



HOME

User Manual

DELMIA Process Engineer®

Process Graph - Application



Foreword

This manual provides an introduction to the basic operations and functions of the Process Graph 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 Process Graph and menu guidance 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 process Graph. This manual briefly describes:

- Menus provided by the Process Graph
- How to create and edit a Process Graph



Note

When handling the process graph 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 New Functions in Process Graph

No new functionality has been added for this release.

2. Overview

The Process Graph plans processes, which are to be used for processing and editing of planned products. A process structure for a Process Graph is determined in the PPR Navigator. A Process Graph can only be created once for one hierarchical level. To make changes to a Process Graph already created, this Process Graph can be opened for processing as many times as you want.

A Process Graph is opened, in which a change takes place from the PPR Navigator to the process view. Processes are displayed in the Process Graph, which can be arranged in line or in parallel. Configurable relations define the relations between the linked processes. Relations show, which conditions need to be followed to guarantee a clear process sequence. Using the relations, a clear preceding and succeeding relation between two processes can be created. In the case of relations, there is a general distinction between an optional and mandatory relation. When displaying process sequences in the Process Graph, the order, which almost automatically results from the chosen relations, should be observed. The goal should be to find a clear display for the process sequences.

The processes can be linked directly in the Process Graph or in the PPR Navigator. When opening a Process Graph, the links generated in the PPR Navigator are displayed. To optically display a process sequence, the Process Graph needs to be opened. The links can, however, be generated in the PPR Navigator, but the optical display can only be shown in the Process Graph itself. Processes can be linked to products and resources.

2.1 Starting Process Graph

The process structure is generated in the PPR Navigator.

- 1) Change from the PPR Navigator to the process view.
There you can open the Process Graph.
- 2) The Open Process Graph function is only available on the hierarchical level from where the PPR Navigator has been opened in the process view. Only one Process Graph can be created for each hierarchical level

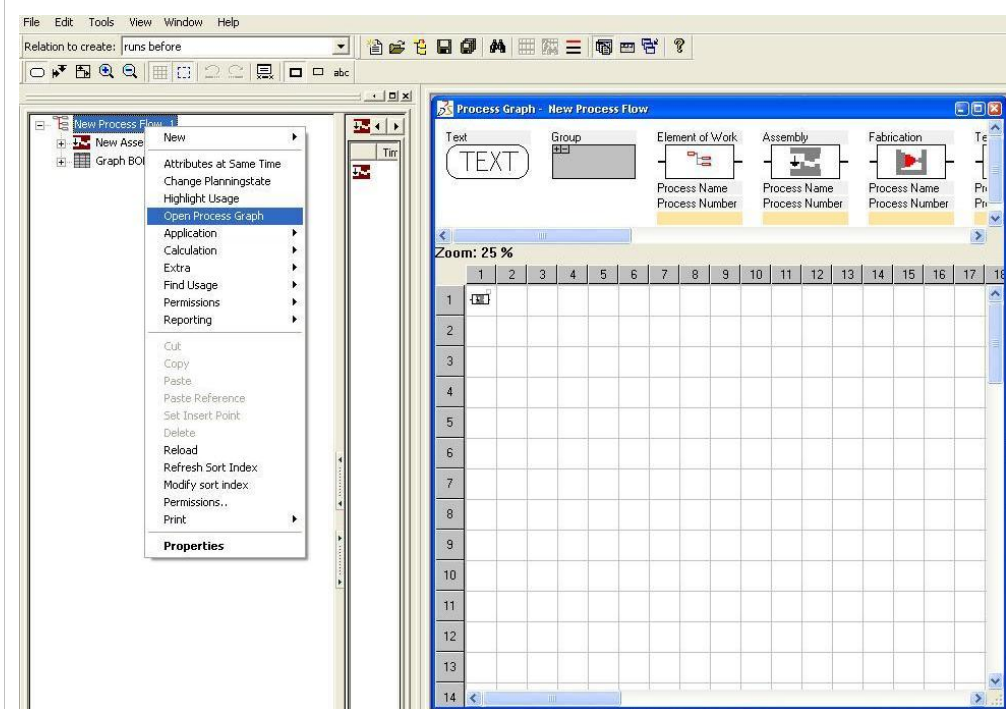

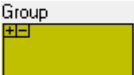
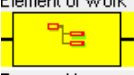



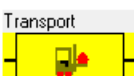




Figure 1: Opening Process Graph

2.2 Signs and Symbols

The [Table 1](#) depicts the symbols used in process graph.

Table 1: Symbols in the Process Graph

Symbols	Description
	Click this icon if you want to write a comment.
	Click this icon if you want to add a group.
	This icon enables a process by which the parameters can be set without restrictions. You can use this type of process for different types of processes, i.e. for assembly or manufacturing processes. You can set the parameters for the calculation of an optimized manufacturing time determined on the basis of a script according to the specified parameters.
	This icon enables an assembly process. This type of process is used if you plan assembly processes in the process graph, such as pre-assembly or final assembly processes.
	This icon enables a manufacturing process. This type of process is used for processing procedures such as milling, rotating, or galvanizing, etc.
	This icon enables a test process. This type of process is used if you plan test or measuring processes in the process graph.
	This icon enables a transport process. This type of process is used for planning the transport in the process graphs, for example, in a process line or between process lines.

Symbols	Description
	This icon enables a process used in the shell construction, such as process types for joining methods.
	This icon enables a process, which you can use for various processes, for example, for assembly or manufacturing processes, or even for non-value-added partial processes such as cleaning or plastering.



Note













You can determine the definition of these symbols and the assignment to process types during configuration. Yellow color in symbols, in [Table 1](#) means that the icon has been activated.

2.3 Process Graph Toolbar



Figure 2: Toolbar

Table 2: Toolbar Symbols

Symbols	Description
	Enable this symbol to add or to link processes in the Process Graph.
	If this symbol is enabled, you can move process or group symbols to the next line or column. Hold down the CTRL-button 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%, 25%, 50% up to 100%.
	Using the minus function, you can reduce the view in the same increments from 100% to 6%. To enable one of the two zoom functions click on one of the two icons in the toolbar.
	Use this symbol to hide or show grid lines.
	If this symbol is enabled, a frame line is shown at an open group.
	Use this symbol to cancel process moving actions.
	Use this symbol to restore process moving actions.
	If this symbol is enabled, you can choose which relations between the processes are shown in the Process Graph.
	If this symbol is enabled, you can increase or decrease the view mode
	If this symbol is enabled, you can view the symbol descriptions in textual mode only.

2.4 Displaying Process Links

The icons above a process show whether there are links to an existing process. Processes can be linked to products and resources. The resources are created in the Manufacturing Concept. Moreover, additional resources can be generated in a layout, which has been created using a Manufacturing Concept.

The process links are highlighted in the icons.



Note

The icons above the process symbols are only visible at 100% zoom.

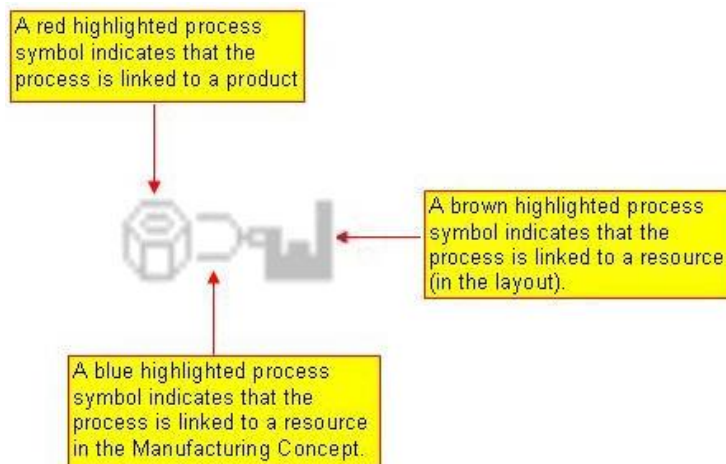


Figure 3: Small Icons for the Links

2.5 Properties and Context Menus

In the processes' Properties dialog the data are specified, which clearly define a process. In the Properties dialog, you can specify general data regarding the type and the properties of a process or you can specify special data with regard to validity or to products for which a process should be used for processing. Two dialogs are available for editing the Properties: the Properties dialog and the Extended Properties dialog.

Context Menus

The right mouse button context menus provide current functions necessary for the currently performed work. Context menus are available for the complete Process Graph in the case of selected objects (processes and groups). Similar processes forming a unit, like a production group where certain work processes are combined to finish the gearbox drive assembly, are combined in groups.

Valuation

Data such as time or costs are calculated in the Process Graph. The results for individually selected objects and for all objects of a Process Graph can be displayed using the Valuation function.

Using the Print and the Export functions in the Process Graph the results of the valuation can be saved permanently.

3. Working with Process Graph

To work in the process view, you have to select the process symbol first.



Process structures created in the PPR Navigator can be edited in the Process Graph module. The processes can be arranged in line or in parallel and can be linked to a Process Graph. Moreover, you can generate new processes in the Process Graph module, which are then transferred to the process structure in the PPR Navigator. This chapter describes the functions that are used to create a Process Graph.

3.1 Generating Process Graph

The toolbar in the Process Graph shows the process symbols available to generate a process. The available process symbols for planning, like the process symbol for a group or a value-adding operation, are determined in the Plan Type Set during configuration. The display in the toolbar may change according to this configuration. The example shows a toolbar containing all process symbols. The three process symbols displayed on the left side of the figure in the first column have been created in the PPR Navigator. *Please refer to the Figure 4.*

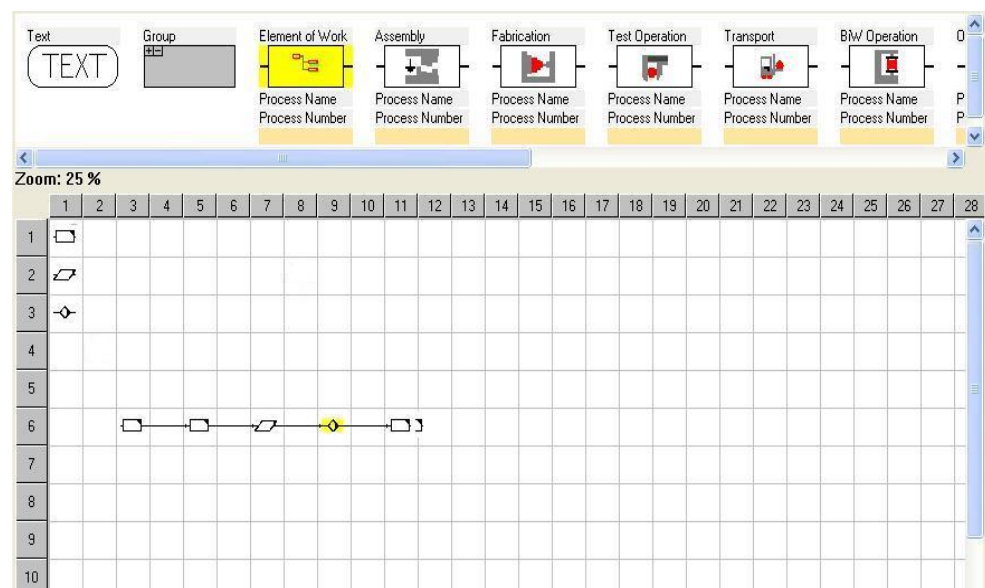


Figure 4: Example of a Process Graph with Complete Toolbar

3.1.1 Symbol Layout

Starting with version PE 5.12, the context function symbol layout is omitted. The symbol layout setup is more flexible as of this version: all **configured** attributes can be used for the symbol layout, in contrast to previous versions. Every user can set up the symbol layout individually. In addition, the step value is defined with this function. Free attributes can be individually configured.

In this section, you learn about the procedure for setting, editing, and changing a symbol layout. This new function is also available in the Manufacturing Concept for editing a symbol layout of resources.



3.1.1.1 Setting the Symbol Layout

There are always three lines (two lines in previous versions) for editing the symbol layout. The three possible lines are, as always, arranged underneath the process symbol. Only the third line for the symbol layout is used to define a step value.

The attributes used for the symbol layout are defined in the toolbar. You can select different attributes (name, nameshort, time, etc.) for the three lines for every plantype (process, partial workplan, test process, etc.). The contents of the symbol layout can be edited directly from the Process Graph; this is not possible in the toolbar.

Example

Toolbar: configuration with both attributes, name (process name) and nameshort (process number).

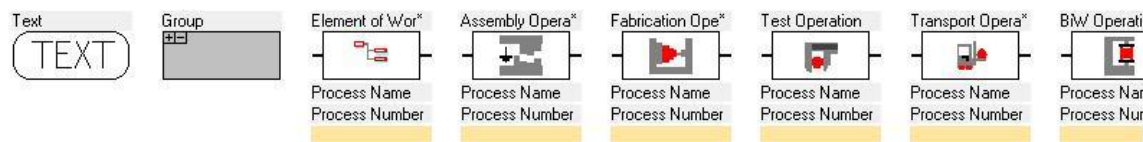


Figure 5: Toolbar – Situation at Start – Symbol Layout Attributes Name, Name-short

In the situation at the start, the attribute **name** has been selected for the process name and the attribute **nameshort** for the process number for both of the first lines.

Example

This example shows you to edit a previously set symbol layout. The procedure is the same for all plantypes used. Both designations for the symbol layout should be changed:

- In **line one**, an assigned PoT curve attribute should be displayed instead of the process name.
 - In **line two**, the estimated time attribute should be displayed.
- 1) The **Select Attribute** dialog is opened by clicking in the respective line of a symbol layout (in the example it is the process plantype). The title line of the dialog contains additional information on the editing status.

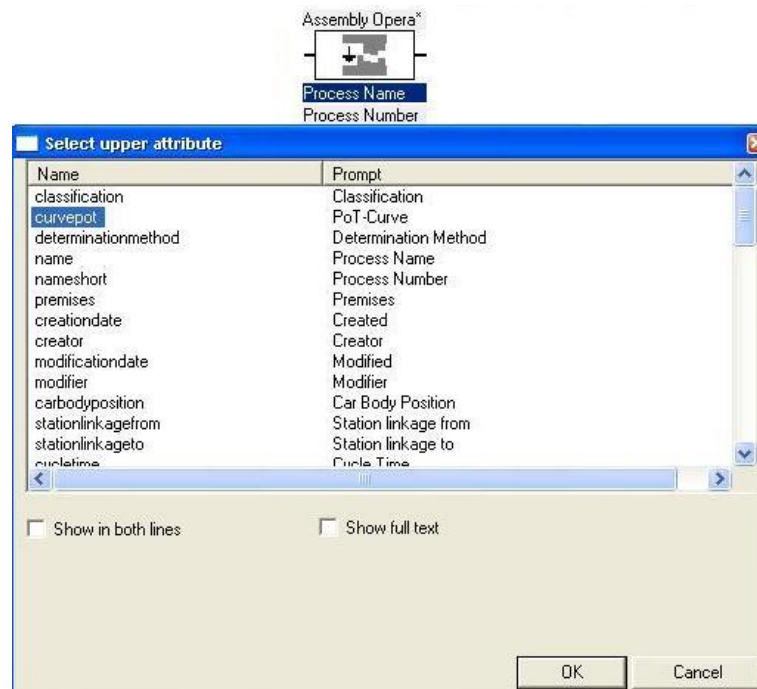


Figure 6: Select New Attribute – Line one PoT Curve

- 2) In the **Select Attribute** dialog select the attribute you would like to use for the symbol layout (in the example it is the attribute **curvepot** for the PoT curve display).
- 3) Confirm the selection with **OK**. *Please refer to the [Figure 6](#).* The change is immediately shown in the toolbar under the plantype and in the Process Graph.

Changes to the symbol layout are displayed immediately.

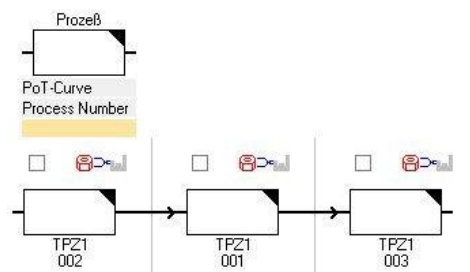


Figure 7: Display of Change to Line one in the PoT Curve

- 4) Select the attribute **time** to display the second line.

Second line symbol layout – use the attribute time.

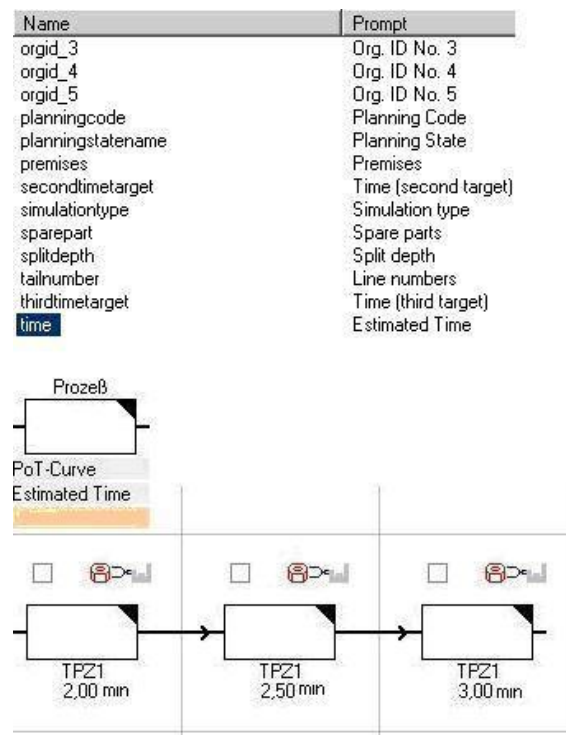


Figure 8: Designation Changed – Time is Displayed

3.1.1.2 Editing the Contents of Symbol Layout

The contents of a selected symbol layout are edited exclusively in the Process Graph under the plantype added (in the example, the plantype is process).



Note

The contents of the selected attribute are displayed only if the specifications for the selected plantype are provided: For example, if for the display values time and PoT curve there is an existing time/PoT curve for the process plantype.

- 1) Click in the line under the process symbol to open the **Edit Symbol Attributes** dialog.

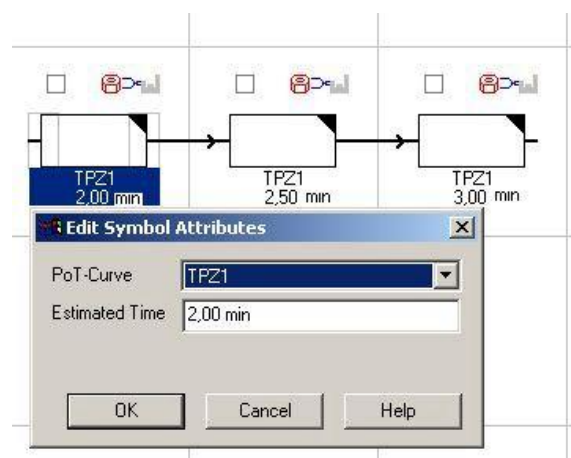


Figure 9: Edit Symbol Dialog

- 2) Another PoT curve can be assigned via drop-down list.
- 3) Enter the time in **Estimated Time** textbox.

3.1.1.3 Specifying the Step Value

You could select any configured attribute for displaying a step value, but it is not sensible to highlight deviations from the planned nominal value for every attribute.

The example with the **time** attribute shows you how to specify a step value. It is by all means sensible to highlight deviations from the planned process time for this attribute. The procedure to specify a step value is the same for all available attributes. You can reuse a previous attribute with the same plantype for the specification of a step value in the symbol layout.

The step value is entered only in the third line under symbol layout.

- 1) Click to open the **Select Attribute** dialog.
- 2) Select the attribute for which the step value is to be determined and displayed. In the example, the attribute **time** is again used for the estimated planned time of a process. Deviations (*Step value lower than target*, *Step value bigger than target*) from the target value are entered in percent.

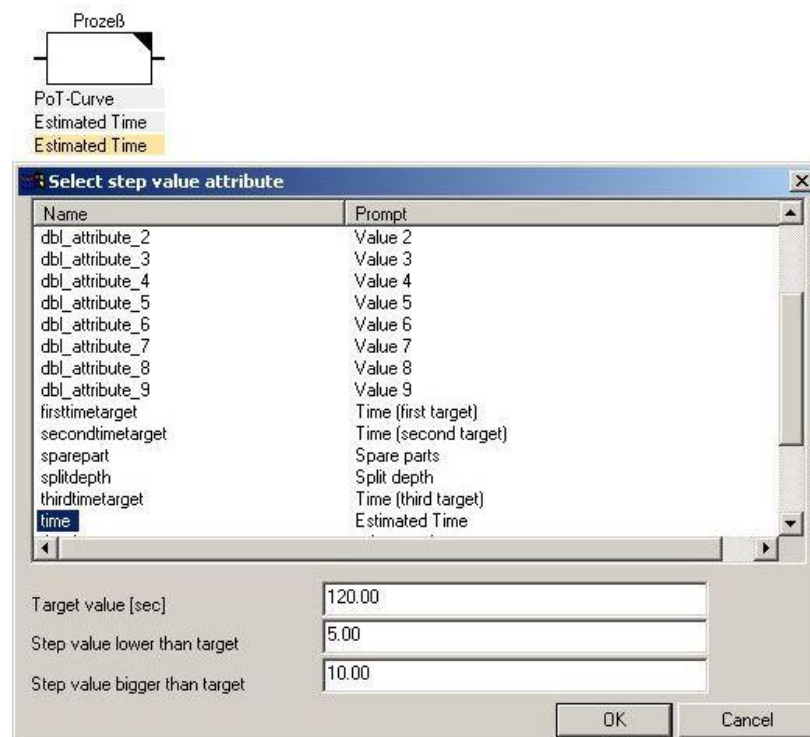
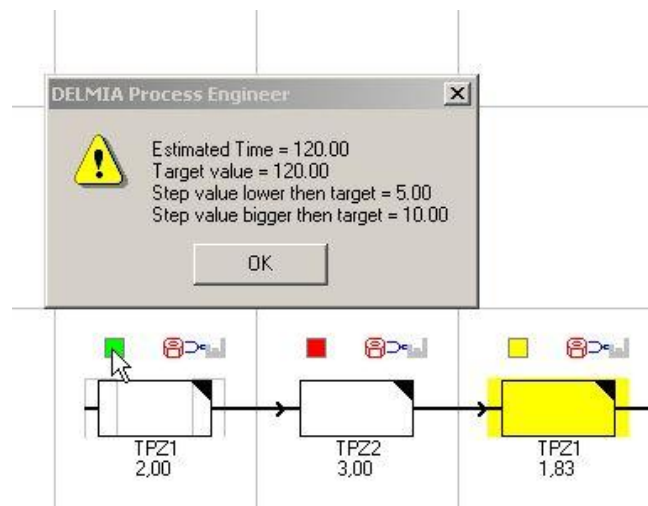


Figure 10: Specify Step Value in the Symbol Layout

- 3) Confirm the entries with **OK**.
 - 4) The specified target values are displayed in a message window; click the icon for the symbol layout above the process symbol.
- The colors in the icon for the symbol layout indicate whether the target values have been reached or exceeded.



Icons indicate the deviation from the target value.

Figure 11: Message for Symbol Layout – Check Target Values

- : Green means that 100% of the target value has been reached.
- : Red means that the target value has been exceeded or not reached.
- : Yellow means that the value is not yet within the allowed range.

The values can be adapted to the preset target value based on the display. *Please refer to the [Updating Status Field](#).*

For more information, *Please refer to the [Manufacturing Concept Manual](#).*



3.1.1.4 Updating Status Field

If you alter values because of the display, you must update the display.

Always update the view after making changes.

Open the context menu in the free Process Graph. Select **Recalc status field**. The display is updated.

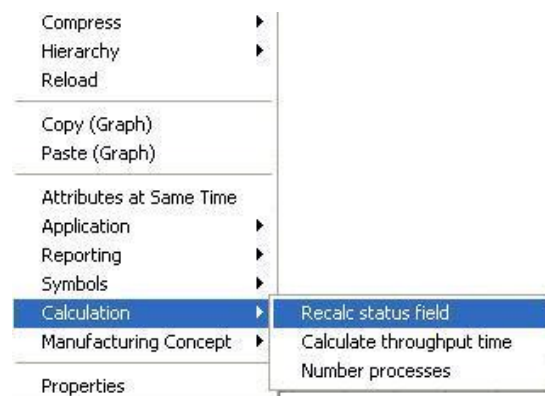


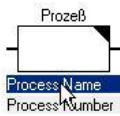
Figure 12: Open the Context Menu with the Right Mouse Button – Update View

3.1.1.5 Writing the Process Name in Two Lines

Names of processes and resources can as of version PE 5.13 can be written in two lines. The attribute **Show in both lines** single must be enabled for the various process or resource types. This display is also available in the Manufacturing Concept.

You must enable the field **Show in both lines** in the **Select attribute** dialog. A name can extend over two lines only if this field is enabled. This attribute is available only for the upper line under a symbol.

The names of all symbols of the same type (i.e. process, test process, work plan, etc.) for which this field is enabled are displayed in the upper line above two lines. This means that the contents of the second line are not displayed with this symbol.



Open the dialog in the upper line.

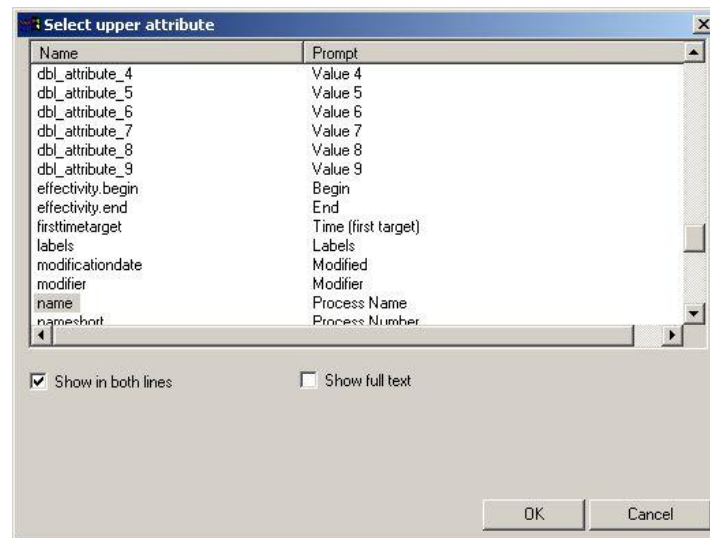


Figure 13: Dialog – Enable Name in Two Lines

The name of P2 is to be changed:

Example

- 1) Click under the symbol (P2) in the upper line in the Process Graph. The **Edit symbol attributes** dialog appears.

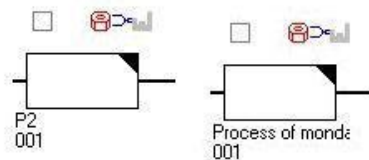


Figure 14: P2 Symbol

- 2) Enter the new name in dialog.

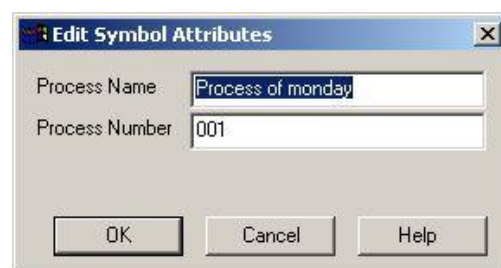


Figure 15: Change Symbol Attributes Dialog

- 3) To display the new name in two lines, enable the field **Show in both lines**. Please refer to the [Figure 13](#).
 - The name is displayed in two lines under the symbol.

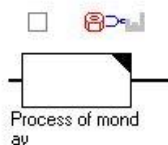


Figure 16: Display Name in Two Lines

3.1.1.6 Displaying Process Name in a Complete Line

Process and resource names can be displayed in the first line as full text for every plantype in the process graph and manufacturing concept configured for the process and resource structure.

