symbol if you want to write a comment.
 Group	Click this symbol if you want to add a group. Groups, for example, may combine similar resources.
 Buffer	This symbol enables a resource for a buffer. The Manufacturing Concept uses buffers for assemblies, preassemblies, and for material supply.
 Worker	This symbol enables a resource for a worker. The Manufacturing Concept requires workers for transport tools or assembly stations.
 Transport System	Use this symbol to enable a resource for a uni-directional transport system. The direction of transportation is indicated by the triangle shown in the symbol.
 Transport System	This symbol enables a resource for a bi-directional transport system (forwards and backwards) between an assembly station and the location for material supply.
 Interlaced Transp	Use this symbol to enable a resource for an interlaced, uni-directional transport system. The triangle shown in the symbol marks the required direction for an interlaced transport system.
 Interlaced Transp	Use this symbol to enable a resource for an interlaced, bi-directional transport system.
 Transport Tool	This symbol enables a resource for a transport tool. Transports are made with transport tools, such as fork lifters, trolleys, or carts.
	The circulation resource refers to logistics processes which take place on an assembly line and whose individual stations are continuously connected to one another.



Note

Yellow means that the symbol has been enabled. You can determine the definition of these symbols and the assignment to the resource types during configuration.

2.2 Toolbar Icons



Figure 1: Toolbar

Table 2: Toolbar Icons Description

Icon	Description
	When this icon is enabled, you can edit the resources in the Manufacturing Concept. This icon must always be enabled, for example, to paste or link resources (in) to the Manufacturing Concept.
	If this symbol is enabled, you can move resource or group symbols to the next line or column. Hold down the CTRL key to move either to the next line or to column.
	If this symbol is enabled, you can change the size of a group.
	Use these two icons to activate the zoom function. Using the plus function, you can enlarge the view in increments of 6%, 12%, 25%, 50% up to 100%.
	Use this icon to hide or show grid lines.
	If this icon is enabled, a frame line is shown for any group that is currently open.
	Use this icon to cancel resource-moving actions.
	Use this icon to restore resource-moving actions.
	If this icon is enabled, you can define the display of relations for the Manufacturing Concept.

2.3 Icons to Link a Resource

The four icons above a resource are used to display available links to that resource. The links are marked by different colours.

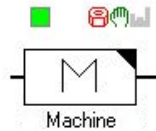







Figure 2: Four Icons – Display of Links to a Resource



Note

The icons above the resource are only visible in zoom 100%.

- 
 - This icon indicates whether a resource is linked to a product. A link is available if the icon is red.
- 
 - This icon indicates whether a resource is linked to a process. A link is available if the icon is green.
- 
 - This icon indicates whether a resource is linked to a layout. A link is available if the icon is brown.
- 
 - This icon indicates the occupancy of a resource. The icon can have three different states: red, yellow, or green. Green, for example, means that a resource is optimally utilized. Red, however, means that a resource is not optimally utilized.
- 
 - This icon indicates that a Manufacturing Concept has been created for a resource. Using this icon you can open the Manufacturing Concept of the resource.

2.4 Inserting Resources into the Manufacturing Concept



Figure 3: Example of a Toolbar in the Manufacturing Concept

- 1) To insert a resource in the Manufacturing Concept, click the required resource in the toolbar. The selected resource get highlighted in yellow. Please refer to the [Figure 3](#) and [Table 1](#).
- 2) The cursor assumes the shape of a parachute.
- 3) Place the selected resource in the Manufacturing Concept. To do this, left-click any empty space in the Manufacturing Concept. The resource get inserted once you release the mouse button.
- 4) If you repeat this procedure, you can insert as many resources as you like. To finally complete the insertion process, click the same resource once again in the toolbar. Consecutively, inserting multiple resources into the Manufacturing Concept.

- 5) If you immediately want to insert a further resource, click the required resource in the toolbar. Again, you may insert as many resources as you like. You can repeat this procedure until you have inserted all resources.
- 6) To finally complete the insertion process, click the most recently selected resource in the toolbar.

2.5 Planning a Manufacturing Concept

You can use the Manufacturing Concept to display factory structures and to consider the uses of resources and processes, which are required to manufacture the planned products. Workstations, conveyors, and conveyor sections are displayed together with the appropriate resources, which are arranged by the Manufacturing Concept in line, a parallel structure or as a single workstation. The resources are linked to each other to illustrate a product or material flow. You can only link resources that have been assigned a relation. There are two different relation types, i.e. relations that are only valid within one Manufacturing Concept or relations that are valid projectwide, i.e. for an entire project.

Each Manufacturing Concept can generate a layout where the planned resources are shown in a three-dimensional display. You can edit the layout. Multiple Usage can be generated for further planning processes of each Manufacturing Concept. A Multiple Usage planning process takes resources into account that have already been inserted into the original Manufacturing Concept – i.e. during the cost calculation of resources. Such resources are referenced during Multiple Usage.

Properties Dialogs and Context Menus in the Manufacturing Concept

The resources in the Manufacturing Concept can be edited using two different properties dialogs: the **General Properties** dialog and the **Extended Properties** dialog. The Extended Properties dialog displays information, i.e. on capacities and quality. By using context menus you may, for example, create a layout or reuse your Manufacturing Concept (Multiple Usage). Context menus are available either for individual resources or for the entire Manufacturing Concept. Calculated results for a resource or an entire Manufacturing Concept can be evaluated using the **Valuate** function from the context menu. You may also use this menu to export or print your results. Moreover, the context menu allows you to compare Manufacturing Concepts to each other or to show costs that may have additionally incurred for Multiple Usage.

3. Creating/Editing the Manufacturing Concept



The Resource icon must be selected if you want to work in the Resource View.



To create a new Manufacturing Concept or to edit an existing one, you must change to the Resource View (*Please refer to the [Figure 4](#)*) the **Open Manufacturing Concept** function is only available on the hierarchical level from where you have changed to the Resource View. Only one Manufacturing Concept can be created for each hierarchical level.

This chapter describes the functions, which are used to create and edit a Manufacturing Concept. The following chapters describe how to specify properties for a resource and how to use context menus. Each section of a chapter contains cross references, which you can use to obtain further information about the section you are currently reading. *Please refer to the [Defining Properties for Resources and Groups](#) and [Right Mouse Button Functions](#).*

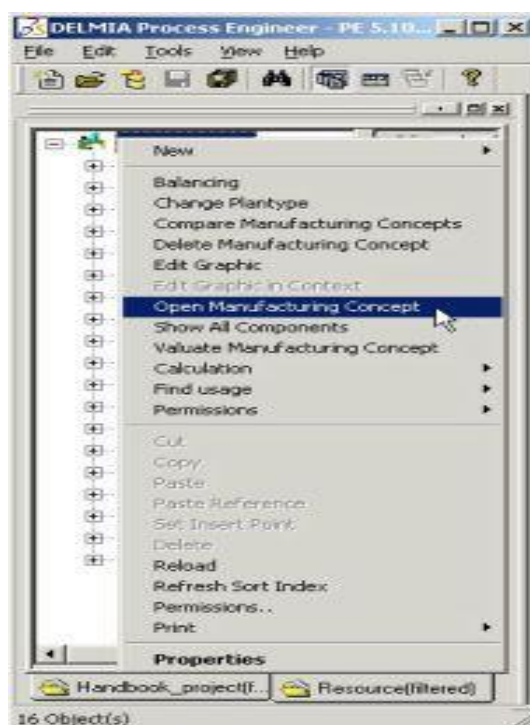


Figure 4: Opening the Manufacturing Concept

3.1 Link Processes and Resources

Whenever you link processes to resources, you can select the relation for the link (as of Version PE 5.14) between the two relations **Process runs process/Process running on Resource** and **Resource used by Process/process uses resource** in the dialog.

Links between processes and resources can be made in two directions:

- Process to resource
- Resource to process

The relations are offered for selection in the dialog according to the selected direction. A process can be linked to a resource only once with the same rela-

tion. The direction is irrelevant in this case; the same relation is involved, only the name of the relation is changed. The relations on the one hand shown from the perspective of the resource (process to resource) and on the other hand they are shown from the perspective of the process (resource to process).

Corresponding dialogs have been extended in version PE 5.14:

- In dialogs, you can select relations for the link – such as create new manufacturing concept on the basis of a Process Graph.
- You can show existing relations in dialogs – such as in the extended properties dialog of a resource.

The process and resource structure create the basis for various program modules, which you can use in the Process Engineer. If you use both the manufacturing concept and the balancing process module **Work Load Balancing** (WLB), you should always use the relation **Resource runs Process/Process running on Resource** for a link. You need this relation also if you create auto-relations between products, processes, and resources.

You can use the following relations for linking processes and resources:

Process to Resource

- Resource runs Process
- Resource is used by Process

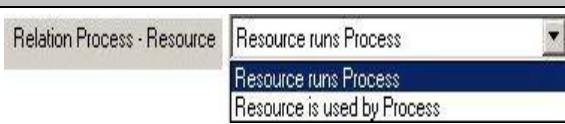
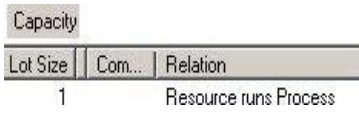
Resource to Process

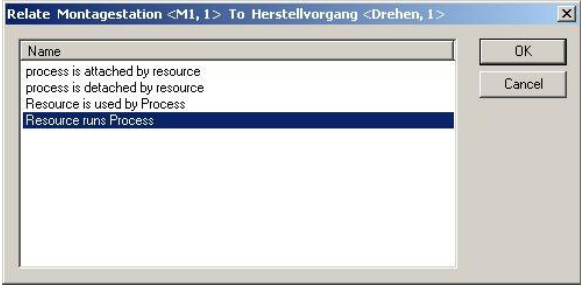
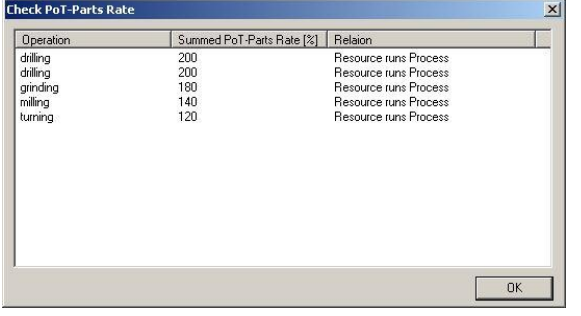
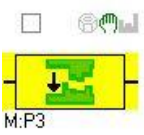
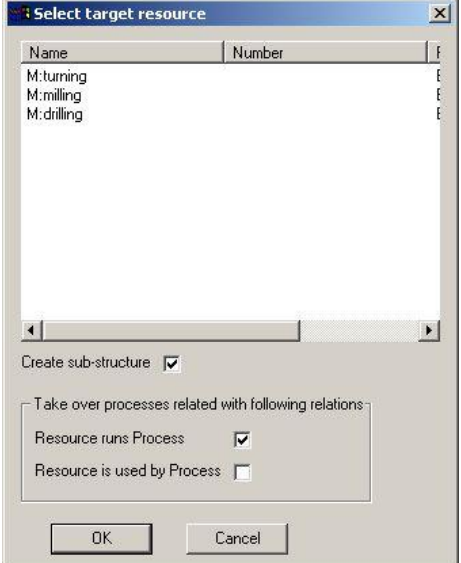
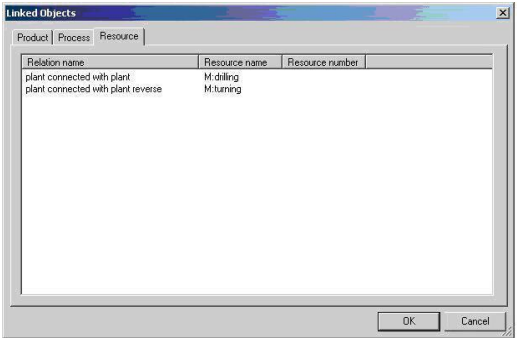
- Process running on Resource
- Process uses resource

3.1.1 Functions for Relations

[Table 3](#) provides an overview of the dialogs in which the relations can be found, for displaying or editing.

Table 3: Overview of Functions for Relations

Dialogs	Description
 <p>Please refer to the Figure 8.</p>	<p>Creating a new Manufacturing Concept.</p> <p>Select circulation for relation dialog</p>
 <p>Open extended properties from the context menu; the relation is shown under the Capacity tab.</p> <p>You can create processes and relations for this resources using the New button.</p>	<p>Extended properties dialog for stations and employees.</p>

Dialogs	Description
	<p>Dialog for selecting a relation to the link process to resources is available for:</p> <p>Drag and Drop in the MC</p> <p>Process to the resource. Process to an empty cell. Process to an empty group Process to an employee</p>
	<p>Show PoT-parts rate for relations.</p> <p>Use Check PoT-Parts Rate button to open the dialog in the extended properties dialog.</p> <p>Relations to resources are shown.</p>
	<p>Icon for process link.</p> <p>The icon shows the link between both relations.</p>
	<p>Integration of resources:</p> <p>In the dialog, you can select the relation for the link.</p>
	<p>The relations of the linked resource are shown via the context menu of a resource, menu item Linked Objects/Resources.</p>

3.1.2 Defining Relations for Resources

Relations in the Manufacturing Concept are always between two resources. Relations are generated by linking individual resources in the Manufacturing Concept.

Using Relations in the Manufacturing Concept

When selecting relations (*Please refer to the [Figure 5](#)*), you can specify exclusively whether relations are to be valid for the current Manufacturing process only or on a projectwide basis. Normally, you can define only one relation for each Manufacturing Concept.



Figure 5: Selection List for Relations

- **Plant connected with plant:** This relation always affects the current Manufacturing Concept. For resources that have been generated and connected from a Process Graph, this relation automatically get assigned in the Manufacturing Concept.
- **Plant connected projectwide with plant:** This relation affects the entire project. For the planning process of resources, this has the following consequences for the project. If this resource relation has been defined in a Manufacturing Concept, this relation is valid for any Manufacturing Concept created in a project.

if there is a connection between resources **A** and **B**, and if, for example, resource **A** is directly located before resource **B**, this arrangement is valid for the entire project. Simply try to imagine two machines where the work processes to be performed on the second machine depend on the first machine. As a result, there is a clear relationship between the two resources, which must be considered when planning a Manufacturing Concept. As an alternative, you could create a manufacturing process which is basically new, thus defining new resources for this manufacturing process that would allow a different constellation.

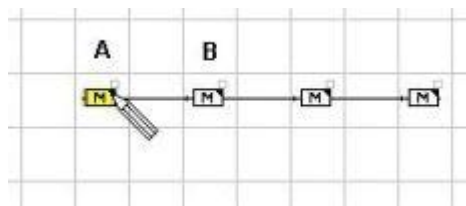


Figure 6: Connecting Lines between Resources

Select the required relation before connecting. Then draw a connecting line while holding down the mouse button. *Please refer to the [Figure 6](#).*

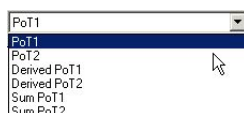
3.2 Creating a New Manufacturing Concept

New Manufacturing Concepts are usually created on the basis of a Process Graph. However, version 5.10 and higher allows you to create Manufacturing Concepts without using a Process Graph.

The Manufacturing Concept processes the displayed processes in a Process Graph and assigns them to resources such as machines, assembly stations, or manual workstations. The processes created in the Process Graph are only transferred to the new Manufacturing Concept if you checkmark the Create Groups and the Create Machines fields in the **New Manufacturing Concept** dialog. Please refer to the [Figure 8](#).

Required input for a new Manufacturing Concept

To create a Manufacturing Concept, you must first enter some essential basic information:



- 1) Specify the start date for the Manufacturing Concept in the **Selected Date** dialog (Please refer to the [Figure 7](#)) The PoT curves determine the planned numbers and the scheduled dates. To select a realistic start date, refer to the scheduled dates from the PoT curves.
- 2) Click **Select** button ([Figure 8](#)) to open the required dialog.

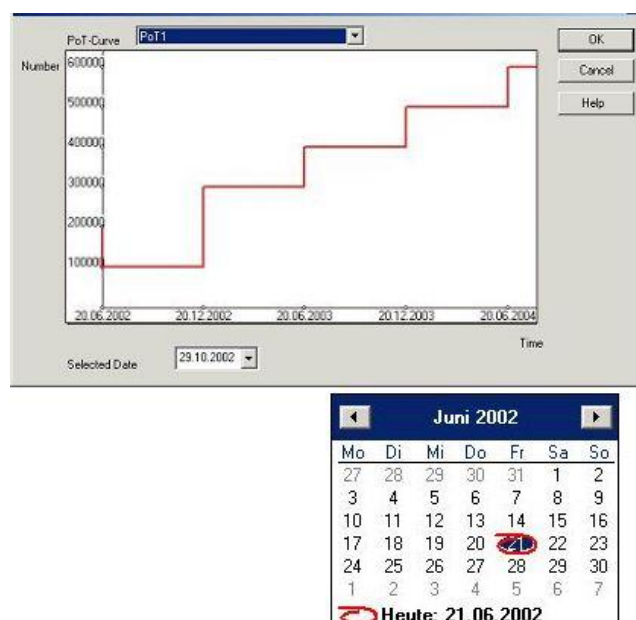


Figure 7: Specifying the PoT Curve and the Start Date



Note

If you want to create a Manufacturing Concept on the basis of a Process Graph, the respective Process Graph must have been created beforehand. Previously created processes are displayed in the dialog (Please refer to the [Figure 8](#)) below the Process Graphs. If you want to create a Manufacturing Concept **without a Process Graph**, no Process Graph must be selected and the **Create Groups** and **Create Machines** fields must be disabled (do not checkmark). Please refer to the [Figure 8](#).

3.2.1 Creating a Manufacturing Process using a Process Graph

- 1) Select a **Process Graph** from the **New Manufacturing Concept** dialog.
- 2) To create resources for processes in the Process Graph of the Manufacturing Process, enable **Create Groups** and **Create Machines**. This is done by checkmarking the two fields. Please refer to the [Figure 8](#).

- 3) Select relation from the combobox. The processes are automatically linked according to the selected relations to all resources which are generated on the basis of Process Graph.

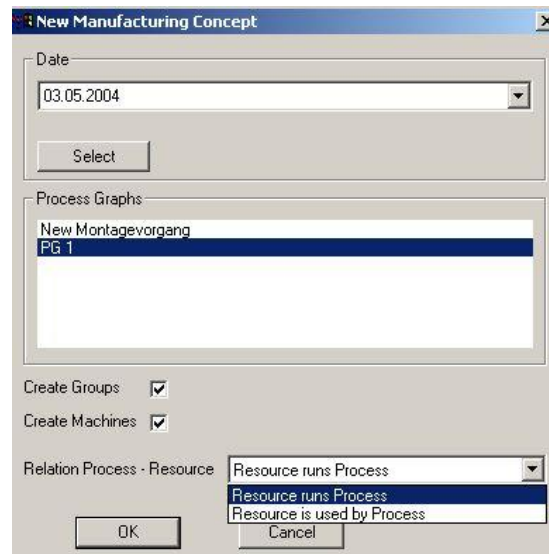


Figure 8: New Manufacturing Concept

- 4) Click **OK**, once you have entered all required information.
- 5) The **Define relationship between plantypes fr...** dialog allows you to define the relationships between the plantypes from the Process Graph and the Manufacturing Concept. This dialog is only available if both fields, i.e. **Create Groups** and **Create Machines**, have been enabled. *Please refer to the [Figure 8](#).*

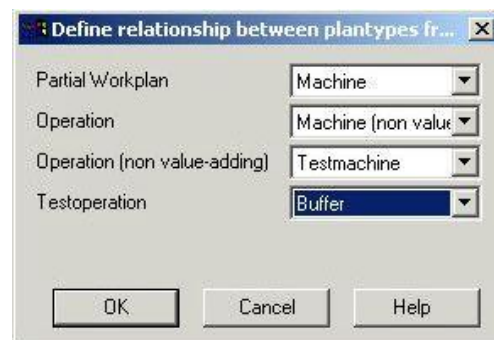


Figure 9: Relationships between Plantypes – Process and Resource

The Process Graph provides three types of processes (operations) to edit a Process Graph.

- Value-adding operation
- Non value-adding operation
- Test operation

On the left side of the dialog (*Please refer to the [Figure 9](#)*), these processes are displayed. During configuration, these processes have been defined as plantypes. The **Define relationship between plantypes fr...** dialog defines which plantype (process) is related to which plantype (resource).

The resulting relationships should correspond to the real planning process for which you are creating the Manufacturing Concept. **Value-adding operations** should therefore only be assigned to **value-adding resources** (machines). Accordingly, **non value-adding operations** should only be assigned to **non value-adding resources**.



Note

The relationship between plantypes refers exclusively to processes that have been displayed in the Process Graph.

A relationship between plantypes that has been incorrectly chosen may cause severe errors for the overall planning process.

Example

For example, you may have related the **value-adding operation** plantype to the **non value-adding resource** plantype. This can affect the overall planning of the Manufacturing Concept. In this case, all **value-adding resources** would be marked with the wrong symbols and, as a consequence, they would be evaluated as **non value-adding resources** during the valuation of a Manufacturing Concept.

- 6) Click **OK**, once you have established all required relationships between the different plantypes. The new Manufacturing Concept is created and displayed. Please refer to the [Figure 10](#).

Example

The resources displayed in the example of a Manufacturing Concept come from the resource structure and from the Process Graph. The resources from the resource structure are arranged within the blue framed rectangle. The resources in the red framed rectangle correspond to the selected Process Graph display. The connection between the plantypes from the Process Graph and from the Manufacturing Concept establishes a connection between the processes created in the Process Graph and the resources. The Manufacturing Concept is exclusively intended for editing resources. Please refer to the [Figure 10](#).

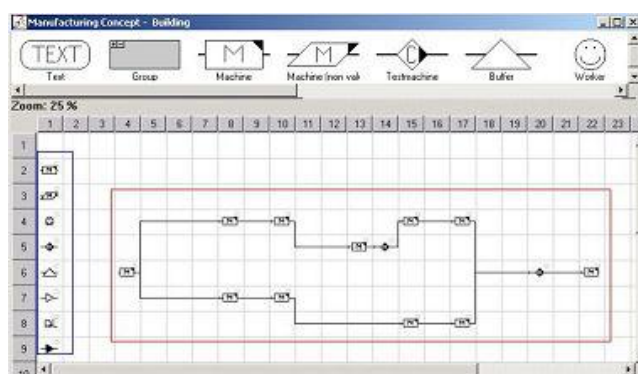


Figure 10: Example – Display of a new Manufacturing Concept

3.2.2 Creating Manufacturing Concepts for Several Levels

Creating manufacturing concepts all at once for as many hierarchical levels as you like saves time and allows you to work efficiently when planning manufacturing concepts. This approach allows you to create manufacturing concepts for subsequent hierarchical levels from a single hierarchical level, without having to change to the resources view via the **Open this view** context function. The new function, **Create Manufacturing Concepts**, can only be performed directly in the PPR Navigator.



Caution

The manufacturing concepts created in this way are always created without process graphs.

Hierarchical Level “0” is also Included

- This hierarchical level corresponds to the level from which the manufacturing concepts are created for the following hierarchical levels, and must also be included when planning the manufacturing concepts to be created.
- If you enter **zero** in the dialog, (Please refer to the [Figure 13](#)), a manufacturing concept is created for this hierarchical level only. In the example it is (Please refer to the [Figure 11](#)) the hierarchical level **Location of New Plant**.

Example

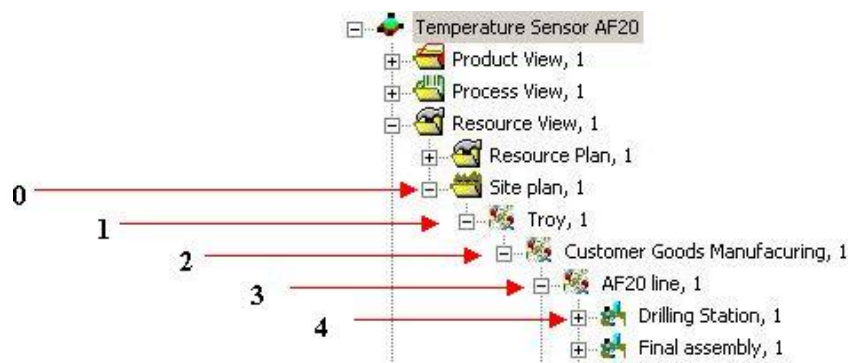


Figure 11: Example - Manufacturing Concept for Creating Several Levels

To Create Manufacturing Concepts

The **Create Manufacturing Concepts** function can be executed from every hierarchical level of the resources view in the PPR Navigator. Manufacturing concepts for subsequent hierarchical levels are created if these hierarchical levels have been created in the PPR Navigator, such as the location, plant, hall, and system hierarchical levels in the example.

- 1) Select the hierarchical level with the left mouse button (in the example, the Location of New Plant hierarchical level).
- 2) Press the right mouse button and select **Create Manufacturing Concepts**.

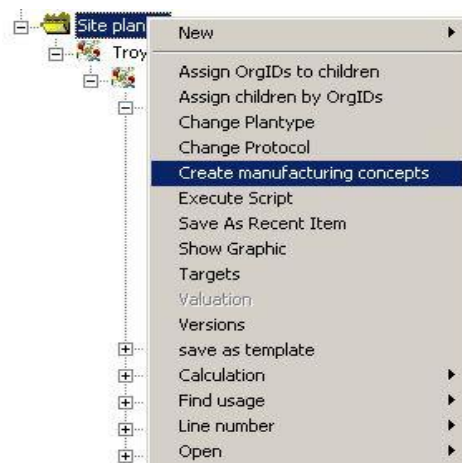


Figure 12: Open Context Menu – Create manufacturing Concept

- 3) Enter the hierarchical levels in the **Next hierarchical step down** dialog. In the example, manufacturing concepts are created for the four following hierarchical levels plus the level zero.

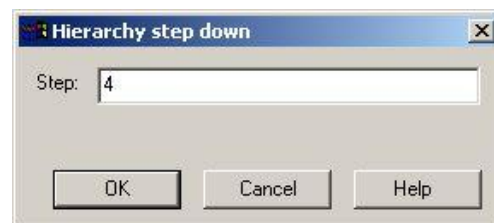


Figure 13: Dialog – Enter Hierarchical Levels

To Open Manufacturing Concepts

- 1) Select a hierarchical level in the PPR Navigator for which a manufacturing concept has been created. In the example it is the hierarchical level Hall.
- 2) Press the right mouse button and select **Open this application** to change to the Resource view.



The hierarchical level **Graph BOM** has been created in the structure. If this hierarchical level is available, a manufacturing concept has also been created.

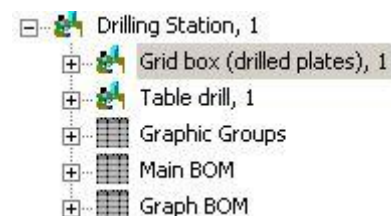


Figure 14: Graph BOM shows – Manufacturing Concept has been created

- 3) Select the hierarchical level that you have opened and then select **Open Manufacturing Concept** in the context menu. The manufacturing concept created with the **Create manufacturing concepts** function opens.

3.2.3 Prerequisite to run “Update MC with Processes from Process Graph”

- 1) Create processes, create processgraph, and link process and resource components. *Please refer to the [Link Processes and Resources](#) .Create “Process uses Resource” relation between the process and resource components.*
- 2) Create manufacturing concept. *Please refer to the [To Create Manufacturing Concepts](#).*
- 3) Open manufacturing concept. *Please refer to the [To Open Manufacturing Concepts](#).*
- 4) Right-click manufacturing concept window. Select **Application < Update MC with Processes form PG**.
- 5) Select **ProcessGraph** and click **OK** in the **ProcessGraph** window.
- 6) Manufacturing Concept gets updated with the processes from process graph. Otherwise, you can get an error message.