If you select full text display for a plantype, the display follows this setting exclusively; the function **Show in both lines** is ignored, even if it is activated.

This display is also available in the Manufacturing Concept.

To Display the Name as Full Text

- 1) Open the **Select upper attribute** dialog as usual by clicking on the first line of a symbol layout (the assembly process plantype in the example). The title line of the dialog contains additional information on the editing status.
- 2) Check the field in the dialog for **Show full text**. The complete text is displayed in the first line for the respective plantypes.

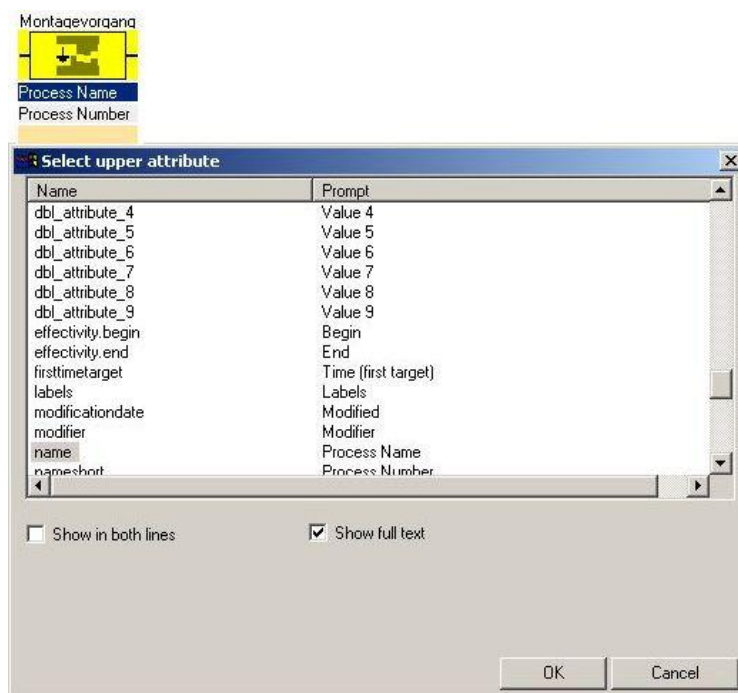


Figure 17: Dialog – Full Text Display for the First Line

In principle, you have three options for the display:

- One of the two fields is not activated
- To display the text of the first line in two lines
- Full text

The example of the **Assembly process plantype** clarifies the three possible displays. The respective pictures show what the display looks like.

- 3) If you activate neither one field nor the other (**Show full text, Show in both lines**) in the dialog, you can see this display:



Figure 18: Display – no Field Activated

- 4) If you activate **Show in both lines** in the dialog, you can see this display:



Figure 19: Display – Show in both lines activated

- 5) If you activate **Show full text** in the dialog, you can see this display:




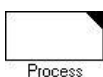
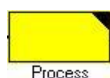
Figure 20: Display – Show in Full Text Activated

3.1.2 Adding Process Symbols

You can generate a Process Graph either by using the process symbols in the toolbar or by using the processes generated in the PPR Navigator. The process symbols generated in the PPR Navigator are arranged either vertically or horizontally in the Process Graph. Use the left mouse button to place these process symbols in the Process Graph; they can be edited in the same way as the process symbols in the toolbar.

3.1.2.1 Inserting Process Symbols from the Toolbar

This icon  must be enabled in the toolbar to insert and edit processes.



- 1) In the toolbar click on the process symbol that should be inserted. The symbol is highlighted in yellow and can be inserted into the Process Graph.
- 2) During the process of insertion, the form of the cursor changes to a parachute. As long as the cursor has this form, process symbols can be inserted into the Process Graph.
- 3) To insert a process symbol into the Process Graph, move the cursor to an empty field in the Process Graph and click on it. As long as a process symbol is enabled, you can insert as many process symbols as you like.

Only yellow highlighted process symbols are to be inserted in the Process Graph.

- 4) You can cancel the process of insertion by clicking on the enabled process symbol. The process symbol is no longer highlighted in yellow.
- 5) You can continue to enable additional process symbols and to insert them into the Process Graph.

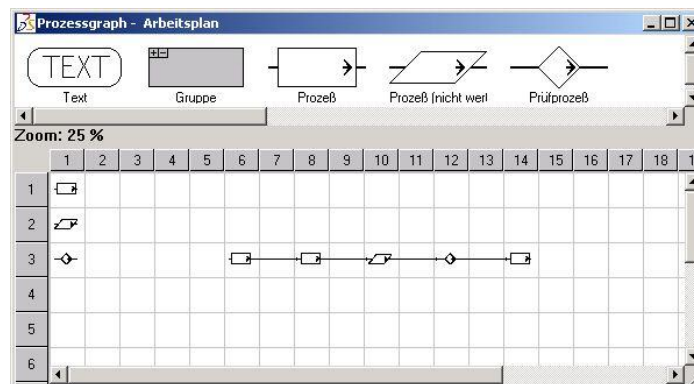


Figure 21: Process Graph with Inserted Process Symbols

3.1.3 Linking of Process Symbols

To determine the order of a Process Graph, the individual process symbols have to be linked. Following this procedure, you can determine the direction and the relations in which the processes should successively take place. The processes can be arranged in line or in parallel and can be linked.

For processes that are being linked the relations, need to be determined before linking.



Note

*As a rule, a distinction must be made between an **optional** and a **mandatory relation** when selecting the relations. When a **must-relation** is selected, this relation, as the name already indicates, has to be observed during the entire project, for example, in case of the **must precede** relation. In the case of this relation, a succeeding process always requires the same predecessor.*

*In the case of an **optional relation**, such as **runs before**, the succeeding process can have this preceding process, but does not need to have it. If the same process is used in different Process Graphs, different predecessors for the optional relation are possible, too. A mandatory relation is unambiguous throughout the entire project.*

The available relations are determined during configuration of the Process Engineer.

3.1.3.1 Selecting Relations

As of version PE 5.16 SP4 in the General Settings you can set whether the relation **Runs before** is shown as preset when creating a new process graph in the combobox **Relation to Create**.

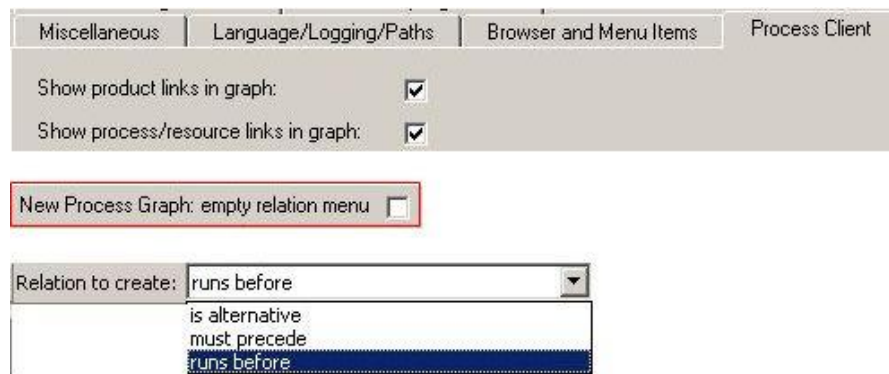


Figure 22: Combobox – Relations

Combobox Relations to Create is Empty

If you activate this setting, the default setting is deactivated. In addition to this, the combobox display is empty while a new process graph is being created.

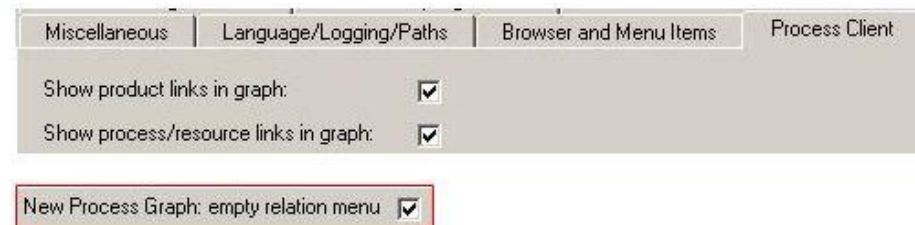


Figure 23: New Process Graph Empty Relation Menu

To create the relation in the graph, you must first select the relation. This global setting should help verify that the correct relation is always being used for linking processes.

The message shows that no relation has been selected.

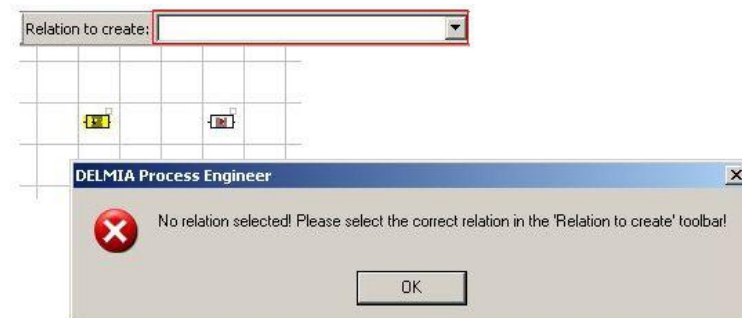


Figure 24: Relation not Selected

3.1.3.2 Linking Processes

A connecting line is always generated between two process symbols.

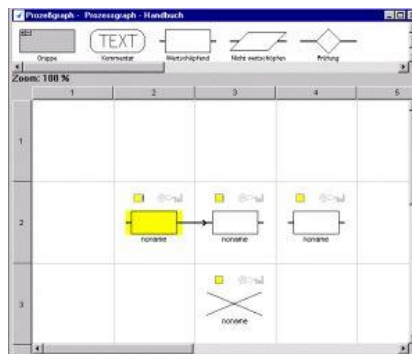


Figure 25: Linking Processes

- 1) To link processes, you first need to determine the relations. *Please refer to the Figure 22.*
- 2) Select the required process. If the cursor has the form of a pencil, the link between two processes can be established.
- 3) While holding down the left mouse button, move the cursor to the second process symbol. Release the mouse button. The link between the two processes has been established. *Please refer to the Figure 25.*

3.1.3.3 Automatically Linking Processes in the Graph

You can automatically link processes in a line with relations. A prerequisite for automatic linking of processes is that the processes are arranged in a line and that at least one process in the line is available. The successor process of the line is therefore automatically linked.

This function is also available in the manufacturing concept for the linking of resources.

Activating Automatic Linking

- 1) In order to automatically link processes, activate the field **Create relations automatically** in the **Select viewed relations** dialog. *Please refer to the Figure 30.*
- 2) You can open the dialog using the icon in the tool bar.
- 3) Insert the processes from the tool bar into the graphs as usual. The selected relation between the two processes is automatically created upon reaching the second process. All further processes inserted into this line are linked to one another automatically.



Click this icon to open the Relations dialog.

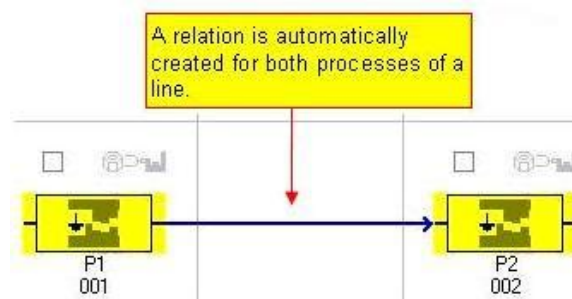


Figure 26: Example – Automatically Link Relations

Another Example of different Plantypes in the Process Graph

Automatic linking of different plantypes in a line.

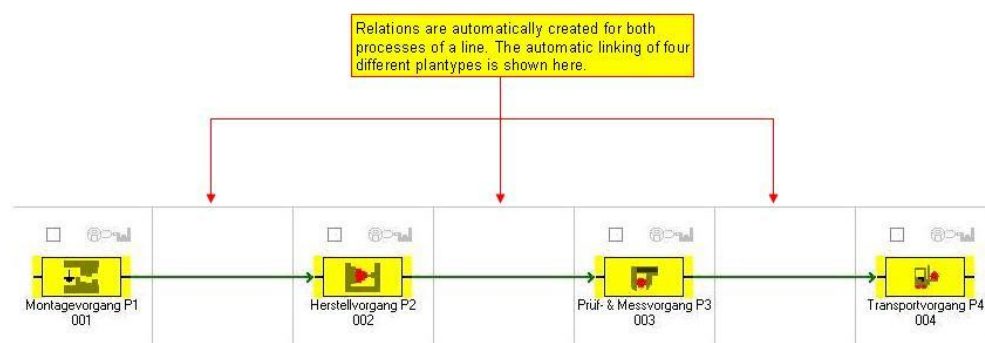


Figure 27: Example – Automatically Link Relations – different Plantypes

Parallel Process Lines

As mentioned above, processes can be automatically linked to one another only if they are arranged in a line.

If, for example, you create a process line in which the processes run parallel, you can continue to create parallel linked objects manually, or you can first automatically link the processes in a line and then move them so they are parallel. After moving the processes so they are parallel, the automatically created linked objects remain linked, just as if they are manually linked.

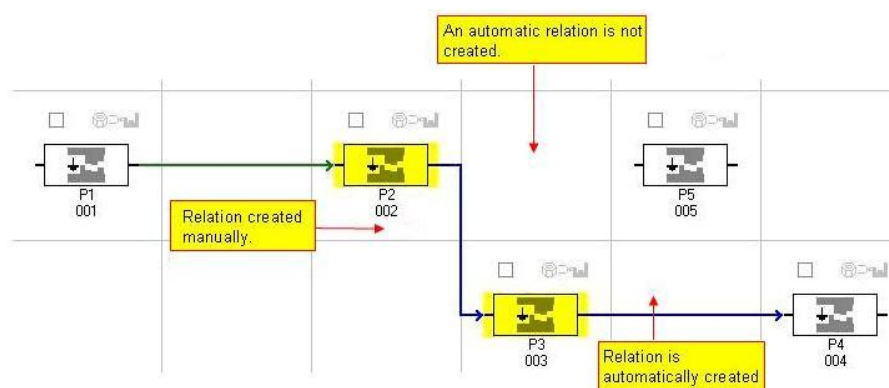


Figure 28: Example - Parallel Relations are not Automatically Created

3.1.4 Showing Relations

The connecting lines between the processes show that there is a link between the processes. There are relations between those linked processes. You can also select the display of the connecting lines in this dialog *Please refer to the Figure 29.*



Click this icon to open the Relations dialog.

- 1) To show a connecting line, checkmark the box next to **Relations**.
- 2) To horizontally display connecting lines, checkmark the box next to **Rectangular**.
- 3) In order to automatically link processes, activate the field **Create relations automatically** in the **Select viewed relations** dialog. *Please refer to the Figure 30, Figure 31, and Figure 32.*

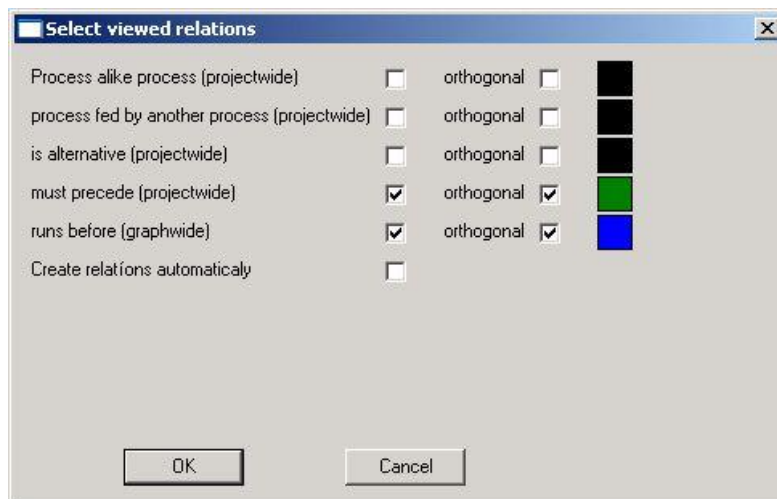


Figure 29: Show Links Dialog

The relations established between processes in the process graph are color-marked in a corresponding configuration. The colors of the relations set by the Configuration Manager are displayed in the **Selection of visible relations** dialog. Relations that are established between resources in the Manufacturing Concept can also be color-marked (highlighted). Please refer to the [Figure 29](#).

For more information, Please refer to the [Administration Manual](#).



Displaying Connecting Lines in the Process Graph

Example

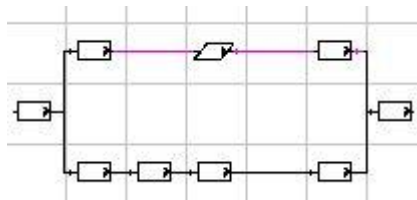


Figure 30: Connecting Line – Horizontal Display

Example

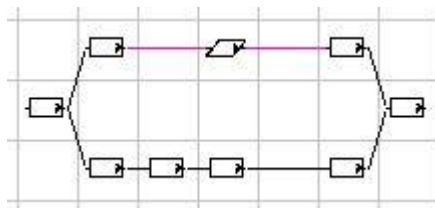


Figure 31: Connecting Line – no Horizontal Display

Highlighting Relations

Highlighting of the relations gives you a quick overview of the relations that exist between the processes. You can select any colors you like in the Configuration Manager for displaying the relations.

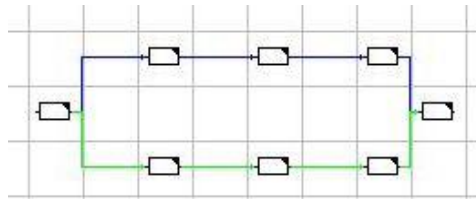


Figure 32: Connecting Lines - Highlighting Relations

3.1.4.1 Showing Relations in the Graph

In the general settings you can set how the relations should be shown in the graph.

- If you have activated the setting **New Process Graph: slanting relation line**, relations in the graph are shown as slanting lines in when creating a new process graph.



For more information, *Please refer to the* [Settings Manual](#).

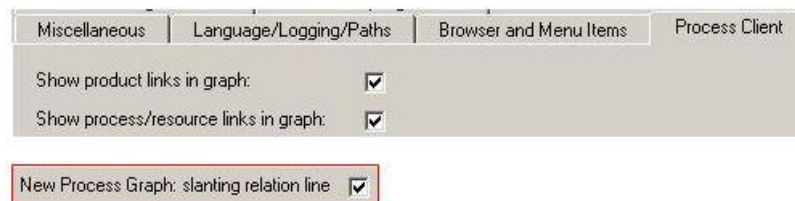


Figure 33: General Settings – Slanting Relation Line Activated

3.1.4.2 Changing General Settings in Graphs

The display of the relations in the process graph can be changed in the dialog **Select viewed relations**. *Please refer to the* [Figure 29](#).

Example One

The process graph is created in this example. The setting **New Process Graph: slanting relation line** is activated in the general settings. The fields relevant for the display of the relation – see [Figure 34](#), **orthogonal** – are not activated.

Relations are displayed as slanting lines as set in the general settings.

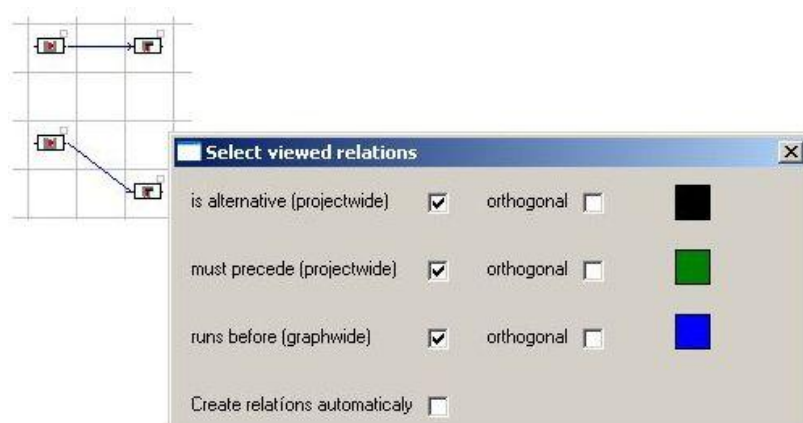


Figure 34: Slanting Relation Lines

Example Two

The display of the relations for newly created process graphs pre-specified in the general settings. [Figure 34](#) can be changed for every process graph. A change to the general setting affects only these process graphs.

In this example, the slanting relation line display from **example one** is changed. The relations should be shown orthogonal in graphs.

The relations correspond to the relation type **runs before** - (in this graph).



- 1) In order to change the slanting line display of the relations in graphs, open the dialog **Select viewed relations**.
- 2) Select the used relation type (**runs before**); to do this click in the field for **orthogonal**. All relations of this relation type are displayed in orthogonal.
- 3) In order to display the relations permanently with this setting, save the process graph.

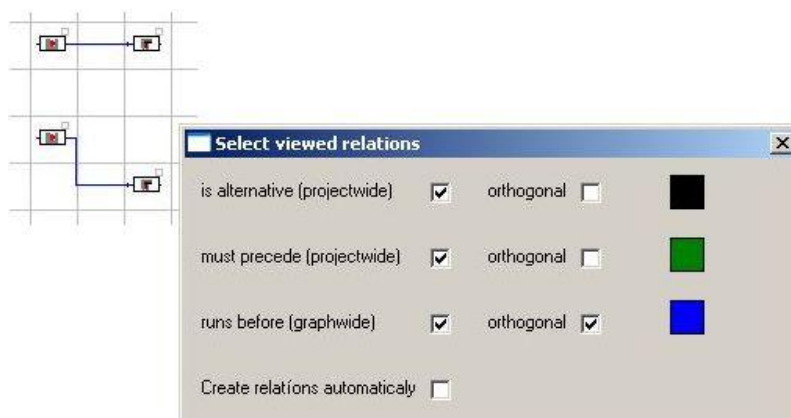


Figure 35: Change Display of the Relations

3.1.5 Displaying Filtered Processes

Relations and processes of filtered projects can be displayed in the Process Graph. To do this, you must checkmark the **Show filtered symbols in graph** entry in the Process Engineer settings

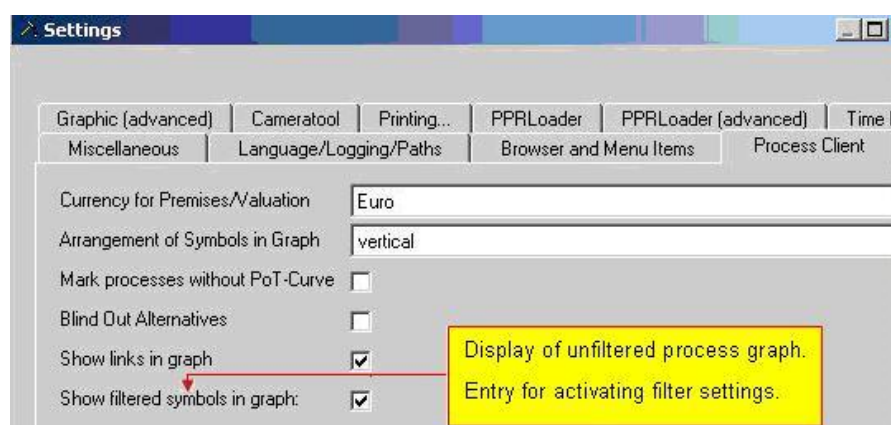


Figure 36: Activate Entry for Filtered Symbols

- 1) You can call the Settings dialog by clicking **Tools < Settings**.
- 2) Activate **Show filtered symbols in graph** under the **Process Client** tab and checkmark the field.

Code rules that have been assigned to the processes must be available in the Project in order to get a filtered display in the process graph. These code rules can be set as a filter when a project is opened and the process graph is displayed with the filtered process symbols according to the selected filter.

A filtered process symbol cannot be edited. The display of filtered process symbols provides you with a complete overview of the entire planning progress that has been developed up to this point in time. You can continue to edit the **non-filtered** process symbols.



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

Unfiltered Process Graph Opened

You can edit all process symbols.

Display of unfiltered process graph

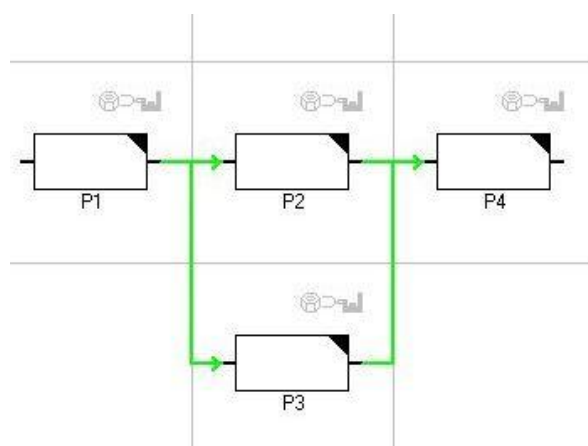


Figure 37: Example – Displaying Unfiltered Process Graph

Example

Display of filtered process graph.

Filtered process graph opened

Filtered process symbols stand out from other process symbols by the display – see the display of the two processes **P2** and **P3** in the [Figure 38](#). Filtered processes cannot be edited, but they do exhibit the current planning status.

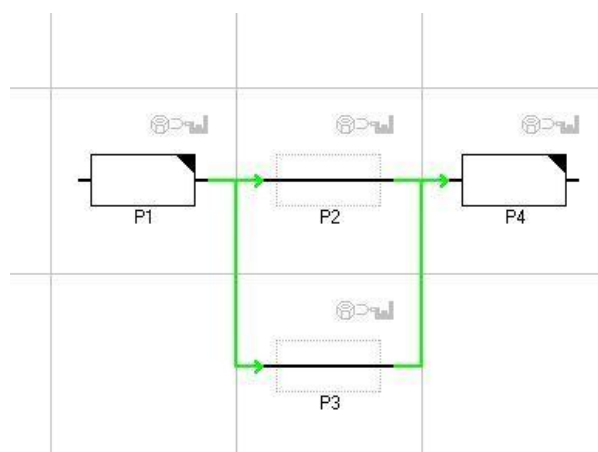


Figure 38: Example – Displaying Filtered Process Graph

3.1.6 Editing Properties for Connecting Lines

The properties of a connecting line can be edited in the connecting lines **Extended Properties** dialog. Two functions are available for editing in the context menu. Both functions – **Change route** and **Extended properties** – are

executed using the right mouse button context menu. Use these functions, for example, to change the route direction of the connecting line.

In the [Figure 39](#) below, the first process is moved downwards. By using these two functions, you can change the route of the connecting line.

- 1) To execute this function, click a connecting line; the line is marked red.
- 2) Press the right mouse button to open the context menu. *Please refer to the [Figure 39](#).*

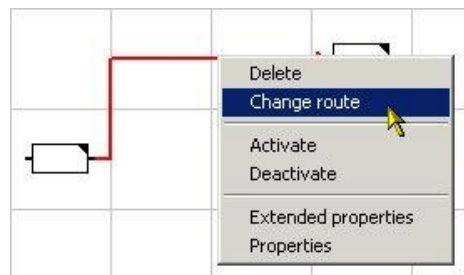


Figure 39: Connecting Line – Change Route Context Menu

Connecting Lines Properties Dialog

Enter the informative data for planning a connection between processes.