3.3 Integrating Processes into one Workstation

You can integrate, i.e. combine processes (for example, spinning, milling, or drilling) into a single workstation (resource) or allocate them to multiple workstations. Familiarise yourself with the **Integrate** function of the right mouse button. This function allows you to combine multiple processes on a single workstation.

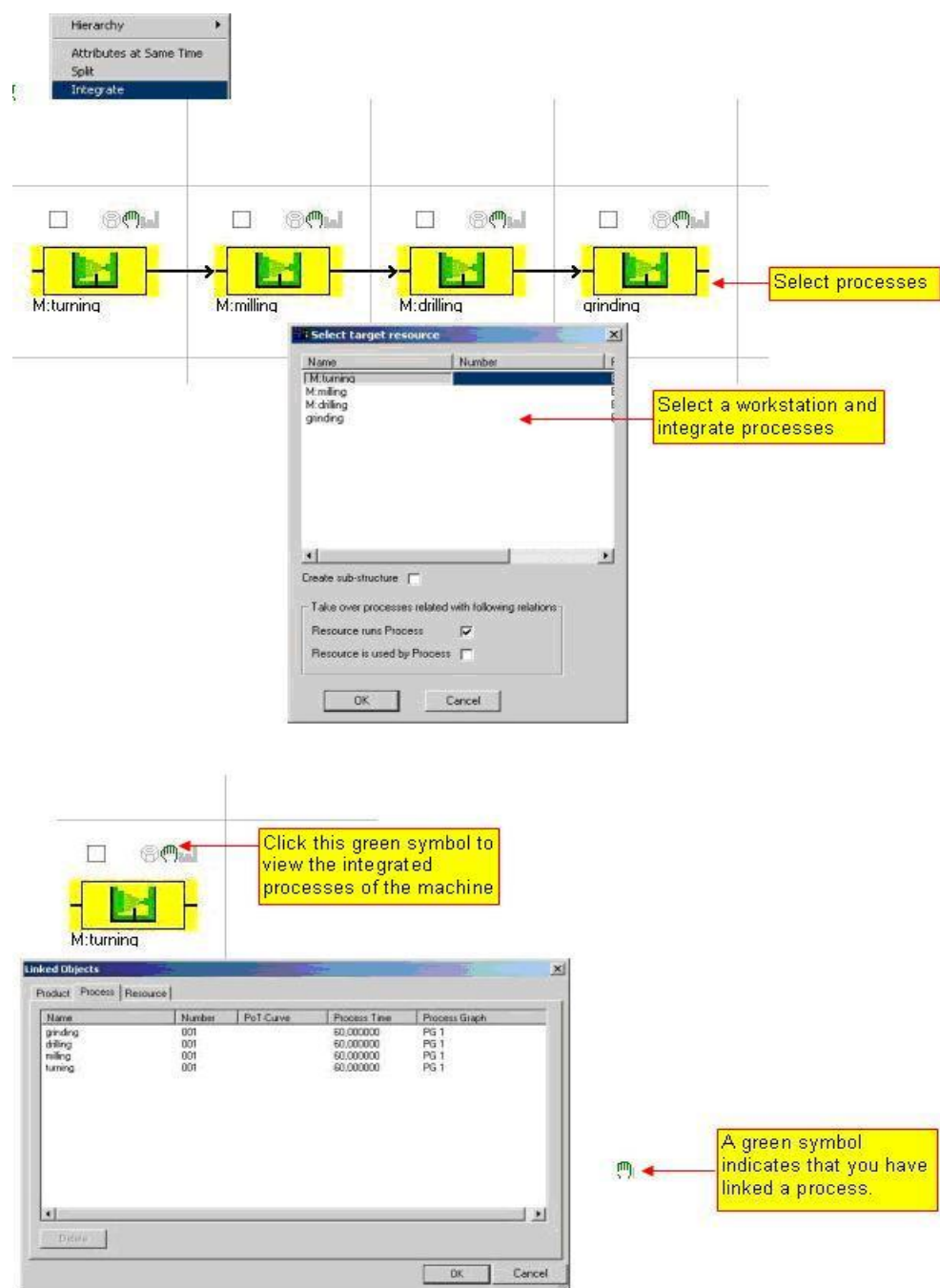


Figure 15: Integrating Processes on one Machine

3.3.1 Integrating Processes in a Time Saving Manner

- 1) Select the stations where you want to integrate processes.
- 2) Drag the cursor to a selected symbol and press the right mouse button.
- 3) The context menu opens. Click **Integrate**. The **Select target resource** dialog appears.
- 4) Select the station where you want to integrate individual processes. Then click **OK** button to link the processes for one station.

- 5) Then single-click the green hand above the symbol. The Link context menu opens. You can now view all processes that are currently performed on the respective workstation.

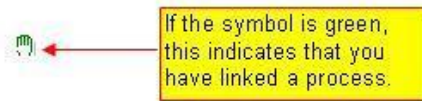


Figure 16: Green Hand Symbol

This allows you to assign one or multiple processes to a workstation. You can also rename a created process using the **Properties** function. If you want to delete a process from a particular workstation, proceed as follows:

- 6) Click green hand above the symbol. The Linked Objects menu opens. You can now view the processes, which are linked to the station.
- 7) Select the line you want to delete. To do this, simply click the required line. Then click **Delete**. Confirm your entry using the **OK** button.
- 8) Click **Cancel** button if you are not certain. This gives you time to reconsider if you really want to delete the selected link.

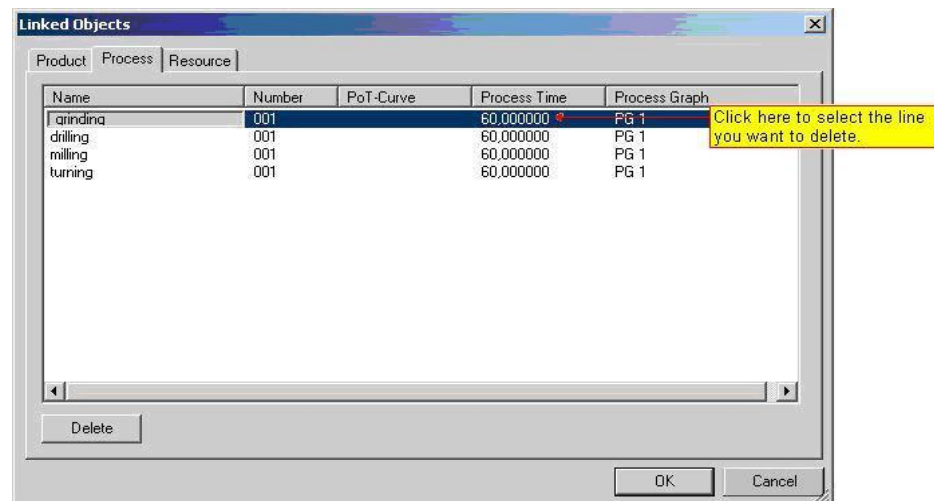


Figure 17: Delete Process

Here you can assign a name to a station or rename it.

Machine <Spin, 1>

General | Investment | Organization | Area | Simulation | Graphic Settings | Notes

Component Name: Spin

Number: 1

Investment Type: Standard machine

Shift Model:

Order Date: ☒ 28.10.2002

Supply Date: ☒ 28.10.2002

Length: 3,00 m

Width: 3,00 m

Height: 3,00 m

Allowance Set:

Premises: Stuttgart

Rejected Parts Concerned: ☒

Realizes MC for Process:

Write Change Protocol: ☒

Floor Height: 0 mm

Timestamps

Modified	29.10.2002 08:57:30
Created	28.10.2002 09:33:59

Figure 18: General Machine Properties

3.3.2 Creating Manufacturing Concepts for Resources

Another option of the **Integrate** context function is to create a Manufacturing Concept for a resource. This Manufacturing Concept displays and edits all integrated resources.

You can create a manufacturing concept for a resource using logistical aspects in order to save space in the layout in the basic manufacturing concept (initial manufacturing concept). This resource is representative in the basic manufacturing concept for the resources that are physically planned in the manufacturing concept of this resource.



Note

You can only create a Manufacturing Concept for a resource if the field next to Plantype of resource, i.e. machine, has been recursively enabled in the Properties dialog.

Example

- 1) Select the resources you want to integrate. The example below shows three resources which are to be integrated into the **M1** resource.

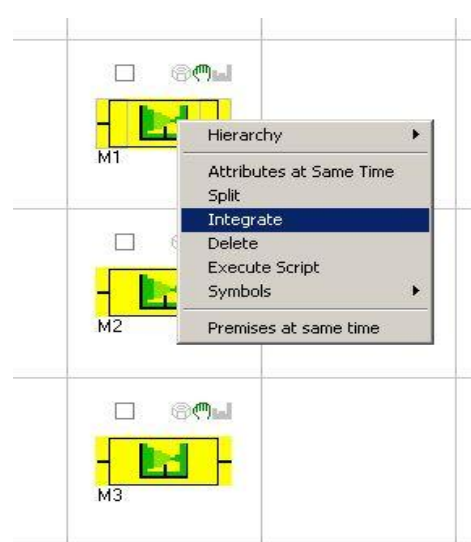


Figure 19: Integrating Processes

- 2) Open the context menu and click **Integrate**.
- 3) Select the required resource from the dialog (*Please refer to the [Figure 20](#)*) and enable the checkbox next to **Create sub-structure**. The Manufacturing Concept of the resource is created once you have selected this box.

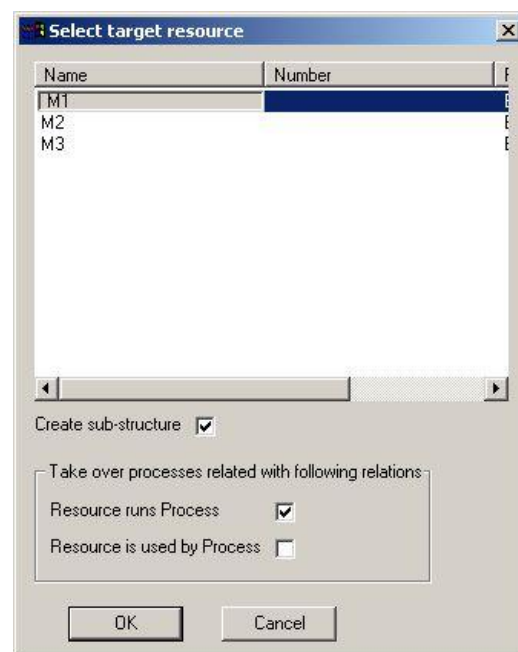


Figure 20: Dialog for the Integration of Resources



New icon to open the Manufacturing Concept of a resource.

The Manufacturing Concept is equipped with a new symbol for integrated resources. The symbol designation corresponds to the resource which combines the integrated resources (in our example, this is the **M1** resource). Furthermore, there is an additional icon above this symbol, which can be used to open the Manufacturing Concept of the resource.

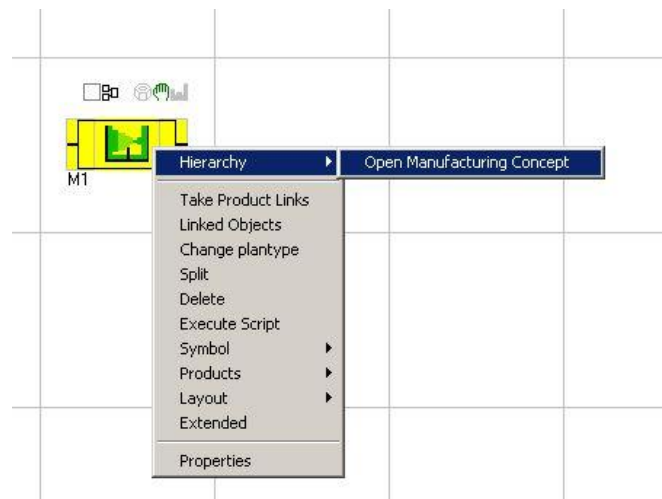


Figure 21: Opening the Manufacturing Concept of a Resource



- 4) To open the Manufacturing Concept of a resource, you can either use the appropriate context menu or the icon above the new symbol. *Please refer to the [Figure 22](#).*

Example

You can display and edit all the integrated resources in the opened Manufacturing Concept. In the example below, these are again the three machines (M1, M2, and M3).

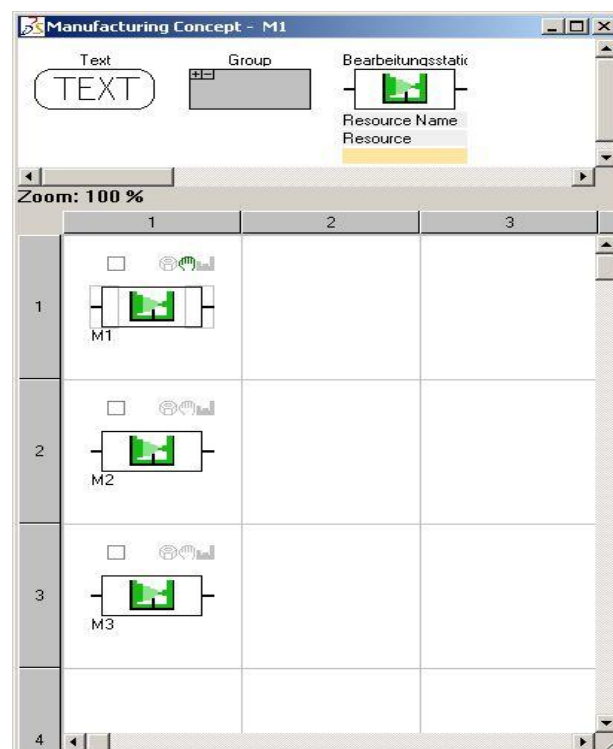


Figure 22: Manufacturing Concept of a Resource – three Integrated Resources

- 5) Use **Open parent graph** function to close the Manufacturing Concept.

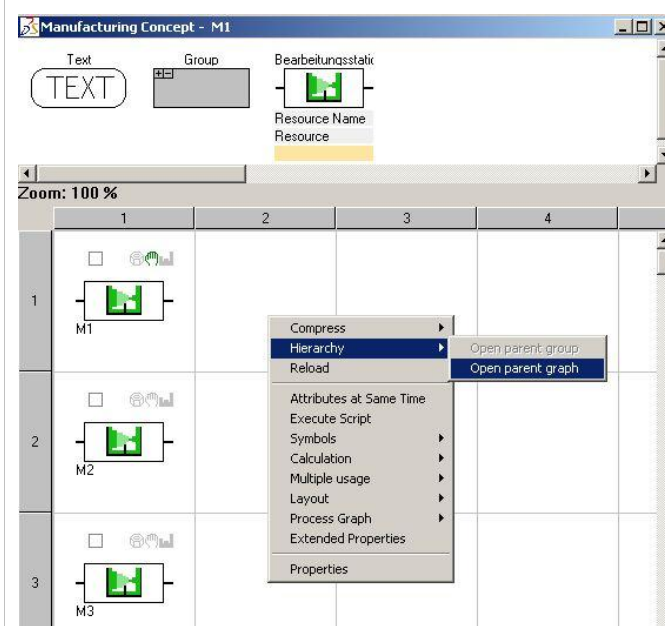


Figure 23: Close Manufacturing Concept

3.3.3 Creating Multiple Workstations



Figure 24: The Split Context Menu

- 1) Use the Split function of the right mouse button to create multiple workstations of the same type.
- 2) Highlight the workstation for which you want to use multiple workstations.
- 3) Press the right mouse button and click **Split**. Please refer to the [Figure 24](#).
- 4) The **Split symbol** dialog box appears. Please refer to the [Figure 25](#).
- 5) You can now specify the number of new stations to be created in the **Quantity** field.
- 6) Select the required position of the new stations from the Position window. Click **OK** to confirm your entry.

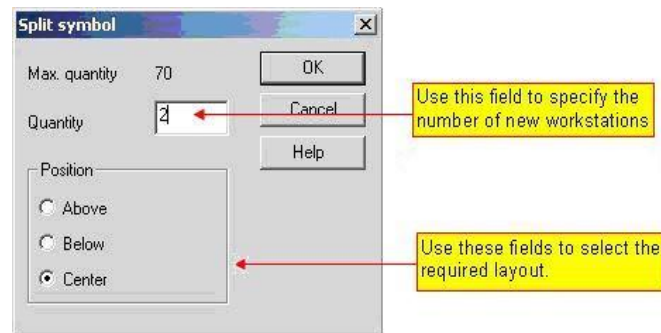


Figure 25: Split Symbol Dialog

The two **Copies** of stations are generated.

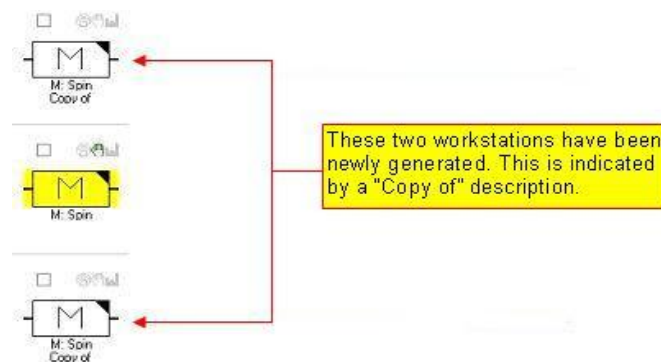


Figure 26: New Station Generated – Split Function

3.4 Linking Options

3.4.1 Creating Resources from Processes

The Manufacturing Concept allows you to create a resource directly from a process. When a new Manufacturing Concept is created, the processes that have been assigned to the Manufacturing Concept via a Process Graph are used to create resources using the relationship between the process and resource plantypes. This principle also applies, if you choose to create a resource directly from a process of an already existing Manufacturing Concept.



Note

It is possible to create a process from a resource if the process is inserted in an empty space of the Manufacturing Concept. Use drag and drop to insert the processes into the Manufacturing Process.

To Create Processes

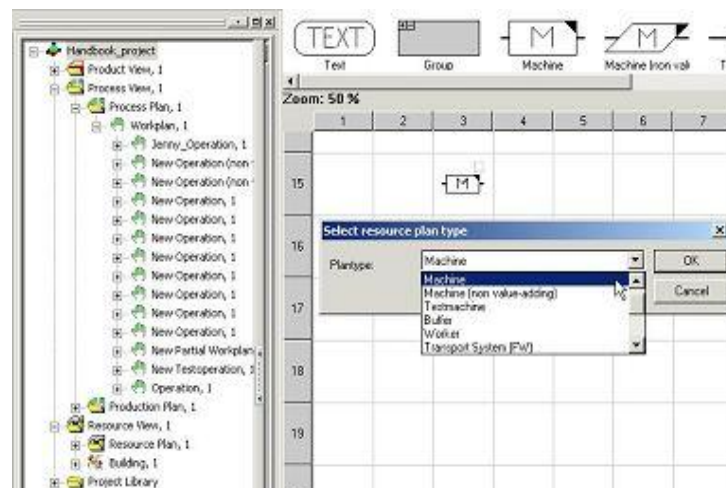


Figure 27: Creating a Resource from a Process

- 1) Select a process from the PPR Navigator Process View. Drag the selected process to an empty space in the Manufacturing Concept.
- 2) Release the mouse button. Select the required planttype from the dialog. When selecting a planttype, you also need to specify the resource type to be planned and inserted into the Manufacturing Concept. Such a resource planttype might be a machine or a buffer.
- 3) Use the **Properties** dialogs to edit the new resource.

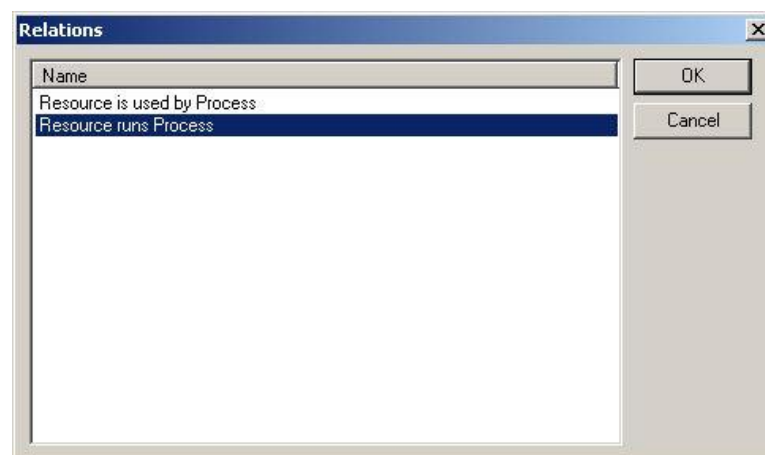


Figure 28: Select Relation from the Dialog

- 4) Click **OK** to confirm your entry. You can plan the newly created resource in the manufacturing concept; for example, set the properties and link to further resources.

3.4.2 Assigning a Worker to a Station

Machines must be operated, transports must be performed, and even in the automation era, there is still the need to set up and maintain machines or to equip them with new tools. Workers are essential for the process and planning.



Note

To link a worker to a resource, you can follow the same procedure as when linking a transport tool to a resource.

- 1) Activate the worker symbol featuring a smiley face. The symbol is shown below.

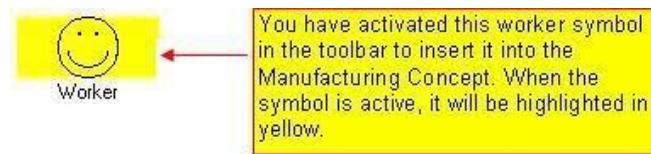


Figure 29: Smiley Face Symbol



Note

This symbol must be activated whenever you want to insert a worker into a Manufacturing Concept. Workers can be assigned either to value-adding stations, non value-adding stations, or test stations.

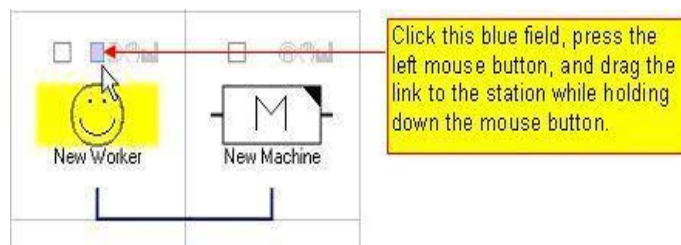


Figure 30: Connecting a Worker to a Station

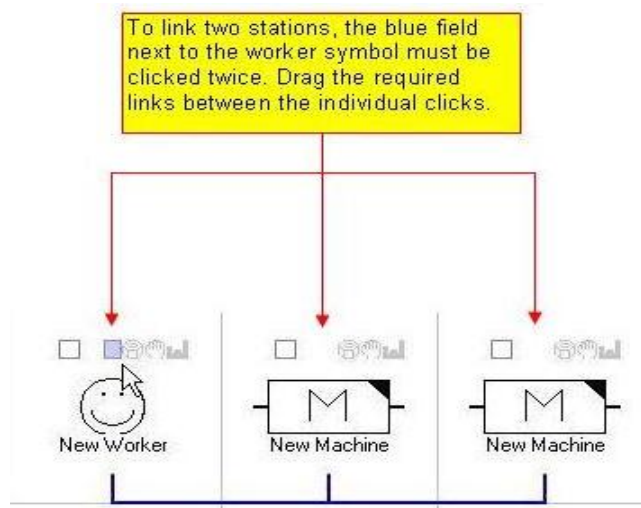


Figure 31: Connecting a Worker to Two Stations



Caution

Whenever you assign a worker to a station or a group, you must first open the required station/group. The same applies to a group within a group. To open a group, simply click + sign of a closed group symbol.

- 2) Click blue box above the symbol to establish the connection.

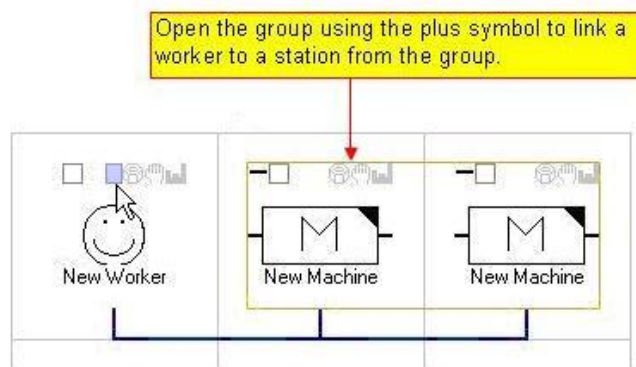


Figure 32: Assigning a Worker to a Station within a Group

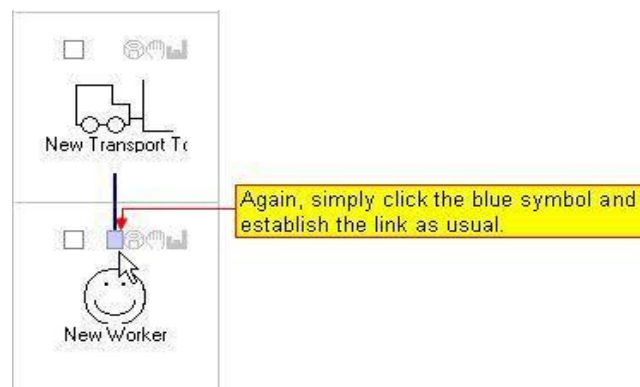


Figure 33: Connecting a Worker to a Transport Tool

- 3) Click worker symbol in the toolbar.
- 4) Insert the symbol into the Manufacturing Concept. Deactivate the symbol by a single click of your mouse if you do not want to insert any further workers into the Manufacturing Concept.
- 5) Click blue box above the worker symbol. Hold down the left mouse button and draw the connecting line to the target symbol. Release the mouse button. Now you have successfully linked a worker to a station.
- 6) If you want to assign the worker to further stations, follow the same procedure.

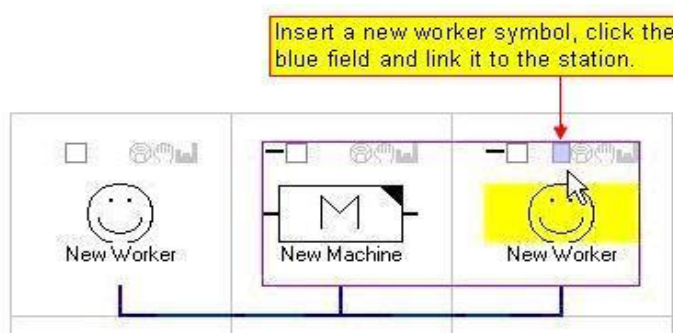


Figure 34: Connecting Two Workers to a Station

3.4.3 Linking a Buffer

Even in times of globalized competition and just in time production, the following is true: A material flow is only as good as its buffer organisation. A few parts in the buffer are always better than a two-hour standstill of a machine. Realistic planning concepts include lead times, i.e. parts intended to bridge production flows. This can be achieved by using a buffer. The buffer location is of minor importance for our purposes. It may be located either at the customer's site, in your own warehouse or between individual production sites. Optimum buffer planning means more than just increased safety in the material flow. It also shows that a planner is able to assess production flows on a realistic basis. It is therefore important to evenly optimize the use of buffers for the entire production flow.

It is actually a pity that buffers do not have the smiling features of a smiley face. However, this symbol is equipped with different elements that are typical of buffers. The buffer symbol is shown below.

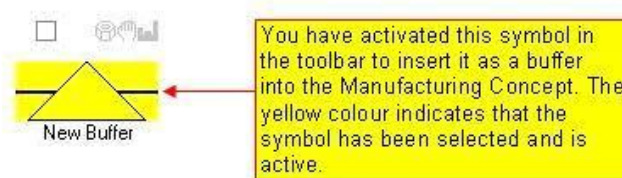


Figure 35: Buffer Symbol



Note

This symbol must be activated whenever you want to insert a buffer into a Manufacturing Concept. You can use this symbol to connect buffers with stations or transport systems.

To Insert a Buffer

- 1) Click buffer symbol in the toolbar. It is highlighted in yellow, showing that it is ready for operation.
- 2) Insert the buffer symbol into the Manufacturing Concept. If you do not require further symbols, click again the buffer symbol in the toolbar to deactivate it.

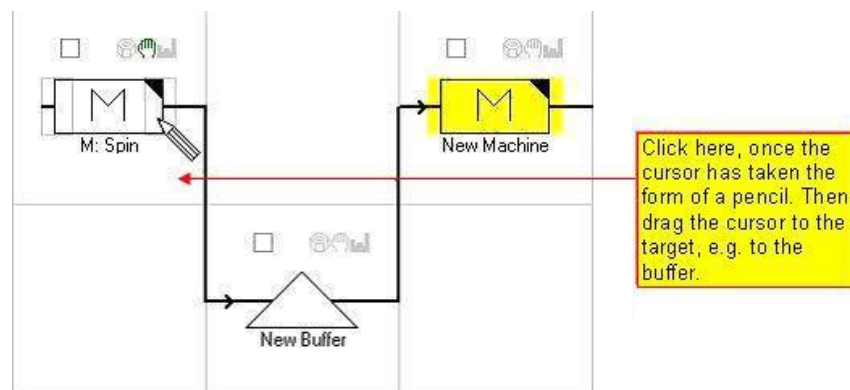


Figure 36: Inserting a buffer

- 3) To connect a buffer, the pointer must assume the shape of a pencil.

- 4) Press the left mouse button and hold it down until you have connected the buffer to the station. The arrows on the black connecting line indicate the flow direction. If you want the material flow to run from the station to the buffer, you must draw the connecting line from the station and vice-versa.

3.4.4 Linking a Transport System

To transport goods, it is necessary to determine the type of goods, the container used and how the goods are going to be transported. For this purpose, you must define and describe the transport.

3.4.4.1 Inserting and Linking a Transport System

- 1) Click one of the transport symbols in the toolbar. It becomes yellow.

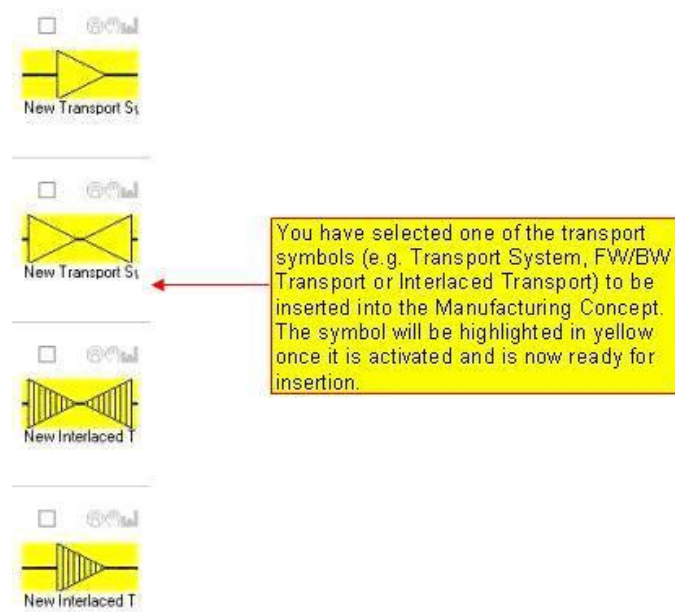


Figure 37: Example - Transport Symbols



Note

This symbol must be activated whenever you highlight and insert a transport system into a Manufacturing Concept. The inserting procedure is the same for all transport symbols. Please refer to the [Figure 38](#).

- 2) Insert the transport symbol into the Manufacturing Concept.

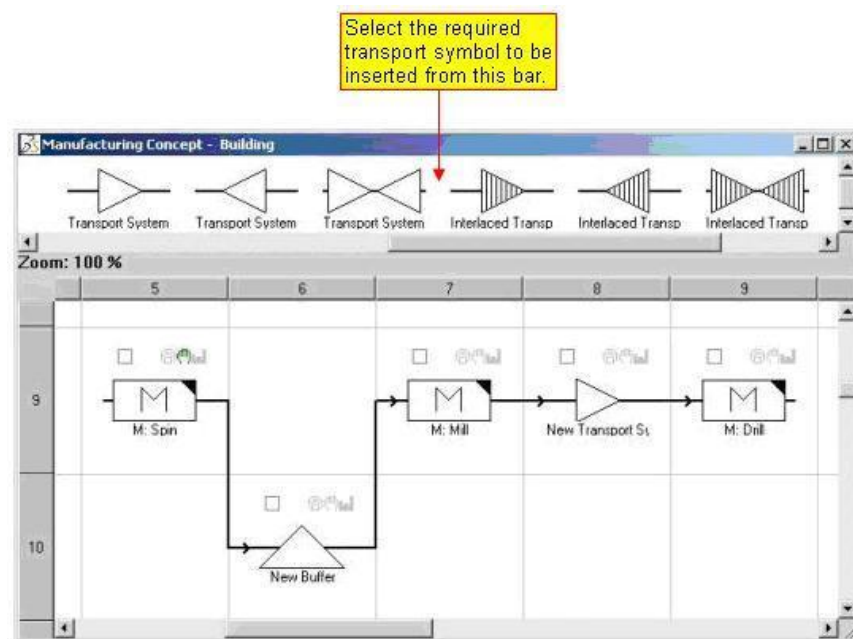
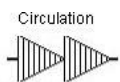


Figure 38: Example of a Transport - Machine

- 3) Click the transport symbol when the cursor has assumed the form of a pencil and draw a link by moving it to the target station while holding down the left mouse button.
- 4) Release the mouse button. The station is now connected to the transport system.

3.4.4.2 Relating Chained Transports to Circulation



Icon for circulation

The circulation resource refers to logistics processes which take place on an assembly line and whose individual stations are continuously connected to one another. Parts are transported between the individual stations by chained transport units. With the circulation resource, you can relate these chained transports, and in the properties dialog you can define the logistics data. The circulation resource is also used for related chained transports to provide data for the simulation in a simple and fast manner.

The circulation resource is used in closed systems, such as transport or assembly lines whose transport units are continuously connected to one another. *Please refer to the [Defining Interlaced Transport Properties](#).*

Settings in the Plantype Set for Circulation Resource

The settings for circulation are made only in the plantype set in the **System library**. You cannot plan a circulation without these settings. Make the following settings in the respective plantype set used for your project:

- 1) Enable the **Display in process graph** field.
- 2) Assign the bitmap for the circulation resource.

Make the settings in the plantype set of the system library for circulation resource.

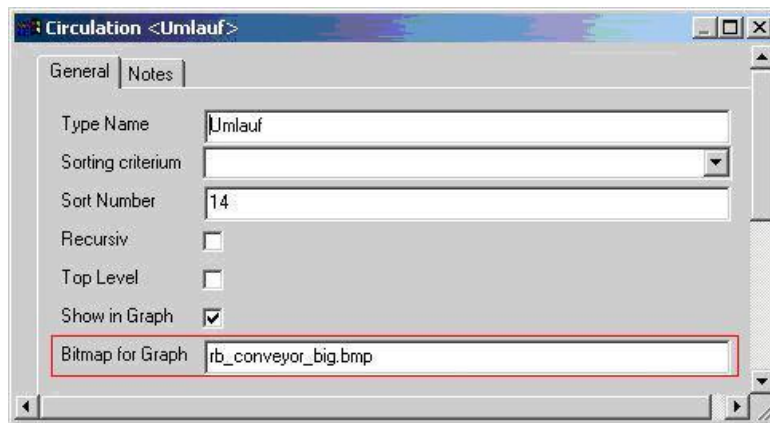


Figure 39: Properties Dialog of Circulation – Plantype Set System Library

To Relate Circulation and Chained Transports

There are several possible ways to relate the circulation resource:

- You can drag and drop the circulation to a chained transport in the Manufacturing Concept.
- You can create the relation in the PPR Navigator by drag and drop or you can create the relation in the manufacturing concept.

Relations made in the PPR Navigator may necessitate the selection of the relation in a dialog. Whether this dialog appears depends on your configuration.

You may use only the relation **plant related with plant (reverse)** for relating the circulation resource to a chained transport.

Select the relation from the dialog.

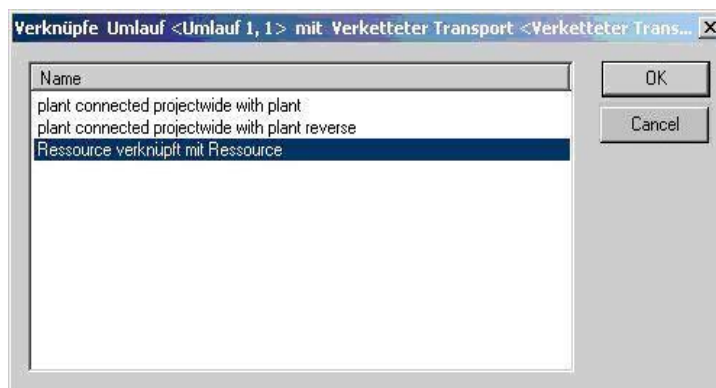


Figure 40: Select Circulation for Relation Dialog

To Drag the Circulation to the Manufacturing Concept

- 1) Select the circulation resource in the PPR Navigator in the resource structure.
- 3) Drag the relation to the chained transport in the Manufacturing Concept.
- 4) Select the relation. *Please refer to the [Figure 40](#).*



Icon for chained transport.

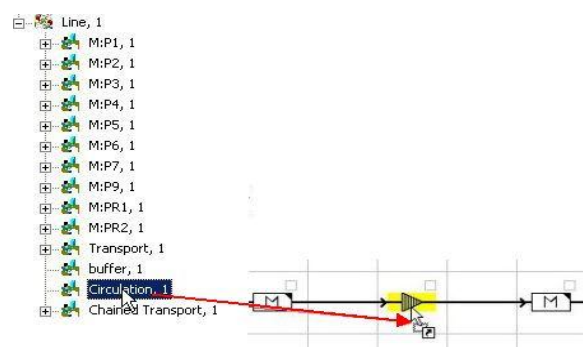


Figure 41: Relating Circulation by Drag and Drop

- 5) Confirm the selection with **OK**. Circulation and chained transport are related to one another.

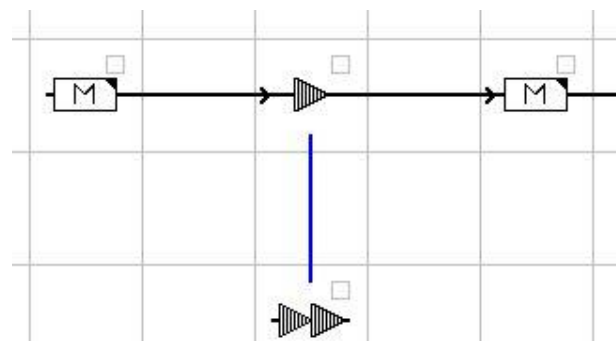


Figure 42: Blue Line Indicates the Relation

- 6) Save the Manufacturing Concept.
- 7) Open the context menu in a free field in the Manufacturing Concept.
- 8) Click menu entry **Reload**. The blue line marks the link between circulation and chained transport.

3.4.4.3 Relations in the PPR Navigator

- 1) Select the circulation resource in the PPR Navigator in the resource structure.
- 2) Drag the relation to the chained transport in the resource structure.
- 3) Select the relation in the dialog. *Please refer to the [Figure 40](#).*

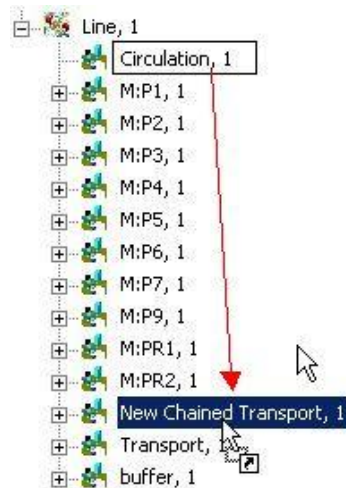
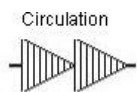


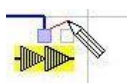
Figure 43: Relating the Circulation in the PPR Navigator by Drag and Drop

- 4) Confirm the selection with **OK**. Circulation and chained transport are related to one another.

3.4.4.4 Relations in the Manufacturing Concept



Mouse pointer as pencil.



- 1) Drag the mouse pointer to the circulation icon.
- 2) Drag the mouse pointer to the chained transport. Circulation and chained transport are now related.

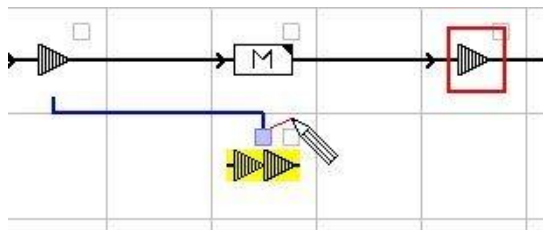


Figure 44: Drag Mouse Pointer to the Chained Transport

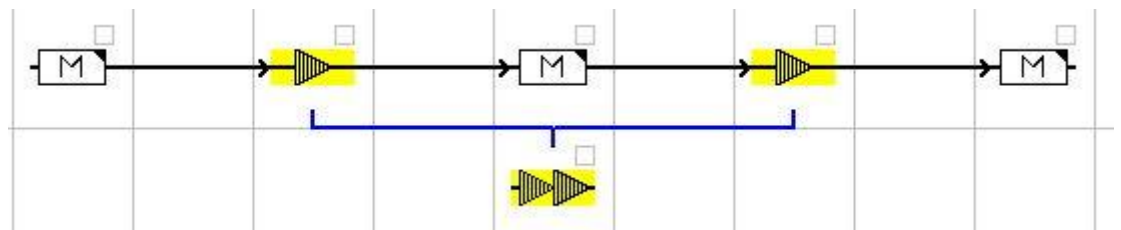


Figure 45: The Blue Line Indicates the Relation

3.4.4.5 Selecting Multiple Items

You can relate the circulation to several symbols at the same time with a multiple selection of chained transports in the Manufacturing Concept. This type of relation can be executed only by drag and drop from the PPR Navigator.

- 1) Select the chained transport in the Manufacturing Concept (multiple selections by pressing the control key).
- 2) Select the circulation resource in the PPR Navigator in the resource structure.

- 3) Drag the relation to **one** of the chained transports in the Manufacturing Concept.

Multiple selection of chained transports.

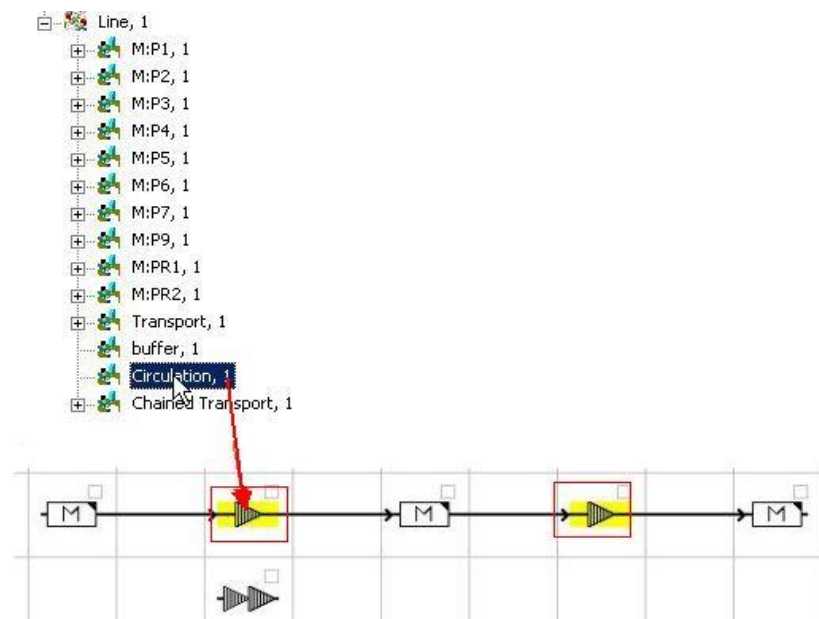


Figure 46: Multiple Selection – Relating from the PPR Navigator

- 4) Select the relation in the dialog. Please refer to the [Figure 40](#).
- 5) Confirm the selection with **OK**. Please refer to the [Figure 47](#).
- 6) Confirm the message with **Yes**. Circulation and all selected chained transports are simultaneously related to the circulation resource.



Figure 47: Confirm message with Yes

- 7) Save the Manufacturing Concept.
- 8) Open the context menu in a free field in the Manufacturing Concept.
- 9) Click **Reload**. The blue line indicates the relations between circulation and chained transports.

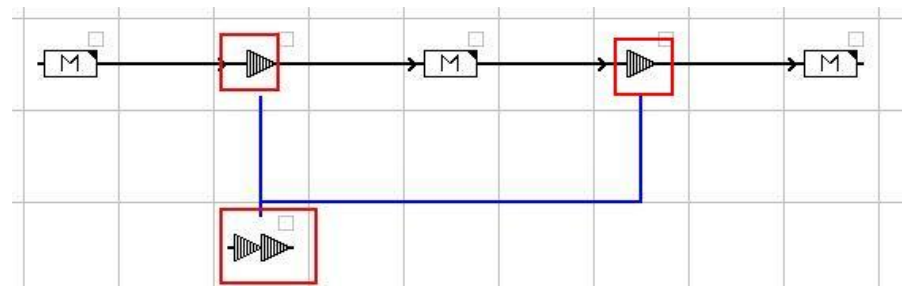


Figure 48: Relation between Circulations by Multiple Selection

3.4.5 Inserting/Linking a Test Station

Imagine all parts have already been produced and sold. Meanwhile, the customer has started production, intending to assemble the parts during the third assembly operation. The quality engineer interlocks the parts: What would have to be done now? Even though your company has been certified according to the ISO 9001 standard, a batch has apparently reached the customer without undergoing any test operations. No offence meant! Yet the old maxim is still true: Control is better than running after things! This section describes how to insert a test station and how to define the respective properties. However, you are the person in your company who decides which parameter and values are to be defined. We can just show you the way.

To Assign a Teststation

- 1) Activate the **Teststation** symbol. Once activated it gets highlighted in yellow.

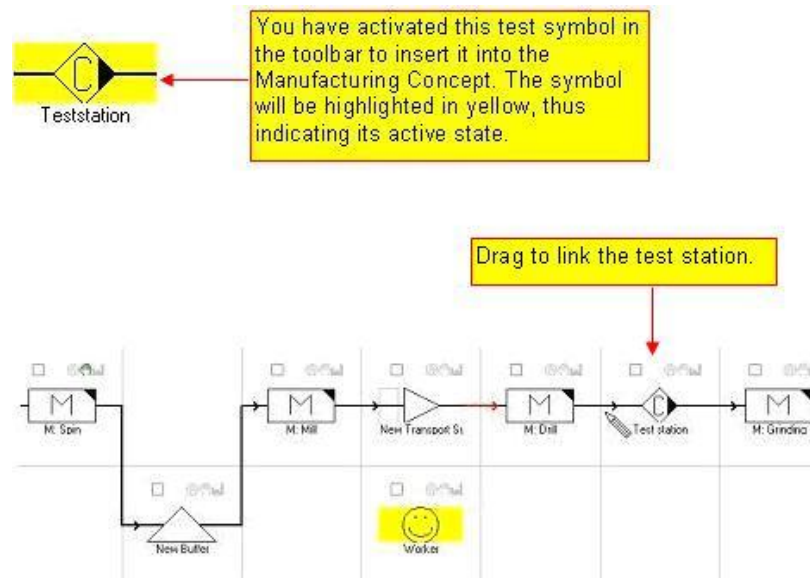


Figure 49: Assigning a Station to a Test Station



Note

Always keep in mind that workers must be assigned to stations and not vice-versa. To link them to a test station, you need to click the blue sign above the symbol.

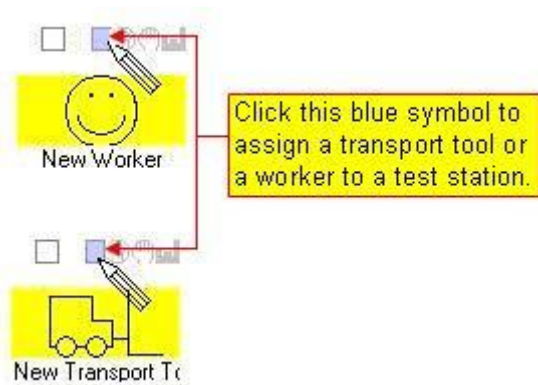


Figure 50: Assign Transport Tool

- 2) Drag the cursor across the test symbol until it assumes the shape of a pencil. Now press the left mouse button and select the link while holding down the mouse button.
- 3) Drag the cursor to the station and release the mouse button. You have successfully linked a test station.
- 4) When you have established the link, you should define the test station properties. Of course, this could be also done before establishing a link. In any case, you should now familiarize yourself with the menu.

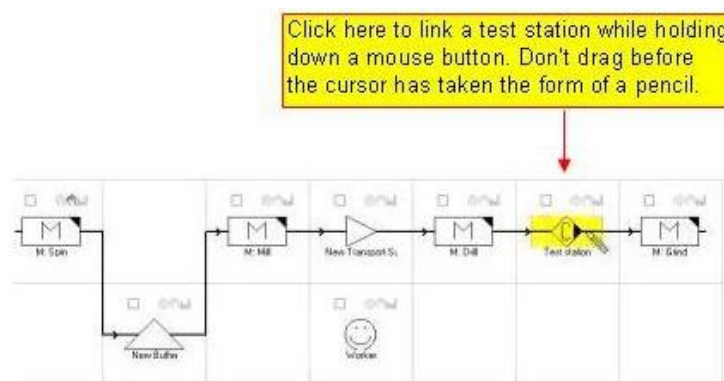


Figure 51: Linking a Test Station to a Station

3.5 Step Value in the Manufacturing Concept

In Version PE 5.12 you can use all configured attributes for the step value. The step value is as of this version preset for the respective plan type.

For example, the deviations from planned investments above the step value for machines (resources) can be displayed in the Manufacturing Concept. However, this option is only available if you have indicated a step value.

The step value is preset directly for the plan type in the toolbar with the function PE 5.12.



For more information, please refer to the [Process Graph Manual](#).



This chapter briefly discusses the principal procedure. In addition, this chapter includes a schematic diagram for the step value (Please refer to the [Figure 56](#)).

3.5.1 Presetting the Step Value for Machine Plan Type

Example

This example shows possible deviations from the planned investment above the step value for all resources of the machine plan type. The third line under the plan type in the toolbar is used exclusively for the attribute step value.

- 1) Double click to open the attribute selection dialog. In the example, the attribute **dummyinvest** is used for estimated investments.
- 2) The target value (planned investment) is entered in Euros, the deviations in percent.

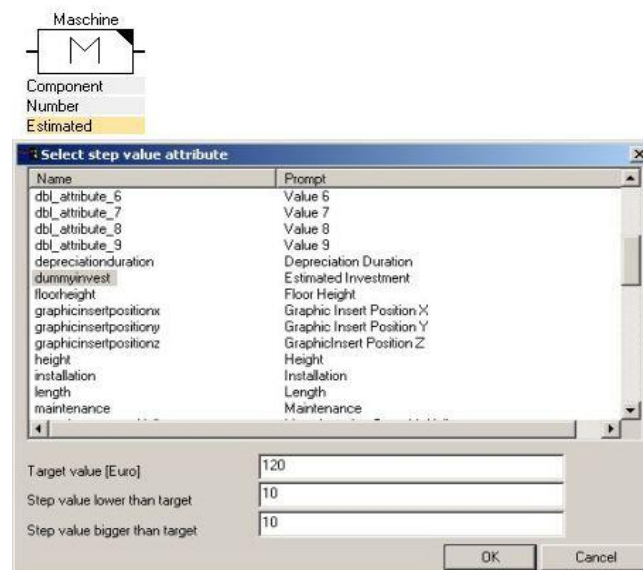
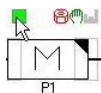


Figure 52: Attribute for Step Value Dialog

Example

The result is represented by colored symbols in the Manufacturing Concept:

- A step value of 10%, the icon is green in the interval (Step value lower than target) from 100% to 90%. A yellow icon indicates an investment deviation between 80% and 90%.
- An investment deviation under 80% is indicated by a red icon - just as are investment deviations > 100% (Step value bigger than target).



- 3) Click icon above the resource machine. The values preset for the step value are displayed along with the planned investment sum for the resource. This data allows you to immediately correct the presets in the **Properties** dialog.

Message for resource **P1**.

A green icon indicates no deviation from the target value.

Example

Message for resource **P3**. Red icon indicates an excessive deviation from target value.

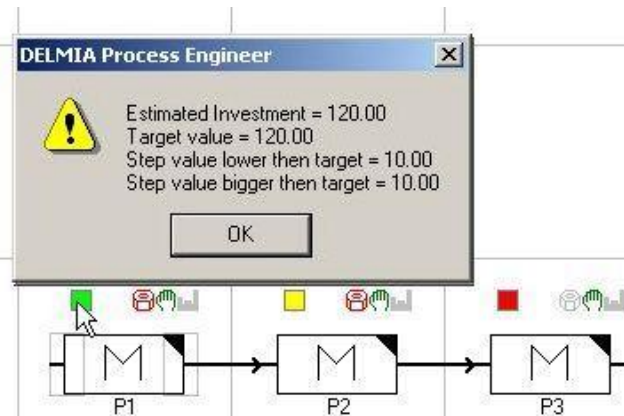


Figure 53: Example - Display Target Value Met, Green Icon

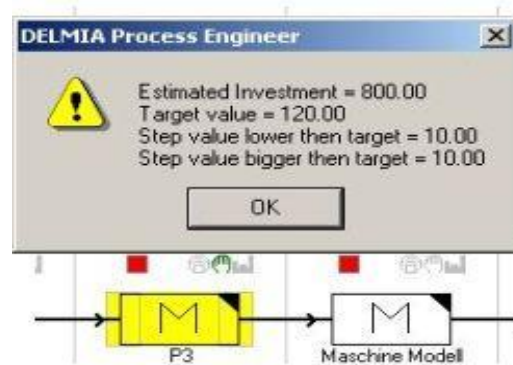


Figure 54: Message Displays Investment Sum – Correct Deviations

3.5.1.1 Machine Occupancy

Example

The occupancy can be displayed for workers and machines, just as in previous versions. In the example, the attribute **occupancy** is used for displaying the step value. Please refer to the [Machine Occupancy Script](#).

Note

The result of the preset target value is displayed only if you run the script for the resource occupancy beforehand.

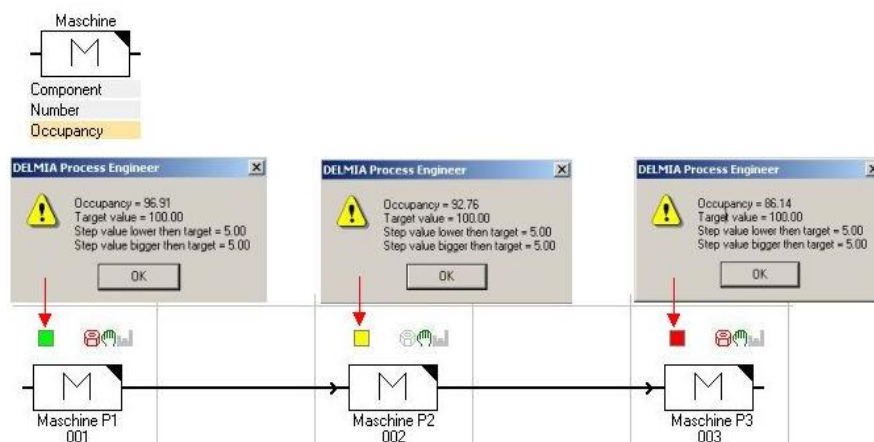


Figure 55: Example: Machine Occupancy Target Value

3.5.2 Schematic Diagram of Step Value

Example

In principle, there is no limit for the step value in the program. However, the entered values should be realistic. Entering a step value automatically defines a section in which the investment deviations are recorded.