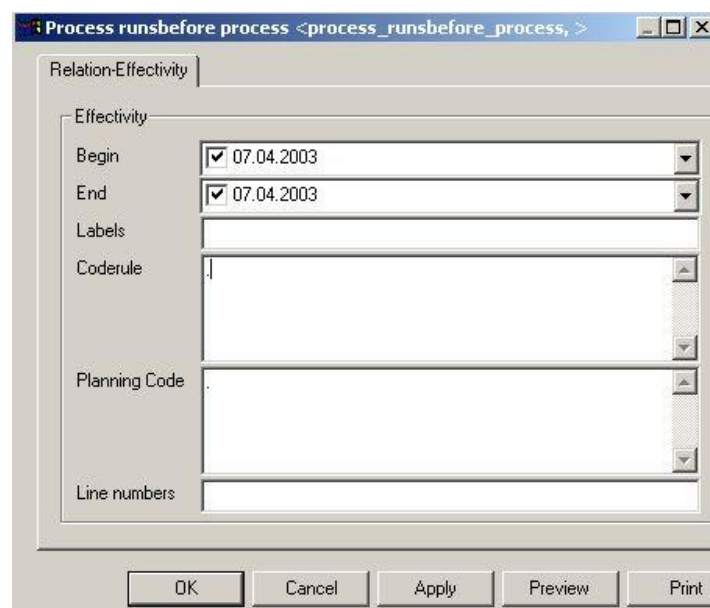


Figure 40: Connecting Line Properties Dialog – Informational Data only

There are two possibilities available to change the route of a connecting line in the **Extended properties** menu. In contrast, the **Change route** context function only offers one option to change the route. However, you can edit the course subsequently in the **Extended properties** dialog.

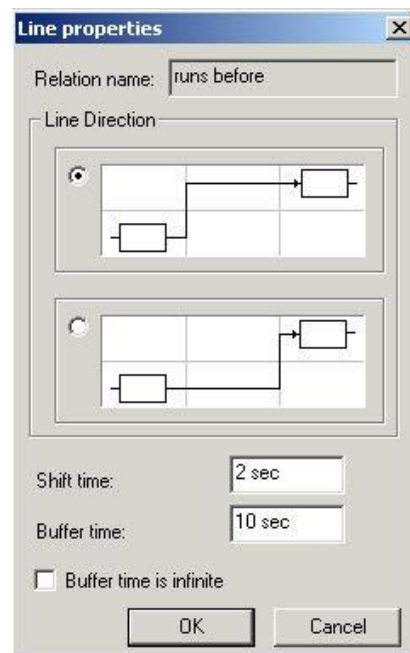


Figure 41: Properties Dialog with Display

In addition, in the Extended properties menu you can specify data for shift time and buffer time. These two entries determine when a succeeding process should start. *Please refer to the [Figure 42](#).*

Linking of two processes, for example, determines that **process A** is to be followed by **process B**.

Example

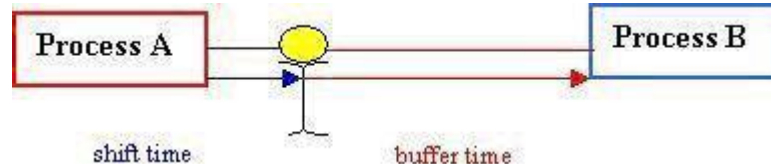


Figure 42: Buffer Time for Succeeding Process - Symbols

As **shift time**, for example, 2 seconds are entered. This means with regard to the **succeeding process B**: **Process B** can start the manufacturing process two seconds after the **preceding process A** is finished at the earliest.

As **buffer time**, for example, 10 seconds are entered. This means with regard to the **succeeding process B**: **Process B** can start the manufacturing process two seconds (shift time) after the **preceding process A** is finished at the earliest, but must start the manufacturing process after 12 seconds (shift time plus buffer time) at the latest.

Conclusion

In principle, the specification of these two times determines a duration in the course of which the succeeding process needs to start.

The buffer time can also be **ignored** by checkmarking the box **Buffer time is infinite**. If this box is enabled, the buffer time is infinite. Which means that there is no time limit by which time the succeeding process needs to start. *Please refer to the [Figure 41](#).*

3.1.7 Moving Processes



This icon must be enabled to edit processes.

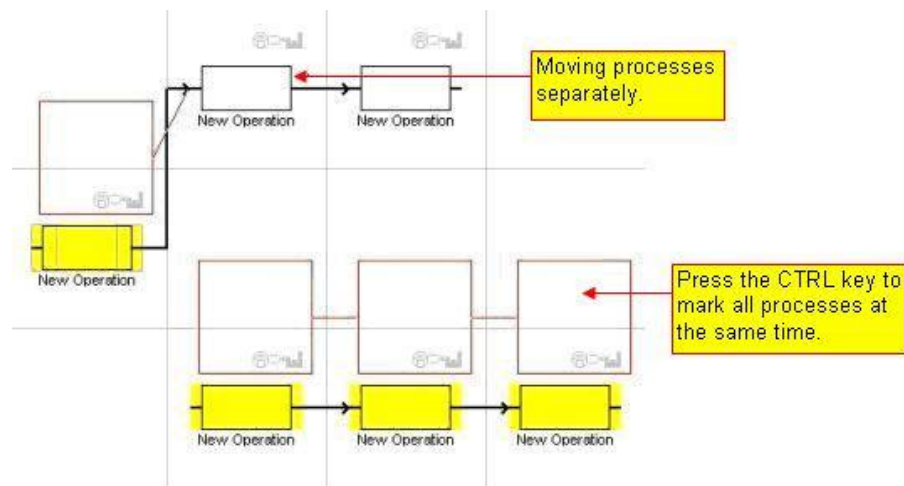


Figure 43: Moving Processes using or not using the CTRL Key

3.1.7.1 Placing Process Symbol at a New Location

- 1) Click process symbol that you would like to move. Move the process symbol marked and highlighted in yellow to the target cell by holding down the left mouse button.
- 2) Release the mouse button. The process symbol is added to the target address.

To Move Several Process Symbols at Once

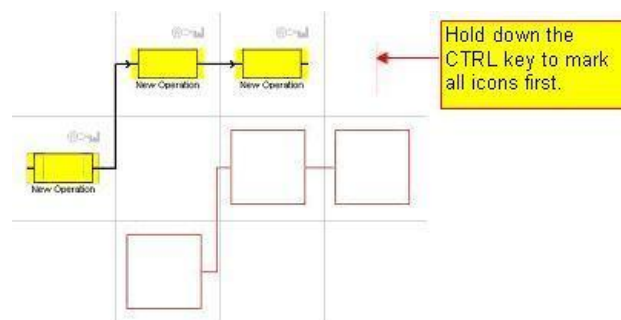


Figure 44: Moving of Several Processes at Once

Press the CTRL key to mark the individual symbols.

- 4) Before moving the symbols, release the CTRL key. If the target cell is not empty, the following error message appears on the screen.

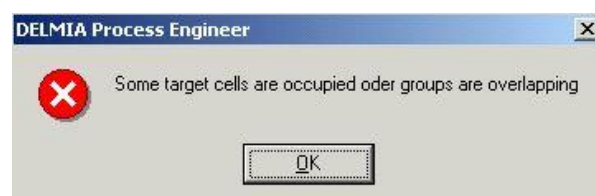


Figure 45: Error Message

- 5) Release the CTRL key. Click one of the marked symbols and move the cursor to the target cell. Release the left mouse button; the symbols are inserted.

- 6) In the case of linked processes, the connecting lines are also moved.
- Or a little bit easier -
- 7) Simply draw a frame around the symbols.

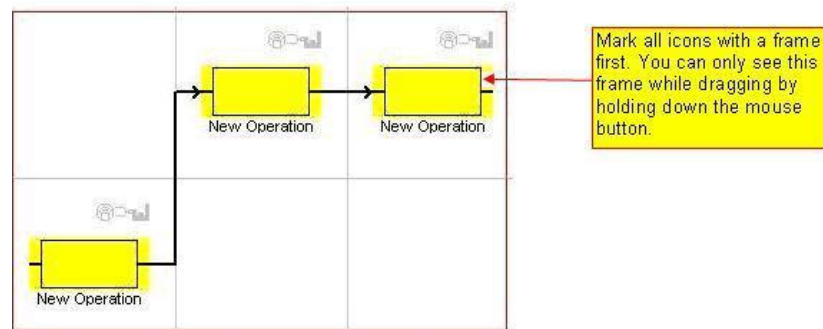


Figure 46: Make a Frame

- 8) Use the left mouse button to click in the empty field of the Process Graph. When moving the mouse, the red frame is formed. To select, draw the frame around the process symbols.
- 9) Release the left mouse button.
- 10) The frame now invisibly encloses the symbols.
- 11) Click one of the marked symbols and move the cursor to the target address.
- 12) Release the left mouse button. The process symbols have been moved.

3.1.7.2 Moving of Lines and Columns



Click this symbol in the symbol bar to simultaneously move the content of lines and columns.

When you have selected this symbol, you can move processes to the next line or column.

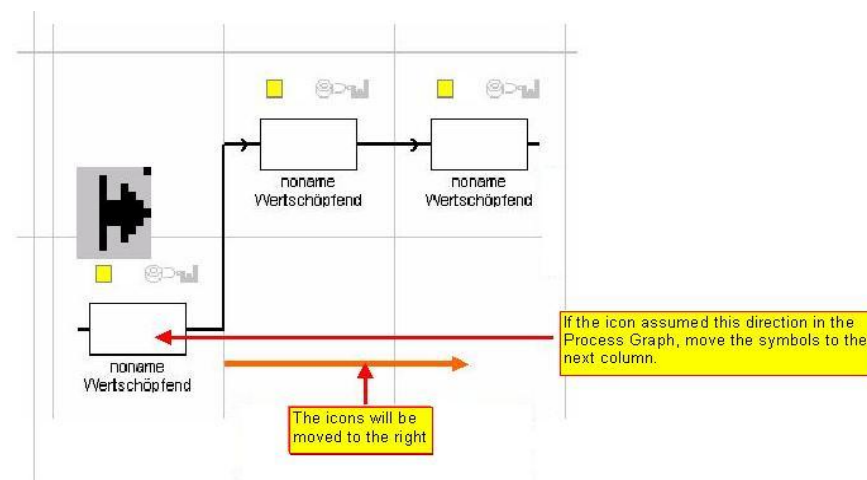


Figure 47: Moving Symbols in the Process Graph

- 1) Click the symbol in the symbol bar.

- 2) Insert the symbol into a line or a column. The symbol always assumes the direction in which you can move.
- 3) Left-click in the field. The symbols move to the next line or column in the direction chosen. You can move the symbols in all 4 points of the compass.
- 4) If you only want to move the contents of a line or a column, press the CTRL key. Press the CTRL key to move only the content of a line or a column.

Use this function also to create empty space for a new process.

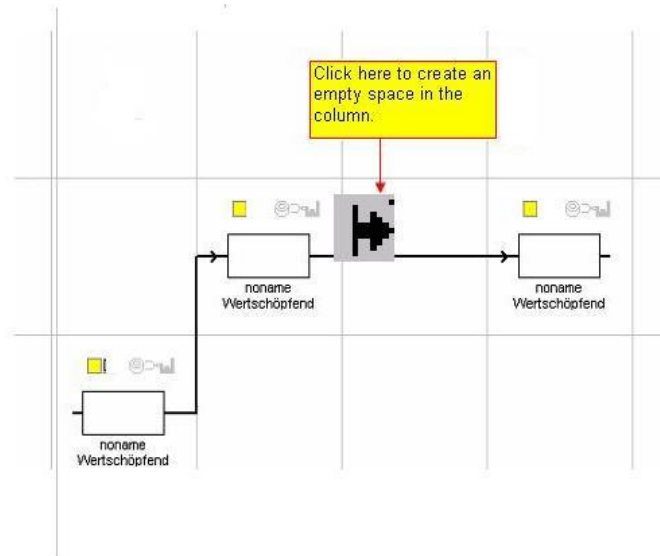


Figure 48: Moving Symbols – Creating Empty Space

3.1.8 Copying of Processes



This icon must be enabled to edit processes.

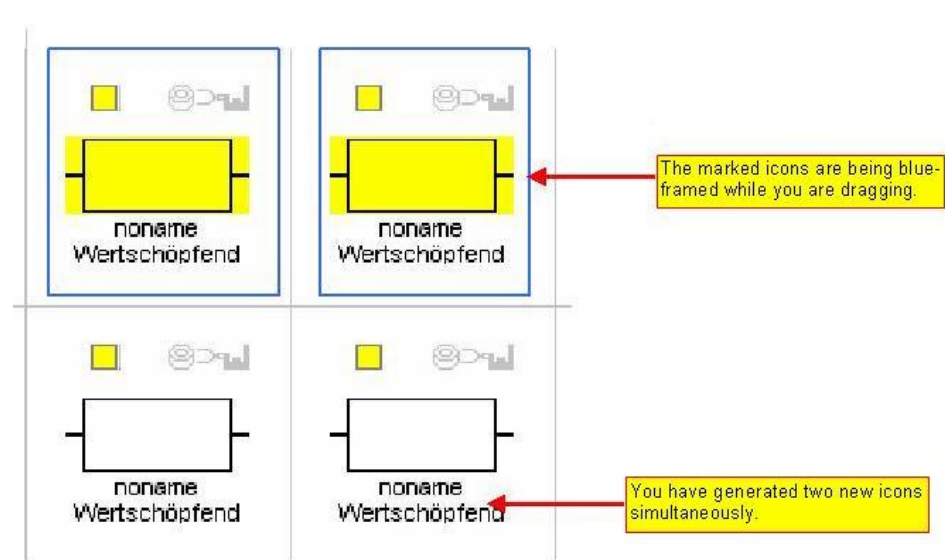


Figure 49: Icons

- 1) While moving a process, release the CTRL key before inserting into the target cell. While copying, use this CTRL key to mark and insert.
- 2) While holding down the CTRL key, mark a process.
- 3) Hold down the CTRL key and move the marked process to the target cell.
- 4) Release the CTRL key to finish the copying process. You have now created a second symbol.
- 5) If you want to copy several symbols, select the symbols and move them to the target cell while holding down the CTRL key.
- 6) Release the CTRL key. The symbols are inserted into the new cell.

3.1.9 Grouping of Processes



This icon must be enabled to edit processes.

Groups can be created in two different ways. Using the **Top – Down – Method**, the processes are first created and then grouped into one group. Using the **Bottom – Up – Method** the group is first created and the processes are then assigned to the group.

3.1.9.1 The Top – Down - Method

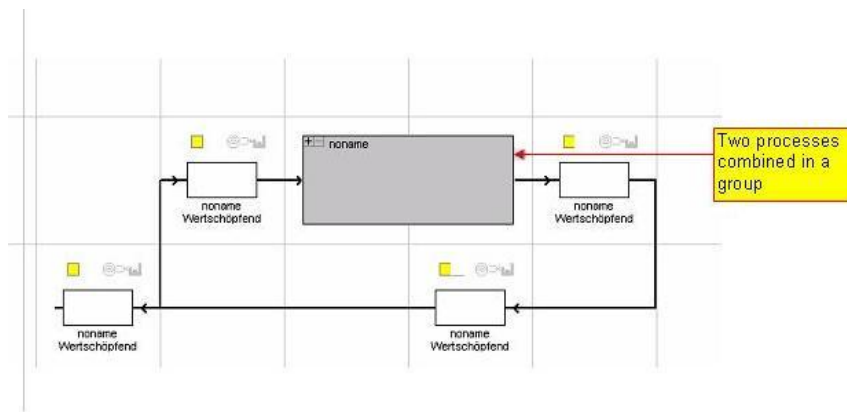


Figure 50: Top – Down - Method

- 1) Mark the process symbols that you want to combine to one group. Hold down the CTRL key and mark the individual process symbols successively. The marked symbols are highlighted in yellow.
- 2) Release the CTRL key.
- 3) Now press the right mouse button and select the function **Create group**. The grey rectangular group symbol appears on your screen. As a result, you have created a group, which can be edited.
- 4) Click plus sign in the group symbol. The group opens and you can see the individual group symbols.

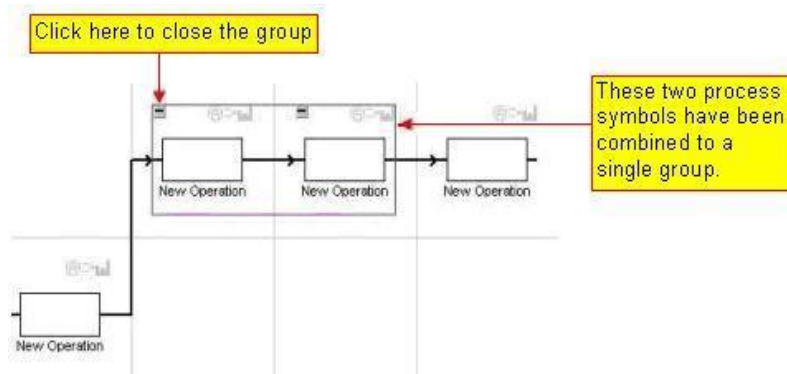


Figure 51: Creating Group - Closing

- 5) If you want to assign a name to the group, you have to close the group again. Click minus sign in the opened group.
- 6) The familiar grey rectangular group symbol appears on your screen again.
- 7) Click closed group symbol to mark it. The group symbol is highlighted in yellow again.
- 8) Press the right mouse button. Select the Properties function. The Properties menu is opened. *Please refer to the [Figure 52](#).*

Figure 52: Group Properties Menu

- 9) You can delete processes or groups by selecting the corresponding symbol and by selecting the Delete function using the right mouse button.

3.1.9.2 The Bottom – Up - Method

This icon must be enabled to edit processes.

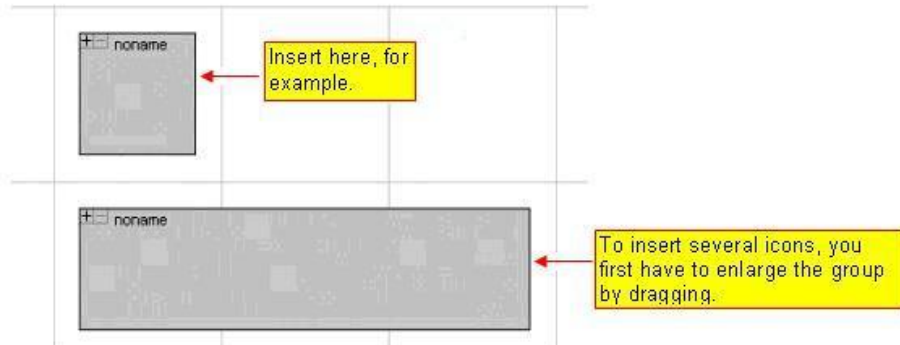


Figure 53: The Bottom – Up - Method

- 1) Click icon to change to the working mode.
- 2) Select the group symbol from the symbol bar and add it to the layout.
- 3) Click location where the group symbol should be inserted.
- 4) Now click symbol to enlarge the group. All directions are possible. You can use this symbol also to reduce groups.
- 5) Click edge of the group, the cursor assumes the form of cross hairs. Drag until the desired size has been reached. Change to the working mode again.
- 6) To open the group, click plus sign in the group.



- 7) Successively add several process symbols. You still know how this is done: Select the process symbols in the symbol bar and insert them into the Process Graph. Without enlargement the space is sufficient for one process symbol.

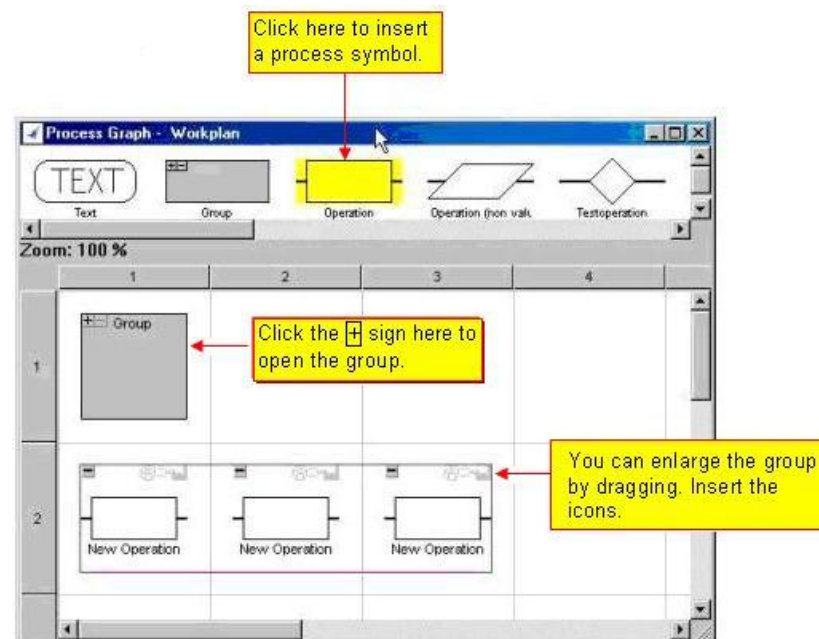


Figure 54: Editing a Group

3.1.9.3 Deleting a Process/Group

- 1) To delete a process or a group, mark the corresponding symbol and press the right mouse button.
- 2) Click **Delete** function. The marked symbol is deleted. *Please refer to the [Delete Options in the Process Graph](#).*

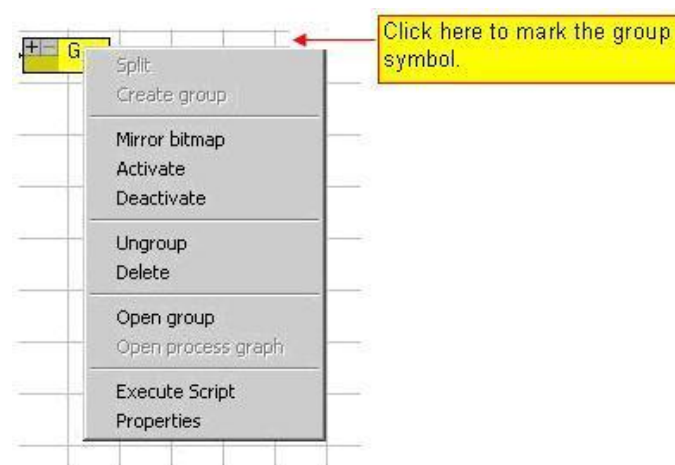


Figure 55: Delete Function

3.1.10 Splitting of Processes

It is very time efficient to create processes using the Split function if they are needed at another location. Using the Split function, you can generate new processes with the same properties that you can edit afterwards.

Operation <New Operation,...>

General | Time | Organisation | Simulation | Notes | Version Information | 3D-View | Effectivity | Planttype Ini

Process Name: Operation

Process Number: New Process

Classification: Core Process

Allowance Set:

Premises:

Has Process Graph:

PoT-Curve:

Car Body Position:

Write Change Protocol: ☐

Timestamps:

Created: 14.10.2002 13:24:58

Modified: 14.10.2002 13:24:58

Car body Position

OK Cancel Apply Preview Print

The output process Properties menu.

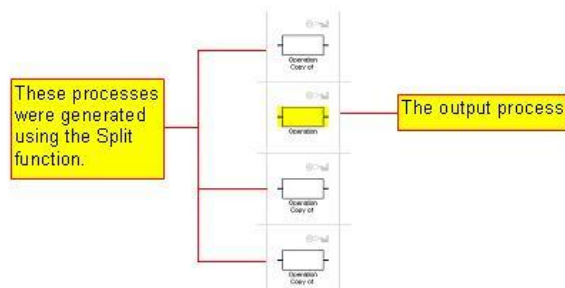


Figure 56: Splitting of Processes

To Split a Process

- 1) Mark a process symbol by left-clicking.
- 2) Press the right mouse button and click **Split**. The context menu **Split symbol** appears.

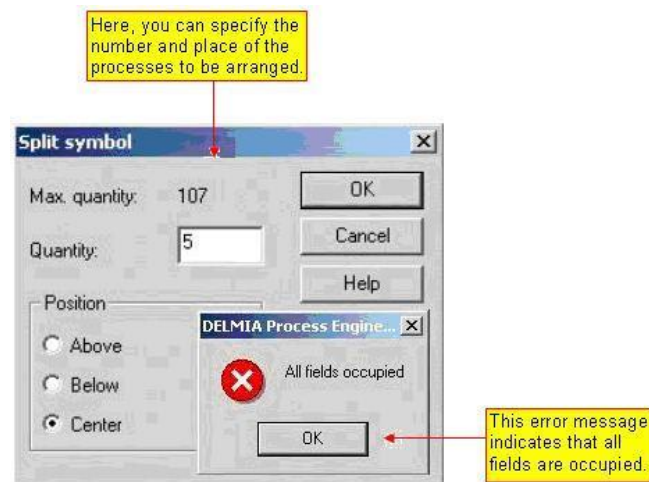


Figure 57: Split Processes Dialog



Note

If you generate new processes using the Split function, you must always make sure that there are enough lines available in the target area.

- 3) You can select between “Above”, “Below”, or “Center”.
- 4) If you have selected “Above”, the process symbols are arranged above the start symbol.
- 5) You can determine the quantity of the symbols to be created. In the **Quantity** field, the number one is always preset. At least one new symbol is created. If you can enter a zero, no new symbols is created.
- 6) If you have selected “Below”, the processes are arranged below the start symbol according to their quantity, which you have determined.
- 7) If you have selected “Center”, the symbols are arranged evenly around the start symbol. A prerequisite is always that there is enough space in the target area. If there is not enough space, the symbols are arranged in one direction in an empty space. *Please refer to the [Figure 57](#).*

3.1.11 Linking Products to Processes

Customer-specific relations can be configured in the Process Engineer. In this section, four configurable relations are explained; using those relations, a product can be linked to a process.

In the Process Graph, a product always has to be linked to a process using Drag and Drop.



Figure 58: Selecting Relations Dialog

3.1.11.1 Determining Relations

Process Creates Product

This relation should be selected when a product has been finished after this process. The product may be a completed part, a subassembly or a fully-assembled part for example, in the case of a process or final assembly. *Please refer to the [Figure 58](#).*

Process Processes Product

This relation should be selected when a product is processed in a process. The product may be a subassembly or a part that has been processed and completed in previous processes and that is now to be processed further, for example, in an assembly process. *Please refer to the [Figure 58](#).*

Process First Processes Product

This relation should be selected when a product is processed by a process for the first time. The product may be a raw material from a parts bin. *Please refer to the [Figure 58](#).*

Process Removes Product

Select this relation to remove a product, for example, a safety device for an assembly part or the direct removal of an assembly part. *Please refer to the [Figure 58](#).*

3.1.11.2 Show Product Links via Script

Use the script to open a dialog in which all product links to the processes in the Process Graph are shown.

- You can execute the script for the entire Process Graph; then all existing product links in the Process Graph are shown in the dialog.
- You can execute the script for one or more selected processes, then the respective product links of the selected processes are shown in the dialog.

The display in the dialog makes for a quick overview of existing product links.

- You can create new product links directly from the dialog by dragging and dropping to processes.

3.1.11.3 Opening the Dialog

Always open the dialog via the context menu.

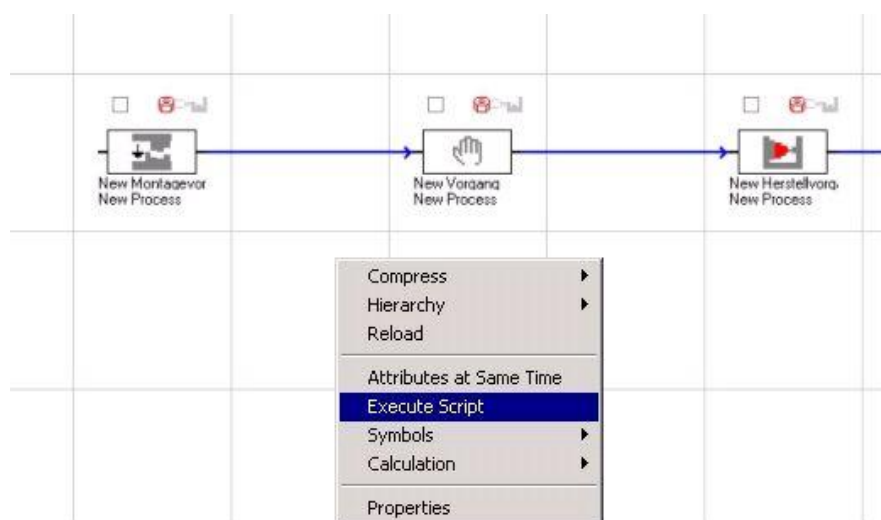


Figure 59: Execute Script via the Context Menu

- 1) In order to open the dialog for the entire Process Graph, click in an empty field, open the context menu, and select **Execute Script**.
- 2) In order to open the dialog for selected processes, select one or more processes, open the context menu, and select **Execute Script**.