S = step value

x = step lower (%)

Y = step bigger (%)

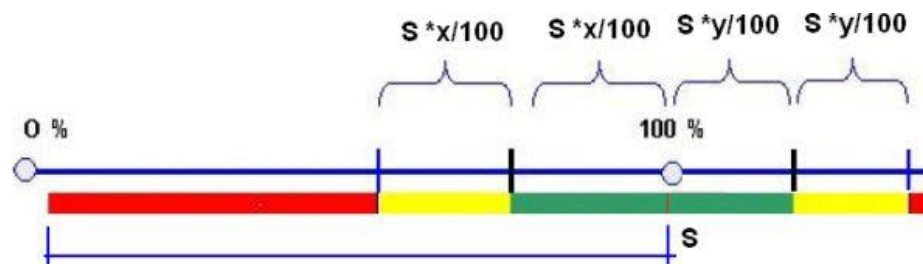


Figure 56: Example of a Defined Section – Step Value

The step value controls the traffic-light function. Similar to traffic lights, the icons above a resource are displayed in red, yellow, or green. Each display corresponds to the currently recorded occupancy.

- Red marks the endangered section. The section marked in red is always beyond the section that has been defined by the step value.
- Yellow means, that occupancy is approaching the limit of the section permitted.
- Green means that occupancy is at its optimum level. *Please refer to the Figure 56.*

3.6 Displaying Product Flow

In Version PE 5.12, the product flow for resources is executed in the Manufacturing Concept via the context menu entry **Display product flow**.

Product flow is no longer displayed in the symbol layout as in previous versions. The product flow can be displayed for all resource symbols linked to products in the Manufacturing Concept. The product flow is displayed in green.

Products that are faded out in the Manufacturing Concept by a filter are not displayed.

To Start Product Flow via the Context Menu

- 1) Open the context menu in a free field in the Manufacturing Concept.
- 2) Select **Show product flow**.

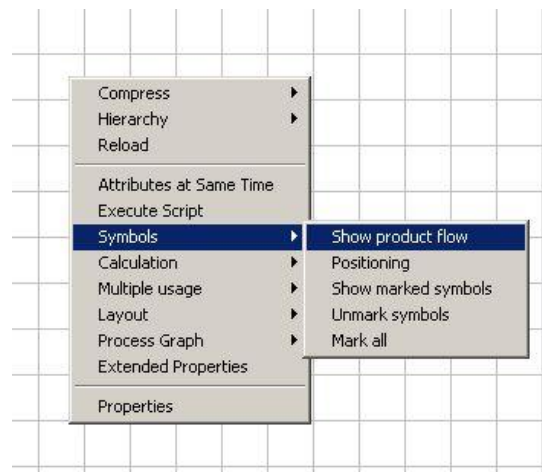


Figure 57: Context Menu – Show Product Flow

To Select a Product

- 1) In the dialog **Select product**, select a product to show its product flow.
- 2) You can always select several products at the same time. Press and hold down the Ctrl key to select more than one product.



Figure 58: Select Product Dialog

- 3) Click **OK** to confirm the selection. The resources that are linked to the selected product are displayed in green.

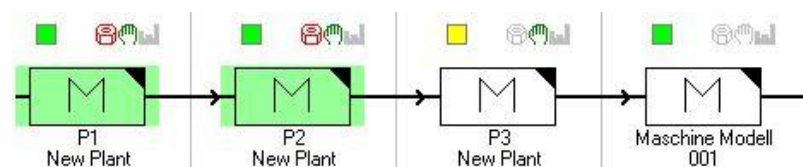


Figure 59: Green Display – Product Flow in the Manufacturing Concept

To Unmark Symbols

- 1) Open the context menu in a free field in the Manufacturing Concept.
- 2) Select **Unmark symbols**. Please refer to the [Figure 57](#).

3.7 Creating a Layout



This symbol starts the search function.

Use **Create Layout** function (Figure 61) to create a layout for an existing Manufacturing Concept, for example, to position the machines and stations planned in the Manufacturing Concept, in the layout. You cannot create a layout unless you have assigned the corresponding system items to each machine and station beforehand. The objects are assigned to the system items in the system library. You can use the Finder to quickly find a system item. Always assign system items to the object using drag and drop. There are two ways to assign system items to an object: You can either directly drag the system item to an object (machines, stations) in the Manufacturing Concept or drag it to the object in the created resource structure of the PPR Navigator (Project View). Please refer to the Figure 60.



Note

Please read the **Finder dialog box** and **Application of the PPR Navigator** in the [PPR Navigator Manual](#).

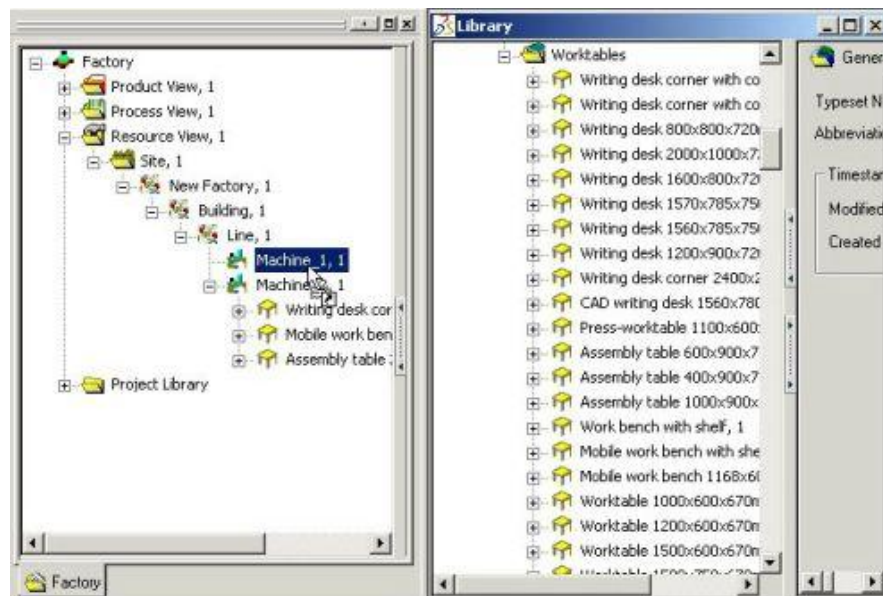


Figure 60: Assigning System Items in the Project View

Layouts of manufacturing concepts can be shown via the context menu in the manufacturing concept as of version PE 5.14. Furthermore, the three layout functions have been integrated under one menu item in the context menu. The display for a layout in the manufacturing concept can be shown both for a resource and for the whole manufacturing concept.

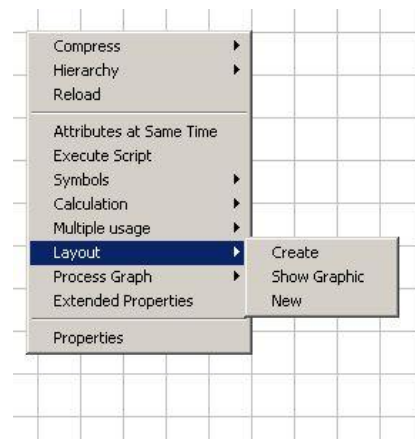


Figure 61: Context Functions Layout in the Manufacturing Concept

3.7.1 Layout Functions

There are three functions available for editing a layout for an overall manufacturing concept:

- [Create Layout](#)
- [Show Graphic](#)
- [Create New Layout](#)

In order to start the layout functions, click free field in the manufacturing concept and open the context menu.

3.7.1.1 Create Layout

Use **Create Layout** only for arranging the resources in the layout. The resources are arranged and displayed in the layout according to the sequence specified in the manufacturing concept.

Use this function when you assign resources to graphic icons (system elements) or if you have created a new manufacturing concept and have arranged the assigned graphic icons in the layout. The layout is displayed using the context menu. *Please refer to the [Figure 61](#).* The procedure involves the following steps:

In the example, a manufacturing concept has been created with various resources. In the first step, assign the graphic icons (system elements) to the resources. In the example, these graphic icons are to be assigned via the General Search.

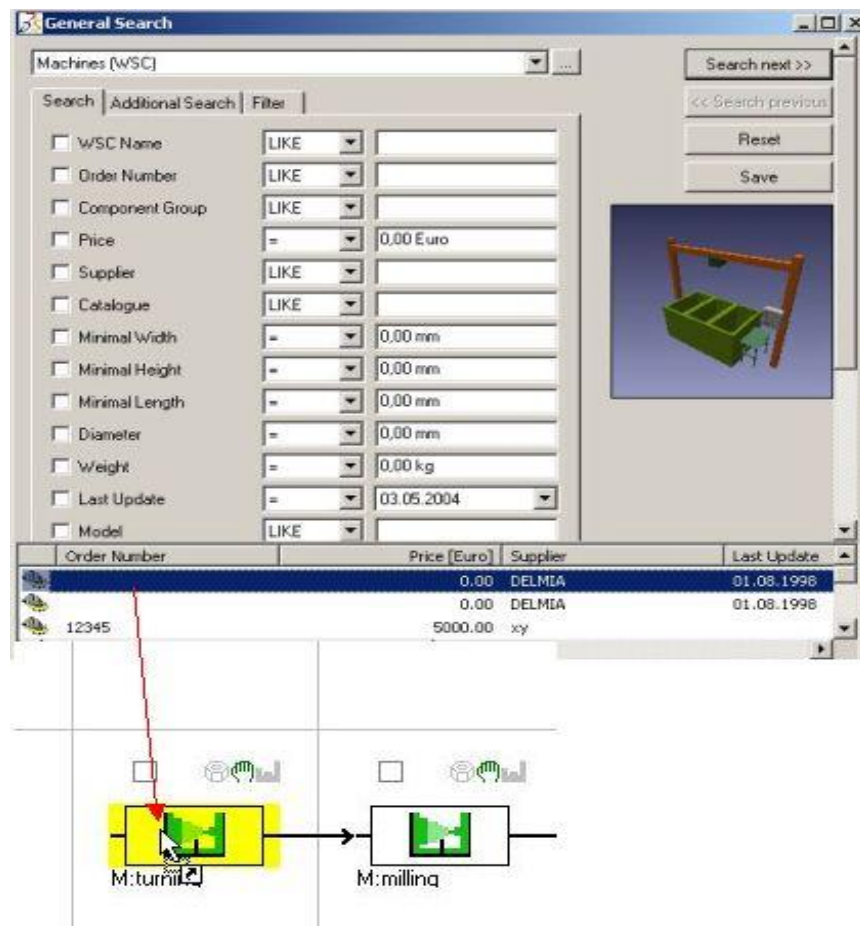


Figure 62: Assign System Elements via the General Search



- 1) Open the General Search.
- 2) In the Search, select the category, (Machines in the example).
- 3) Select the system element in the list and drag and drop it to the resource. In this way you can assign graphic icons to all resources (system elements). Please refer to the [Figure 62](#).

The assigned graphic icons (system elements) are shown without arrangement in the layout. Please refer to the [Figure 63](#).

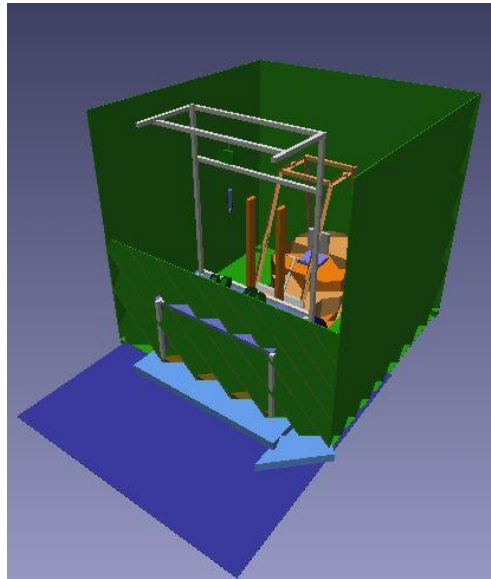


Figure 63: Graphic Icons shown in the Layout without Arrangement

To Show Arranged Graphic Icons in the Layout

- 1) In order to start the function **Create Layout**, click free space in the manufacturing concept. Then press the right mouse button and click **Create Layout** (Please refer to the [Figure 64](#)). The graphic icons are arranged if the message **A new layout was created** appears on your screen.

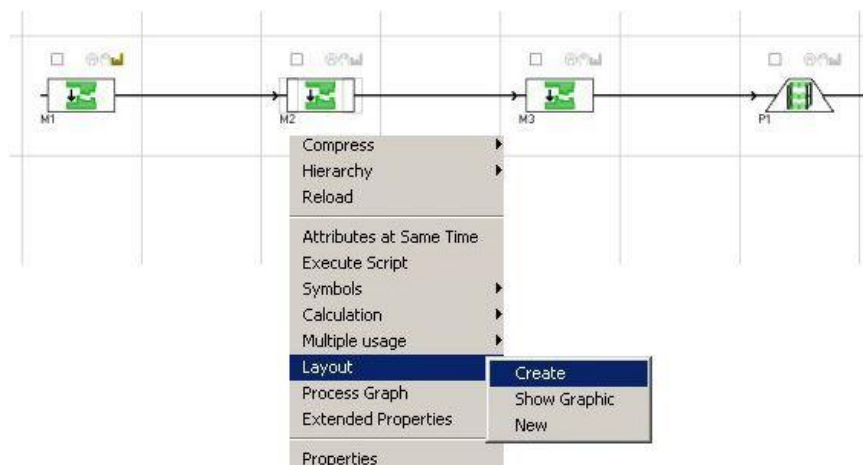


Figure 64: Start Create Layout via the Context Menu

3.7.1.2 Show Graphics

You can display the system elements assigned to a selected resource (graphic icons of the resource) via the context menu **Layout < Show Graphic**. The function **Show Graphic** is available only for individually selected resources. **Show Graphic** is not available for the simultaneous selection of several resources.

- 1) Open the context menu in a free area in the Manufacturing Concept.
- 2) Select **Layout < Show Graphic**.

The Graphic Symbols are shown as arranged. In the example, these are three machines, a buffer, and a means of transport.

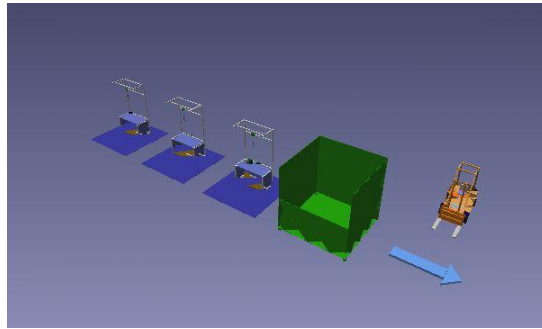


Figure 65: Show Arranged Graphic Icons in the Layout

3.7.1.3 New Layouts

Use this function to create an alternative layout for a basic Manufacturing Concept.

- 1) Click **Layout < New** in the context menu. *Please refer to the [Figure 64](#).*
- 2) Specify the data for the new layout in the **Properties** dialog. *Please refer to the [Figure 66](#).*

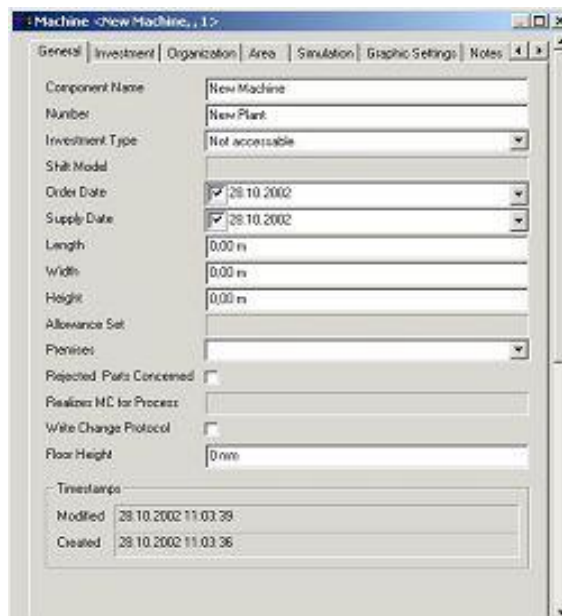


Figure 66: Properties Dialog for the New Layout

- 3) Confirm the entries in the properties dialog with **OK**. The message indicates that the new layout has been created.



Figure 67: Layout Message Finished

The newly created layout can be edited: *Please refer to the [Editing a New Layout](#).*

3.7.2 Editing a New Layout

After the new layout has been created, it can be edited as shown in the following steps:

- The display of an (alternative) layout created in this manner can be viewed using the function **Edit Graphic**.
 - You can assign new graphic icons to the layout directly by drag and drop. After being saved, these graphic symbols are used in the bills of material tree of the new layout as well as in the layout. You can re-design the layout in this view. You do not need the function **Create Layout** in order to do this.
- 1) In order to open the new layout, switch to the project view of the PPR navigator.
 - 1) Select the hierarchical level for which the manufacturing concept or layout is created in the resource structure.
 - 2) Click **Layouts** tab in the right display area.
 - 3) All alternatively created layouts of this manufacturing concept are displayed.
 - 4) Select the layout and open the context menu. Select **Open in Process Engineer**. Please refer to the [Figure 68](#).

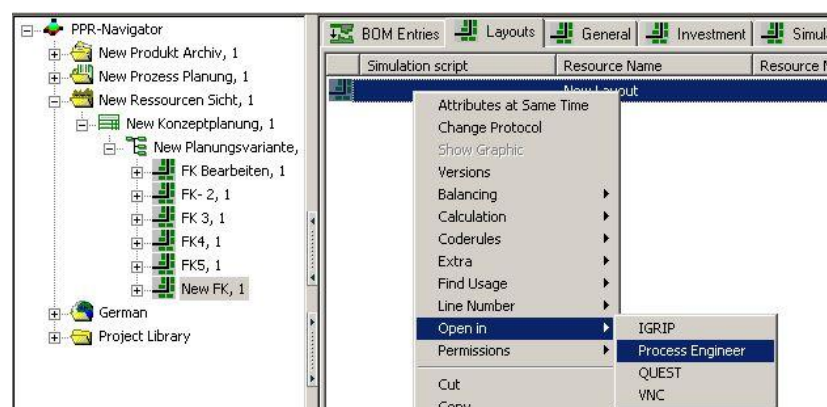
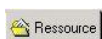


Figure 68: Switch from the Display Area to the Resources

3.7.2.1 Editing Graphics



Open the new layout from the Resource View using the **Graphic < Edit** context function. (Please refer to the [Figure 69](#)).

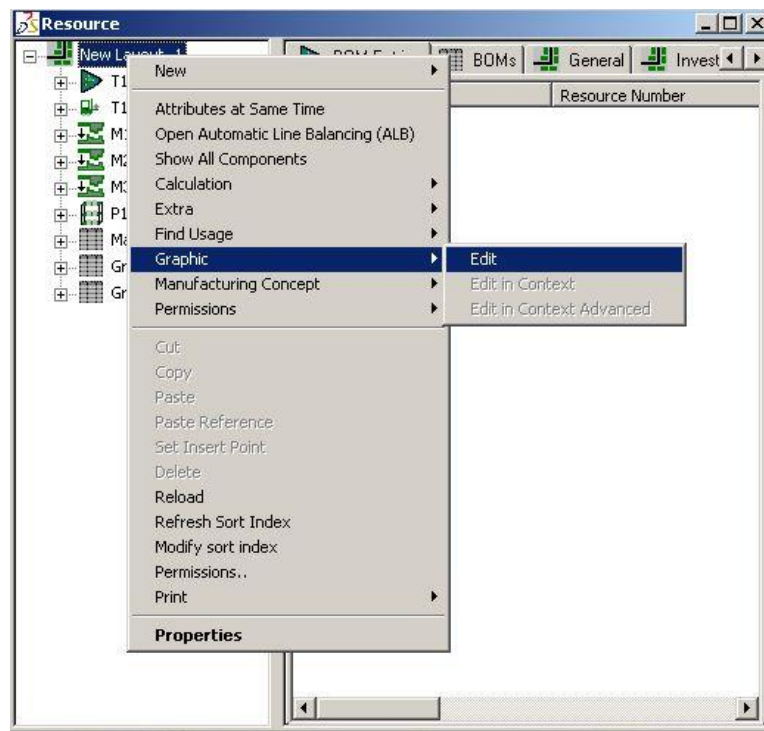


Figure 69: Edit Graphic Context Menu

In the example, a floor with a grid is made visible and the buffer is placed in another location. *Please refer to the [Figure 65](#) and [Figure 70](#).*



For more information, *please refer to [Graphic Tools Manual](#).*

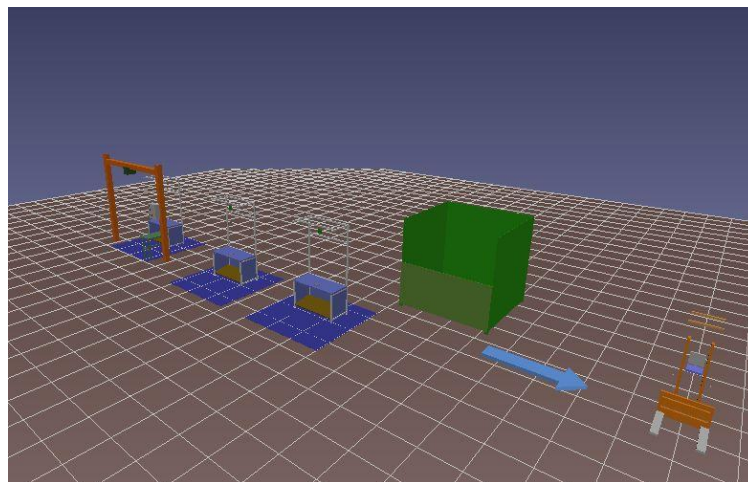


Figure 70: Edit Alternative Layout

3.8 Creating Multiple Usage

You can use the **Create multiple usage** function to create a further alternative Manufacturing Concept. This function is designed to reuse a Manufacturing Concept for independent editing purposes. Multiple Usage is also referred to as a master/slave relation between the base concept and the reused version.

The **Create multiple usage** function copies any objects (resources) created in the base Manufacturing Concept as well as any relevant master data. However, the properties of these objects can only be edited on a limited scale. The

Process Engineer configuration defines the fields that can be edited in the **Properties** dialog. You can delete these objects using the **Delete** function during Multiple Usage. However, they remain unchanged in the base Manufacturing Concept. While configuring the Process Engineer, you can specify the properties that can be edited using the Attributes function.

You can edit the original operating functions, i.e. moving or deleting objects, as you like.

If you create new resources during Multiple Usage, you can fully edit all properties. The editing process during Multiple Usage provides the same functions as an editing process in the Manufacturing Process. You can do the following:

- Create a new layout
- Delete objects and add new ones
- Create a new process during Multiple Usage

1) To start this function, click **Multiple Usage < Create** in the context menu.

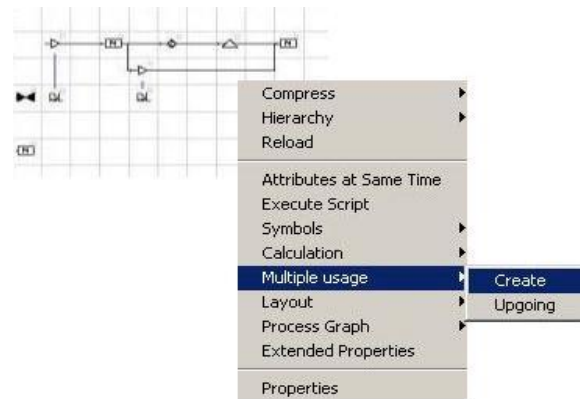


Figure 71: Creating a New Derived Manufacturing Concept – Context Function

2) The **Properties** dialog allows you to enter specific data for Multiple Usage. Such data may include a designation or information on how to change the dimensions (length, width, and/or height) for the Multiple Usage project. Please refer to the [Figure 72](#).

Figure 72: Properties Dialog - Multiple Usage

3.8.1 Calling a Layout for Multiple Usage



To call the **Multiple Usage** function, you first have to change to the Project View (PPR Navigator). You can select the hierarchical level of the resource structure for which the Manufacturing Concept has been created. A new tab (**Reusage of MC**) has been added to the right display area (object list).



- 1) Click **Reusage of MC** tab in the right display window.
- 2) To edit Multiple Usage, you have to return to the Resource View. Select the Multiple Usage item from the display area. Click **Open in < (Process Engineer)** in the context menu. *Please refer to the [Figure 73](#).*



Figure 73: Opening Multiple Usage PPR Navigator Object List



- 3) If you are in the Resource View, open Multiple Usage using the **Manufacturing Concept < Open** context function. Please refer to the [Figure 74](#).

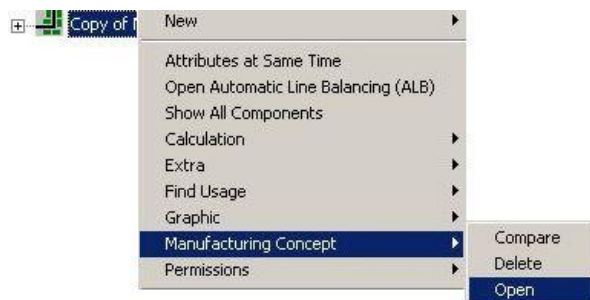


Figure 74: Opening Multiple Usage from the Resource View

Example

Three additional objects have been inserted into Multiple Usage. The object properties can be newly specified.

Multiple Usage with New Resources

Three new objects (resources) have been created during Multiple Usage. To create the layout with these three additional objects, you have to restart the **Create layout** context function. You can only view three objects in the layout after having assigned the required system items from the System Library.

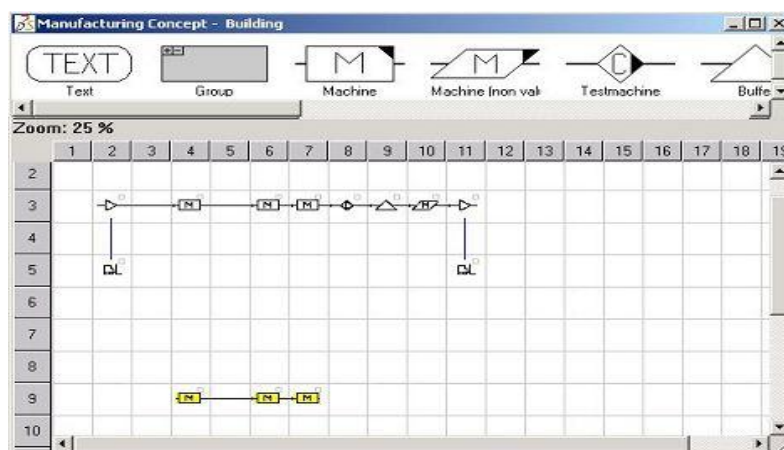


Figure 75: Multiple Usage with Three New Objects – highlighted in Yellow

Example

The three additional system items (3 work benches, violet in the foreground) have been assigned to the objects from the system library using drag and drop.

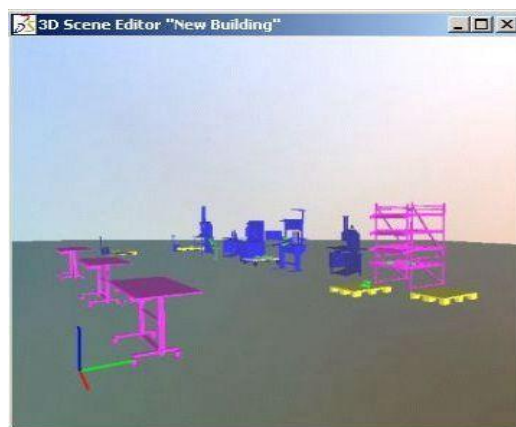


Figure 76: Layout for Multiple Usage with three New Objects

3.9 Run-Up Calculation

The run-up calculation (Upgoing function) displays and calculates additional costs for newly planned objects (resources) that incur for Multiple Usage. This function can be used if you are planning to reuse the Manufacturing Concept and intend to calculate additional costs.

The additional costs calculated for Multiple Usage can be used as a basis for any further decisions: for example, when considering an appropriate point in time to buy new machines.

Example

Let us assume you are planning a new assembly line. In the current year, the assembly line is to be equipped with assembly stations or robots. Further resources are to be bought for the same assembly line during the following five years. You may now calculate and consider such future costs for your current planning processes.

3.9.1 Starting an Upgoing Calculation

- 1) Press the right mouse button on any empty space in the Manufacturing Concept. *Please refer to the [Figure 77](#).*
- 2) Click **Upgoing**. The **Select Manufacturing Concepts (for upgoing)** dialog opens. *Please refer to the [Figure 78](#).*

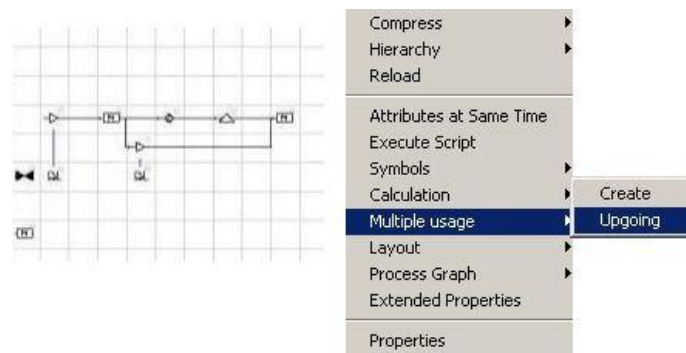


Figure 77: Starting an Upgoing Run-Up Calculation

- 3) Select the required Manufacturing Concept from the left window. You must select two Manufacturing Concepts for each upgoing run-up calculation. *Please refer to the [Figure 78](#).*
- 4) Click double arrow after selecting the required Manufacturing Concept to view the Manufacturing Concept in the right window of the upgoing run-up calculation. Select the **Calculation Date** using the **Select** button.

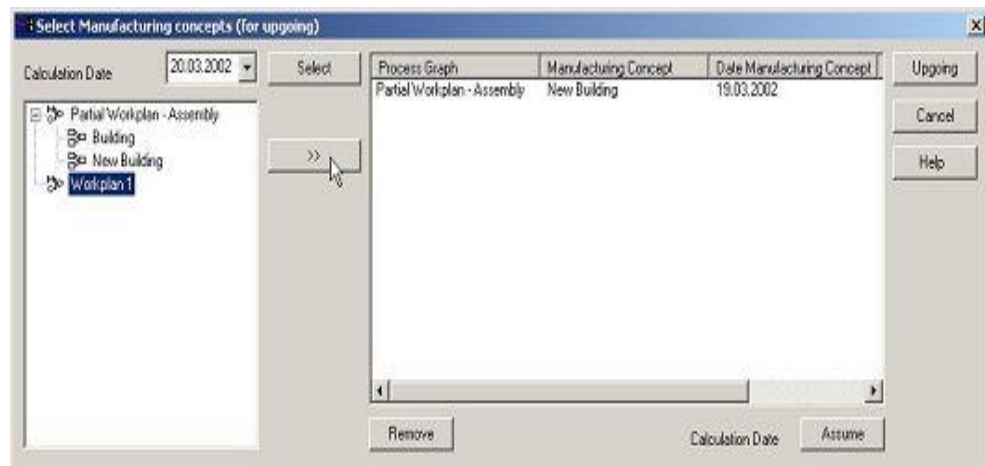


Figure 78: Selecting Manufacturing Concepts for Upgoing (run-up) Calculation

- 5) Click **Upgoing** button. The dialog displaying the results opens. *Please refer to the [Figure 79](#). Please refer to the [Comparing Manufacturing Concepts](#).*

Example

Valuation	New Building (19.03.2002)	Building (20.03.2002)
Investment (TUA_CU...	0,0	0,0
Software Costs (TUA...	0,0	0,0
Tool Costs (TUA_CU...	0,0	0,0
Sum (TUA_CURREN...	0,0	0,0
Installation (TUA_CU...	0,0	0,0
Customs (TUA_CURR...	0,0	0,0
Transport (TUA_CUR...	0,0	0,0
Spare parts (TUA_CU...	0,0	0,0
Risk allowance (TUA...	0,0	0,0
Sum (TUA_CURREN...	0,0	0,0
Running tool costs (U...	0	0
Maintenance (UA_CU...	0	0
Valuweighted Occup...	n.c. (Costs are zero)	n.c. (Costs are zero)
Area [m2]	0	0
Area Costs (UA_CUR...	0	0
Area Side Costs (UA...	0	0
Worker amount Salary...	0	0
Worker amount Direct	0	0
Worker amount indirect	0	0
Costs of worker (UA_...	0	0
Costs of worker (UA_...	0	0
Costs of worker (UA_...	0	0
Sum (UA_CURRENC...	0	0
Sum of medium costs ...	0	0
Costs of buffer (UA_C...	0	0
Costs of buffer (UA_C...	0	0
Costs of buffer (UA_C...	0	0

Figure 79: Result of the Upgoing Run-Up Calculation

3.10 Comparing Manufacturing Concepts

A comparison of Manufacturing Concepts can be performed either in the Resource View or in the Manufacturing Concept. You can use the Compare function, for example, to analyze the difference in costs between the Manufacturing Concepts involved in the comparison process.

3.10.1 Comparing Manufacturing Concepts – Resource View



- 1) To compare two Manufacturing Concepts, you must first open the Resource View.
- 2) Select the highest possible hierarchical level from the structure tree (this hierarchy corresponds to the level that has been created for the Manufacturing Concept).
- 3) Press the right mouse button and click **Manufacturing Concept < Compare**. Please refer to the [Figure 80](#).

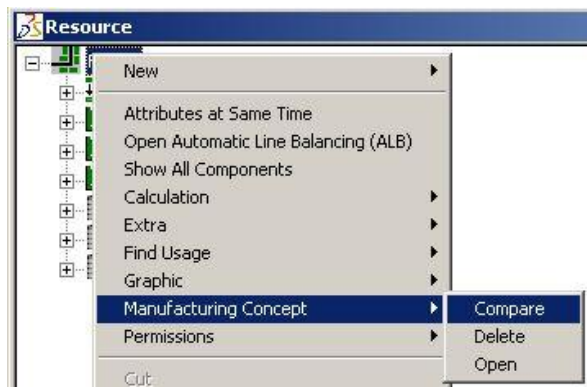


Figure 80: Comparing Manufacturing Concepts –Resource View

3.10.2 Starting the Compare Function from Manufacturing Concept

- 1) Left-click an empty field in the Manufacturing Concept.
- 2) Press the right mouse button and click **Compare**.

Click an empty field in the Manufacturing Concept.

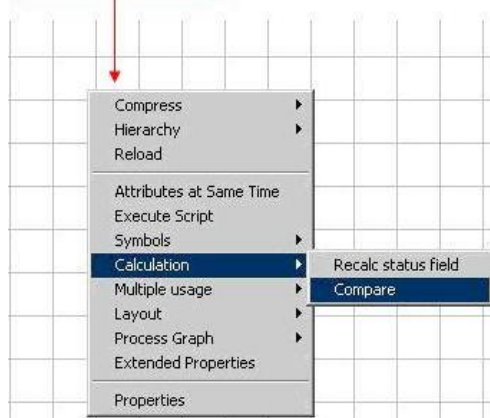
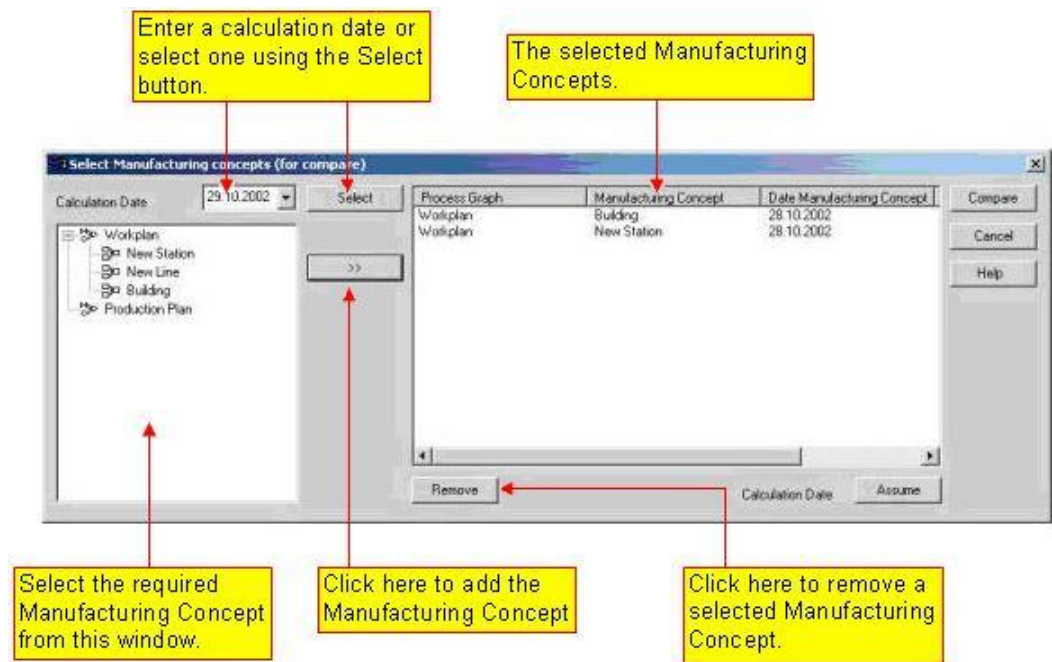


Figure 81: Manufacturing Concept – Compare function – from Empty Field

- 3) The **Select Manufacturing Concepts (for Compare)** dialog appears.

Example**Figure 82: Adding a Manufacturing Concept for Comparison****To Start a Comparison**

- 4) Select at least two Manufacturing Concepts for comparison from the left window.
- 5) Click double-arrow sign after each selection to add a Manufacturing Concept to the right window for comparison.
- 6) Type the valuation date or select one using the **Select** button.
- 7) Click **Compare** in the right window. The dialog displays the result. *Please refer to the [Figure 83](#).*
- 8) Click **Export** or **Print** to export or print data.

Example

Valuation	Building (28...	New Station...
Investment [TEuro]	0,0	0,0
Software Costs [TEuro]	0,0	0,0
Tool Costs [TEuro]	0,0	0,0
Sum [TEuro]	0,0	0,0
Installation [TEuro]	0,0	0,0
Customs [TEuro]	0,0	0,0
Transport [TEuro]	0,0	0,0
Spare parts [TEuro]	0,0	0,0
Risk allowance [TEuro]	0,0	0,0
Sum [TEuro]	0,0	0,0
Running tool costs [E...	0	0
Maintenance [Euro]	0	0
Valueweighted Occup... n.c. (Costs a...	n.c. (Costs a...	n.c. (Costs a...
Area [m2]	0	0
Area Costs [Euro]	0	0
Area Side Costs [Euro]	0	0
Worker amount Salary...	0	0
Worker amount Direct	0	0
Worker amount indirect	4	0
Costs of worker [Euro]...	0	0
Costs of worker [Euro]...	0	0
Costs of worker [Euro]...	0	0
Sum [Euro]	0	0
Sum of medium costs ...	0	0
Costs of buffer [Euro] ...	0	0

Figure 83: Comparing Manufacturing Concept – Dialog Showing Results

3.11 Opening Work Load Balancing

Using work load balancing, resources such as assembly stations are balanced with processes. Work load balancing is opened using two dialogs – balancing-list and column diagram – which mirror the current situation in the planned manufacturing concept. The two diagram views of work load balancing allow to move existing processes or to add new processes from the process structure.

Upon saving of the work load balancing, these changes also apply to the manufacturing concept. Properties of resources or processes cannot get edit in the work load balancing.

Processes can be moved easier in the work load balancing between the planned resources in the manufacturing concept.



For more information, *please refer to the* [Work Load Balancing Manual](#).

- 1) Ensure that the field **MC Collaboration** is activated in the configuration of work load balancing. This field must be activated to connect the manufacturing concept to the work load balancing. Work load balancing can only be opened directly from the manufacturing concept.

- After the configuration for work load balancing has been created.
- After unique assignments have been made between resources and processes that are used for the manufacturing concept.



For more information about the configuration of work load balancing *please refer to the* [Administration Manual](#).

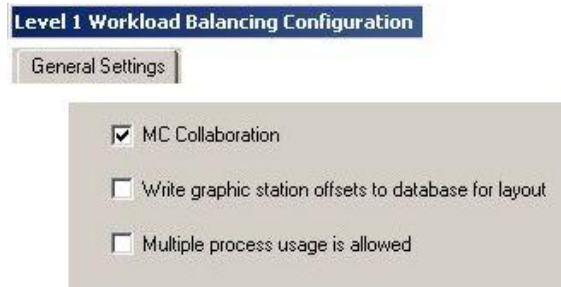


Figure 84: Properly Configuring Work Load Balancing

You may open work load balancing for the selected resources and for the entire manufacturing concept. The processes and resources are shown accordingly in the two diagrams.

Opening Work Load Balancing for an Entire Manufacturing Concept

- 1) Open the context menu on a free field in the manufacturing concept and select the menu item **Open Work Load Balancing (WLB)**.

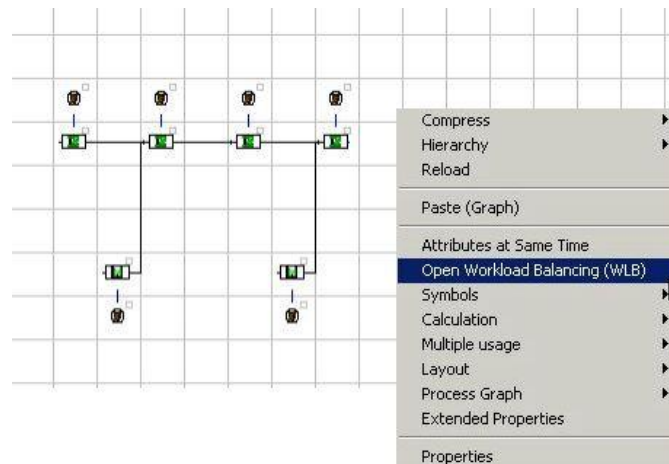


Figure 85: Opening Work Load Balancing for an Entire Manufacturing Concept

Opening work load balancing for Selected Resources

- 2) Select the resources for which the work load balancing is to be opened and then open the context menu on a free field in the manufacturing concept. Again select the menu item **Open Work Load Balancing (WLB)**.

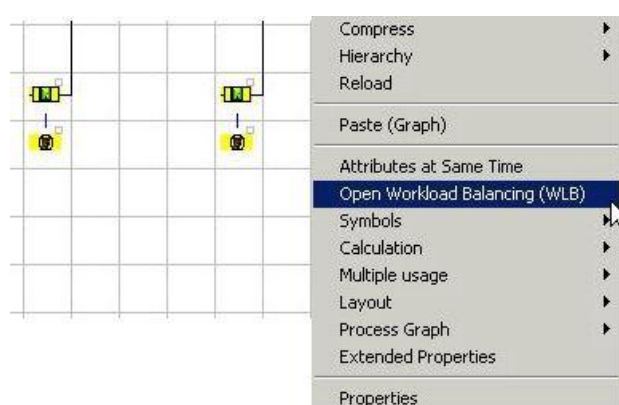


Figure 86: Opening Work Load Balancing on Selected Resources

3.11.1 Editing Work Load Balancing

As mentioned earlier, the resources with the assigned processes are shown in the two diagrams for work load balancing.

Using drag and drop you can move processes or add new processes from the process structure to a resource. After opening the work load balancing, the work load is computed for all resources. The results are shown in the column diagram. Changes get updated immediately. Changes are only considered in the manufacturing concept, if you save them.



For more information about work load balancing, please refer to the [Work Load Balancing Manual](#).

The following three diagrams illustrate the work load for all resources of the manufacturing concept and for selected resources.

Column Diagram of Work Load Balancing for all Resources in a Manufacturing Concept

Example


Work load - column diagram for all resources.



Figure 87: Column Diagram of Work Load Balancing for all Resources in a Manufacturing Concept

Work load -
balancinglist
for all re-
sources.

Balancinglist for all Resources in a Manufacturing Concept



No.	Name	Short Name	Time [min]	Freq. [%]	Alternating Color
1	P1	M:P1 - New Process calculated time: 2.000	2.00	100	-
2	P2	M:P2 - New Process calculated time: 1.000	1.00	100	-
3	P3	M:P3 - New Process calculated time: 1.500	1.50	100	-
4	P4	M:P4 - New Process calculated time: 1.000	1.00	100	-
5	B1	M:B1 - New Process calculated time: 4.000	4.00	100	-
6	B2	M:B2 - New Process calculated time: 4.000	4.00	100	-

Example

Work load -
column dia-
gram for se-
lected re-
sources.

Figure 88: Balancinglist for all Resources in a Manufacturing Concept
Column Diagram for Selected Resources

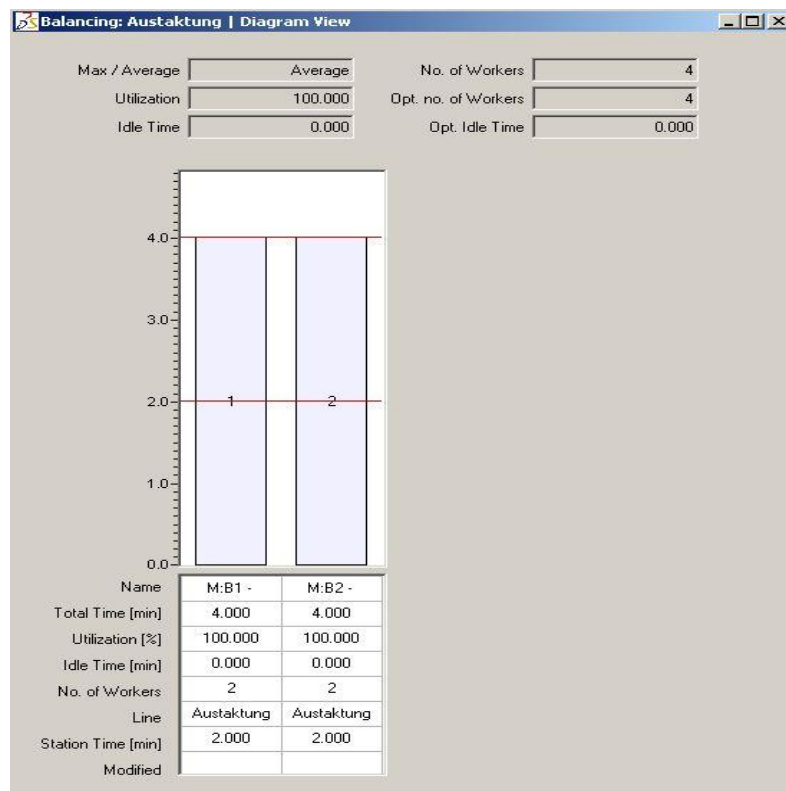


Figure 89: Column Diagram for Selected Resources

4. Defining Properties for Resources and Groups

Use **Properties** dialog and the **Extended Properties** dialog to enter specific data for comprehensive descriptions of each resource.

Grey fields are not input fields. These fields are filled automatically when a corresponding assignment has been made for a resource.

Groups may combine similar resources, for example. The Properties for a group are determined in the **Properties** dialog of a group. *Please refer to the [Defining Resource Group Properties](#).*



Note

New resources created in the Manufacturing Concept are transferred to the resource structure (PPR Navigator and Resource View) after saving. These resources are immediately displayed in the PPR Navigator. The resources are not be shown in the Resource View before it has been closed and re-opened.

The resource Properties can be defined either in the PPR Navigator, in the Resource View, or in the Manufacturing Concept.

You can open the Properties menu either by using the right mouse button context menu or by double-clicking the respective resource.



For more information, *please refer to the [PPR Navigator Manual](#).*

Example of newly created resources

Example

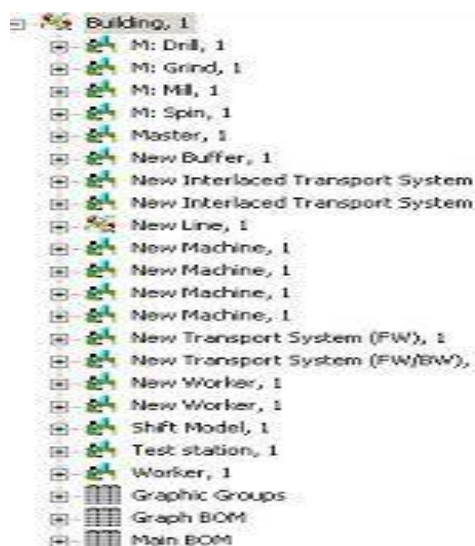


Figure 90: Example – Resource View Display with New Resources

4.1 Defining Resource Properties

You are provided with several tabs for both dialogs (Properties and Extended Properties). The tabs are arranged according to their function (*Please refer to the [Figure 91](#)*). The resource properties are defined according to these functions.

Figure 91: Example – Defining Resource Properties – General Tab

4.1.1 Opening a Properties Dialog from the Manufacturing Concept

Both dialogs can be opened using the right mouse button context menu.

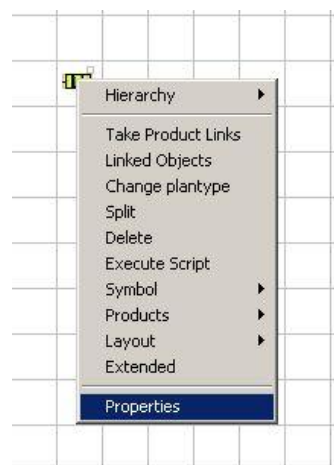


Figure 92: Opening Properties Dialogs using the Context Menu

Always follow the same procedure when opening a **Properties** dialog for a resource in the Manufacturing Concept. *Please refer to the [Manufacturing Concept Representation](#).*

- 1) Select the resource for which you want to define.
- 2) Click the respective resource in the Manufacturing Concept.
- 3) Press the right mouse button and click **Properties** (*Please refer to the [Figure 92](#). If you want to open the extended menu, click **Extended**.*
- 4) You can enter the specifications in the input fields in the corresponding tab. Left-click a tab to be provided with the required input fields.

4.1.2 Tab Functions – Value-Adding Resource



The tabs and input fields provided may vary for different resources in the Manufacturing Concept. According to these settings, such differences are shown in the following sections for the corresponding resources. The section below describes the most important input fields of a value-adding resource.

General Tab

You can specify general process data for a resource in this tab. *Please refer to the [Figure 91](#).*



Note

When specifying general process data, remember that many of the input fields in this tab can be used as a search criterion. You can make these settings during configuration in the Configuration Manager.

You can clearly specify the designation and number of a value-adding resource in the **Component Name** and **Number** fields. The component in our example (*Please refer to the [Figure 91](#)*) is a preassembly station. The **M** in the **Component Name** input field indicates that this resource has been already defined as a process in the Process Graph. The Component Name entry field should contain a clear description of your resource.



Specify the resource type in the **Investment Type** field. You have three options to select from: Not accessible, Standard machine, or Special machine. Thus, this selection simultaneously defines the investment types for each resource. In addition to this, the tab requires the following information: the Order and Supply Dates and the resource dimensions. Furthermore, you can determine whether you want to take rejected parts into account when planning the resource.

Investment Tab

This tab allows you to describe the costs incurred for a resource. At the very beginning you need to decide whether you want to include estimated values such as **Estimated Investment** in your calculation or whether you prefer to base your planning considerations exclusively on precisely calculated values. *Please refer to the [Figure 93](#).*

This decision is made using the **Calc. Investment is valid** box. The values for the Calculated Investment are calculated from the structure that belongs to the respective resource. In other words, all resources below the current resource get included. The estimated value can be entered directly into the respective input field. The **Cum. Estimated Investment** is calculated in the same way as the calculated investment, i.e. by using the structure.

In addition to this, you can enter further information concerning Transport, Customs, or Depreciation Duration. *Please refer to the [Figure 93](#).*

Field	Value
Software costs	300,00 Euro
Estimated Investment	7000,00 Euro
Cum. Estimated Investment	0,00 Euro
Calculated Invest.	0,00 Euro
Calc. Investment is valid	<input type="checkbox"/>
Investment Type	Standard machine
Investment Group	
Manufacturing Costs Multiplier	0,00
Tool costs	100,00 Euro
Installation	1,40 %
Customs	100,00 %
Transport	0,00 %
Spare parts	0,00 %
Risk allowance	0,00 %
Running Tool Costs	0,00 Euro
Maintenance	0,00 Euro
Depreciation Duration	4,00 a

Figure 93: Value-Adding Resource – Investment Tab

Organization Tab

This tab allows you to define the affiliation to technical and organizational areas. The organisational identification number (Org ID) must have been previously defined.



For more information, please refer to the [PPR Navigator Manual](#).

The Org ID definitions are based on the designation of a specific area, the corresponding abbreviation and the identification number. The names of the field can be freely configured.

The Org ID displays the structural relation of a resource. Org IDs are entered in ascending order, corresponding to the affiliation of each resource.

To enter the Org ID you can type either with the exact designation, the abbreviation or the identification number.

Example of entering the Org ID

Example

The **Preassembly** resource shown in the picture is directly assigned to the **Org ID 1 Assembly group. ID 1**.

- Consequently, the **Org ID 1** entry is **1**.
- The Assembly group is assigned to the master area with the abbreviation **M**. Consequently, the **Org ID 2** entry is **M**.

Org ID.	Value
Org ID. 1	1
Org ID. 2	M
Org ID. 3	
Org ID. 4	
Org ID. 5	

Figure 94: Value-Adding Resource – Organization Tab

Area Tab

This tab allows you to enter the required space. The Area Costs Multiplier is used to calculate any additionally required space for the work area.

Field	Value
Estimated Area	20,00 m²
Area Costs Multiplier	1,4
Required Space (1)	1,00 m²
Required Space (2)	0,00 m²
Required Space (3)	0,00 m²
Required Space (4)	0,00 m²
Required Space (5)	0,00 m²
Required Space (6)	0,00 m²
Required Space (7)	0,00 m²
Required Space (8)	0,00 m²
Required Space (9)	0,00 m²
Required Space (10)	0,00 m²

Figure 95: Value-Adding Resource – Area Tab

Simulation Tab

This tab allows you to specify the values that you can transfer to a simulation program interface. To do this, you are provided with two options. One option is to calculate failure times. This means that the times and parameters required for simulator calculation are clearly defined. The other option is to use the mathematical distribution functions provided by the simulator. However, you can choose only one of these options. The simulation fields allow you to enter user-defined parameters that are able to define logical processes, such as a material flow or operations of a particular machine. Examples of parameter designations for a distribution function are “MTBF parameters” or “MTTR parameters”.

Machine <B:Packaging, 1>

General | Investment | Organization | Area | **Simulation** | Graphic Settings | Notes | Version Info

General Attributes

Simulation type:
 Class Name:
 Process Logic:
 Route Logic:

Graphic Attributes

Quest Graphic:
 Graphic D5:
 Graphic:

MTBF Details

MTBF: 0,00 sec
 MTBF Function:
 MTBF Parameter 1: 0,00
 MTBF Parameter 2: 0,00
 MTBF Parameter 3: 0,00
 MTBF Parameter 4: 0,00

MTTR Details

MTTR: 0,00 sec
 MTTR Function:
 MTTR Parameter 1: 0,00
 MTTR Parameter 2: 0,00
 MTTR Parameter 3: 0,00
 MTTR Parameter 4: 0,00

Mean Times are Functions: ☒

Figure 96: Value-Adding Resource - Simulation Tab

Graphic Settings Tab

This tab allows you to define the coordinates required to insert an object into the layout.

Machine <New Machine, 1>

General | Investment | Organization | Area | Simulation | **Graphic Settings**

Graphic Insert Position X: 0.00 m
 Graphic Insert Position Y: 0.00 m
 Graphic Insert Position Z: 0.00 m

Figure 97: Value-Adding Resource – Graphic Settings

Field Notes



Note

Knowledge of simulation programs such as Quest is necessary for data input.