3.1.11.4 Start Script

- 1) Select the script in the dialog. In the example, the name of the script is **PG-D&D List of linked products**. You can change the name of the script to suit your individual needs.
- 2) Click **OK**. The dialog opens up.

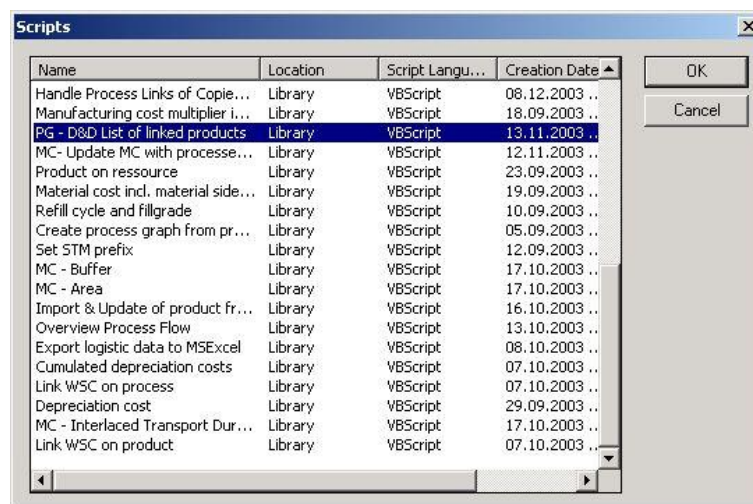


Figure 60: Selecting a Script in a Dialog

3.1.11.5 Display Linked Objects in the Dialog

The linked objects are shown in the dialog.

You can create new links by drag and drop.

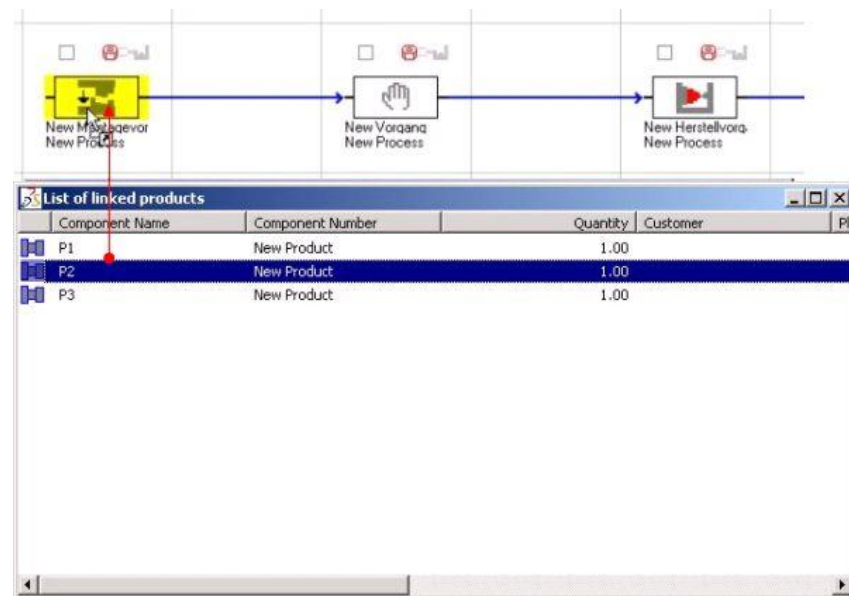


Figure 61: Dialog with Display of the Product Links

3.2 Delete Options in the Process Graph

If you execute this right mouse button context function for a selected process, you can be asked on which level you want to delete processes. In the PPR Navigator, processes are generated in a hierarchical way and displayed in the form of a tree structure. According to your selection, either processes with the corresponding structure or only certain links to other hierarchical levels are deleted.



Figure 62: Message – three Delete Options to select from

- **Link Flat:** Using this option, you can delete all links to the next hierarchical level (in ascending order). However, the process itself cannot be deleted. If (a) further hierarchical level(s) is/are assigned to the process, these links cannot be deleted.

Example

If the process you want to delete is linked to a resource in the Manufacturing Concept.

If you select this delete option, the process is deleted from the Process Graph. However, the process remains in the process structure. As a consequence, the process of the linked resource is evaluated as a machine-dependent process.



Note

To avoid such problems, delete all links to the resources in advance.

- **Component Flat:** Using this option, you can delete the entire process. If (a) further hierarchical level(s) is/are assigned to the process, these links cannot be deleted. After deleting, all links to higher or lower hierarchical levels have disappeared. They have been deleted.
- **Deep:** Using this option, you can delete the process and the assigned lower hierarchical levels. After deleting, all links to the higher hierarchical levels have disappeared. They have been deleted.

3.2.1 Deleting Processes

In Version PE 5.12, existing relations between processes are automatically re-created 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.

Relations play an important role when a process is deleted from a process line. Project-wide relations between processes of the same type which are available in other Process Graphs of a project are, upon deletion, treated differently from relations valid for only one Process Graph.



In the case of relations, which are hidden in the **Selection of the visible relations** dialog, no new links are automatically formed between the processes after a process is deleted.

3.2.1.1 Forming Project-Wide Relations between Similar Processes

Project-wide relations (must precede) between similar processes are valid for these processes in all Process Graphs of a project. *Please refer to the [Figure 63](#) and [Figure 64](#).*

Example

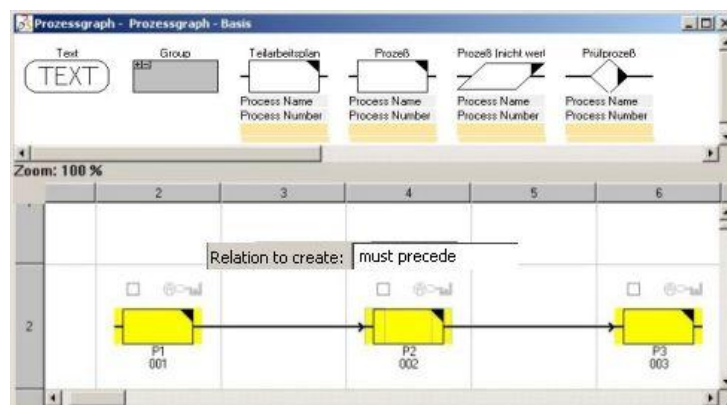


Figure 63: Project-Wide Relation must Precede Formed

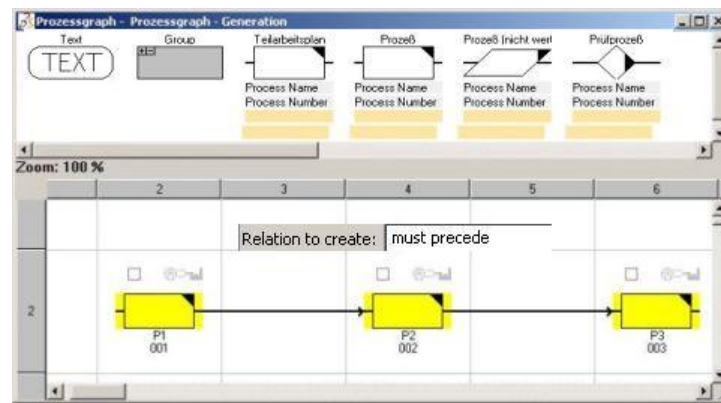


Figure 64: Same Relation in another Process Graph Formed

3.2.1.2 Forming Process Graph-Wide Relations between Similar Processes

Example

Relations meant to be value only for one Process Graph (runs before) between similar processes are not automatically comprehended in other Process Graphs of a project. Please refer to the [Figure 65](#) and [Figure 66](#).

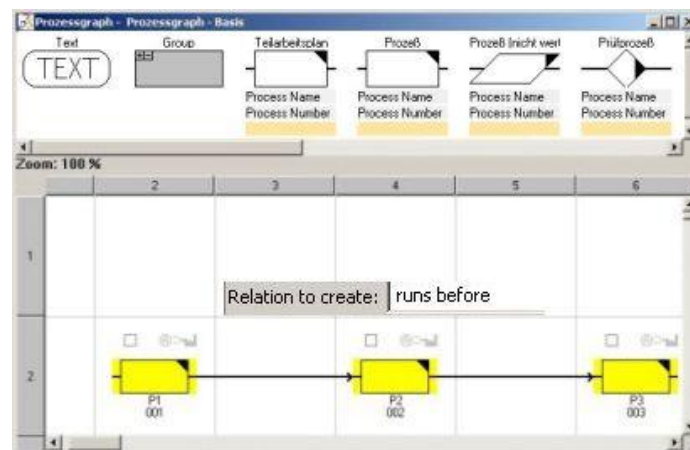


Figure 65: Relations Runs before Formed

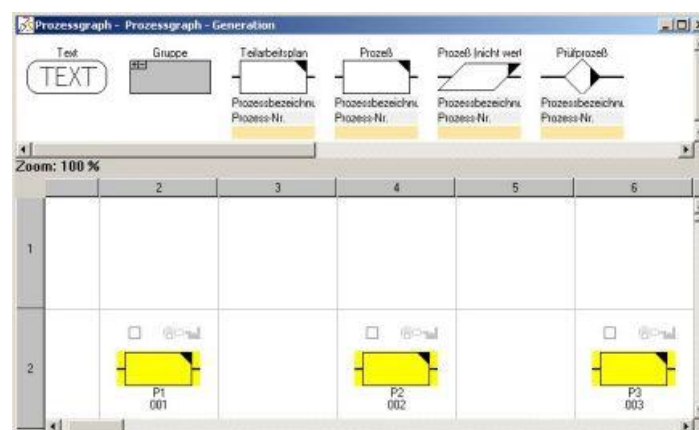


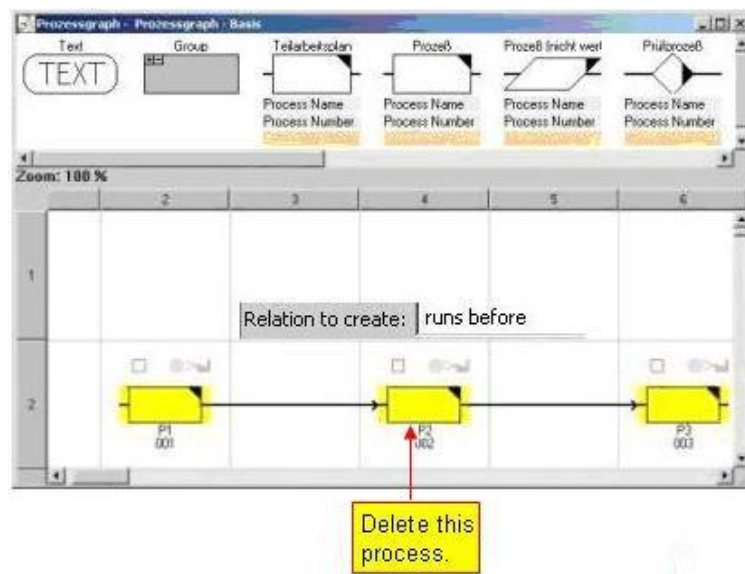
Figure 66: Relation runs before not formed in other Process Graphs

3.2.1.3 Deleting Processes with Process Graph-Wide Relations

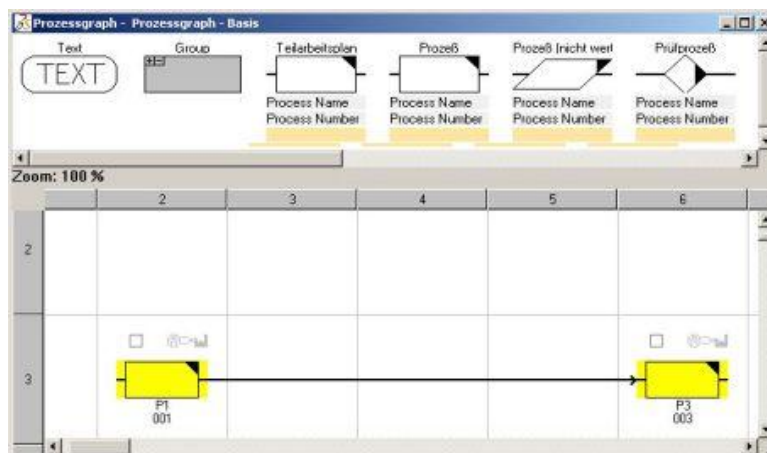
Several simple examples shows you how to delete processes linked to Process Graph-wide relations.

Example

- 1) Create an empty Process Graph.
- 2) Generate three processes and link them to the relation *runs before*.
- 3) Delete the middle process.

**Figure 67: Delete Process**

- The link with the same relation (runs before) is automatically formed between the two processes.

**Figure 68: Link after Deleting****3.2.1.4 Deleting Two Processes at the Same Time**

If, for example, you delete two or more processes in one process line at the same time, no new links are automatically formed. You have to generate these links manually, as in previous versions. If, however, you delete two or more processes sequentially, the links are formed automatically.

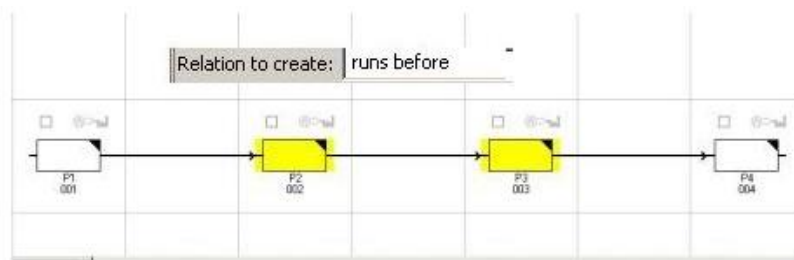


Figure 69: Deleting Two Processes – no Automatic Linking



Figure 70: No Link – Automatic between the Processes

3.2.1.5 Deleting Processes with Project-Wide Relations

Several simple examples shows you how to delete processes linked to project-Wide relations.

- 1) Create an empty Process Graph.
- 2) Generate three processes and link them to the relation *must precede*.
- 3) Delete the middle process.

Example

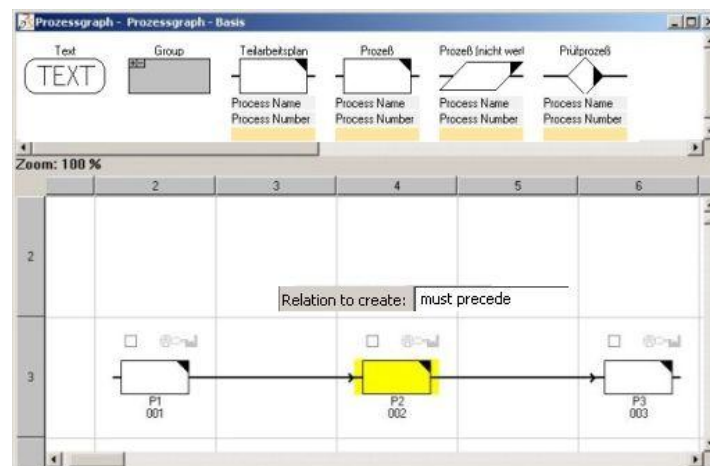


Figure 71: Deleting Processes - Project-Wide Relation must Precede Linked

- 4) If you confirm the message with **Yes**, the relation is generated after deletion in all Process Graphs of a project in which the same processes are available.
- 5) If you confirm the message with **No**, the relation cannot be generated after deleting.



Figure 72: Message – should Relation be Formed

3.2.1.6 Special Notes on Deleting Processes

When deleting processes, no new relations are automatically formed if

- Different relations are generated between the processes.
- The number of relations at the start and end of a process is greater than one.
- Processes are displayed as filtered or deactivated.
- A group is deleted from a process line.

3.2.1.7 Deleting Processes with different Relations

If there are different relations between processes, the program cannot decide which of the two relations should be formed again after a process has been deleted. For this reason, a new relation is not automatically formed in this situation.

- 1) Generate three processes.
- 2) Generate the relation **runs before** between the first and second process (processes P1 and P2 in the example).
- 3) Generate the relation **must precede** between the second and third process (P2 and P3 in the example).

Example

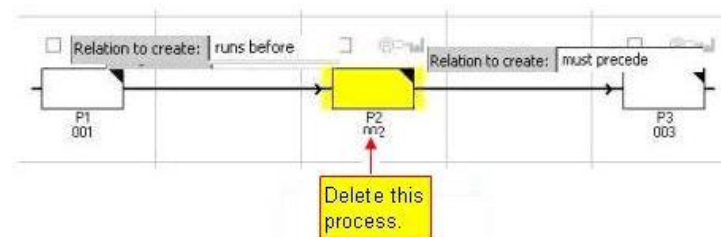


Figure 73: Deleting a Process - Two Different Relations

- 4) Delete the middle processes (P2 in the example). No new relation is automatically generated between the processes after deleting.



Figure 74: No Relation after Deleting – Two Different Relations

3.2.1.8 Deleting Processes with Similar Relations

If similar relations are generated between processes, the relations are automatically formed again after a process is deleted. *Please refer to the [Deleting Processes with Process Graph-Wide Relations](#).*

If several processes are linked differently to the same relation, only those relations are formed again which were not linked to the preceding and subsequent processes of the process deleted.

Example

In the example, the relation **runs before** has been formed between the three processes. In addition, between **process P11** and **P33** there is also the relation **runs before**.

After **process P22** is deleted, only the relation between **P11** and **P33** is formed again.

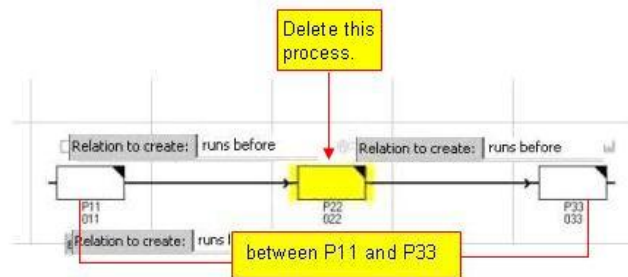


Figure 75: Process Line with Several Links



Figure 76: Process Line with One Link

3.2.1.9 Number of Relations Greater at Process Start and End

If at any one time the number of relations at the start and end of a process is greater than **one**, no new relations are formed after this process has been deleted. The reason for this is that relations are supposed to be formed deliberately between processes. It should, for example, be clearly ascertainable which preceding and subsequent relationships should exist between processes.

If there are several possibilities for forming relations between processes, the program cannot clearly determine which relations should actually be formed.



Note

In this situation you must form the relations manually after deleting, as in previous versions. This situation comes about only if several relations exist at the start and end of a process.

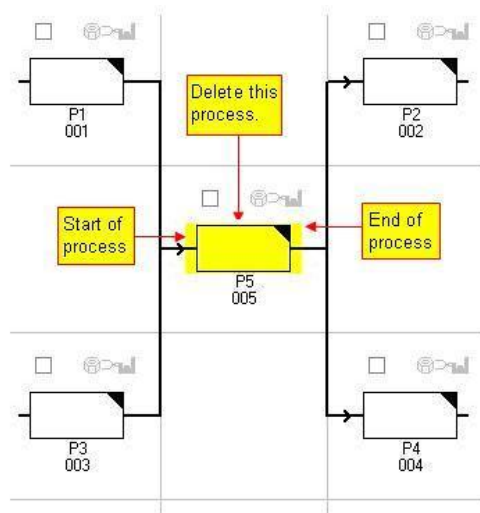


Figure 77: Number of Relations Greater at the Start and End of a Symbol



Figure 78: Message – Number of Excessive Relations

- No new relations are formed after deleting

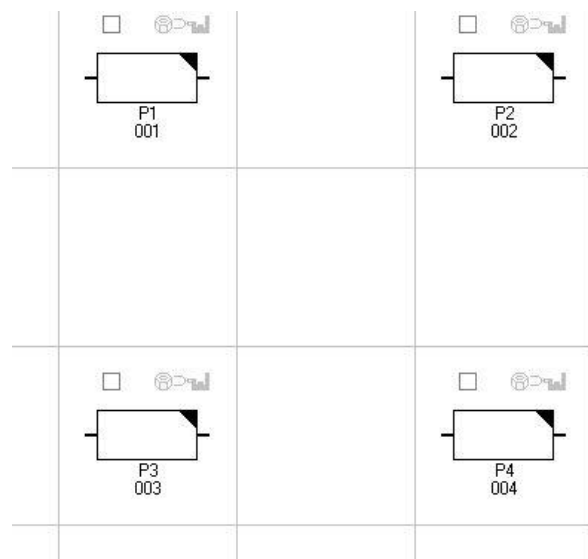


Figure 79: Form Relations Manually

Example

Example of a Possible Relation

In this example there are four relations at the start of the process (process P5), but only one relation the end of the process. In this way, the program can recognize which relations should be formed between preceding and subsequent relationships.

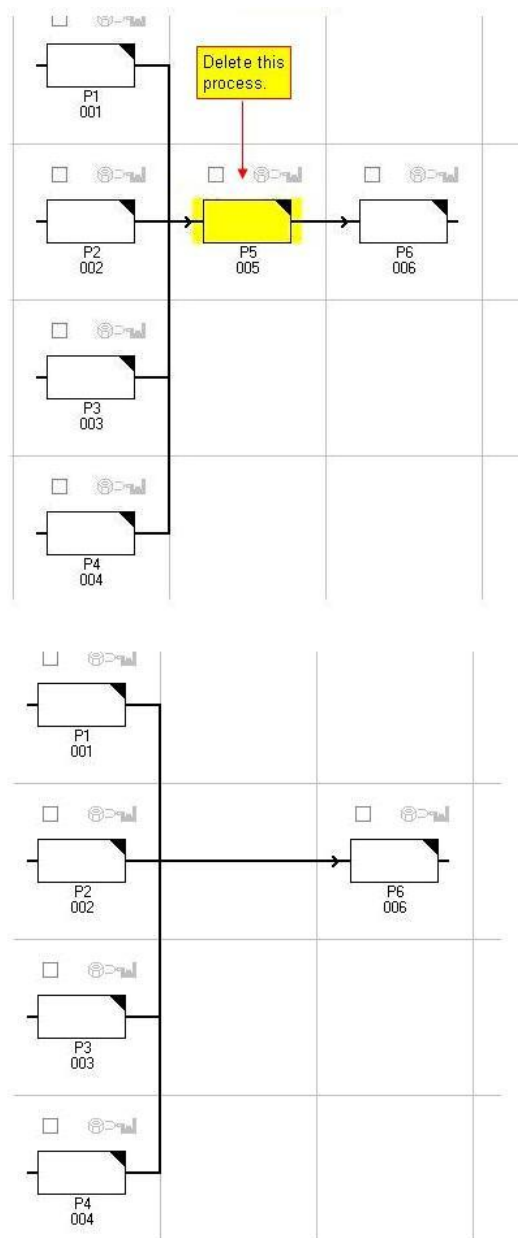


Figure 80: Relations are Formed again Automatically – One Relation Output

3.2.2 Displaying Relations

In Version PE 5.12, all relations which exist between processes, products, and resources are displayed in the **Linked Objects** dialog. Filtered and hidden relations are not displayed.

Example

- 1) The **Linked Objects** dialog is opened in the context menu of a selected process.
- 2) Select one of the tabs, and the corresponding relations are displayed.
Please refer to the examples [Figure 81](#), [Figure 82](#), and [Figure 83](#).

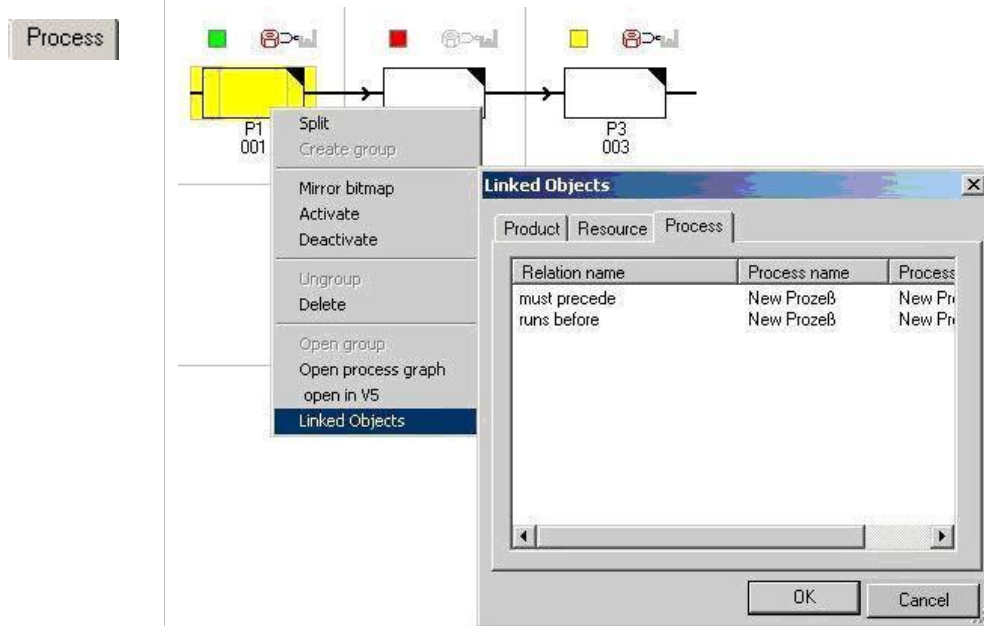


Figure 81: Display Relations – Process Tab

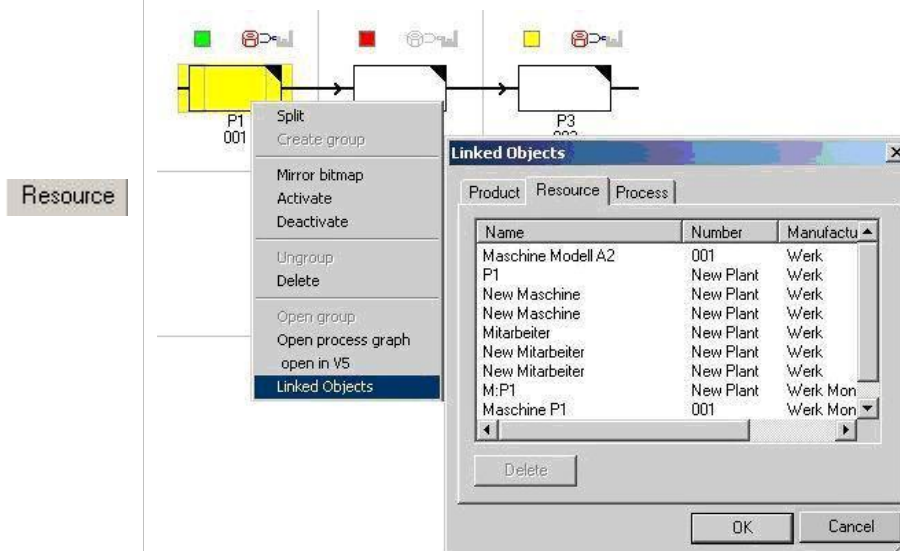


Figure 82: Display Relations – Resource Tab

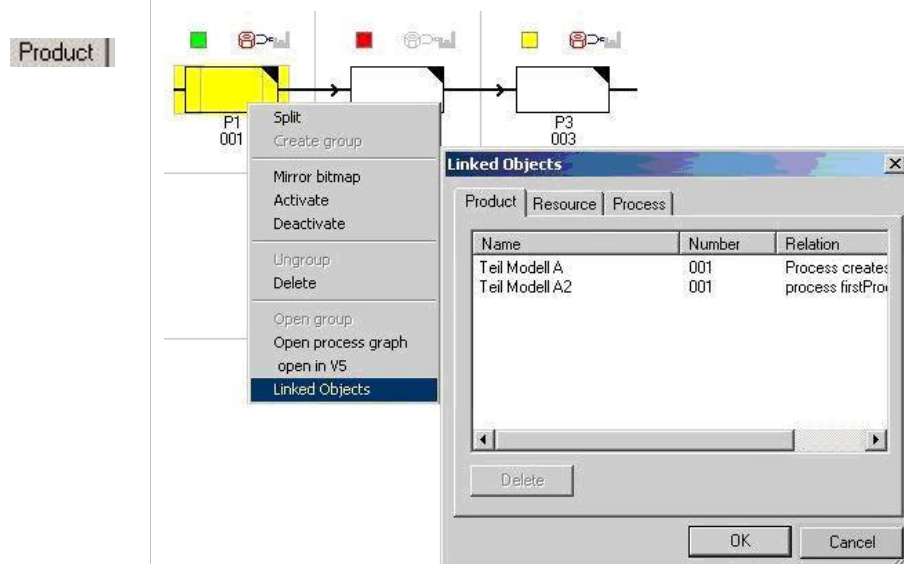


Figure 83: Display Relations – Product Tab

3.3 Supplying Data for the Simulation

In version PE 5.13, data for the simulation are supplied via the relation **process processes product** for the simulation program **Quest**.