- **MTTR:** MTTR (Mean Time To Repair) is the time required for a failure and/or to fix a defect. The calculation of these values is usually based on empirical, i.e. estimated data. This field is an input field.
- **MTBF:** MTBF (Mean Time between Failure) indicates the average time between two failures. The calculation of these values is usually based on empirical, i.e. estimated data. This field is calculated from the performance rating and the respective MTTR value.

- **MTBF and MTTR Parameters:** The function parameters are defined according to the selected distribution function.
- **Simulation Geometry:** This function allows you to enter user-defined graphics to display individual objects, such as a particular machine or shelf.

Version Information Tab

This tab allows you to display version and planning state information for a resource. Each resource may change during a planning period. For example, you may wish to analyse and calculate the investment sum and other specific resource data from a different point of view.

To retain the current state, this resource can newly created on the basis of the old resource. The new resource can be assigned a version number to be clearly identifiable. This version of the resource can now be further edited without any loss of (original) data. The Planning State field indicates the current state of each version.



For more information, please refer to the [PPR Navigator Manual](#).

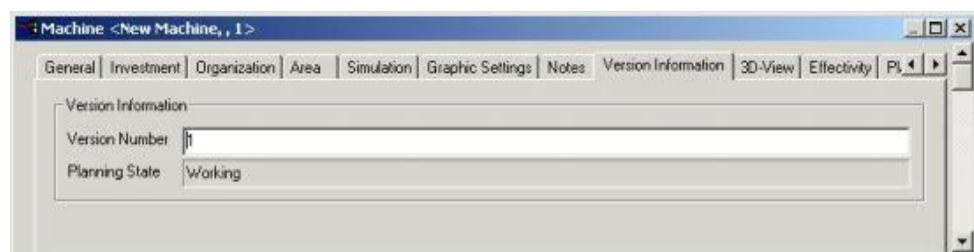


Figure 98: Value-Adding Resource – Version Information Tab

3D View Tab

The 3D View tab allows you to display system items that are assigned to a resource.

- 1) Click **Show 3D View** to display the view in the current window.



Figure 99: Value-Adding Resource – 3D View Tab

- 2) Use the left mouse button to move this view. The view cannot be edited.

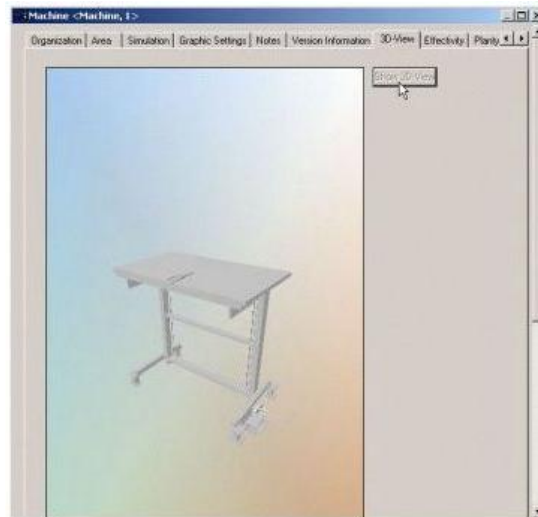


Figure 100: Value-Adding Resource – Moving the View

Effectivity Tab

Use this dialog to specify the validity period for a specific resource in this display. In addition, you can make further specifications. You can use these fields as a filter for search criteria as well.

- Enter the production number in the line numbers field so that a product can be clearly identified. You can thus automatically define which processes are to be performed by this resource for a particular product. For example, a production number may define the assembly of particular wings for an aircraft.
- Use the planning code to specify the planning section to which this resource belongs, i.e. preliminary planning.
- Products processed at this resource are assigned using the code rule; for example, the assembly of special equipment for a car.
- The Labels field allows you to enter data that are required to filter particular resources. Such filter information can be either purely numeric or alpha-numeric. You can use such filter information to open projects according to special criteria. For example, whenever you open a specific object, you may wish to only view resources that correspond to a particular label. Filters are always set when opening a project.



For more information, please refer to the [Project Library Manual](#).

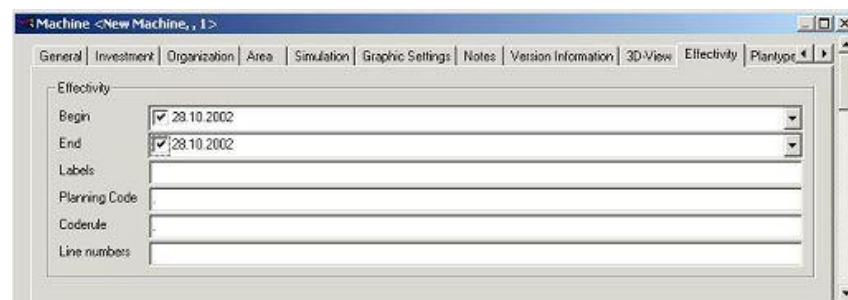


Figure 101: Value-Adding Resource – Effectivity Tab

Plantype Information Tab

This tab allows you to view information on the component area (PPR area) and the plantype (Plantype Name).

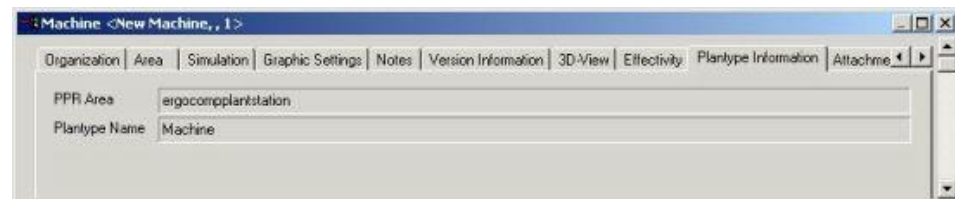


Figure 102: Value-Adding Resource – Plantype Information Tab

Attachment Tab

Use this tab to add files (Add File button) and Internet or Intranet addresses (Add URL button). These two functions provide you quick access to information that you may require, for example to edit a resource.

- 1) Click **Add File** to select a file from the directory. When you have inserted the file in the **Attachment** dialog, it can be opened using the **Open** button or by a double-click on the file name.
- 2) Click **Add URL**. Write the exact address in the **Add URL** dialog. If the address is not typed correctly, the required page cannot be displayed. *Please refer to the [Figure 103](#).*
- 3) Click **OK**. The entry can be shown in the **Attachment** dialog. Double-click the entered address designation or click Open to view the required page. A displayed page, for example, may include an Intranet directory. *Please refer to the [Figure 104](#).*

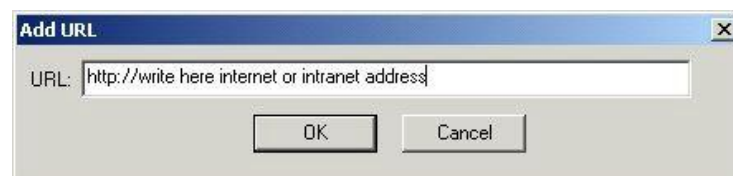


Figure 103: Dialog for Entering Internet/Intranet Addresses

- 4) Use the **Cancel** button to remove entries from this dialog.

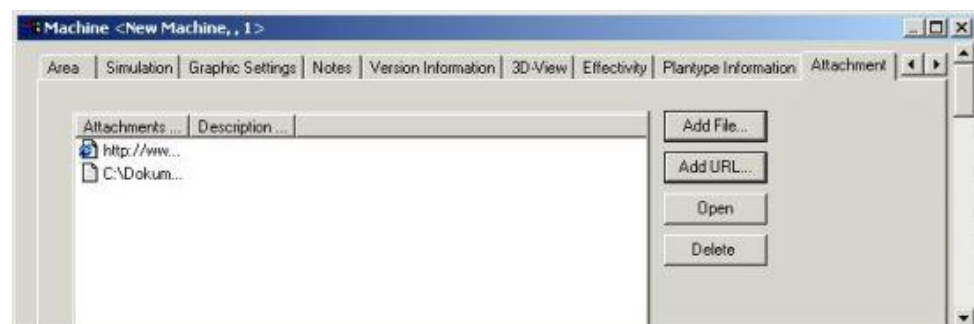


Figure 104: Value-Adding Resource – Attachment Tab

Extended Properties Menu

In Version PE 5.12, the expanded properties have changed for value-adding resources.

In the **Extended properties** of a value-adding resource, there are three tabs available – the **Capacity**, **Medium**, and **Quality** tabs.

The Premises and Simulation tabs are no longer included as of this version.

Extended Properties - Capacity Tab

The Capacity tab allows you to view any processes that have been assigned in the Process Graph or in the PPR Navigator. In addition to this, the Capacity tab allows you to create processes that can be only performed on this particular resource.

In version PE 5.12, capacity evaluations are created with scripts.

- Calculation for the evaluation function has been excluded
- The planned occupancy is set in the properties dialog of the station



Note

Fields showing a zero value by default, are purely numeric. The Process time, Occupancy and Worker fields are not input fields. They are calculated and filled by the program. These set values cannot be changed in this menu item.

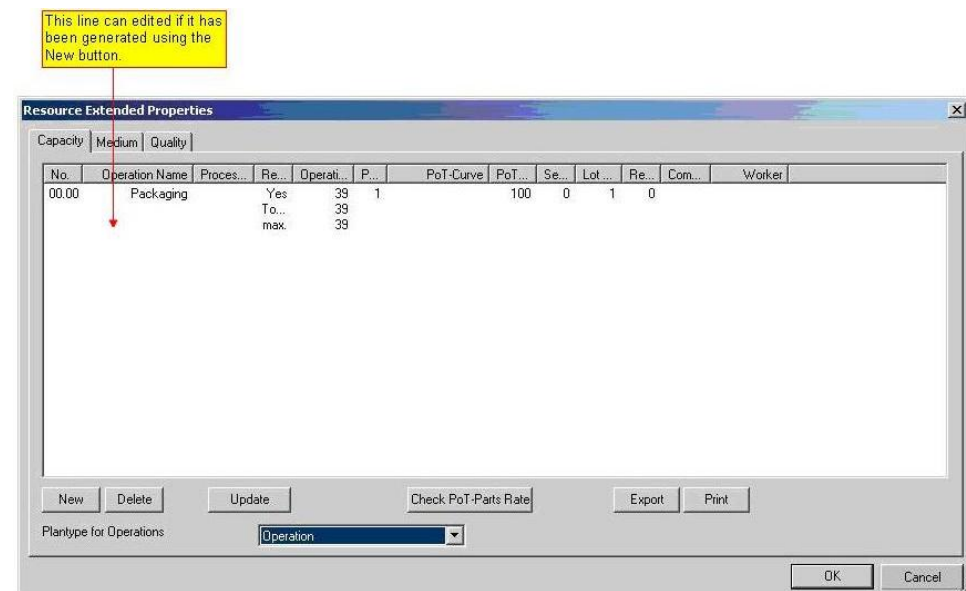


Figure 105: Value-Adding Resource – Capacity Tab

The editing of fields in the Capacity tab depends on the process type, i.e. resource-related processes that are created in this dialog and processes that have been assigned to a resource by the PPR Navigator or the Process Graph. For example, you may edit the Operation Description field for resource-related processes. However, this field cannot be edited for processes that have been assigned by the Process Graph or the PPR Navigator.



Caution

*The **Resource Extended Properties – Capacity** dialog allows you to delete only lines you have previously created in this location. In contrast to that, you may not delete a process that has been assigned by the PPR Navigator. After all, not all fields are to be edited. Such relations must be retained. Please refer to the [Figure 105](#).*

Creating Resource-Related Operations

A line for operations intended for performance on one resource only, can be created for that resource directly in the **Capacity** tab.

- 1) Select the plantype for the operation. *Please refer to the [Figure 105](#).*
- 2) Click **New** to create the required line.

Capacity Tab Fields Description

- **Number:** This field allows you to display operations in ascending order. You can also make corrections in this field. However, you need to adapt any changes to the preset number format: Number format: 00.00.
- **Operation Name:** This field can be only edited for resource-related operations.
- **Process Time:** This view cannot be edited. The Process time value can be automatically calculated, i.e. the values can be input during process creation. For resource-related operations, the operation time can be entered in the **Operation Time** field.
- **Relevant:** This field allows you to determine whether or not an operation shall be relevant for lead time calculation. To do this, click the field and choose between "yes" and "no". If you have chosen "yes" for an operation, it can be added to lead time.
- **Operation Time:** This field allows you to enter the real production time for an operation. This time can be also used to calculate the two process types. Unlike the Operation Time, the Process Time is only estimated.
- **Parts Simultaneously:** This field allows you to enter the number of identical parts to be produced in one cycle. This field is purely numeric.
- **PoT Curves:** PoT curves can only be assigned to resource-related operations in the **Capacity** tab.
- **PoT – Rate %:** This field allows you to specify the percentage rate of an operation on the machine. Only percentage values are permitted. For newly created lines, this value is set to 100% by default – since at that time it is usually uncertain how many machines are involved for one job. This rate allows you to determine the percentage of stations that have been passed through for one production job. If a production job is processed on two machines, this percentage is 50 for each machine.
- **Setup Time:** This field displays the setup time for an operation in seconds.
- **Lot Size:** This field allows you to specify the production lot. It is purely numeric. By default, this field is set to 1.
- **Reject Rate (%):** This field records the percentage of rejected parts. Ideally, the rate is 0%. To keep this goal in mind, this field is initially set to zero. Only percentage values are permitted.
- **Comment:** As its name indicates, this field allows you to make comments for each operation.
- **Worker:** This field does not allow you to make any entries. The field only displays workers who have been assigned to the current operation.



- **Update:** This button allows you to update the view, for example, to re-arrange operation numbers that have been changed.
- **Checking the PoT-Parts Rate:** This window allows you to view the occupancy rate for a particular operation.

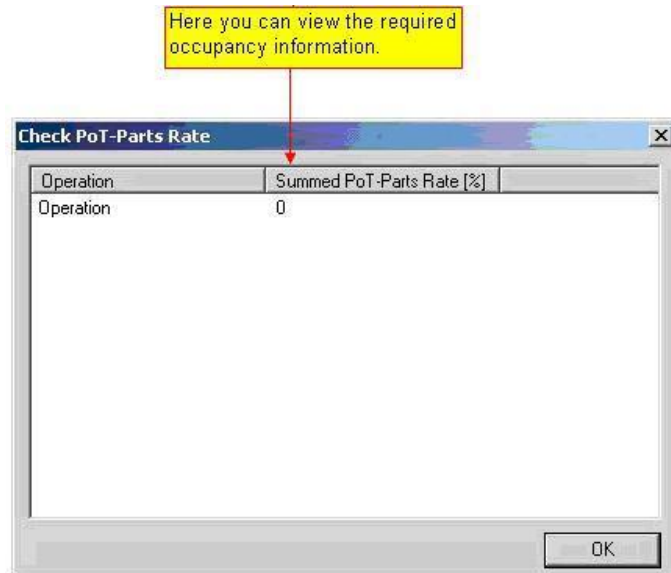


Figure 106: Check PoT-Parts Rate Window

Extended Properties - Medium Tab

This tab provides you with basic information on media (e.g. electrical current or water) that are supplied to operate a resource. The **Quantity** and **Comment** fields cannot be edited.

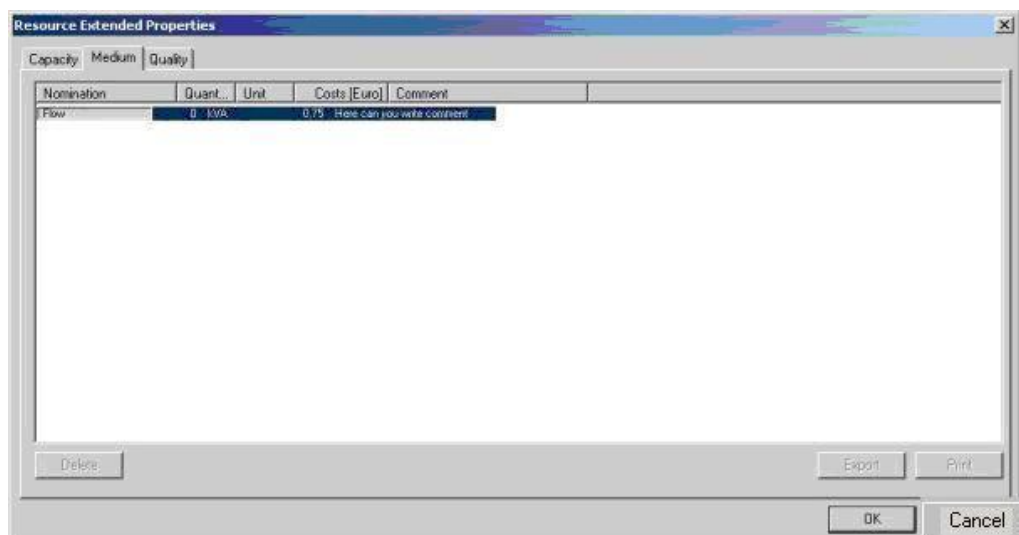


Figure 107: Resource Extended Properties – Medium Tab

Extended Properties - Quality Tab

The **Quality** tab allows you to add notes to a product or a process. As the name suggests, you can take the necessary steps to avoid possible weak points of a process or product.

The definition of quality criteria reduces the risk of failure causes that might possibly occur and provide a basis for continuous improvement of your results at an early stage.

Figure 108: Value-Adding Resource – Quality Tab

Create a new line by clicking **New**.

The quality criteria are used to mark the quality features for a process. All of the following descriptions are meant to show by example how the individual fields of the quality criteria can be used.

Quality criteria are parameters, which must be complied with whenever a process is executed in order to achieve the planned product quality. You can use all of the fields individually and according to the company's quality standard. Please refer to the [Figure 108](#).

Quality Tab Fields Description - Setting Parameters

- **Process:** The parameter process shows the type of a process, which is an indication of the execution.
The type of process in turn depends on the purpose for which this process is to be used. Examples include the assembly and editing processes. Another possibility would be the process number if the type of process or assignment to a product is to be inferred via its key, or simply to identify the process directly via this process number.
- **Type Attribute Name:** The parameter description shows additional information about the process. A possible use of this field would be to show the further use of the product after the process is edited, i.e. the availability. For example, In which containers should the product be made available? What is the optimal number of items? In which units should the product be transported?
- **Unit:** The essential parameter of a process is the time. Time is an ambiguous term; on the one hand it can refer to the process time, and on the other it can refer to the throughput time for the making available of products on the defined transport units.
The parameter throughput time (which also includes the pure process time), in turn influences the amount, which is to be made available by a product in order to guarantee a continuous flow of material.
You can use the parameter unit to specify parameters for transport, such as the type of loading units (boxes, box pallets) or how the products are to be made available, i.e. with which transport units (i.e. boxes per pallet).

- **Nominal Value:** You can use the parameter nominal value to specify the specific nominal value for the delivery amount, i.e. the number of items of products and number of loading units.
- **Min./Max:** You can use these two parameters to set the tolerance range for the delivery amount. The parameter Min. corresponds to the minimum delivery amount and the parameter Max. corresponds to the maximum delivery amount.

Quality Tab Fields Description - Setting Risk Value

You can specify important information for the quality risk value for optimizing the process quality.

- **Product/Process:** The parameter product/process displays the type of a product/process for which the following risk values are set.
- **Failure Impact:** Assess possible effects correctly and write them down here. Always think ahead.
- **Failure Cause:** Write down possible failure causes. The best way to avoid failure is to recognize the cause on time and to take measures against them at an early stage.
- **Failure Avoidance:** Determine which possibilities exist to prevent failure causes from occurring at all. Reduce the failure cause to the lowest degree.

4.1.3 Defining Worker Properties



This dialog allows you to indicate worker-specific data. Again, the following two dialogs are available: **Properties** and **Extended Properties**. The dialogs are arranged in the same way as the corresponding dialogs for value-adding resources. The following items are worker-specific input fields:

- **Cost type selection for a worker in the Worker Type input field:** You can choose between three different cost types – Salary Earner, Direct, and Indirect accounting for a worker.

Example

A Salary Earner could be, for example, the foreman for a particular production area. As a result, the worker who works directly with this resource would be directly accounted for any overall calculations. Administration areas, such as accounting, are usually included in the indirect (overhead) cost calculation. Even though these costs are of an indirect nature, they must be added to the overall worker costs.

- **Selection Speed Busy and Speed Empty:** This entry field allows you to enter the time required by a worker to perform a job and to return to his original position.

Example

Let us assume this worker works at a conveyor belt. His activities would cover multiple conveyor stations: For such activities, you would need to enter the time in the **Speed Busy** field. Hence, you would enter the required time for his return into the **Speed Empty** field.

Figure 109: Worker Properties

For each worker, the **Extended** Properties provide capacity and quality tabs for editing purposes. For Capacity and Quality entries, *Please refer to the [Figure 105](#) and [Figure 108](#).*

Capacity Tab

Changes to functions

In version PE 5.12, capacity evaluations are created with scripts.

- Calculation for the evaluation function has been excluded.
- The additional allowance time/rest time is defined in the **Properties** dialog-worker.

Linking

The Link function is only available in the **Capacity** tab. The corresponding dialog allows you to allocate a worker to individual operations.

This is important in order to record the work time, to calculate the salary, or to organize time schedules for shift work. The dialog only displays operations for a resource (i.e. machine) which is linked to the Worker.

- 1) Select an operation and click **OK** to confirm the link.

Link

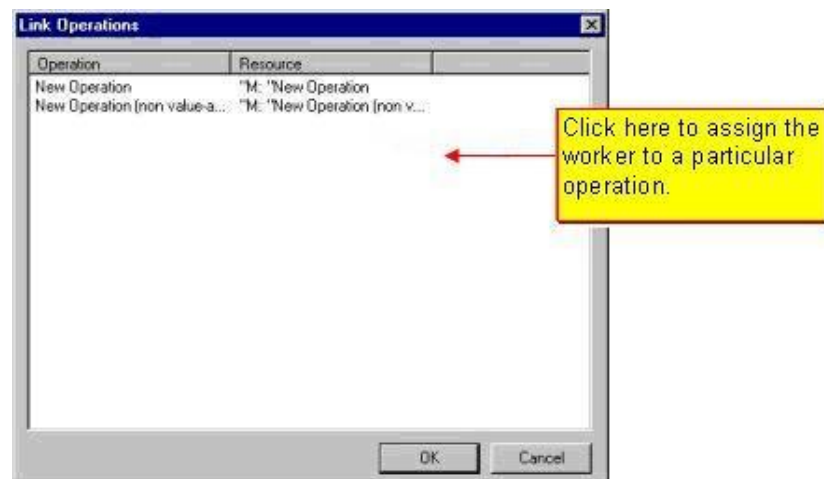


Figure 110: Linking a Worker to an Operation

4.1.4 Defining Buffer Properties

This dialog allows to indicate buffer-specific data. Again, the following two dialogs are available: **Properties** and **Extended Properties**. The dialogs are arranged in basically the same way as the corresponding dialogs for value-adding resources. The **Length**, **Width**, and **Height** fields allow you to specify the required buffer space.

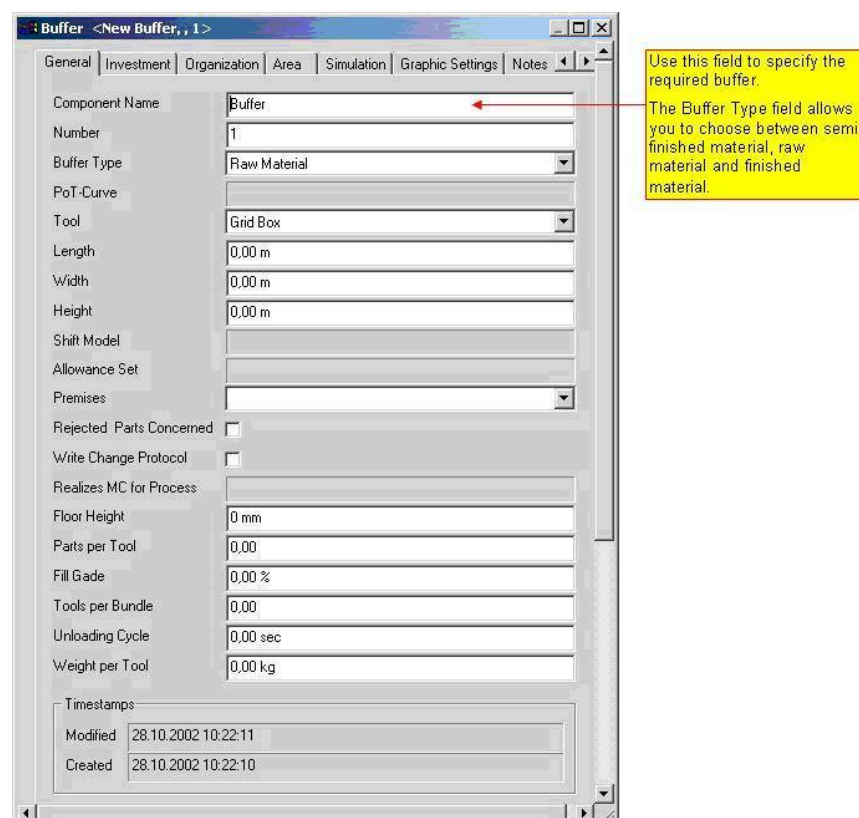


Figure 111: Buffer Properties

Extended Buffer Properties

The basic information concerning the **Medium** and **Quality** tabs has already been discussed. *Please refer to the [Figure 107](#) and [Figure 108](#).*

Changes to Functions

In version PE 5.12, capacity evaluations are created with scripts.

- Premises tab excluded. System elements are displayed in the properties dialog (3D view tab).
- Costs and Capacity tabs are excluded. The calculation is made with scripts. (*Please refer to the [Execute Evaluations via Script.](#)*)

4.1.5 Defining Transport Properties

This dialog allows to indicate transport-specific data. Again, the following two dialogs are available: **Properties** and **Extended Properties**. The dialogs are arranged in basically the same way as the corresponding dialogs for value-adding resources. For example, you can decide:

- Container type is to be used
- Transport aids to be used for transporting the parts

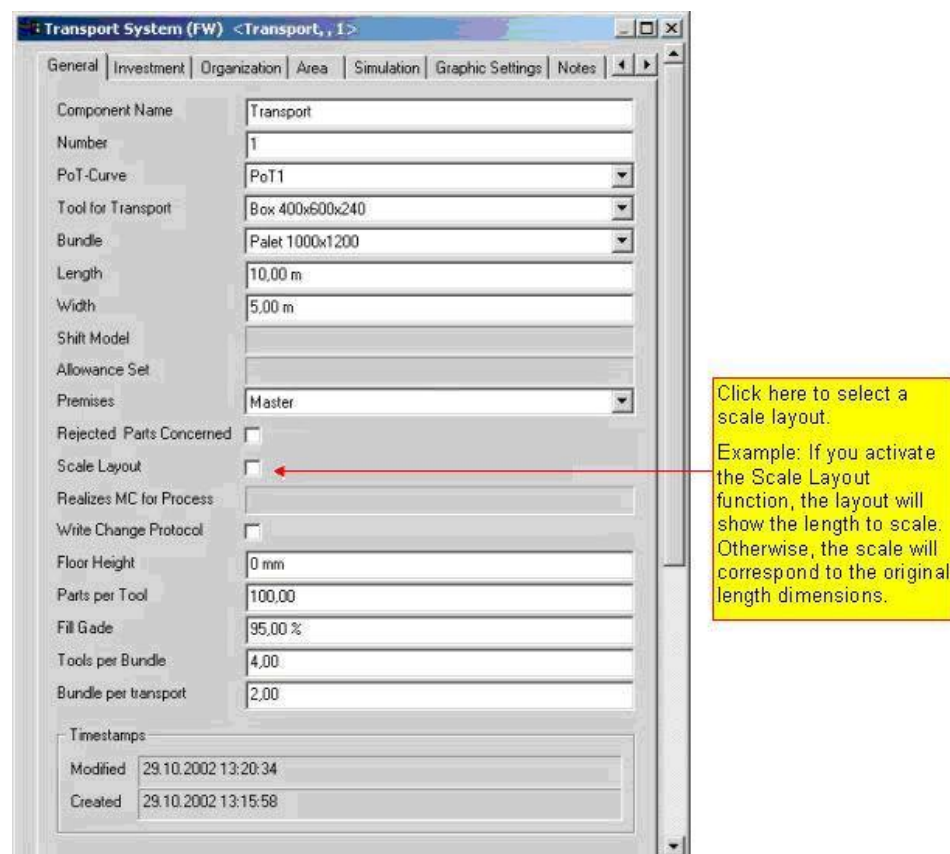


Figure 112: Transport Properties

Extended Properties of Transport Operations includes quality tab. For formation on Quality tab, *Please refer to the [Figure 108](#).*

Changes to Functions

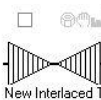
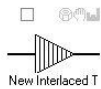
In version PE 5.12, capacity evaluations are created with scripts.

- Transport (BW) and Capacity tabs are excluded. The calculation is made with scripts. *Please refer to the [Execute Evaluations via Script](#).*

4.1.6 Defining Interlaced Transport Properties

The basic idea behind interlaced transports is to mirror an overall system from multiple, yet constantly interlaced individual elements, such as a conveyor belt consisting of several individual parts but whose suitability for processing is only evident from an overall perspective. The interlacing procedure is thus required to integrate the conveyor belt into a closed system. Such systems are used, for example, for transfer systems in mechanical production or for constantly interlaced assembly systems. The workpieces (products) are transported on workpiece carriers between the workstations. It is therefore important to define the overall system as well as any related individual stations. For this reason, modern transport systems mark workpiece carriers with the sender's address and one or more destination addresses. In the previous section, you have already learned how to insert symbols and how to link them to resources. Follow the same procedures to define interlaced transport systems.

4.1.7 Symbols for Interlaced Transport Systems



- Interlaced transports always require two routes. For example, these two routes may be arranged in a parallel position between two resources. The transport symbol indicates the direction of transportation. An interlaced transport can run towards a resource or from a resource.
- The interlaced forward and backward transport system uses always the same transport tools. The interlaced forward and backward transport moves parts exclusively on one route. Just try to imagine a route where - at the end points of this route - a carriage is constantly moved forwards and backwards. At first, this carriage is unloaded and then re-loaded at each of these route end points.

This dialog allows you to define specific data for an interlaced transport system. Again, the following two dialogs are available: **Properties** and **Extended Properties**. The dialogs are arranged in basically the same way as the corresponding dialogs for value-adding resources. The extended properties dialog defines the quality attributes of an interlaced transport system.

Figure 113: Interlaced Transport Properties

4.1.8 Defining Transport Tool Properties

Several thousand years ago mankind invented the wheel to spare himself the bother of always having to transport things manually. The 19th century saw the advent of the Otto engine that was later used by Gottfried Daimler for his first motorised coach vehicles. It is not without reason that the 20th century has been characterized by continuous development. Due to the many resulting advanced technologies, robots have become also a common tool for transport systems. Today, the use of robots is essential for many assembly sequences in special areas, such as in car manufacturing. The following section helps you to get familiar with the fork lifter icon in the toolbar, and explains how to name the relevant properties.



Caution

To link a transport tool to a transport system, follow the same procedure as when linking a worker to a station.

Transport Symbol

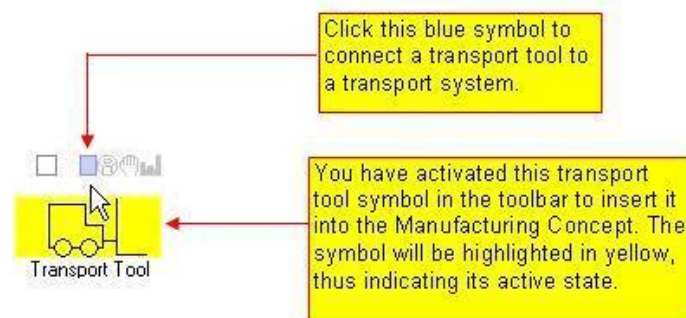


Figure 114: Transport Tool Symbol

- This dialog allows to define specific data for transport tools. Again, the following two dialogs are available: **Properties** and **Extended Properties**.

Figure 115: Transport Tool Properties

Changes to Functions

In version PE 5.12, capacity evaluations are created with scripts.

- Transport tools and Capacity tabs are excluded. The calculation is made with scripts. *Please refer to the [Execute Evaluations via Script](#).*

Extended Properties includes medium and quality tabs. For Medium/Quality tabs, *Please refer to the [Figure 107](#) and [Figure 108](#).*

4.1.9 Defining Test Station Properties

This dialog allows to indicate test station data (Testmachine). Again, the following two dialogs are available: **Properties** and **Extended Properties**. The dialogs are arranged in basically the same way as the corresponding dialogs for value-adding resources.

The screenshot shows a software dialog box titled "Testmachine <New Testmachine, 1>". It has several tabs: General, Investment, Organization, Area, Simulation, Graphic Settings, and Notes. The "General" tab is selected. The form contains the following fields and values:

- Component Name: Testmachine
- Number: 1
- Investment Type: Standard machine (dropdown)
- Shift Model: (empty)
- Order Date: 30.10.2002 (calendar icon)
- Supply Date: 30.10.2002 (calendar icon)
- Length: 0,00 m
- Width: 0,00 m
- Height: 0,00 m
- Allowance Set: (empty)
- Premises: Master (dropdown)
- Rejected Parts Concerned: ☐
- Realizes MC for Process: (empty)
- Write Change Protocol: ☐
- Floor Height: 0 mm
- Timestamps section:
 - Modified: 30.10.2002 08:55:24
 - Created: 30.10.2002 08:55:19

Figure 116: Testmachine Properties

4.1.10 Defining Properties for a Non Value-Adding Resource

You can insert a “non value-adding station”, for example, when processing parts that do not add any measurable value, i.e. do not alter the shape or attributes of a product. For this reason, these operations, such as the cleaning of parts, are normally not assigned new identification numbers; they do not appear in any parts list or usage of parts. This operation is only recorded in a workplan. Define the “non value-adding stations” for your company and make a clear distinction between these stations and “value adding stations”. Checklists can be very useful for this purpose.

Again, the following two dialogs are available: **Properties** and **Extended Properties**. The dialogs are arranged in basically the same way as the corresponding dialogs for value-adding resources.

The screenshot shows a dialog box titled "Machine (non value-adding) <New Machine (non value-adding),, 1>". It has several tabs: General, Investment, Organization, Area, Simulation, Graphic Settings, and Notes. The "General" tab is active. The fields are as follows:

Component Name	New Machine (non value-adding)
Number	1
Investment Type	Standard machine
Shift Model	
Order Date	29.10.2002
Supply Date	29.10.2002
Length	4.00 m
Width	3.00 m
Height	4.00 m
Allowance Set	
Premises	Master
Rejected Parts Concerned	<input type="checkbox"/>
Realizes MC for Process	
Write Change Protocol	<input type="checkbox"/>
Floor Height	0 mm
Timestamps	
Modified	29.10.2002 13:32:54
Created	29.10.2002 13:32:52

Figure 117: Properties of Non-Value Adding Resources

4.2 Defining Resource Group Properties

This dialog allows you to indicate group-specific data. Groups may combine, for example, multiple resources.



For more information, please refer to the [Process Graph Manual](#).

The screenshot shows a dialog box titled "BOM <Group>". It has three tabs: Properties, Notes, and Supplier. The "Properties" tab is active. The fields are as follows:

Abbreviation	Gr.
Component Name	Group
Timestamps	
Modified	28.10.2002 13:53:44
Created	28.10.2002 13:53:44
Number	
Group Type	Mounting
Responsible	Master
Cycle Time	0.0000000000000000e+000
Area	0.0000000000000000e+000
Investment	0.0000000000000000e+000
Number of Direct Workers	0
Occupancy	0.0000000000000000e+000
Number of Indirect Workers	0
Software Costs	0.0000000000000000e+000
Tool Costs	0.0000000000000000e+000
Type of Direct Worker	1
Type of Indirect Worker	0

Figure 118: BOM Group Properties

5. Right Mouse Button Functions

The right mouse button context menu quickly provides specific functions that you may want to use for your current work. While working with the context menu, two things require special attention:

- The context menu can be opened without an object (For example, a resource or a BOM group) being selected.
- It can be also opened via a selected object.

Each of the two context menus provides different functions.



Some of these context functions have been previously described in the [Creating/Editing the Manufacturing Concept](#). For this reason, the following chapter only deals with additional context functions. The same applies to context functions that have been described in the [Process Graph Manual](#).



Note

Context functions that have not been described in this manual are covered by the [Process Graph Manual](#). The context menu functions in the Manufacturing Concept basically correspond to those of the Process Graph.

5.1 Opening a Context Menu without an Object being Selected

These functions always affect the overall Manufacturing Concept. The context menu functions are given below:

- Valuation
- Simulation

Context function in the Editing the Manufacturing Concept chapter

- Comparison: *Please refer to the [Comparing Manufacturing Concepts](#).*
- Creating layouts: *Please refer to the [Creating a Layout](#).*
- Creating Multiple Usage: *Please refer to the [Creating Multiple Usage](#).*
- Upgoing calculation: *Please refer to the [Run-Up Calculation](#).*

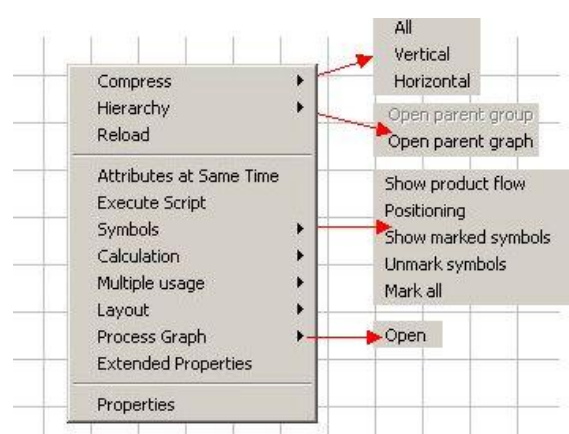


Figure 119: Right Mouse Button Functions without an Object being Selected

To open the context menu, left-click an empty field in the Manufacturing Concept and press the right mouse button.

5.1.1 Execute Evaluations via Script

In Version PE 5.12, the context function Evaluate in Manufacturing Concept is excluded. As of this version evaluations are created via scripts. Based on other scripts (VBscript, Javascript), you can create individual scripts in which the precise data that you need for an evaluation are ascertained.

This new function is also available in the [Process Graph Manual](#) for valuating processes.

The result of the evaluation is written to an Excel table; the templates must have previously been created in Excel (for scripts you have written). The path for these templates must always be specified in the source code of a script.

As in previous versions, this function is also available for a selected object or selected group. The results of this evaluation differ accordingly.

- If **no** object has been selected, the evaluation refers to the entire (all objects) Manufacturing Concept.
- If **one** object has been selected, the evaluation refers only to the selected object.
- Filtered and inactive resources are not valuated.



Note

*The scripts and templates should be saved to your local server only by an **administrator**. This applies also to the path entry for the template in the source code of the available scripts.*

Standard Scripts

Standard scripts with corresponding Excel templates are provided for the evaluation in the Manufacturing Concept:

- Script for the evaluation of area and area costs.
- Script for the evaluation of investments (investment, tool costs, and software costs).
- Script for the evaluation of media (electrical current, water, and air).

- Script for the evaluation of capacity .
- Script for the evaluation of buffers; aids, bunches.
- Script for the evaluation of interlaced transport.
- Script for the evaluation of resource occupancy capacity.
- Script for the evaluation of transport, transport costs, and bunches.
- Script for the evaluation of occupancy of workers, salary groups, and AK cost factor.

Executing Scripts

- 1) Open the context menu and select **Execute script**.

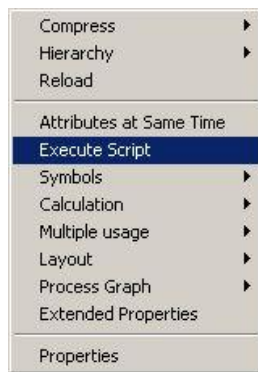


Figure 120: Open Context Menu - Start Execute Script

- 2) In the dialog **Scripts** select the script you would like to execute and click **OK**.

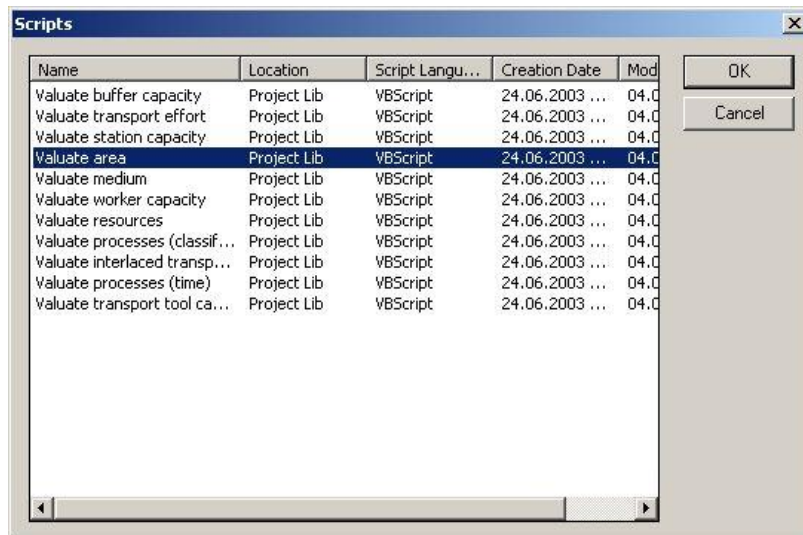


Figure 121: Dialog with Script Selection

5.1.2 Edit Evaluate Capacity

Further dialogs are available via scripts for the evaluation of manufacturing concepts and Process Graphs as of version PE 5.14. The dialogs differ according to the script to be executed, but only in their mode of operation.

In this section, you can learn about various dialogs for evaluation based on examples.

- You can select whether the result is to be displayed in an Excel spreadsheet for capacity evaluations, i.e. for stations and employees.
- For the evaluation of stations in a manufacturing concept, you can also set which relations are to be used for an evaluation among those which exist between processes and resources. *Please refer to the [Dialogs for Evaluations](#).*
- The results of an evaluation can also be shown in the properties dialog or via the function symbol layout under an icon. In order to do this, you have to configure the corresponding attribute, for example, the attribute **occupancy** for the occupancy. *Please refer to the [Step Value in the Manufacturing Concept](#).*

In order to display the result of the evaluation in Excel, select **Show an Excel spreadsheet with results**.

Show an Excel spreadsheet with results ☒

Figure 122: Activate Excel Spreadsheet

Use Process Time

Process times are set for the planning of the processes. An operation time is resource-dependent and it reflects the actual manufacturing time for a product on a resource. Therefore, if processes are planned on a resource and the actual manufacturing time has been set, the process and operation times could be different from one another even though the same process is involved.

This fact plays an important role for the evaluation, and it ultimately leads to various results. Use a process time for the evaluation when only the process time is operational for the execution on all resources of a manufacturing concept for which reports are to be made.



Note

The result of the evaluation can lead to an incorrect result if you do not select the correct time.

When evaluating stations or employees, you can select whether the process time or operation time is used for the evaluation. The sample text shows the sensible use of process time or operation time. This sample text is available in the dialog as a standard; it serves the purpose of providing information and has no relevance with regard to the current process or operation times in the manufacturing concept.

This is only useful if following link is unique:
Process A - Station A Process time = 2 sec

Working with alternatives is not useful with this option:
Process A - Station A Operation time = 1.8 sec
Process A - Station B Operation time = 2.1 sec
Process A - Worker Operation time = 48 sec

Figure 123: Sample Text for Selecting the Process Time

- Use the process time for evaluation **only** if the link between the process and resource is unambiguous. A link is considered unambiguous if a proc-

ess is executed only on one resource or if the process and operation times are the same.

- **Always** use the operation time if the processes that are linked to one or more resources and the process and operation time are **different**.

In order to use the process time for the evaluation, select **Use process time instead of relation operation time**.

Use process time instead of relation operation time ☒

Figure 124: Activate Process Time

5.1.3 Dialogs for Evaluations

As previously indicated, the dialogs vary according to the executed script.

- For the capacity evaluation of stations and employees there are dialogs available in which you can select whether the result is displayed in an Excel spreadsheet, for which relation the evaluation is executed, and whether the process or operation time are used of the evaluation.
- There are also simple dialogs available, which always show the result in an Excel spreadsheet, such as for the evaluation of the area costs.

Summary: The following examples of various dialogs should help you better understand the way the dialogs work.

Activate Reject Parts

In every dialog, you can decide whether the evaluations of the reject parts are taken into consideration:

- Activate the field if reject parts are involved. Only those resources are used for evaluation for which reject parts are set as active in the properties dialog of a resource.
- If you do not activate the field, all resources can be used for evaluation.

Dialog for Station Evaluation

This dialog always opens whenever you evaluate stations in the manufacturing concept.

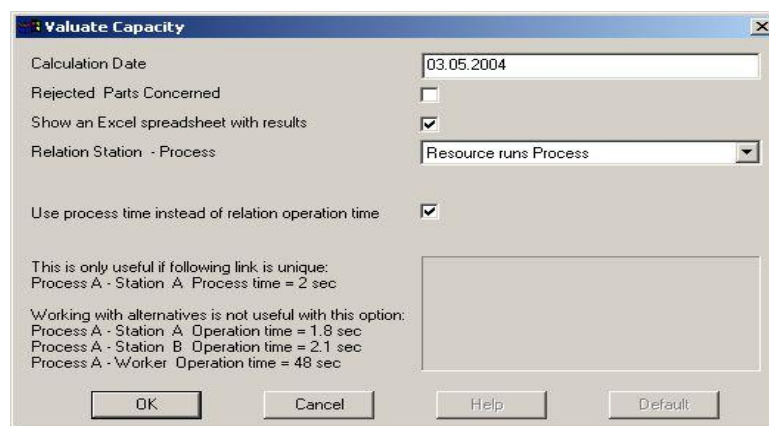


Figure 125: Dialog for Station Evaluation in the Manufacturing Concept

- Select the relation using the combobox for **Relation Station – Process**. In this case only the linked objects which correspond to this relation (process, resource) are evaluated.



Figure 126: Combobox for Relations

Dialog for Employee Evaluation

This dialog always opens whenever you evaluate employees in the manufacturing concept.

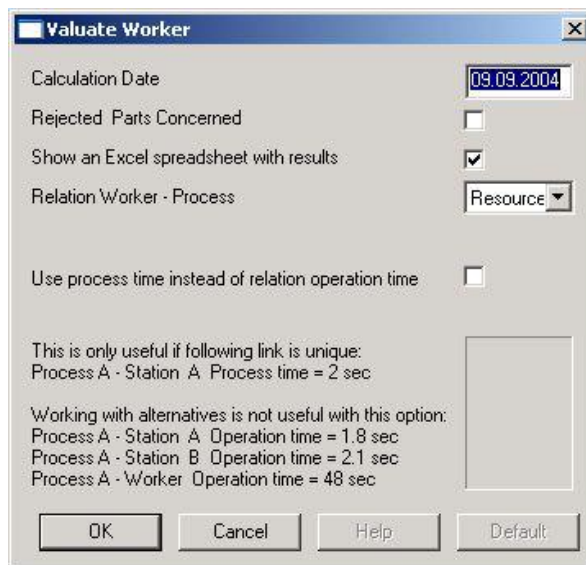


Figure 127: Dialog for Employee Evaluation in the Manufacturing Concept

Dialog for Buffer Evaluation

This dialog always opens whenever you evaluate buffers in the manufacturing concept.



Figure 128: Dialog for Buffer Evaluation in the Manufacturing Concept

Dialog for Area Cost Evaluation

This dialog always opens whenever you evaluate surface costs in the manufacturing concept.



Figure 129: Dialog for Area Cost Evaluation in the Manufacturing Concept

The procedure for and form of scripts are shown in three examples. The examples refer to the entire Manufacturing Concept.



Note

The formula for the respective calculations can be found in the scripts included in the delivery. All of the following values in the examples are samples which could be adapted to the needs of the respective customer at any time.

Area Evaluation Result using a Script

The example for the resources **machine** and **buffer** is shown.

Example

The following premises must be available in the project library for the evaluation:

- Area factor, **2** in the example
- Area costs, **100 Euros** in the example
- Supplemental area costs, **33 Euros** in the example

The following data must be available in the Manufacturing Concept in the properties dialog:

- Premises
- Value for the estimated area, **25m²** in the example
- Area costs multiplier, **1.5** in the example

Example

Formula for the evaluation (line 5):

Basic surface = estimated surface * area factor,

Calculated values ($25 * 2 = 50 \text{ m}^2$)

Area costs = Result of the surface area *(area costs + supplemental area costs),

Calculated values ($(50 * (100 + 33) = 6,650 \text{ Euros})$)

Allocated costs result of area costs * area cost multiplier,

Calculated values ($6,650 * 1.5 = 9,975 \text{ Euros}$)

	A	B	C	D	E	F
1	Are reject parts concerned?		Exchange rate			
2	No		1,000			
3						
4	Name	Number	Area estimate [m2]	Ground area [m2]	Area costs per Resource [Euro/Year]	Applied costs [Euro/Year]
5	M.Prozess22	M22Nummer	25	50	6650	9975
6	M.Prozess42	M42Nummer	0	0	0	0
7	M.Prozess62	M62Nummer	0	0	0	0
8	M.Prozess24	M24Nummer	0	0	0	0
9	M.Prozess44	M44Nummer	25	50	6650	9975
10	M.Prozess64	M64Nummer	0	0	0	0
11	M.Prozess26	M26Nummer	0	0	0	0
12	M.Prozess46	M46Nummer	0	0	0	0
13	M.Prozess66	M66Nummer	25	50	6650	9975
14	Summe		75	150	19950	29925
15						
16	Puffer8-2	Puffer8-2Nummer	25	50	6650	9975
17	Puffer10-2	Puffer10-2Nummer	25	50	6650	9975
18	Puffer12-2	Puffer12-2Nummer	25	50	6650	9975
19	Summe		75	150	19950	29925
20						
21	Insgesamt		150	300	39900	59850

Figure 130: Example: Area Evaluation Result using a Script

Resources Evaluation Result using Investment Script

The example for the resources **machine** is displayed. The following data must be available in the Manufacturing Concept in the **Properties** dialog:

Example

- Estimated investment, **10,000 Euros** in the example
- Tools costs, **2,000 Euros** in the example
- Software costs, **300 Euros** in the example
- Installation, **1%** in the example
- Duty, **2%** in the example
- Transport, **3%** in the example
- Spare parts, **4%** in the example
- Risk premium, **5%** in the example
- Maintenance **40 Euros**
- Continuous tool costs **5 Euros**

Formula for the evaluation:

Sum of investment multiplied by percentage of additional costs

Sum of investment = estimated investment, tool costs, software costs

Sum of additional costs (installation, customs etc.)

Calculated values $12,300 \cdot 15/100 = 1,845$ Euros

Total sum (investment plus additional costs $12,300 + 1,845 = 14,145$ Euro

Maintenance and continuous tool costs are not included in the formula, but they are taken into account and highlighted in the calculation (Excel table display) for the resources.

	A	B	C	D	E	F	G	H
1	Are reject parts concerned?	Exchange rate						
2	No	1,000						
3								
4	Name	Number	Investment [Euro]	Tool costs [Euro]	Software costs [Euro]	Sum [Euro]	Surcharges [Euro]	Grand total [Euro]
5	M.Prozess22	M22Number	10000	2000	300	12300	1845	14145

Figure 131: Example: Resources Evaluation Result using a Script

Machine Occupancy Script

The example for one resource, **Station**, is displayed. The following data must be available in the project library for the evaluation:

- Shift model, in the example the start date is 01/01/2003

	WD/Year	Shift 1 [min/Shift]	Shift 2 [min/Shift]	Shift 3 [min/Shift]	PoT-relevant
1	220	480	480	480	Yes
2	52	480	480	0	Yes

Figure 132: Shift Model for the Example

- PoT curve, in the example the start date is 01/01/2003

Type	Base curve	Per	Year
1	01.01.2003	1000000	80
			90

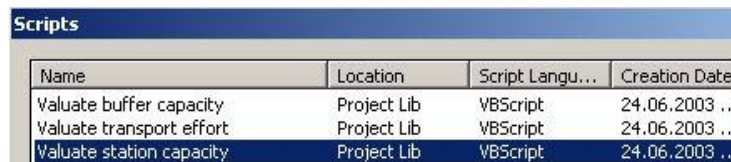
Figure 133: PoT Curve for the Example

The following data must be available in the Manufacturing Concept in the **Extended Properties** dialog:

- Relevant (process for throughput time valid), the field is set to **Yes** in the example. If this field is set to **No**, no evaluation takes place.
- Work cycle time, **10 sec** in the example
- Parts at same time, **1** in the example
- PoT curve, **one million per year** in the example
- PoT percentage (%), **100 %** in the example
- Setup time, **600 sec** in the example
- Lot size, **100** in the example
- Reject rate (%), **10 %** in the example

Execute Occupancy Script

- After **Execute script** starts, select the script for the occupancy (**Evaluate station capacity**) in the script dialog.



Name	Location	Script Language	Creation Date
Valuate buffer capacity	Project Lib	VBScript	24.06.2003 ..
Valuate transport effort	Project Lib	VBScript	24.06.2003 ..
Valuate station capacity	Project Lib	VBScript	24.06.2003 ..

Figure 134: Script for Selecting Occupancy

2) Enter the calculation date.

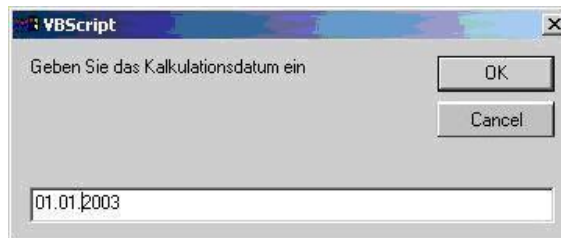


Figure 135: Enter Calculation Date for Example

3) Confirm the message with **Yes**.



Figure 136: Confirm Message with Yes

4) You can see the result of the evaluation in the Excel template.



Name	Number	Occupancy [%]	Ideal occupancy [%]	Setup occupancy [%]	Reject occupancy [%]	Risk occupancy [%]	Availability grade [%]
Station 1		112,22	45,45	27,27	8,00	20,95	10,47

Figure 137: Example: Result – Occupancy Evaluation

5.1.4 Integrating Scripts in the Manufacturing Concept

You can show and execute specific integrated scripts by using the menu item **Scripts** in the context menu of a manufacturing concept or Process Graph. Arrange the scripts which you can use only for the manufacturing concept or Process Graph under this menu item.



For more information, please refer to the [Process Graph Manual](#).

Script Commands

The menu item **Scripts** is only available in the context menu if you create the corresponding script commands in the plantype set. You must create a script command for every script, which is to be displayed under the menu item.



You can open the system library with the icon.

- 1) Create the script commands in the system library if the script commands needs to apply to all projects created on the basis of this plantype set. Create the script commands in the plantype set of the project if the script commands needs to apply to only one project.

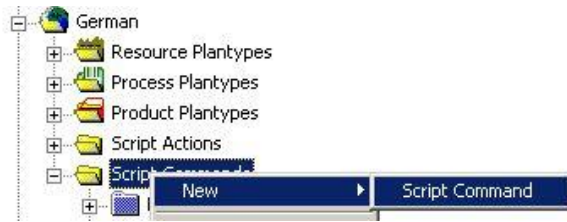


Figure 138: Create Script Command in the Plantype Set

To Open Edit Script Command Dialog

- 2) Select the Script Commands directory in the plantype set in order to open the dialog.
- 3) Open the context menu, select **New > Script Command**. Please refer to the [Figure 138](#).