Products related to the relation *process processes product* can be edited in the dialog **Relations** or **Take product links** via the attribute **pass through**.

Both dialogs are available in the Process Graph for editing the attribute **pass through**, and in the Manufacturing Concept, you can edit the attribute only in the dialog **Take product links**.

In the dialog, you can label these relations with **yes** or **no**; both states are read by Quest. The relations for the Quest simulation are interpreted differently, depending on the indicated state. The labels can be changed for the respective resources depending on the processing and in effect they reflect nothing more than the state of the product in the manufacturing pass through until it reaches its end state.

- The label **yes** indicates that the product is passing through further resources (processes) under the same name, at most until the last resource/process has been reached – for example, if more parts are assembled on a resource for **main product A**, then product A is supplied for further processing. It is therefore always the **same** product.
- The label **no** indicates that a new product is generated after processing on a resources – for example, parts are assembled on one resource, which, after processing result in **main product A**, which did not previously exist in this form. After processing on this resource, the new product A is supplied for further processing. This is therefore an entirely **new** product.

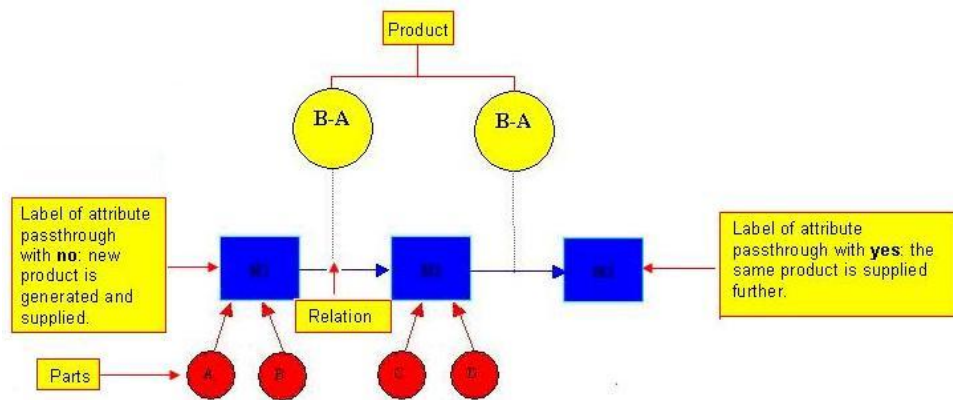


Figure 84: Schema - Relations process processes product label

3.3.1 Editing the Attribute Passthrough

You can edit the Attribute Passthrough in the Process Graph and Manufacturing Concept. Both dialogs can be opened via the context menu of a selected process or a resource in the Manufacturing Concept.

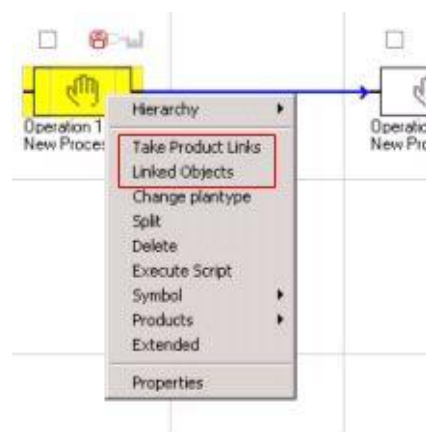


Figure 85: Opening a Dialog using the Context Menu

3.3.1.1 Linked Objects Dialog

The linked objects of the products are shown with the respective selected process in the dialog under the tab Product.

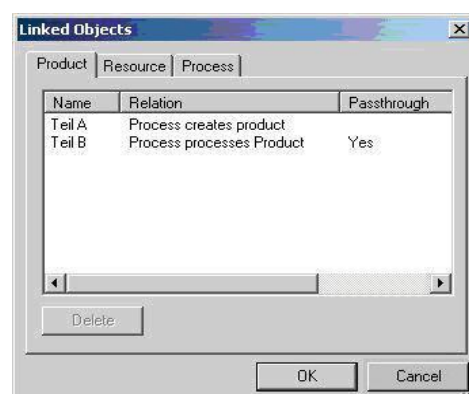


Figure 86: Linked Objects Dialog - Resource Display

Label how the linked object is to be interpreted in Quest in the field of the attribute **passthrough**.

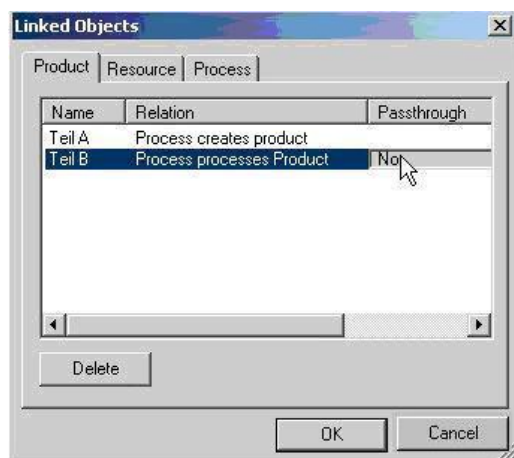


Figure 87: Labeling Relation Process Processes Product for Quest

3.3.1.2 Take Product Links Dialog

There are other ways to create the links apart from the drag and drop which was necessary in previous versions. This eliminates the need for searching for products in the product structure.

The existing relations of previous and subsequent processes or resources are shown in the dialog **Take product links**. In addition, all possible relations you have configured are available for editing. In the Manufacturing Concept you can also call up this dialog for the resources transport and buffer.

Existing relations between processes and products are transparent in this dialog. The links to products are shown and you can label the attribute **passthrough** with little effort, as **Quest** is supposed to take and interpret product links.

All relations, which you edit, are applied in the respective properties dialog in the PPR Navigator of the processes/resources.

- 1) The dialog is opened in the context menu of a selected process or resource.
- 2) Click **Take product links**. The **Take Product Links** dialog appears.

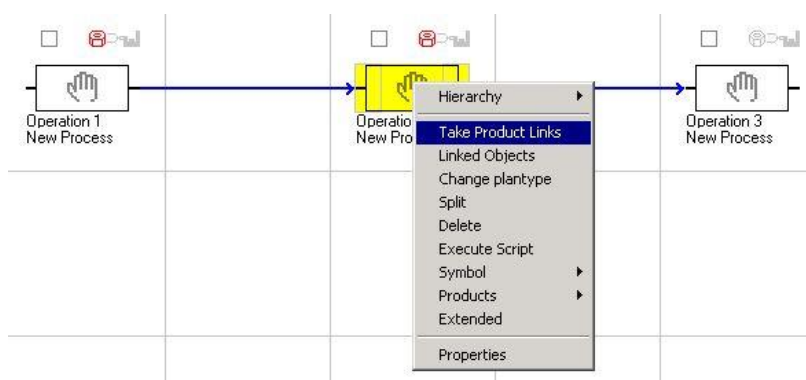


Figure 88: Opening the Take Product Links Dialog

In the dialog you can see the links for products which exist between parent and child. Products linked to the relation **process processes product** can be labeled via the attribute **pass through** for **Quest**.

- 1) Select the product which is to be edited. You can select the products either under *parent/child*.

- 2) The relations are shown under **New Relation**.
- 3) Under **New Relation**, select the relation **process processes product**.

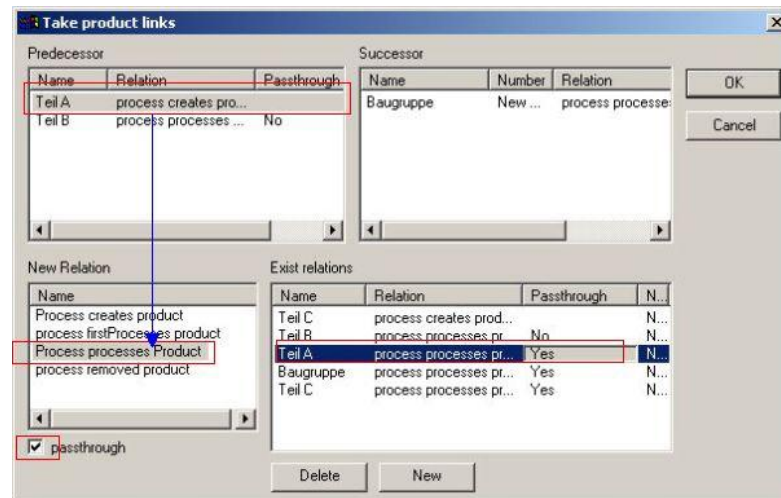


Figure 89: Dialog with Product Links

- 4) Select field **passthrough** and then on **New**. The relation **process processes product** is generated for the selected product, and it is displayed under *Exist relations* with the label **yes**. Click **OK** to confirm your entries. The relation is shown in the **Properties** dialog.
- 5) The attribute **passthrough** can be edited. In order to change the label, click in the line of the generated relation for **Transfer**.

Exist relations		
Name	Relation	Passthrough
Teil C	process creates prod...	
Teil B	process processes pr...	No
Teil A	process processes pr...	No
Baugruppe	process processes pr...	Yes
Teil C	process processes pr...	Yes

Figure 90: Exit Relations

- 6) You can delete the generated relations with **Delete**.

3.3.1.3 Linking Products to Resources

The parts for further processing are supplied in the buffer. The resources are supplied with parts by transports.

In order to plan the requirements for both resources **Puffer** and **Transport**, you must link the products to the respective resource.

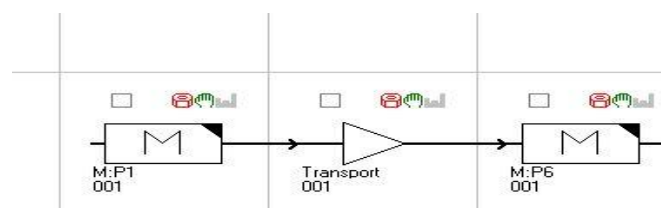


Figure 91: Example – Manufacturing Line with Transport

To Create Link between Product to Resource

You can link the products to the respective resource in the **Take product links** dialog.

- 1) Select the product under either *parent* or *child*.
- 2) Select the relation under **New Relation**.
- 3) Click **New** button. The link between product and resource is created.

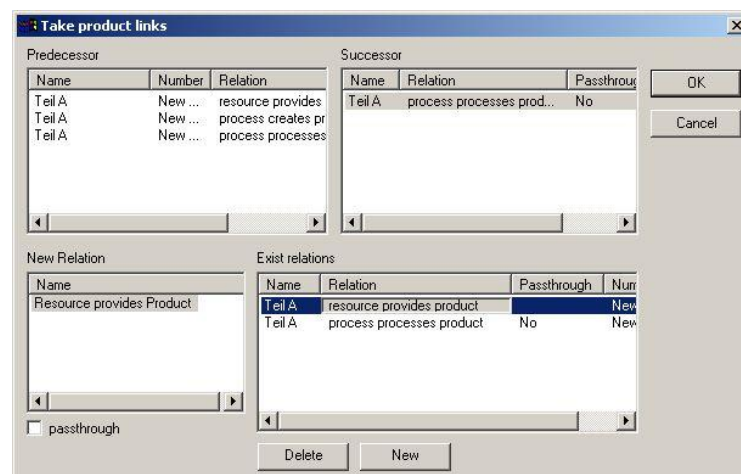


Figure 92: Generating the Link to the Product

3.3.1.4 Checking the Consistency of the Passthrough Attribute

You can check the consistency of the attribute **passthrough** for the planning of products linked to processes in the process graph via the relation **process processes product**. The attribute **passthrough** marks the process data for the simulation.

Whether the value of the attribute is correct for all processes linked to this relation is checked along with whether the processes have been linked to this relation throughout.

If the linked objects are set incorrectly or if the attribute **passthrough** has an incorrect value, this is shown in a table.

The following things are checked during a consistency check:

Link Product to Relation

It is impossible that the same product with the relation **Process processes product** is linked to a process, the attribute **passthrough** is set to **yes**, and this product is simultaneously linked to **this** process with the relation **Process creates Product**.

Attribute Passthrough during Processing

- If a **predecessor** is linked to the product by the relation **Process processes product** and the attribute **passthrough** has been set to **yes**, the **successor process** for this product must also be linked by the relation **Process processes product**.
- If a **predecessor** is linked to the product with the relation **Product created by process**, and the same product is processed further, the successor process must be linked to **this** product by the relation **Process processes product**.

- If a process (as a rule the process with which the product is finished) is linked to the product with the relation **Process processes product**, and the attribute **passthrough** is set to **no**, this process must be linked to this product with the relation **Product created by process**.

Process is to be Set Vertically

- As long as a product is processed within a process line of processes, the attribute **passthrough** is as a rule set to **yes** for the relation **Process processes product**. This value is interpreted in the simulation program accordingly and set to **passthrough**.
- This value is set to **no** for a sink used in the simulation in order to e.g. terminate or interrupt a process simulation. This value is interpreted accordingly in the simulation program; the **passthrough** of the product is marked as terminated.
- In the table created by the script there is a reference to this fact (sink); in this case it is wanted, and hence is not to be considered an error.

Conclusion

The consistency always checks whether the relations between the products and processes are consistent, and whether the attribute **passthrough** is set to the correct value for the relation **Process processes product**.

In other words:

- As long as a product is processed by processes, use the relation **Process processes product** and set the attribute **passthrough** to **yes**. Set the attribute to **no** if this process is supposed to be marked as a sink.
- When a product is finished, always use both relations for this process and set the attribute **passthrough** to **no**.

3.3.1.5 Starting the Consistency Check

The consistency check is executed via the script **Product flow in process graph**.

- 1) Open the context menu in the process graph. To do this, click in an empty field.

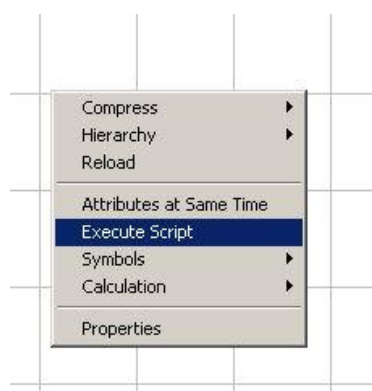


Figure 93: Starting a Script using the Context Menu

- 2) In the dialog select the script **Product flow in process graph**.

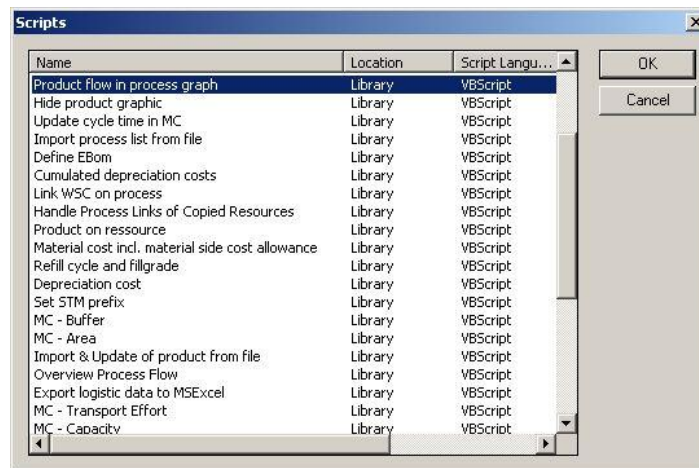


Figure 94: Selecting a Script in the Dialog for the Consistency Check

- 3) If you have correctly set all links of products and processes, the message appears.

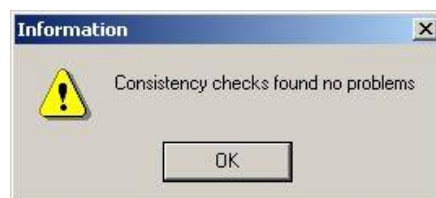


Figure 95: Message – Consistency Check

3.3.1.6 Consistency Check Indicates Weak Points

If when editing a process graph you have incorrectly set linked objects, the consistency check suffices to indicate possible weak points in the process line in a quick manner.

The error sources are listed in a table created by the script.

Process name	Process number	Product name	Product number	Note	Row	Column
--------------	----------------	--------------	----------------	------	-----	--------

Figure 96: Table Columns for the Display of the Table

An overview of all possible error sources and their meaning:

- **Product is processed with passthrough = true and created:** This message indicates that the product is linked to this process by both relations **Product created by process** and **Process processes product**, and the attribute **passthrough** has been set to **yes**. i.e. in a practical sense it is duplicated.
- **Solution:** Delete the relation **Product created by process**.
- **Product is processed with passthrough = true or created but not processed in successor process:** This message indicates that the product is linked by the relation **Product created by process**.
- **Solution:** Link the product to the successor process with the relation **Process processes product**.
- There is product processed with **passthrough** = false and no product created: This message indicates that no product was created on the process (sink).

- Solution: Either set the attribute **passthrough** to yes, if there is a successor process; or link the process to the product with the relation **Product created by process**, if there is no successor process.
- If the process is defined as a sink, i.e. the situation is as you want it, you do not need to do anything; the value of the attribute **passthrough** stays no.

Example

Example of a table created by the script. The possible cases are indicated in the table. Please refer to the [Consistency Check Indicates Weak Points](#).

Mappe1				
1	2	3	4	5
1	Process number	Product name	Product ID	Note
2	7	Component	1	Product is processed with passthrough = true and created
3	7	Component	1	Product is processed with passthrough=true or created but not processed in successor process
4	7	Component	1	Product is processed with passthrough=true or created but not processed in successor process
5	2			There is no relation proc_processes_prod with passthrough=true and no relation proc_creates_prod
6	4			There is no relation proc_processes_prod with passthrough=true and no relation proc_creates_prod
7				
Inconsistencies				

Figure 97: Example – Table with Explanations of Possible Errors

3.4 Inserting Processes between Existing Relations

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

Relations play an important role when a process is inserted from a process line. Project-wide relations between processes of the same type, which are available in other Process Graphs of a project, are, upon inserting, treated differently from relations valid for only one Process Graph.



No relations are formed between the processes and the newly inserted process with relations hidden in the **Selection of the visible relations** dialog. Previously existing relations remain as they are, and they are visible again after being faded back in.

3.4.1 Inserting Process in a Process Graph-Wide Relation

A simple example shows you how to insert processes linked to Process Graph-wide relations.

- 1) Create an empty Process Graph.
- 2) Generate two processes and link them to the relation **runs before**.
- 3) Insert the middle process.



Figure 98: Two Processes – in the Empty Process Graph

- 4) Confirm this message with **Yes**. The process is inserted.

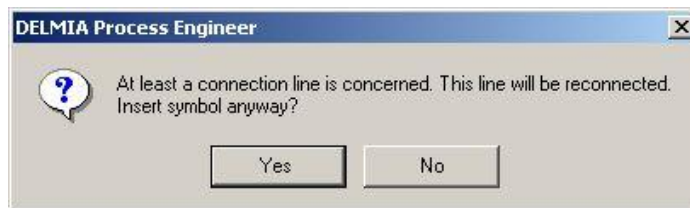


Figure 99: Message when Inserting a Process

- The old relation (P1 and P2) is deleted after the process is inserted. The relation (**runs before**) is formed between the newly inserted process and **P1 and P2**.

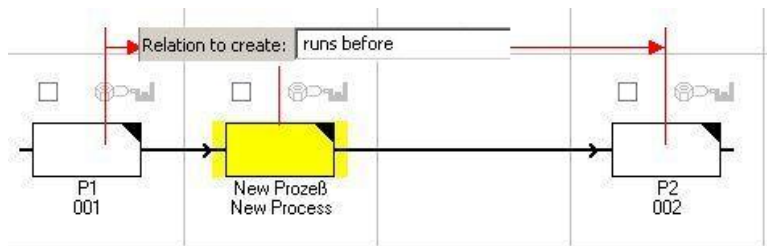


Figure 100: Relations to the New Process

3.4.2 Inserting Process in a Project-Wide Relation

Example

A simple example shows you how to insert processes linked to project-wide relations.

- 1) Create two empty Process Graphs.
- 2) Generate two processes in the first Process Graph and link them to the relation **must precede**.

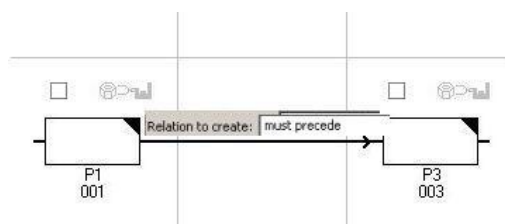


Figure 101: First Process Graph – Relation must Precede

- 3) Click and drag the same two processes from the process view into the second Process Graph.
- 4) Insert a new process between the other two processes in the first Process Graph. First you must confirm the message with **Yes** or **No**.

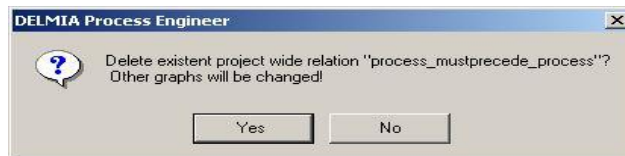


Figure 102: Message Insert Process – Relation must Precede

- 5) If you confirm the message with **No**, the old relation (**must precede**) between **P1** and **P2** remains unchanged in both Process Graphs. Furthermore, the new relation **must precede** is formed between **P1** and **P2** and the newly inserted process.
- 6) If you confirm the message with **Yes**, the old relation **must precede** is deleted from both Process Graphs. Both relations between the newly inserted process and P1 and P2 are formed in both Process Graphs.

You can check the relations in the **Linked Objects** dialog: *Please refer to the Figure 81.*

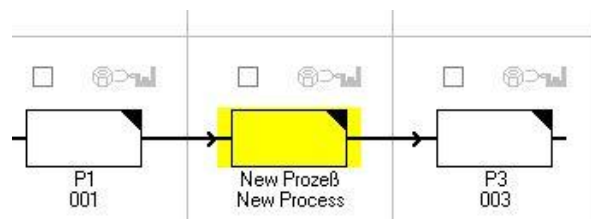


Figure 103: Insert Process – Relation must Precede

3.4.2.1 Special Notes on Inserting Processes

Certain configurations between processes linked by relations require a different procedure from that which you have previously learned about.

Several Relations between Processes

If there are several relations between single processes in a process line, they are displayed in the **Select relations to parts** dialog - for example (see also in example) Process Graph-wide relations (**runs before**) and project-wide relations (**must precede**).

- 1) In the dialog select the relations to be formed between the newly inserted process and the other processes in the process line.
- Only the selected relations are formed.



Note

*If when inserting a process into a process line you select a **project-wide** relation, existing project-wide relations in the direct line between the processes are deleted in all the Graphs of a project.*

If you exit the dialog with Cancel, the new process is inserted, but no relations are generated. The previously existing relations remain unchanged.

Example

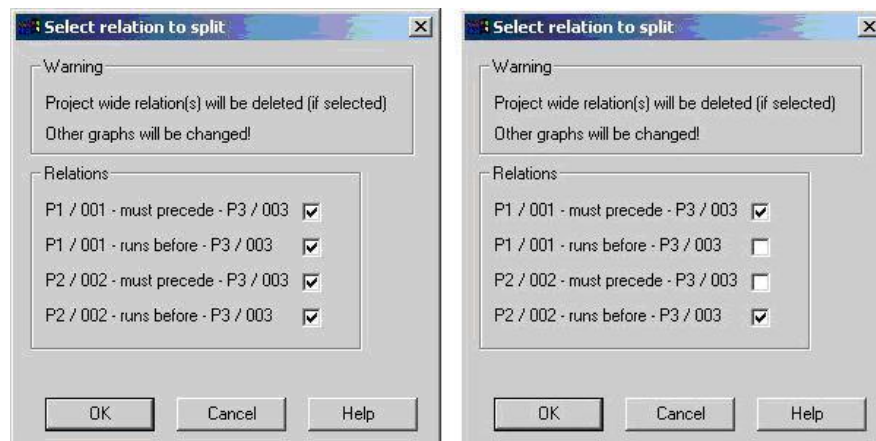


Figure 104: Dialog – Selecting the Relations

- 2) Confirm the selection in the dialog with **OK**. The new process is inserted, and the relations are formed.

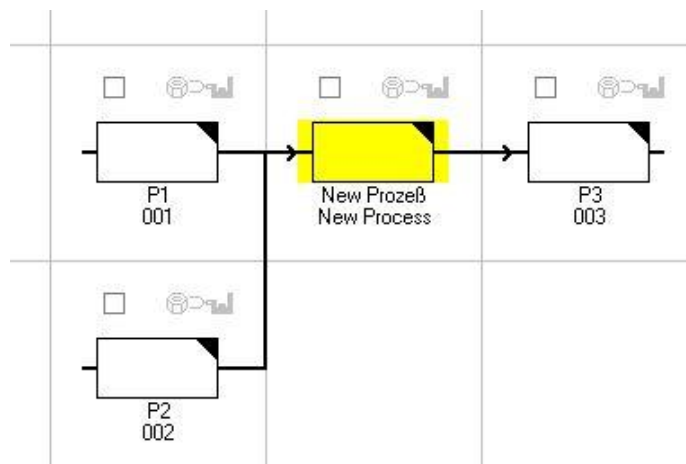


Figure 105: Insert Process – Several Relations to Processes

Insert Process, Hide Relation

If the relation **must precede** is hidden, this relation is not formed when a process is inserted.

Example



- 1) Generate two processes.
- 2) Successively form a link to both relations **must precede** and **runs before** between both of the processes.
- 3) In the **Selection of visible relations** dialog, hide the relation **must precede**.

There are two relations between the two processes. The relation **must precede** is hidden.

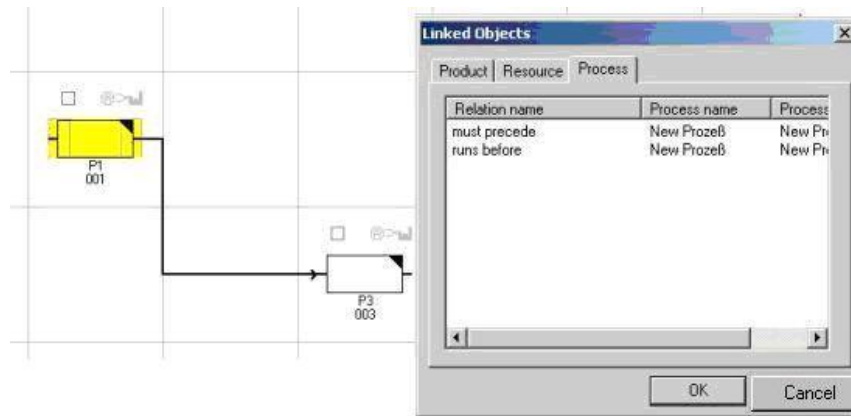


Figure 106: Situation at Start – with Existing Relations

4) Insert a new process.