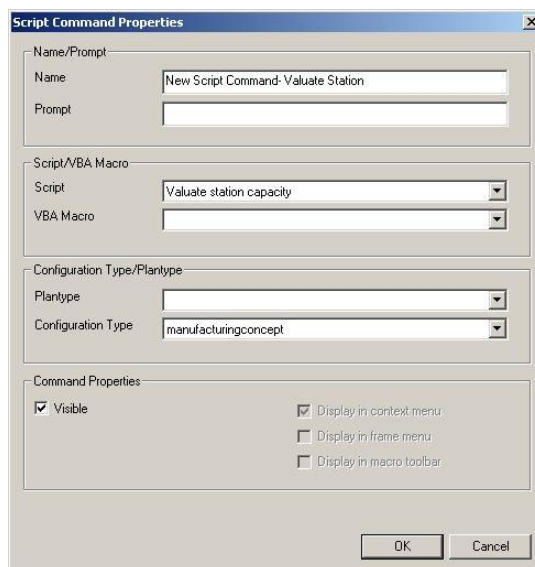


Figure 139: Script Command Dialog

- 4) Type the name for the script command in the **Name** field. The name refers to the script that can be executed. The script commands are created and shown with this name in the **Script Commands** directory.
- 5) Select the script from the **Script** combobox. The name of the script is then shown under the menu item **Scripts** in the context menu.

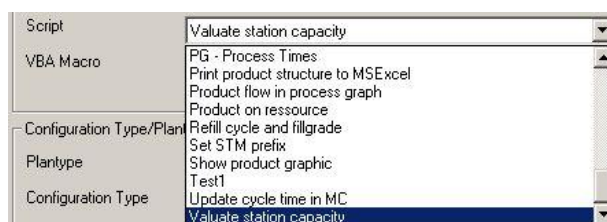


Figure 140: Select the Script from the Combobox

- 6) Select either **manufacturingconcept** or **processgraph** as the configuration type. By selecting one of these you set where the script is executed and displayed in the context menu: So select **manufacturingconcept** for the display in manufacturing concept and **processgraph** for the display in Process Graph.

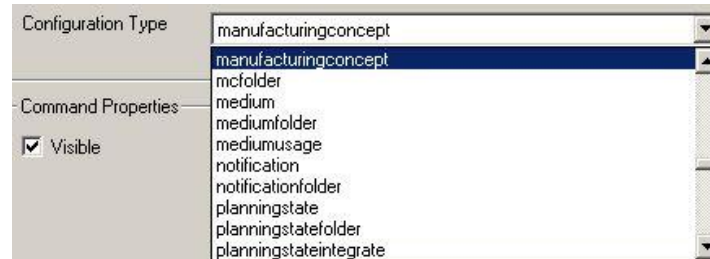


Figure 141: Select the Configuration type for the Display in the Context Menu

- 7) In order to view the display in the context menu, select the checkbox **Visible**.

After you have set and saved the data in the **Properties** dialog, the scripts are available in the context menu. You can start these scripts directly via these menu items.

- 8) In order to start a script, click an empty field in the manufacturing concept or Process Graph, then open the context menu, select **Scripts**, and then select the script.

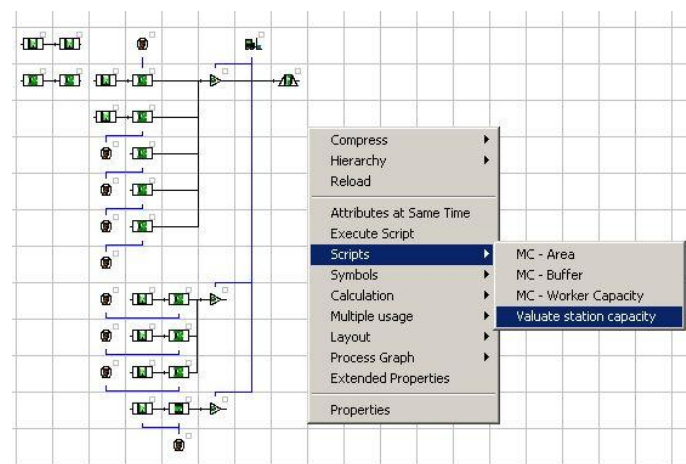


Figure 142: Starting a Script from the Context Menu

5.1.5 Opening the Process Graph

You can easily open a process graph in the manufacturing concept. Both the process graphs created in the project as well as the process graph on which the manufacturing concept was created are displayed in this new dialog.

You can open and edit a process graph, but you cannot assign it to an open manufacturing concept.



This new dialog is also available in the process graph. The mode of functioning is the same as in the manufacturing concept, with a small difference: A process graph can be assigned to any number of manufacturing concepts;

these are displayed in the corresponding field in the dialog. On the other hand, all manufacturing concepts of a project are available for selection.

Opening the Dialog

You can open the dialog via the context menu in the manufacturing concept.

- 1) Click in a free field in the manufacturing concept and select **Process graph > Open**.

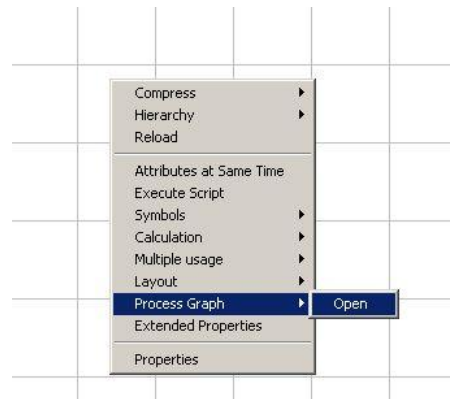


Figure 143: Opening the Context Menu in the Manufacturing Concept

Select the Process Graph in the Dialog

The dialog is divided into two main areas:

- The process graph on which the manufacturing concept was created is displayed in the **Open linked process graph** field. If this field is empty, the manufacturing concept was created without process graphs.
- You can select the process graph you want to open via the combobox in the **Open process graph in project** field. All process graphs of the project are listed in the combobox.

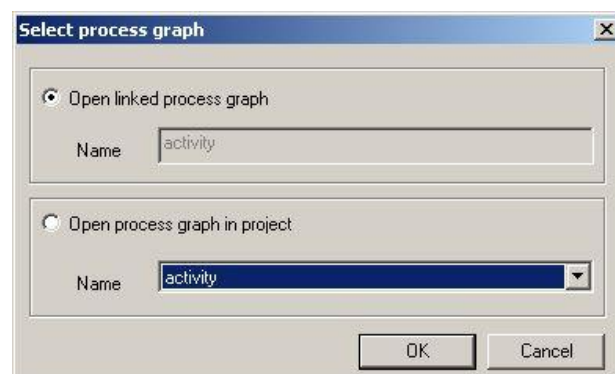


Figure 144: Opening the Process Graph Dialog - Initial Situation

- As a default, the radio button for **Open linked process graph** is activated when the dialog is opened. The assigned process graph is selected.
- If you want to open the assigned process graph, click **OK**.
- If you want to open another process graph of the project, activate the radio button for **Open process graph in project**.
- Select the process graph from the **Name** combobox.

- Confirm the selection with **OK**. The process graph can be opened for editing. An assignment to the open manufacturing concept is not made.

5.2 Opening a Context Menu with an Object being Selected

The functions that are actively available in the context menu with an object being selected (Resource, Group) depend on the object currently selected. Thus, the two functions **Create group** or **Unmake group** are only available if you have selected multiple resources or if you have created a group.



For more information, please refer to the [Process Graph Manual](#).



Note

This right mouse button function is only available if you have selected a resource or a group.

This chapter provides you with information about the following two context functions:

- Open Manufacturing Concept
- Linked Objects

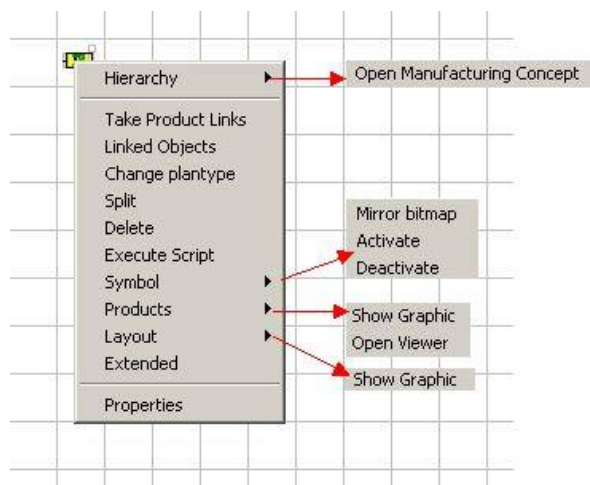


Figure 145: Right Mouse Button Functions with a Selected Symbol

5.2.1 Generating a Manufacturing Concept for a Resource

For resources in the Manufacturing Concept, you can generate additional, more detailed Manufacturing Concepts, for example, if you want to assign additional workplaces to a particular resource which is to be planned specifically for the requirements of this resource (the resource being for example a final assembly station). To edit such additional Manufacturing Concepts, you can use any functions that are commonly provided to generate a Manufacturing Concept, i.e. you can create Layouts or Multiple Usages.

Detailed Manufacturing Concepts can be generated either with or without a Process Graph from a Manufacturing Concept for a resource. *Please refer to the [Defining Relations for Resources](#).*

To Generate a Manufacturing Concept

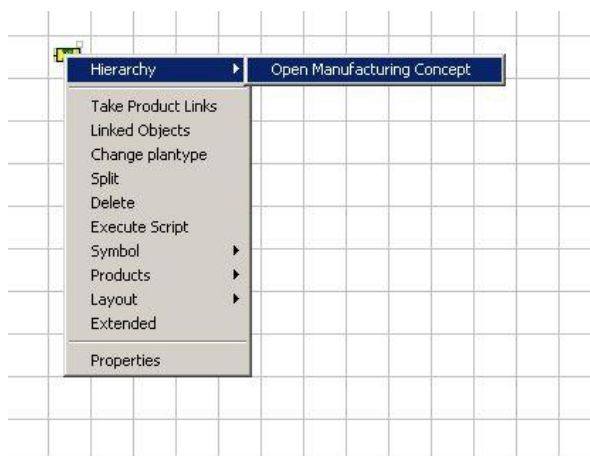


Figure 146: Generating a Manufacturing Concept for a Resource

- 1) Select the required resource from the Manufacturing Concept.
- 2) Then press the right mouse button. Click **Open Manufacturing Concept** in the context menu. You can now follow the usual procedures to create a Manufacturing Concept. *Please refer to the [Defining Relations for Resources](#).*
- 3) Use the **Open parent graph** function from the context menu to return from the newly created Manufacturing Concept to the original Manufacturing Concept.



Figure 147: Context Menu – Open Parent Graph

- 4) Newly created Manufacturing Concepts can be opened using the **Open Manufacturing Concept** function from the context menu. *Please refer to the [Figure 146](#).*

5.2.2 Manufacturing Concept Display Product and Process Links

In Version PE 5.12, all relations (product, resource, and process) which are linked to the respective resource are displayed in the Linked Objects dialog for all plan types in the Manufacturing Concept.

- Only the relations to products and processes are displayed in previous versions.
- In the Linked Objects dialog (*Please refer to the [Figure 149](#)*) relations can be generated between linked products and processes generated exclusively for this resource (resource-dependent processes).

This function displays the links of processes, products, and resources. Relations for resource-related processes are specified here.

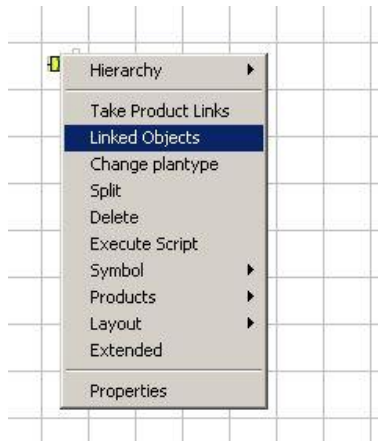


Figure 148: Display Links of a Resource

- 1) To start the menu item **Linked Objects**, select the resource and then click with the right mouse button. *Please refer to the [Figure 148](#).*
- 2) Click **Linked Objects**. The **Linked Objects** dialog opens. *Please refer to the [Figure 149](#).*

The relations are displayed in the **Linked Objects** dialog under the three tabs:

- **Product**
- **Resource**
- **Process**

Relations are not displayed for the following:

- The relations are not shown in the **Linked Objects** dialog if the relation is hidden in the **Select Viewed Relations** dialog.
- Resources that do not correspond to the filter set.
- Resources deactivated in the **Manufacturing Concept**.

Product Tab



Note

*No new relations can be generated in the **Linked Objects** dialog for processes which have already been generated in the **Process Graph** or **PPR Navigator** and have been linked to the respective resources.*

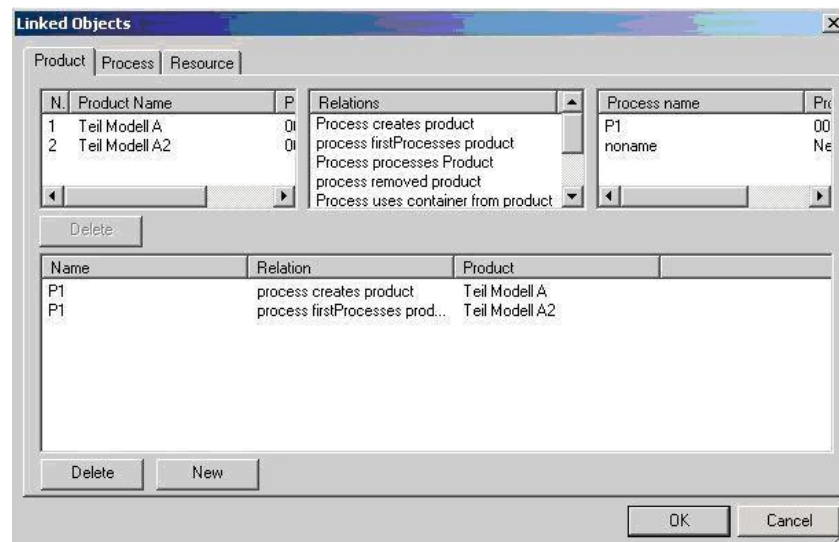


Figure 149: Linked Objects Dialog - Product Display

**Note**

***It could take up a lot of working time:** Generate only relations for resource-dependent processes in the **Linked Objects dialog**. All other relations are **impermissible** and could have **fatal consequences**.*

Example**Example**

If you generate a new process in the PPR Navigator when the Process Graph is open and the **Reload function** have not been executed in the Process Graph, this new process has not been allocated to the Process Graph and is treated as a resource-dependent process. If you then allocate this process to a resource in the Manufacturing Concept, you can then generate i.e. relations for this process similar to the resource-dependent process.

This is why the function **Reload** should always be executed in the Process Graph whenever you generate a new process with the Process Graph open in the PPR Navigator.

To Generate Relations for Resource-Dependent Processes

- 1) To create a relation between a product and a resource-related process, select the product followed by the relation and the process in the upper window. *Please refer to the [Figure 149](#).*
- 2) After selecting, click **New** button. The selected relation is displayed in the bottom window. In the screenshot below, the **noname** process has been assigned to two relations: input process and output process. *Please refer to the [Figure 149](#).*
- 3) Only these relations can be deleted with the **Delete** button.
- 4) Click **OK** to complete input entry.

New

Delete

Process Tab

The process tab shows the processes which are linked to the respective resource.

The links between the processes and the respective resource can be deleted. The processes themselves remain.

Delete

- 1) Select the process and click **Delete**. The link to the resource is deleted.

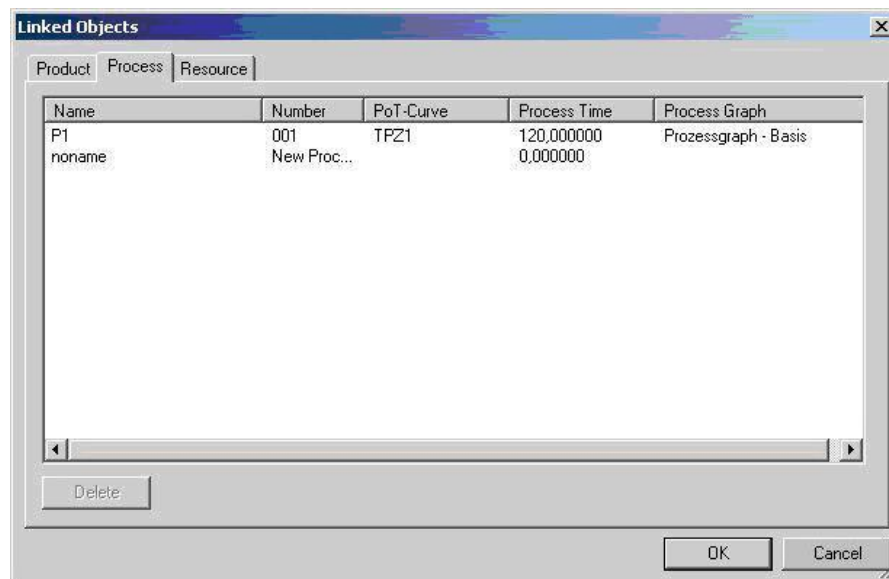


Figure 150: Linked Objects Dialog - Process Display

Resource Tab

The relations with which the resource is linked to further resources are displayed in the resource display.

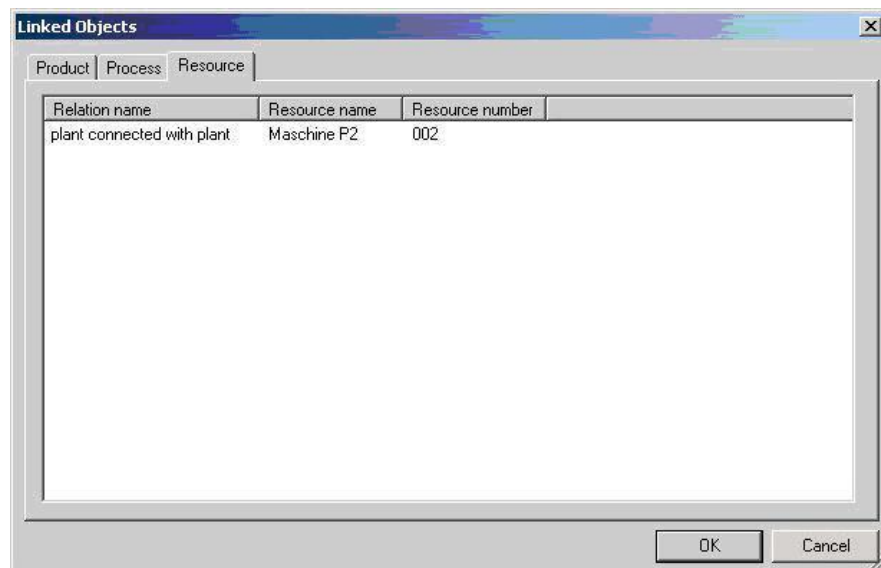


Figure 151: Linked Objects Dialog - Resource Display

6. Tips and Tricks

6.1 Deactivating a Symbol

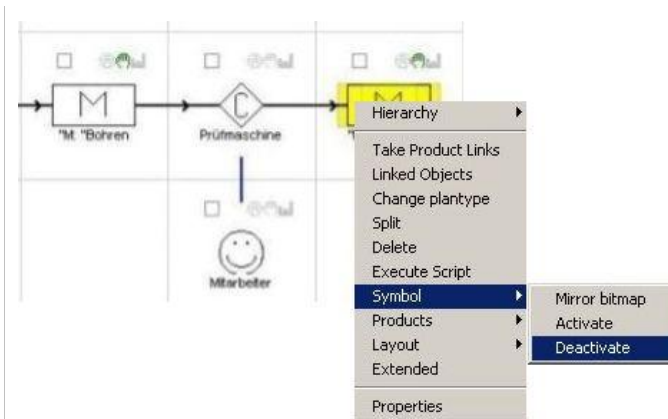


Figure 152: Deactivating a Station

- 1) Select the required station and press the right mouse button.
- 2) Click **Deactivate**. The symbol is changed. You can now see two crossed lines above the station.
- 3) To re-activate a station, follow the same procedure in the reverse order. The steps remain the same. You can again select the station, press the right mouse button and click **Activate**. The station reassumes its original condition.



Note

Stations are deactivated to inactivate the corresponding variants.

6.2 Assigning System Items to Operating Equipment

Open the Library and select a required system item. Drag the system item to the work station component using the drag and drop function. The BOM list contains the entry for the system item. You can also use the Finder to find system items in the Library.

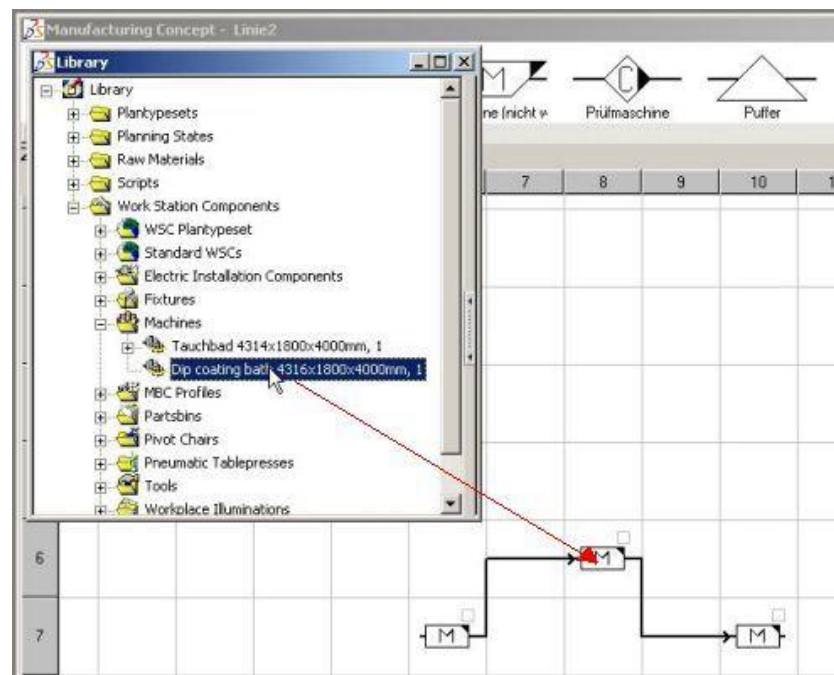


Figure 153: Integrating System Items from the Library into the Manufacturing Concept

6.3 Hide and Show Function

You can hide lines and columns, for example, if you have developed a Manufacturing Concept for a production line and the Manufacturing Concept is only visible in parts. You can use the Show and Hide functions from the menu to avoid having to constantly move the Manufacturing Concept from one side to another.

6.3.1 Show and Hide Function for Columns

The current situation in our example: You have created two additional stations for the end of the production line. To edit these stations, you want to view the beginning of the production line as well. The part in between is currently of minor interest for your purposes. At the moment, it is important to focus your attention on the original (input) and the final (output) situation. This is achieved by hiding the intermediate columns.

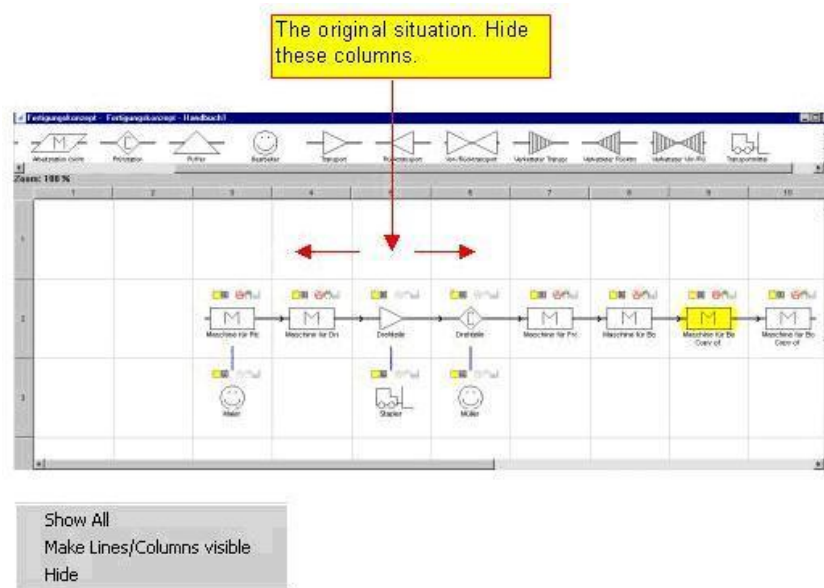


Figure 154: Dialog for Lines and Columns

These three possibilities are available using the right mouse button. In our example, you have hidden columns five to eight.

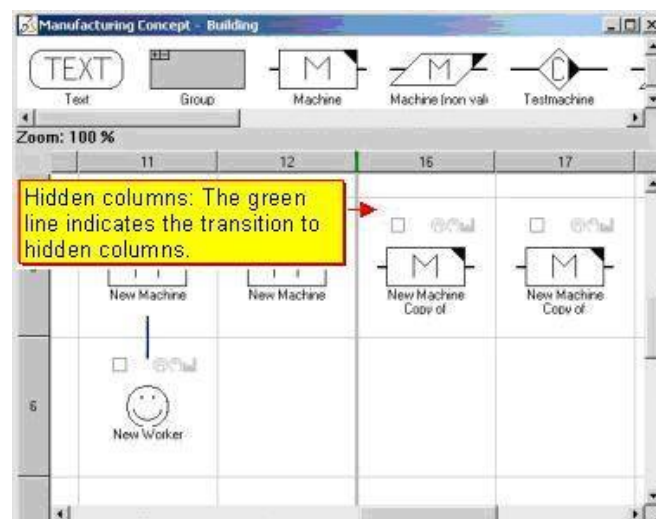


Figure 155: Hidden Columns

The two pictures above illustrate the effect. You may now like to know what steps are to be taken to achieve this effect. If you work with Excel, you may already be familiar with this procedure.

To Show or Hide Columns and Lines



Note

The showing and hiding procedure is identical for both lines and columns. We now explain the procedure using the Hide and Show function for columns as an example.

- 1) Left-click the column header to select the column. If you want to select multiple columns simultaneously, drag the cursor to the right or left while holding down the left mouse-button until you have selected the required columns.

- 2) When you have selected the column(s), press the right mouse button and click on Hide. Columns five to eight have been hidden in our example. As a result, the Manufacturing Concept displays only the areas you want to edit.
- 3) You have completed your work and would now like to view the entire Manufacturing Concept. To do this, you must re-show the columns.

6.3.2 Re-Show Hide Columns and Lines

There are three possibilities:

Double-clicking the green line

If you prefer a quick solution, click twice on the green line in the column header with almost no time between the two clicks. All hidden columns are visible again.

The “Show All” right mouse button function

If you prefer to use the right mouse button, click any column header. Then press the right mouse button and click **Show All**. As a result, all hidden columns can be re-shown.

The “Make Lines/Columns visible” right mouse button function

Another possibility to use the right mouse button context menu is provided by clicking a column header. In this case, however, you cannot select just any column. You must select columns to the left and to the right of the green line. Then press the right mouse button and click **Make Lines/Columns visible**. As a result, all hidden columns can be re-shown.

6.4 Quickly Selecting Objects from the Manufacturing Concept

If you want to quickly select objects from the Manufacturing Concept, perform the following procedure:

- 1) Left-click an empty field in the Manufacturing Concept.
- 2) Draw your cursor across the objects you want to select. As a result, all objects in the red frame can be selected.

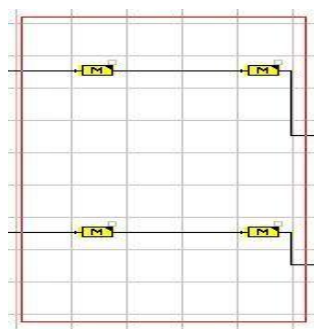


Figure 156: Selecting Multiple Objects from the Manufacturing Concept

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