- In this case, no dialog for selecting relations appears. The existing relation **runs before** between process P1 and process P3 is deleted.
- The relation **runs before** is formed between the new process and both the processes **P1** and **P3**.

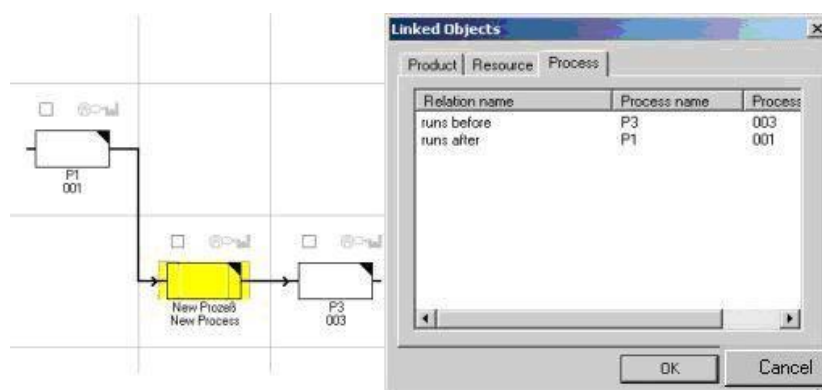


Figure 107: New Process Inserted – New Relations Formed



- The existing relation *must precede* between **P1** and **P3** remains unchanged, and is made visible only after being faded in.

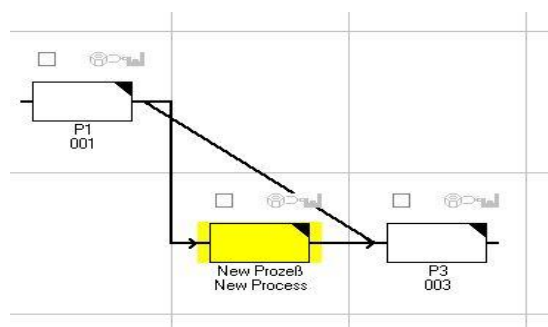


Figure 108: Relation must Precede Faded Back In

4. Determining Processes and Groups

In the processes and groups Properties dialog, the corresponding specific data are determined, with which a process or a group is described completely. Two dialogs are available for the processes: the **Properties** dialog and the **Extended Properties** dialog.

Grey fields are not input fields; these fields are input automatically when a corresponding assignment for a process has been made, for example. Several processes are grouped together. The properties for a group are determined in the **Properties** menu of a group *Please refer to the [Figure 118](#)*.



The simulation is not supported by the Process Graph program module.

4.1 Determining Process Properties



Note

New processes created in the Process Graph are transferred after saving to the process structure (PPR Navigator and process view). These processes are then immediately displayed in the PPR Navigator. These processes are only shown in the process view after the process view is closed and then opened again.

The properties of a process can be determined either in the PPR Navigator, in the process view or in the Process Graph.



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

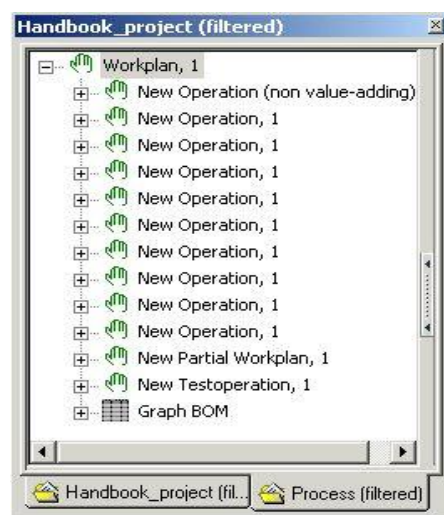


Figure 109: Process View Display – Process Structure with New Processes

There are several tabs available for entering for both menus (**Properties** and **Extended Properties**). The tabs are arranged according to function *Please refer to the [Figure 110](#)*. Corresponding to these functions, the process properties are specified.

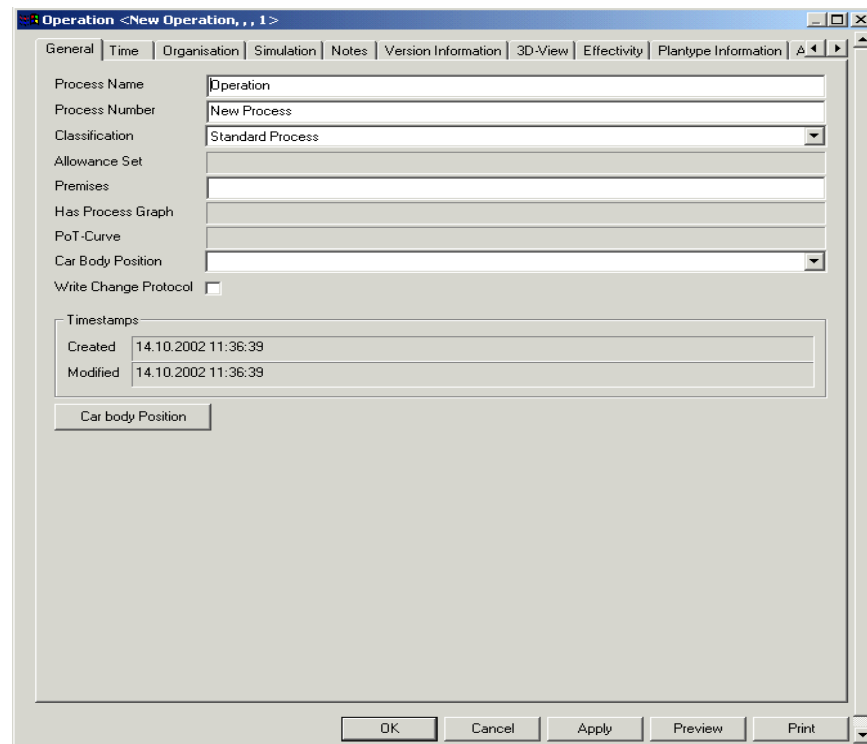


Figure 110: Determining Process Properties – General Tab

4.1.1 Opening the Properties Menu

The Properties menu is opened using the right mouse button context menu.

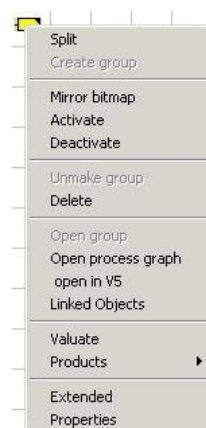


Figure 111: Opening the Properties Dialog via the Context Menu



- 1) First of all select the process you wish to determine properties for. To do this, click on the process symbol.
- 2) Press the right mouse button and click **Properties**. Please refer to the [Figure 111](#). If you want to see the extended menu, click **Extended**.
- 3) You can enter the specifications in the input fields in the corresponding tab. Left-click on a tab, the input fields are available.

4.1.2 Process Properties Tab Functions

4.1.2.1 General Tab



You can specify general process data in this tab, *Please refer to the Figure 110*. When specifying, remember that most of the input fields in this tab can be used as a search criterion. You can set these properties during the configuration in the configuration manager.



A process is clearly identified by specifying the input fields **process designation** and **process number**. Do not enter ambiguous designations in these two fields. Enter in the input field process designation, the type of a process and in the process number field enter a clear character combination, which can later also be used for possible assignments as a search criterion. Using the classification field you can determine the function of a process in the process. You can determine whether it is a core, standard or key process. PoT curves are planned numbers. By selecting a PoT curve, you can determine which planned numbers are to be manufactured in which time period using this process.

Selecting Location Premises



Figure 112: Selecting location premises with selection window



The location premises are defined in the PPR Navigator in the project library. You can determine as many location premises as you want for each process. In the selection window Premises, [Figure 112](#), the defined location premises are displayed. For each process in the Process Graph a different location could be specified. As a rule, this probably is not the case in practice. The reason for this approach lies in the fact, that a product, of course, can pass several locations until it is finished, for example, if there is only one paint shop available at one location, which is used by several plants.

It is possible, in principle, to generate a process structure for each location in the PPR Navigator; for such a process structure an own Process Graph can then be created.

Specifying Car Body Position in the Properties Menu

Use this function when planning an assembly flow in the Process Graph to specify the position of the process to be executed. These different processes can either be assembly processes or material supply process.



When configuring the Process Engineer, you can also specify in the process properties menu whether or not a button for the car body position is to be displayed. This function is already implemented as default in the process structure on the process level in the PPR Navigator.

Use this button in the **Properties** menu to start the dialog. Select the corresponding position in the dialog.

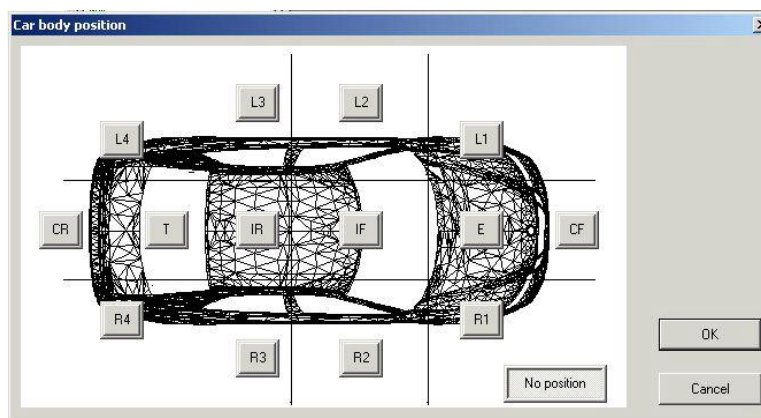


Figure 113: Car Body Positioning Dialog

4.1.2.2 Time Tab

Use the **Time** tab to specify the process time. You can select between calculated and estimated time. Before you start specifying data you should first of all determine which time type you are using to calculate the time (for example, an estimated or a calculated time).

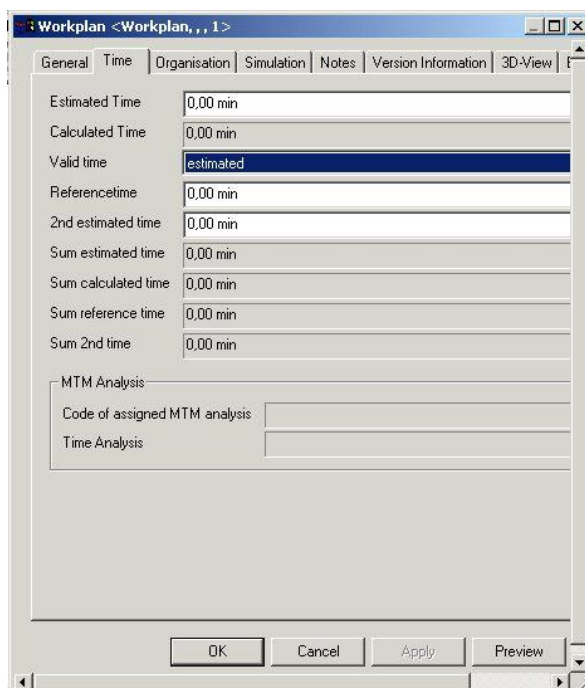


Figure 114: Determining Process Properties – Time Tab

Time Tab Fields Description

Note

The individual fields and tabs can be configured individually. It is your choice which name you want to assign. The properties of the fields are described in detail below.

- **Valid Time:** In this field you can select which time data are used to proceed with the calculation. You can select between “estimated”, “calculated”, and “calculated and estimated time”.
- **Estimated Time:** In this field you can specify an estimated process time.



calculated
calculated and estimated
estimated

- **Sum Estimated Time:** This field is calculated. The sum is calculated using the values from subordinated sub-processes, which are assigned to this process. In the programming language, it is also referred to as a parent/child relation. Children correspond to the subordinated sub-processes.
- **Calculated Time:** This field is calculated. If an MTM analysis is assigned, the value taken from the MTM analysis is entered.
- **Sum Calculated Time:** This field is calculated. The sum is calculated using the calculated values from subordinated sub-processes, which are assigned to this process.
- **Reference Time:** In this field, you can specify a reference time. The reference time e.g. is taken from a similar process from a previous version. The purpose of the reference time is merely informative. The Sum reference time is calculated using values from subordinated sub-processes.
- **Second Estimated Time:** In this field, you can specify a second estimated time. The purpose of the reference time is merely informative. The Sum second time is calculated using values from subordinated sub-processes.
- **Sum Process Time – Estimated Plus Calculated Time:** in this field, the sum calculated is entered using these two fields.

4.1.2.3 Effectivity Tab

In the **Effectivity** tab, you can determine the duration for how long the process should be effective by specifying a **Begin** and **End** date.

The screenshot shows the 'Effectivity' tab of a software interface. It contains several input fields: 'Begin' and 'End' date pickers both showing '14.10.2002', a 'Labels' text field, a 'Planning code' text field, a 'Code Rule' text field, a 'Protect effectivity' checkbox, a 'Frequency' text field showing '100.00 %', and a 'Line numbers' text field. At the bottom, there are five buttons: 'OK', 'Cancel', 'Apply', 'Preview', and 'Print'.

Figure 115: Determining Process Properties – Effectivity Tab

- **Planning Code:** Use the planning code to specify to which planning section this process belongs to, for example, a preliminary planning.
- **Code Rule:** Products that are processed by this process are assigned using the code rule; for example, the assembly of special equipments for a car.

- **Line Number:** Enter the production number in the line numbers field so that a product can be clearly identified. You can also specify which processes are to be carried out by this resource, for example, the assembly of certain wings of a plane.
- **Product Effectivity:** The direct entries in the Code rule and Line numbers fields can be protected by checkmarking the Protect effectivity field. This means that the entries are not overwritten.
- **Frequency:** The percentage in the Frequency field indicates the percentage share of a process in the active production program. This value is calculated. This means in practice that if a production program is supposed to manufacture 5,000 products and a process for 1,000 products is used, then the frequency for this process is 20%.

4.1.3 Extended Properties Menu Tab Functions

In the **Extended properties** two tabs are available: the **Medium** and **Quality** tabs. In the Quality tab you can specify quality features for a process. In the Medium tab, you can inform yourself about the media assigned to this process. In addition, you can add more information about media to this tab. The Nomination and Unit fields cannot be edited.

4.1.3.1 Medium Tab

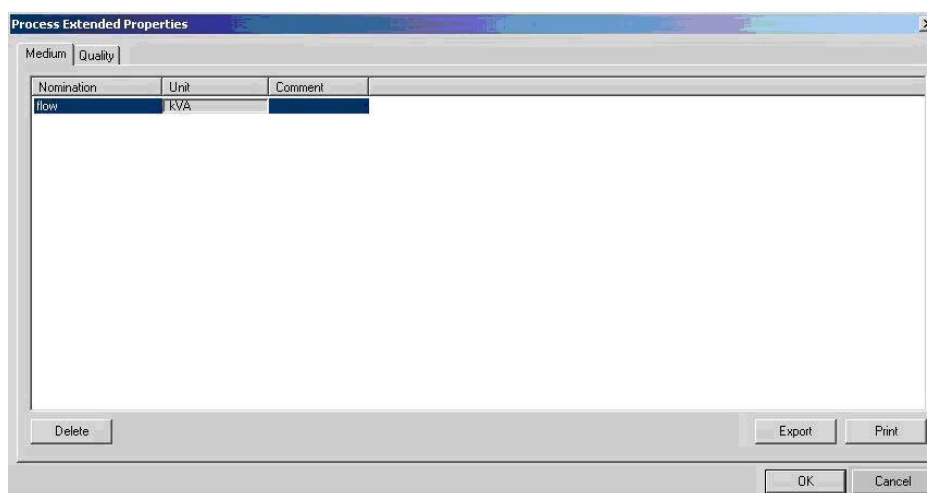


Figure 116: Extended Properties – Medium Tab

4.1.3.2 Quality Tab

In the Quality tab, you can add notes to a product or a process. As the name already indicates, you can draw prospective consequences for possible weak points of a process or product. Label the errors and arrange them according to specified criteria. Using this method, you can reduce the risk rate and you can also lay the basis for constantly improving the results. It can be of advantage for a planner to always know where possible additional potentials are that have not yet been completely exhausted.

Process Extended Properties

Medium Quality

Parameter

	Process	Description	Unit	Nominal value	Minimum	Maximum
1						

New Delete

Risk value

	Product	Process	Failure impact	Failure cause	Failure avoidance
1					

New Delete

OK Cancel

Figure 117: Extended Properties – Quality Tab

- 1) Create a new line by clicking **New**. Please refer to the [Meaning of the Fields for Quality Criteria](#).

4.1.3.3 Quality Criteria Fields Description

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 117](#).

4.1.3.4 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 were 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, for example, the availability.
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 (boxes per pallet).

- **Nominal Value:** You can use the parameter nominal value to specify the specific nominal value for the delivery amount, for example, 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.

4.1.3.5 Setting the Risk Value

You can specify very important information for the quality feature 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. Consider already now that the best way to avoid failure is to recognise the cause on time and to take measures against them at an early stage.
- **Failure Avoidance:** In this field, specify which possibilities exist for preventing failure causes from occurring. Or reduce the failure cause to the lowest degree.

4.2 Determining Group Properties

The Properties dialog of a group can be accessed using the right mouse button context menu. Enter designations according to the input lines. Remember that the fields can also be used as search criteria depending on the configuration.

The screenshot shows a software dialog box titled "BOM <Montagegoup Takt1>". It has three tabs: "Properties", "Notes", and "Supplier". The "Properties" tab is selected and contains the following fields:

- Abbreviation:** 001
- Component Name:** Montagegoup Takt1
- Timestamps:**
 - Modified:** 14.10.2002 15:55:30
 - Created:** 14.10.2002 12:04:56
- Number:** (empty field)
- Group Type:** Montage
- Responsible:** Master

At the bottom of the dialog are five buttons: "OK", "Cancel", "Apply", "Preview", and "Print".

Figure 118: Group Properties Dialog

5. Right Mouse Button Functions

The right mouse button context menu quickly provides specific functions you want to use right now for your work. While working with the context menu, two things require special attention: The context menu can be opened without an object (for example, a process or a group) being selected and it can be opened with an object being selected. Each of the two context menus provides different functions.

5.1 Opening Context Menu without an Object being Selected

The functions that can be triggered by this context menu have an effect on the entire Process Graph. A short description of all context menu functions follows.

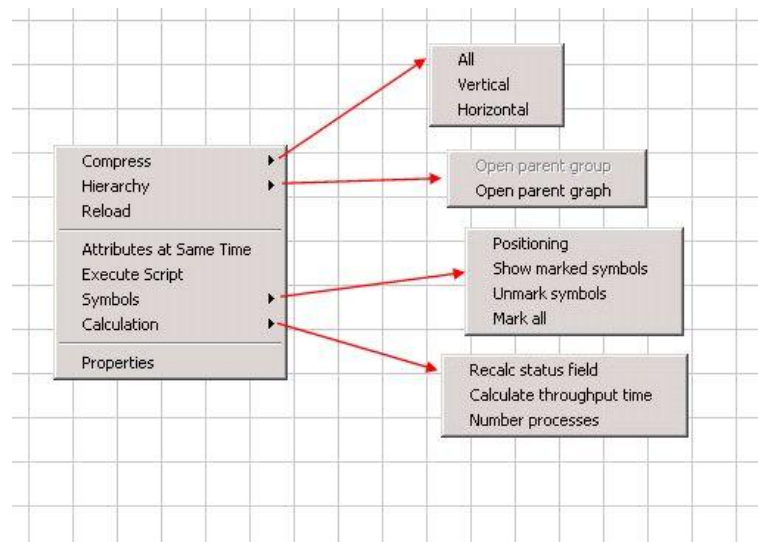


Figure 119: Right Mouse Button Functions, Click in the Process Graph

To open the context menu, left-click in an empty field in the Process Graph and then press the right mouse button.

5.1.1 Compress Function

Using this function, you can hide lines and columns. The view is compressed to the actual work area. There are three possibilities:

- **All:** The columns in vertical and horizontal directions are hidden.
- **Vertical:** The columns in vertical direction are hidden.
- **Horizontal:** The columns in horizontal direction are hidden.

2) You can restore the original situation by clicking in the column or line header, pressing the right mouse button and clicking on *Show all*.

5.1.2 Hierarchy Function

5.1.2.1 Open Parent Graph

This right mouse function is used if you want to change from the open Process Graph to a Process Graph of a higher hierarchical level. In this hierarchical level the Process Graph must already have been generated beforehand, otherwise you get a message that no Process Graph exists on this hierarchical level.

5.1.3 Reload Function

Use this function when the Process Engineer works in the multi-user mode (several users are accessing one database at the same time) and when changed data should be updated. The Process Engineer offers the possibilities of a real multi-user program. The changed data can be displayed using this function. Remember that the changed data are only effective after saving. If you are not working in the multi-user mode, this function can be used according to the **Positioning** function.

5.1.4 Symbols Function

5.1.4.1 Positioning



Use this right mouse button function to enable processes generated in the PPR Navigator while the Process Graph is opened. These processes are then displayed in the Process Graph: either horizontally or vertically. The display in the Process Graph depends on the settings you have selected in the basic settings. Remember that the changed data are only effective after saving.

5.1.4.2 Mark All

The description of this function can be found elsewhere. *Please refer to the [Premises at Same Time Function](#).*

5.1.4.3 Show Print Area

Using **Show print area** you can view the print area of a graph. The display is a print preview of the graph. The set print area does not have a direct effect on the print-out. The function only allows you to view a print area in the graph.



Note

If you want the print-out to match the print area displayed, you need to select the same zoom factor for printing that you have used for display of the print area.

The possible zoom factors are used to vary the print area. Corresponding to the zoom factor selected the preview indicates the number of print pages with the respective symbols shown on the print page. The golden rule is: The smaller you set the zoom factor for **Show print area**, the less pages are required for display and print-out. The default setting for the zoom factor is 25%.

The print area can be shown with the following zoom factors: 6%, 12%, 25%, 50%, and 100%.



The **Show print area** function is also available in the Manufacturing Concept.

To display Show Print Area

- 1) Open the context menu in a free field of the graph. Select **Symbols/Show print area**.

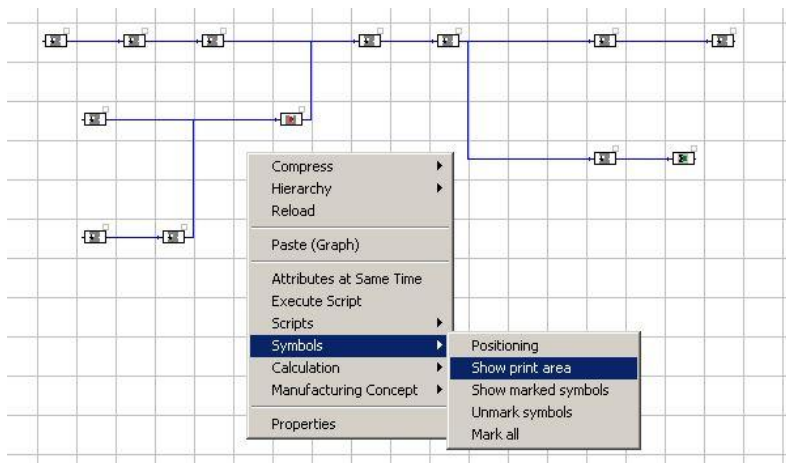


Figure 120: Show Print Area

- 2) Select the zoom factor for the print area. For the following examples the zoom factors 25%, 50%, and 100% for the print area have been used.

The [Table 3](#) below lists the number of lines and columns of a graph that appear on the display or a print-out of a DIN A4 page when the respective zoom factor is set.

Table 3: Number of Lines and Columns for DIN A4 Print-Out

Zoom Factor	Lines	Columns
100%	6	4
50%	13	9
25%	27	18
12%	54	37
6%	109	75

- 3) To display the print area in a graph, activate **Show print area in graph**.

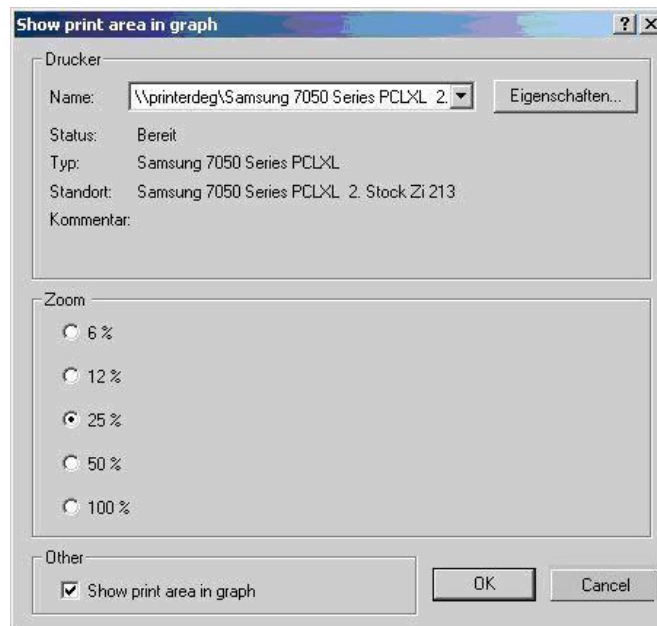


Figure 121: Show Print Area Dialog

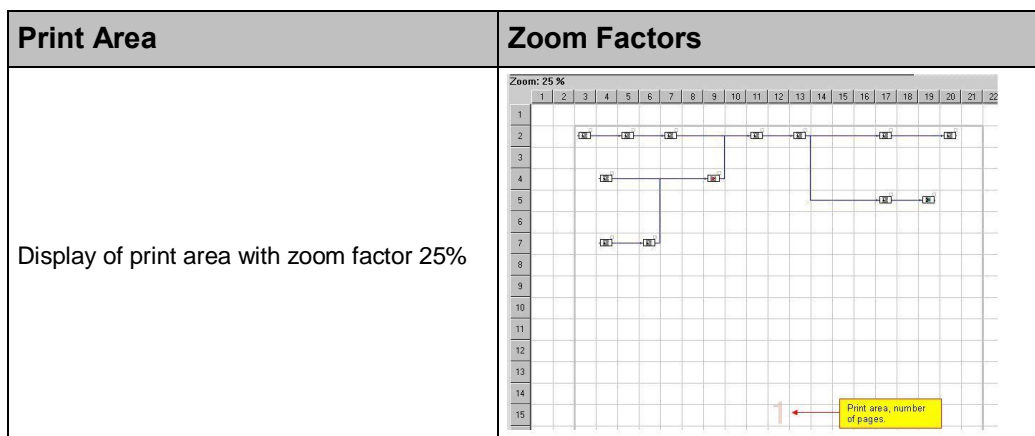
Show Print Area – Applying the Zoom Factor for the Graph

The print area is **independent** of a zoom factor used to show the graph.

In all three examples, the print area is identical, display of the graph changes with the zoom factor.

Table 4: Different Displays of the Print Area

Print Area	Zoom Factors
Display of print area with zoom factor 6%	<p>Zoom: 6 %</p>
Display of print area with zoom factor 12%	<p>Zoom: 12 %</p>



Examples for the Print Area

Three examples show you how display of the print area can be set with different zoom factors.

- To provide a good overview of the print area, the zoom factor has been set to 12% for display of the graph in all three examples.
- Using **Show print area** you may, for instance, change the arrangement of the symbols of the graph.

For the process graph in the figure, print areas are shown at 25%, 50%, and 100%. Please refer to the [Figure 122](#).

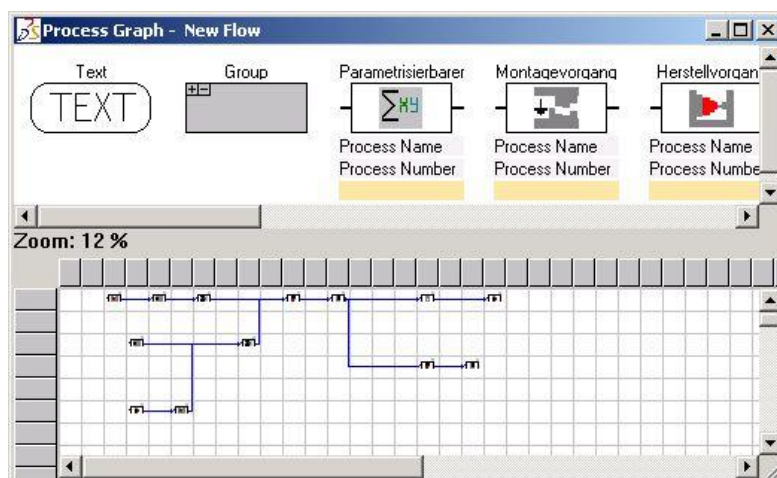


Figure 122: Example - Process Graph

Please refer to the:

[Example 1: Show Print Area, Zoom Factor 25 %](#)

[Example 2: Show Print Area, Zoom Factor 50%](#)

[Example 3: Show Print Area, Zoom Factor 100%](#)

Example 1: Show Print Area, Zoom Factor 25%

Result: At a zoom factor of 25% one page in the print-out is sufficient for the process graph.

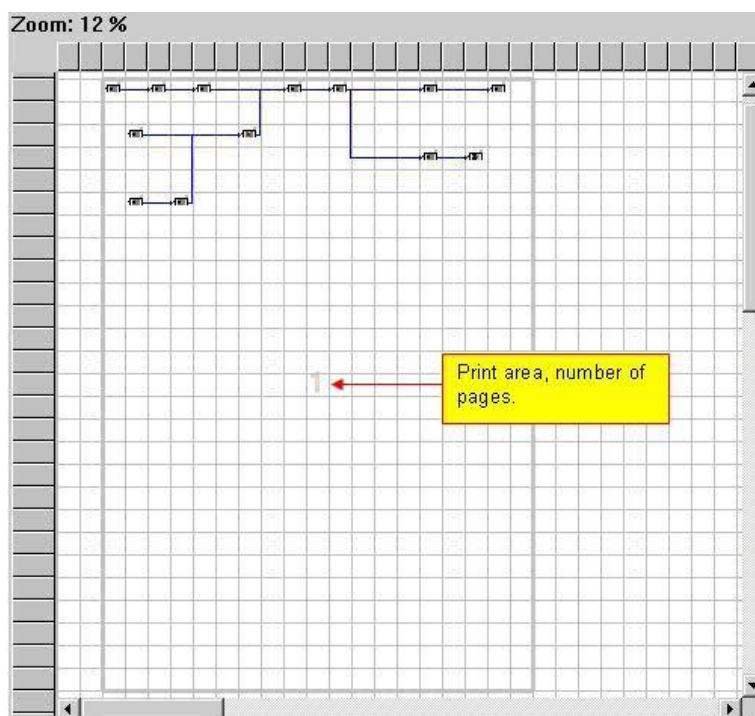


Figure 123: Example 1 – Print Area, Zoom Factor 25%

Example 2: Show Print Area, Zoom Factor 50%

Result: At a zoom factor of 50% two pages in the print-out are already needed for the process graph.

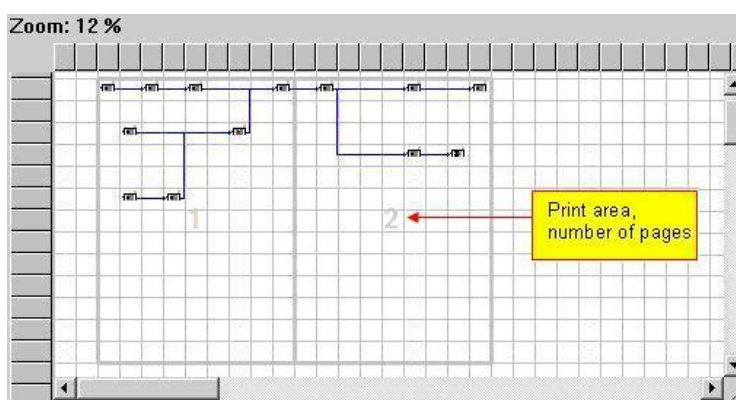


Figure 124: Example 2 – Print Area, Zoom Factor 50%

Example 3: Show Print Area, Zoom Factor 100%

Result: At a zoom factor of 100% five pages in the print-out are already needed for the process graph.

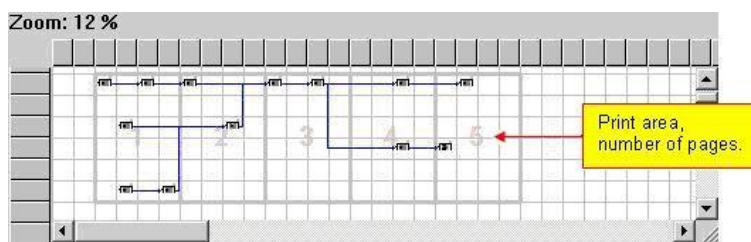


Figure 125: Example 2 – Print Area, Zoom Factor 100%

To **hide** the print area, either open the dialog and deactivate **Show print area in graph** or close the process graph and then re-open it. *Please refer to the Figure 121.*

5.1.5 Execute Script Function

The context function Evaluate in Process Graph is excluded in Version PE 5.12. 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. Two standard scripts with two corresponding Excel templates are provided for the Process Graph - for the evaluation of the process time and the classification of a process (key, basic, or standard process).

This new function is also available in the Manufacturing Concept for evaluating resources. Other scripts and Excel templates are provided in the Manufacturing Concept for evaluation purposes, such as the evaluation of machines, areas, transport operations, and workers. The procedure in the Manufacturing Concept corresponds to that in the Process Graph.

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.

This function is also available for a selected process or a selected group, as in previous versions.

The results of an evaluation differ accordingly.

- If **no** object has been selected, the evaluation refers to the entire (all objects) Process Graph.
- If **one** object has been selected, the evaluation refers only to the selected object.



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.*

Executing the Script

An example for a Process Graph shows you how to execute a script. Two standard scripts **Valuate processes (time)** and **Valuate processes (classification)** are provided for the Process Graph.

Example

- 1) Click in an empty field in the Process Graph.

- 2) Open the context menu and select **Execute script**. Please refer to the Figure 119.
- 3) Select the **Valuate processes (time)** script in the **Scripts** dialog.

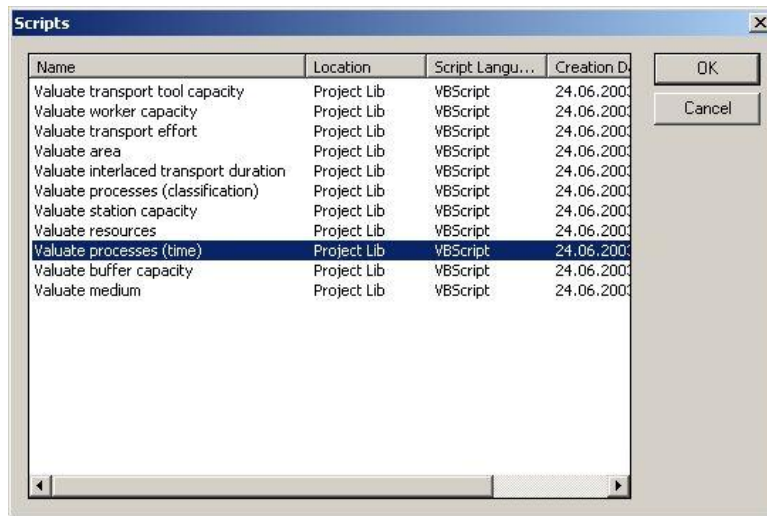


Figure 126: Scripts Dialog – selecting Scripts

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

	A	B	C	D	E	F
1	Plan type	Amount	Amount [%]	Amount without time	Sum process time absolute [sec]	Sum process time part [%]
2	Prozeß	5	83,3	1	470	79,7
3	Prüfprozeß	1	16,7	0	120	20,3
4	Summe	6		1	590	
5						
6						
7						

Figure 127: Result of the Evaluation – Excel Template Process Time

Example

Example of process classification

- 5) Select the **Valuate processes (classification)** script in the Scripts dialog for the evaluation.

	A	B
1	Classification	Amount
2	Core Process	1
3	Standard Process	10
4	Key Process	1
5		
6		
7		
8		
9		

Figure 128: Result of the Evaluation – Excel Template Classification

The classification of a process depends on the respective user's use of it, and therefore cannot be clearly defined. Here are some tips on classification.

Typical applications, for example, involve the classification of processes according to their technology.

- Standard processes are processes with simple technology, for example, face milling, face turning, and simple assembly or packaging operations.
- Basic processes are those with special technologies that can be executed only by in-house specialists or a few supply companies.
- Key processes are processes, which are used mainly for certain products or product groups.

Properties

Use this right mouse button function to open the Properties dialog of a Process Graph. The structure of a Properties dialog corresponds basically to the Properties dialog of a process.

- 6) To open the Properties dialog, click **Properties** in the context menu. Please refer to the [Figure 119](#).

5.1.6 Calculation Function

5.1.6.1 Number Process

Using this right mouse function, you can number the processes in the process graph consecutively and display the numbering during the actual process. Assignment of numbering is done by attribute **name** or **nameshort**. In the example, the attribute has been configured with the name **Process description**.

For more information, *Please refer to the [Administration Manual](#).*



- 1) Click in an empty field in the process graph. Then select **Number processes** in the context menu. Please refer to the [Figure 119](#).



Figure 129: Display Process Number Dialog

- 2) Select the attribute in the **Number Process** dialog, then specify the start number and the sequence for numbering the other processes.
- 3) Click **OK**; numbering of the processes is now carried out. You can obtain the current view from the context function **Reload**. You can carry out the numbering process as often as you like. Please refer to the [Figure 119](#).

The **starting number 10** has been specified for the following example. The sequence of numbering should be in **intervals of ten**. It can be varied in any way you like: for example, assign another start number such as start number 5, or even another sequence; for example, select an interval of five for the sequence, and the display changes respectively.

The process is always the same:

- Select attribute

- Specify the start number
- Determine the sequence

You can combine the display of process numbering - with the process time, for example. *Please refer to the [Figure 129](#).*

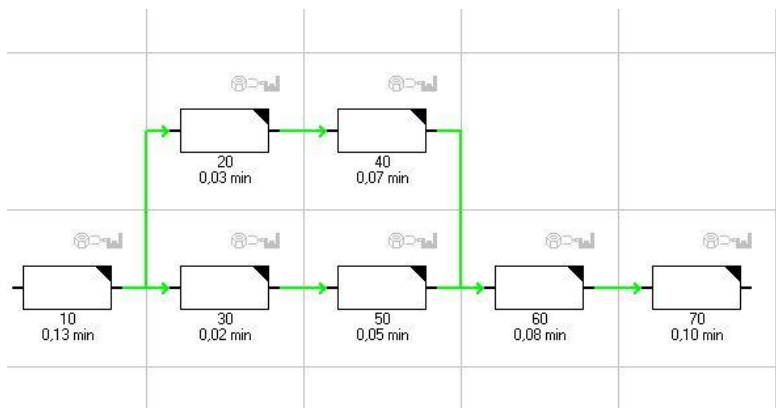


Figure 130: Display Process Numbering – Intervals of Ten

5.1.6.2 Recalculate Status Field

The description of this function can be found elsewhere. *Please refer to the [Updating Status Field](#).*

5.1.6.3 Calculate Throughput Time

The throughput time calculation shows the critical path in the process graph, which stems from the existing relations and process times of planned processes. You can limit the critical path calculation by selecting processes and designating which processes should be included in the calculation by using Start or End symbols. The process times form the basis for the calculation. The critical path is highlighted according to the calculation and indicates the path with the greatest time interval in the process sequence.

Throughput time can only be calculated based on estimated time.



Several examples demonstrate the method for calculating throughput time in the process graph. You can only carry out a throughput time calculation if the planned process sequence is in one direction, i.e., no loop can be created. A loop is created if processes in the opposite direction have been linked to each other in the process sequence.

Critical Path without Set Start and End Symbols

When calculating the critical path without set start and end symbols, the path with the greatest time interval of the planned process sequences can be calculated in the Process Graph.

- 1) Click on an empty field in the process graph to start the throughput time calculation.
- 2) Press the right mouse button and select **Calculate throughput time** from the context menu. *Please refer to the [Figure 131](#).*

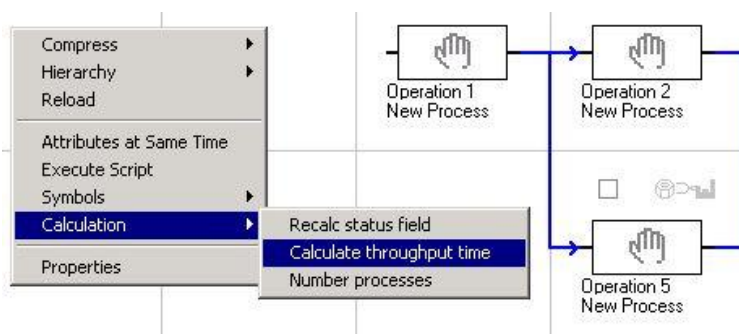


Figure 131: Start throughput Time Calculation – Context Menu

Performing the Calculation

In the **Calculate Throughputtime** dialog, you can specify whether the critical path should be highlighted according to the throughput time calculation. By using the two terms “Start and End symbol”, the marked processes are displayed: For example, “undefined” indicates that no Start or End symbols were set. The program always activates the field **Check graph for cycles** in order to check the planned process links for possible loops.

It is possible to ignore some already set start and end symbols in the throughput time calculation by activating the **Ignore Start/End Symbols** field.

To determine the critical path without set start and end symbols

- 1) Checkmark the field **Mark process along path** to highlight the critical path.

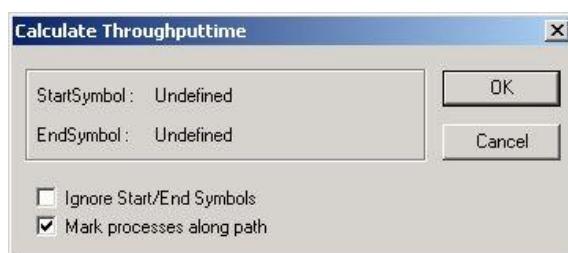


Figure 132: Dialog - Perform throughput Time Calculation

- 2) Click **OK** to start the throughput time calculation.

When the throughput time calculation is complete, all processes belonging to the critical path are highlighted on one hand, *Please refer to the [Figure 135](#)*, and the calculated results are displayed by means of a message on the other hand, *Please refer to the [Figure 134](#)*. You can remove the highlighting of the critical path using the context menu of the right mouse button by selecting **Unmark symbols**, *Please refer to the [Figure 133](#)*. Highlighting of the start and end symbols is removed by selecting the **Reload** function.

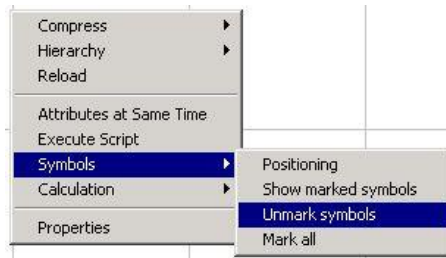


Figure 133: Highlighting – Deselect the Critical Path

Example

Simple example for a critical path for processes in line.

In this simple example, the critical path is determined for three processes arranged in line. The result is always given in a message while it is being determined. The critical path is marked blue.



Figure 134: Message with Results of Throughput Time – Critical Path

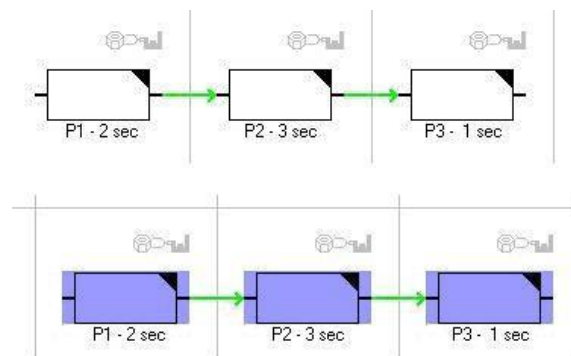


Figure 135: Example – Critical Path Processes in Line

Example of a critical path for processes arranged parallel.

In this example the critical path is determined for processes arranged parallel.

- Critical path equals **7 seconds** (marked blue). Please refer to the [Figure 136](#).

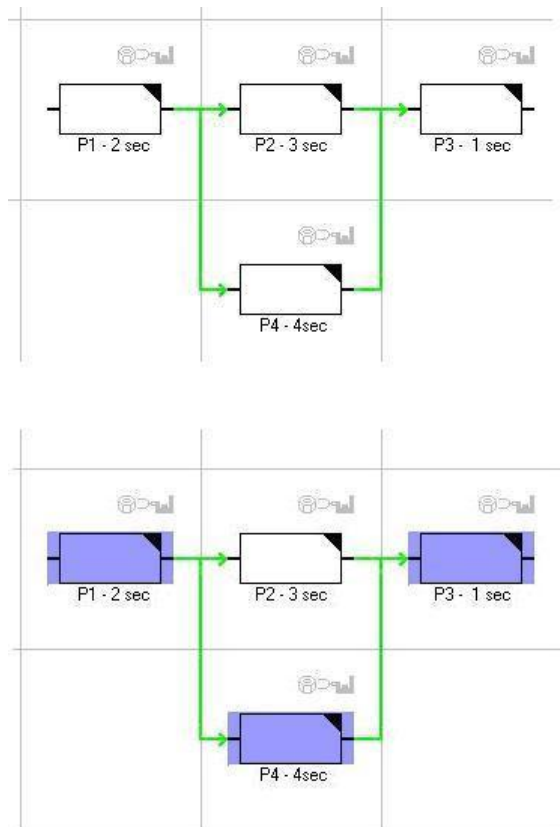


Figure 136: Example – Critical Path Process Arranged Parallel

In this example the critical path for two processes arranged parallel is determined.

- Critical path equals **16 seconds** (marked blue). Please refer to the [Figure 137](#).

Example of a critical path for two processes arranged parallel.

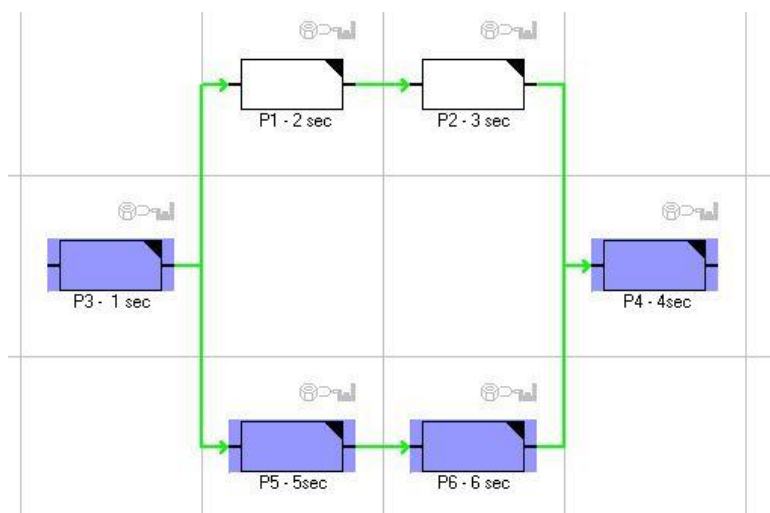


Figure 137: Example – Critical Path for Two Processes Arranged Parallel

No critical path is determined in this example since a loop in the opposite direction was included in the process sequence. An infinite loop simply continues running during the calculation, which means no results can be produced because the underlying calculation scheme must always pass through this loop and thus cannot arrive at any end point.

- The line marked in blue designates the loop that continues to be passed through during the calculation. *Please refer to the [Figure 138](#).*

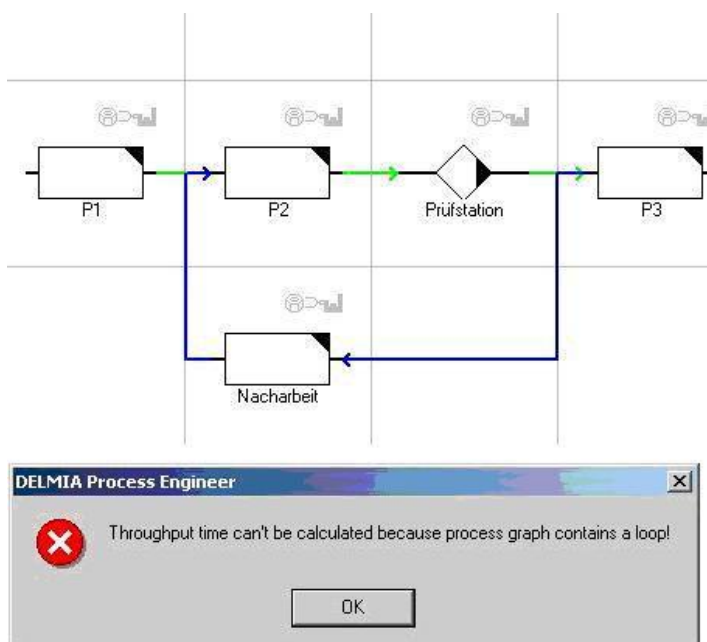


Figure 138: Example – No Critical Path due to a Loop in the Process Sequence

Throughput Time with Start and End Symbols Set

Setting the start and end symbols specify the beginning and ending processes between which the critical path is to be determined.

To specify the critical path between the set start and end symbols

- 1) First select the process for the start symbol. Then press the right mouse button and select **Set Startsymbol**.
- 2) Then select the process for the end symbol. Press the right mouse button again and select **Set Endsymb**.

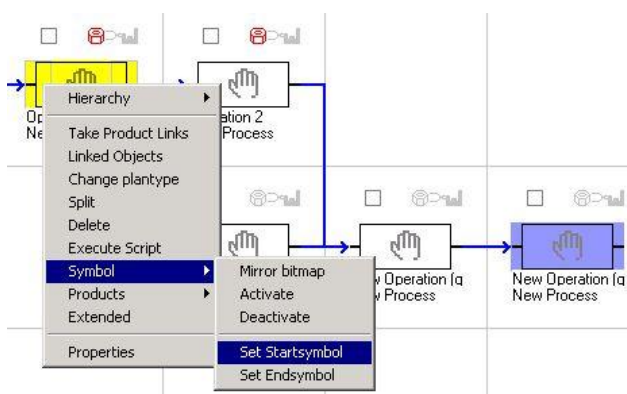


Figure 139: Setting Start and End Symbols – a Process Selected from the Context Menu

The mark of the start or the end icon is removed via the context menu.

- 3) Click in context on **Reload**,
- 4) Click **Remove icon mark**. *Please refer to the [Figure 133](#).*

Example

Example of a critical path with set start and end symbols.

Performing the Calculation

In this calculation, the start symbol is set at **P1** and the end symbol at **P6**. The two set symbols are displayed in the **Calculate Throughputtime** dialog. Please refer to the [Figure 140](#) and [Figure 141](#).

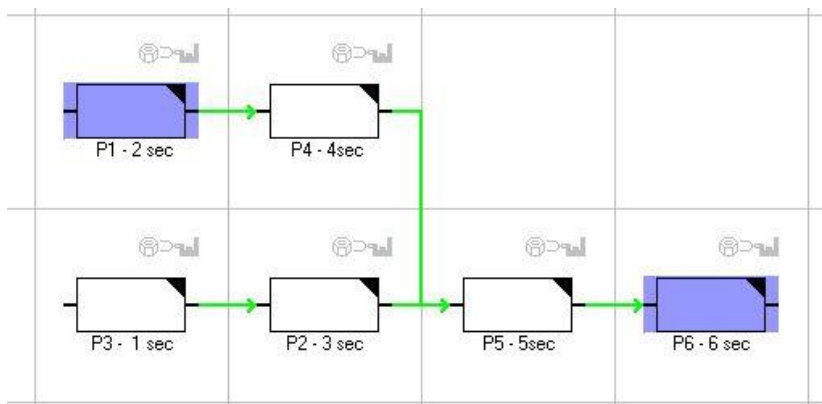


Figure 140: Start and End Symbols Set

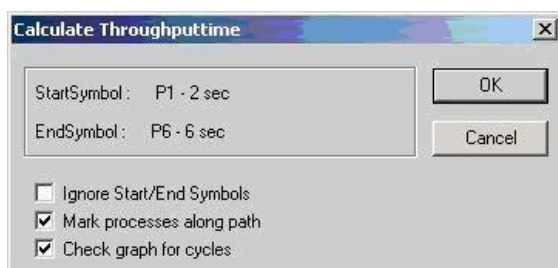


Figure 141: Start and End Symbols Set

- 1) Checkmark the field **Mark process along path** to highlight the critical path.
- 2) Click **OK** to start the throughput time calculation.

The result is displayed: Please refer to the [Figure 70](#).

Example

- The critical path is highlighted (marked in blue). The result amounts to **17 seconds**.

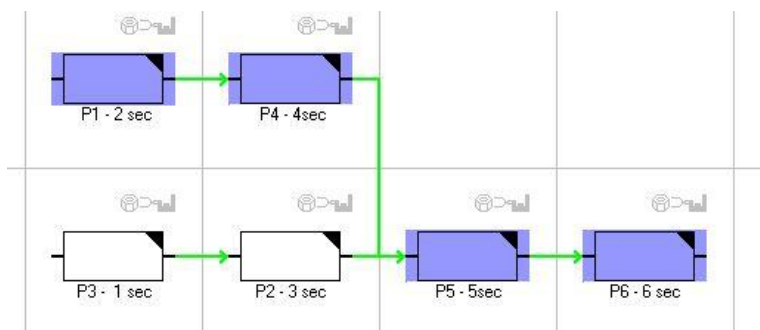


Figure 142: Results of the Critical Path are Displayed

Starting point **P1** was changed; the new starting point is now **P3**. In this example, the critical path should thus be shown between **P3** and **P6**.

- The critical path is highlighted (marked in blue). The result amounts to **15 seconds**.

Example of a critical path with reset start symbol.

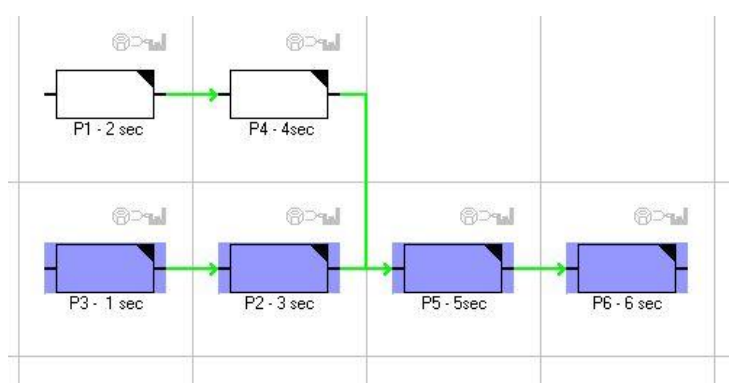


Figure 143: Critical Path Determined – New Starting Point Set

Conclusion

In this way you can set as many start and end symbols as you like to show the critical path. You must observe one restriction, however: Start and end symbols must be set in a way that flow is also feasible. Please refer to the [Figure 144](#).

Example

Example of incorrectly set start and end symbols.

Start and End Symbols Set Incorrectly

You must always set the start and end symbols in a way that enables flow in one direction between the two set processes.

In the example the start symbol is set to **P1** and the end symbol to **P3**. There is no direct connection between these two processes, so that it is impossible to carry out a throughput time calculation.

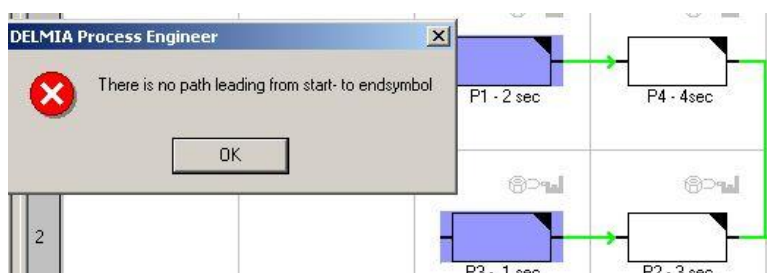


Figure 144: Start and End Symbols – No Flow is Possible

5.2 Opening Context Menu with an Object being Selected

The functions that are actively available in the context menu with an object being selected (Process, Group) are dependent upon which object has been selected. Thus, the two functions **Create group** or **Unmake group** are only available if you have selected several processes or if you have created a group.



Note

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

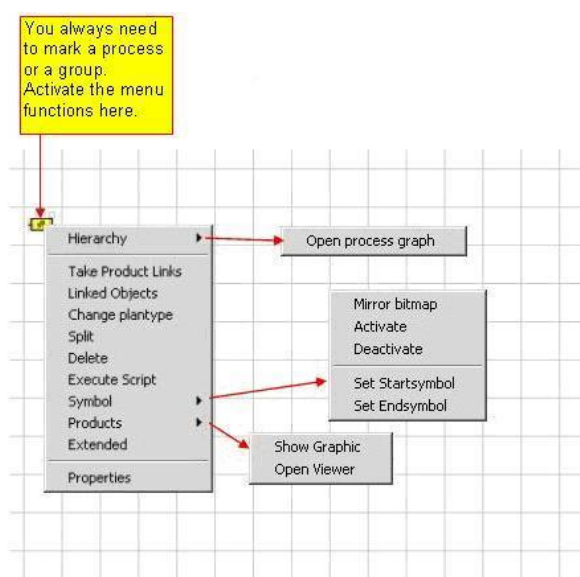


Figure 145: Right Mouse Button Functions with a Selected Symbol

5.2.1 Context Menu Function with a Selected Process

5.2.1.1 Split Function

Use this right mouse button function if you need one process with the same properties several times. You can create several new processes at the same time. The maximum number of processes is determined by the empty fields. *Please refer to the [Splitting of Processes](#).*

5.2.1.2 Hierarchy: Create Groups Function

Use this right mouse button function if you want to combine individual processes into one group. First of all, you need to mark the symbols.

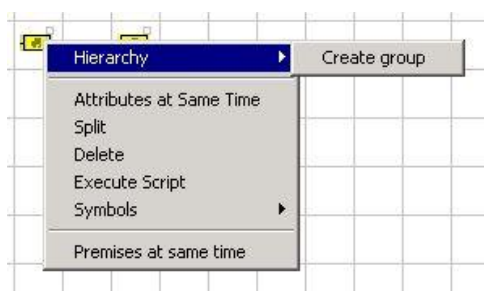


Figure 146: Context Menu for Several Selected Processes

- 1) Click one symbol and press the CTRL key.
- 2) Hold down the CTRL key and continue marking additional symbols
- 3) Press the right mouse button and click **Create group**.

The individual processes are now combined together into one group. The group can then be edited further. *Please refer to the [Grouping of Processes](#).*

5.2.1.3 Attributes at Same Time Function

The description of the function **Attributes at same time** can be found in the [PPR Navigator Manual](#).

5.2.1.4 Execute Script

Please refer to the [Execute Script](#).

5.2.1.5 Symbols

Mirror Bitmap

Use this right mouse button function e.g. to change the transportation direction of a transport.

Deactivate

Use this right mouse button function to deactivate an active process. The process is deactivated. Use this function if you are having alternative thoughts that do not have any connection with the deactivated process. You can reactivate a deactivated process by clicking the right mouse button function *Activate*.

Activate

This right mouse button function is preset during the manufacturing process. Use this function to reactivate a process or a group that has been deactivated.

5.2.1.6 Delete

Use this right mouse button function to delete processes or groups.

5.2.1.7 Linked Objects

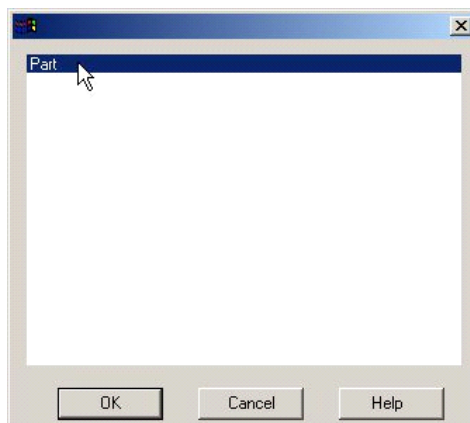
Use this right mouse button function to display the links of a selected process. Please refer to the [Displaying Relations](#).

5.2.1.8 Products

Using this menu item, you can display products from the Process Engineer in graphs as well as views from external programs as well. Thus, all current file formats can be displayed in the Process Engineer.



- 1) Press the right mouse button after making your selection.
- 2) Click the Products menu item and either select **Show graphic** if you want to display an internal graphic.
- 3) Select **Open viewer** if you want to display an external graphic. In both cases, the same dialog appears. Please refer to the [Figure 147](#).
- 4) Select the product in the dialog. Then click **OK**. The graphic is opened. Please refer to the [Figure 148](#) and [Figure 149](#).



**Figure 147: Selecting Dialog for Graphic
Internal Product View**

Example

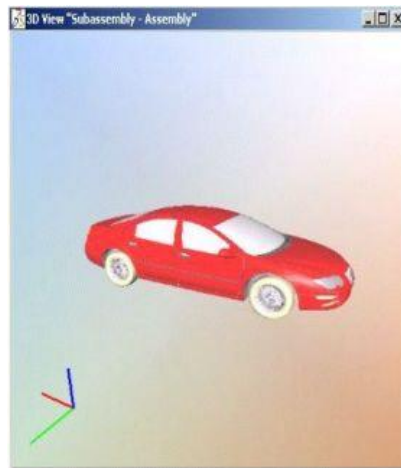


Figure 148: Internal Product View – Entire Picture

Example

External Product View

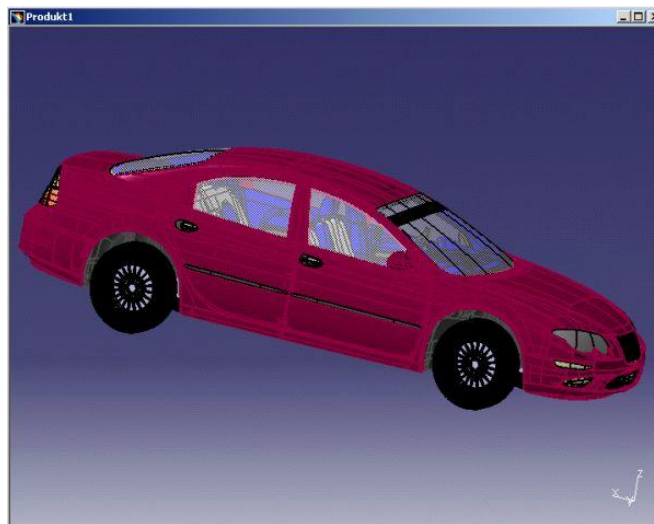


Figure 149: Product View from External Program – Entire Picture

5.2.1.9 Changing Plantype

The plan types can be changed directly in the Process Graph 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.

Let's say, for example, you have formed a process line consisting of value adding processes in the Process Graph. You see that a test instead of the value adding process is to take place at a point in this line. What alternative is there to deleting and inserting if you want to generate a test process from the plantype **value adding process**?



The changes take effect in both the process view and the PPR Navigator.

This new function is also available in the Manufacturing concept for editing resources.

- 1) Select this process.
- 2) Open the context menu.
- 3) Select **Change plantype**.

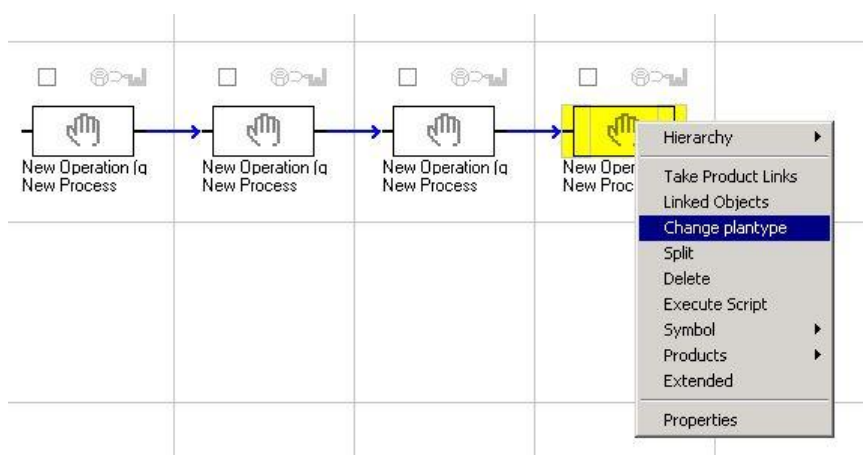


Figure 150: Context Menu – Select Change Plantype

- 5) Select the plantype in the *Change Plantype* dialog. In the example it is the Workplan.

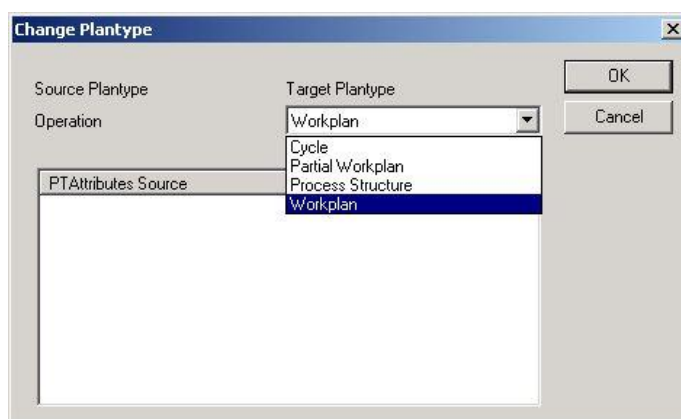


Figure 151: Selecting the Plantype – Change Plantype Dialog



Note

*This **message** can be **ignored** in the Process Graph (PPR Navigator, process view). This message only indicates that the new plantype is not displayed in the uppermost level under process view in the PPR Navigator (this applies to the previous plantype as well).*

*This message is meant for **information** purposes only.*

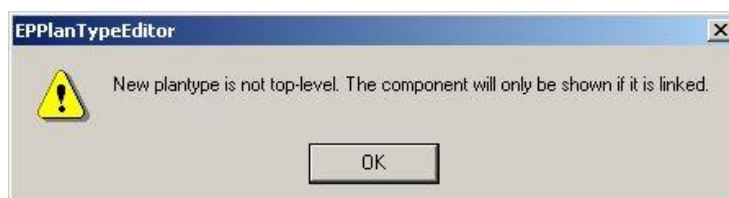


Figure 152: Ignore Message in the Process Graph – Confirm with OK

- 6) **Always** confirm the message with OK.
- 7) Always update the Process Graph view after making changes.

- 8) To do this, open the context menu in a free field in the Process Graph.
Select *Reload*.
- The new process symbol is displayed after the view is updated. The new plantype is displayed in the properties dialog of the changed plantype under the tab Plantype Information.
- 9) After changing the plantype, you can update the data for the new plantype in the properties dialog.

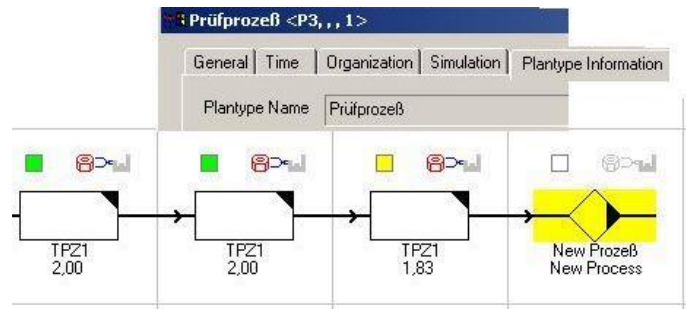


Figure 153: Process Graph Display – Update Data Properties Dialog



Note

If a WSC is linked to a component you cannot change the plantype of that component.

5.2.1.10 Premises at Same Time Function

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 (e.g. resource plantype) in the Manufacturing Concept.

Assigning PoT Curve, Mark All function

The function *Premises at same time* is available only if you previously select the plantype to which you want to assign a PoT curve. You can also assign a PoT curve to all the plantypes used in the Process Graph at the same time – for example, the plantypes process, partial workplan, process (not value adding) and test process; to do this, all the plantypes must be selected in the *Select plantype(s) to mark* dialog.

Example

In the example, the PoT curve is assigned to the Process plantype.

- 1) Open the context menu in the free Process Graph.
- 2) Select **Mark all**.

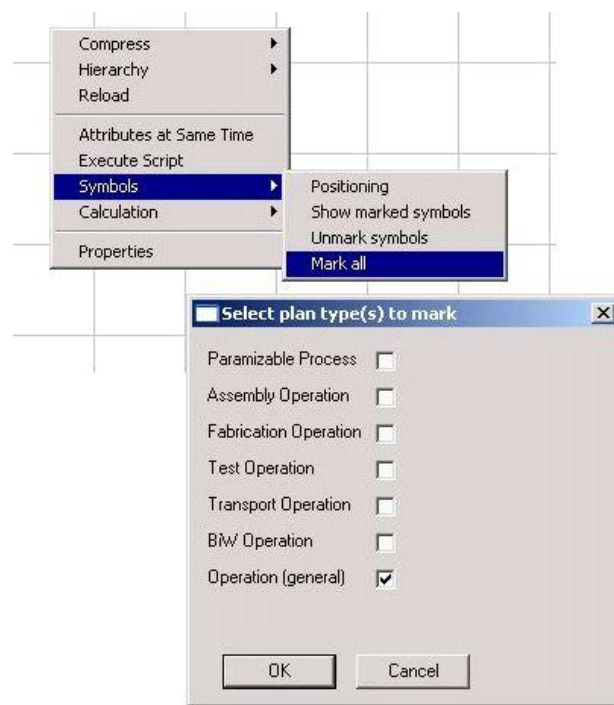


Figure 154: Context Menu – Mark All

Example

- 3) In the **Select plantype(s) to mark** dialog, click in the field for the respective plantype to which you want to assign a PoT curve.
- 4) Confirm the selection with **OK**. The selected plantypes are marked.

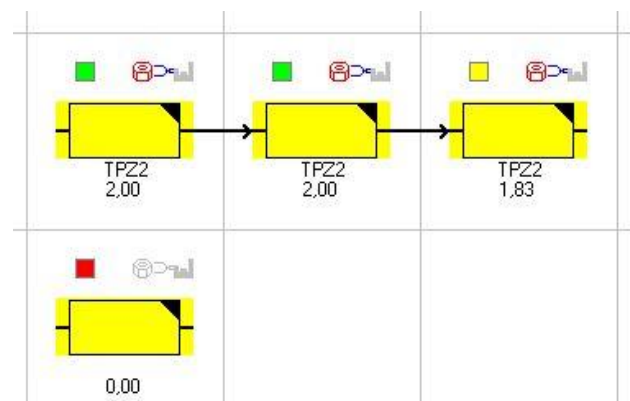


Figure 155: Marked Process Plantype – after the Selection

Example

- 5) Open the context menu on one of the marked process symbols.
- 6) Select **Premises at same time**.

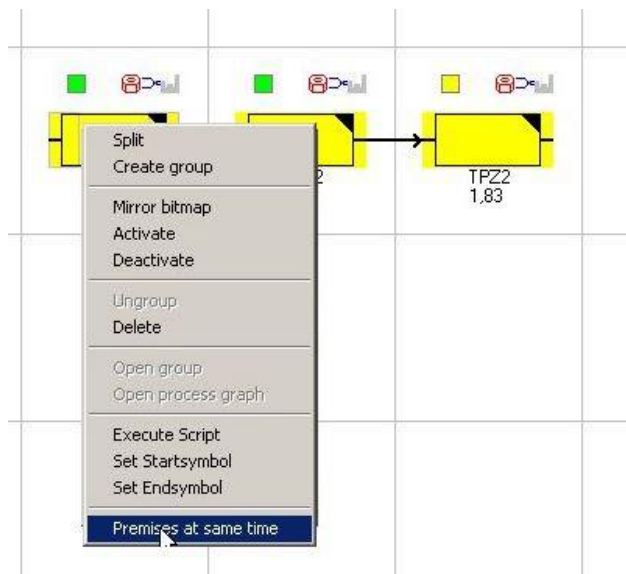


Figure 156: Open Context Menu – Select Premises at Same Time

- 7) Select the PoT curve. Then click **Apply** field. The field must always be marked for the change to take effect.
- 8) Confirm the selection with **OK**.

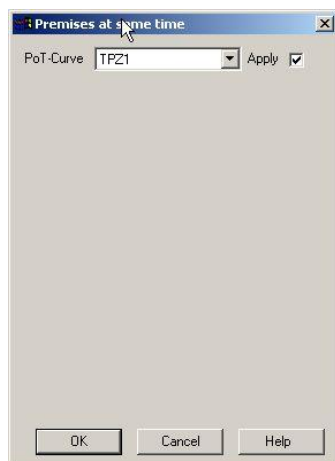


Figure 157: The Apply Field must be Marked

Example

- 9) Check the change in the properties dialog of the plantype.
 - In the example, the PoT curve was changed for the three processes. The selected PoT curve was assigned to the new process.

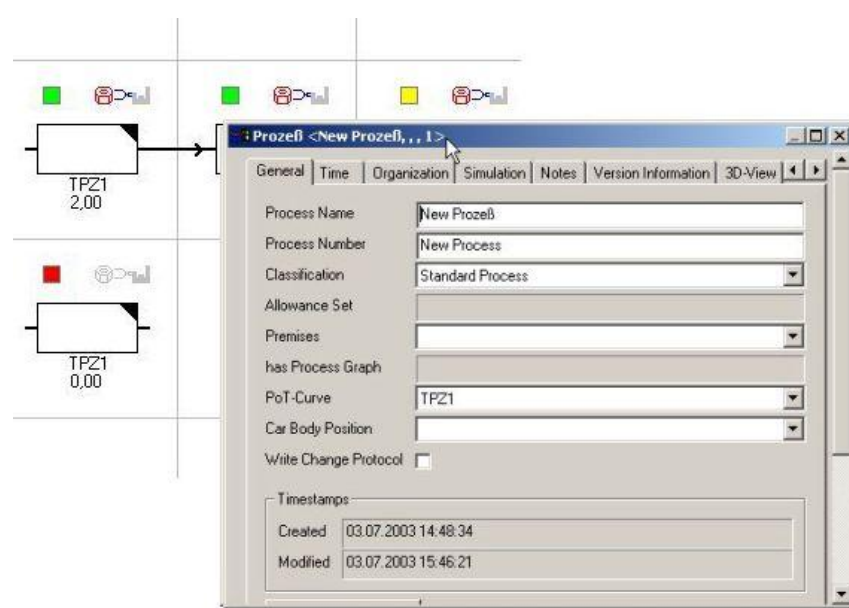


Figure 158: PoT Curve Changed and Reassigned

5.2.2 Context Menu with a Selected Group

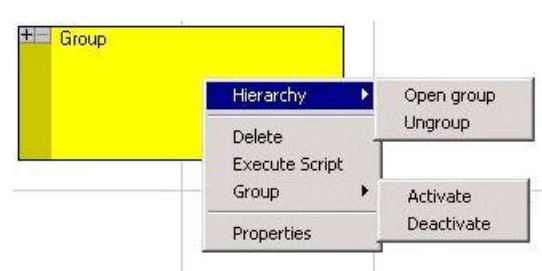


Figure 159: Context Menu - Selected Group

5.2.2.1 Open Group, Open Parent Group

Use the right mouse button function **Open group** to display and to edit all processes of a group. This function can be used more effectively if a group consists of several smaller groups.



Using the plus and minus symbol you can open and close a group.

Use the **Open parent group** function to restore the original situation.

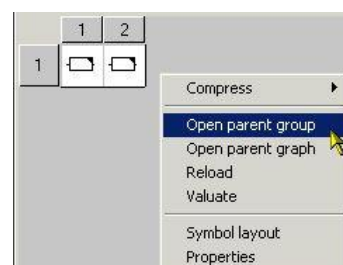


Figure 160: Parent Group – Restoring the Original Situation

5.2.2.2 Unmake Group

Use this right mouse button function to unmake a group.

5.2.2.3 Opening Process Graph

This function is always active. If there is no Process Graph assigned to the selected process a new one is created.

Alternatively the Process Graph can also be opened using the small icon above the process symbol. Use the **Open parent graph** function in the open Process Graph to restore the original situation.

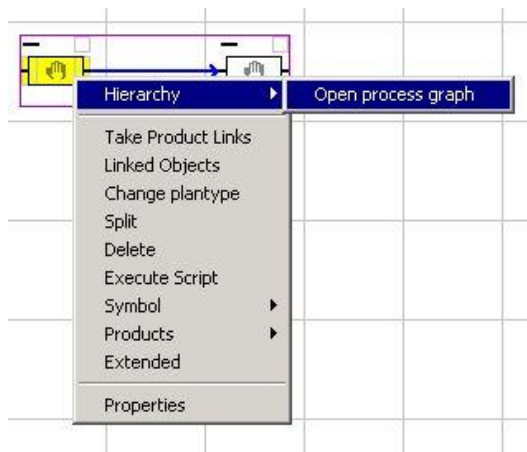


Figure 161: Opening Process Graph

5.2.3 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**. Copy and paste of objects functions as is standard in Windows.

To copy objects the following preconditions must be met:

- Processes of a process graph can only be copied and pasted between process graphs and within a process graph.
- Resources of a manufacturing concept can only be copied and pasted between manufacturing concepts and within a manufacturing concept.



Note

Pasting of objects is possible only if sufficient space is available in the graph. When placing objects none of the cells of the graph must be occupied by other objects.



Figure 162: Messages Target Cells Occupied

Some copy procedure cannot be achieved with these two functions:

- You cannot copy processes into a manufacturing concept.
- You cannot copy resources into a process graph.

- You cannot paste processes or resources in the PPR navigator into the respective structures.
- Changes of relations between the source graph and the target graph are not settled.

5.2.3.1 Copying with Relations applying to the Entire Graph

Example

Copy processes in the source graph.

Relations applying to the entire graph are identified by the two relation types **runs before** and **runs after**.

To show the principle procedure for copy and paste, two process graphs have been made up in the example. From the **Source process graph** four processes are copied and pasted in the empty **Target process graph**. Resources are copied and pasted in the same fashion in a manufacturing concept.

- 1) Open the source process graph and the target process graph.
- 2) Select the processes in the source process graph. In the example, these are the four processes contained in the source process graph.
- 3) After selecting, open the context menu on a free cell in the source process graph. Select **Copy (Graph)**. The processes are copied to the clip board.

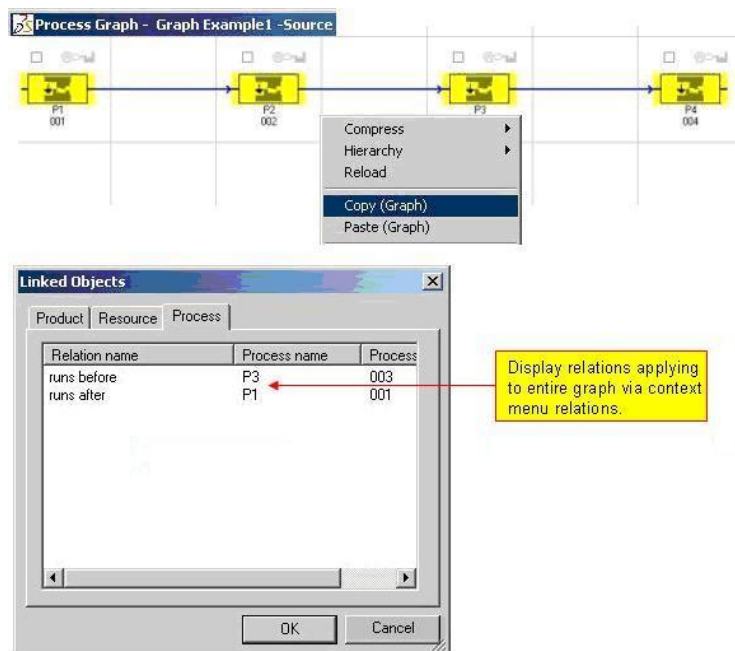


Figure 163: Copy Processes in the Source Graph - applying to Entire Graph

5.2.3.2 Pasting with Relations applying to the Entire Graph

Paste processes in target graph.

Open the context menu in the target process graph. Select **Paste (Graph)**. The processes are pasted from the clip board on to the target process graph.

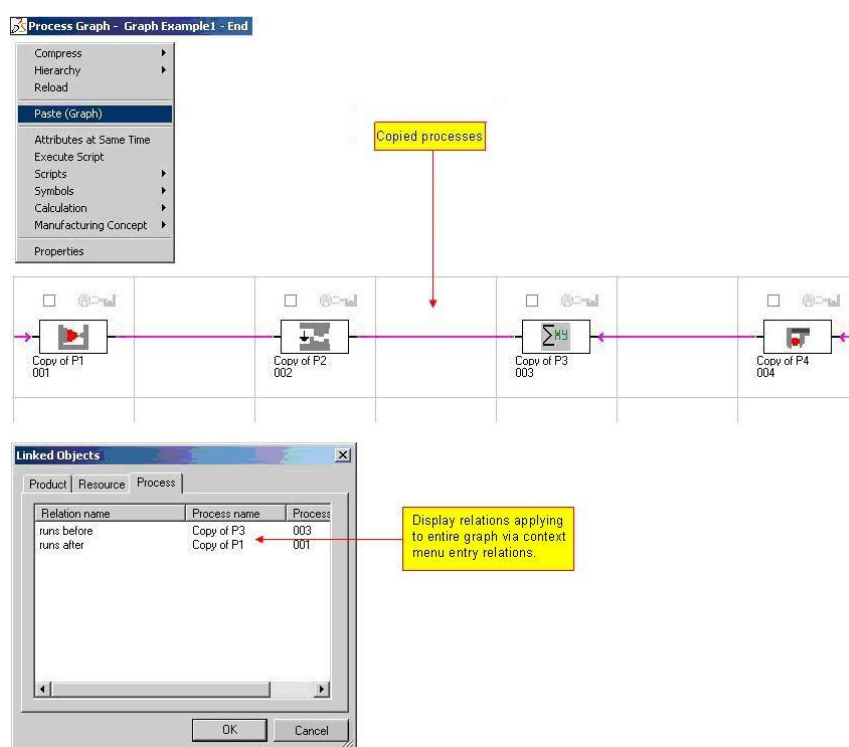


Figure 164: Paste Processes in the Target Graph - applying to Entire Graph

5.2.3.3 Making Changes - applying to Entire Graph

Example

As illustrated by the example, changes made in one graph after copying, such as changing the process name or deleting relations, are not duplicated between source and target process graph. Changes only affect the graph in which they are made.

Delete relations,
change process
name in source
graph.

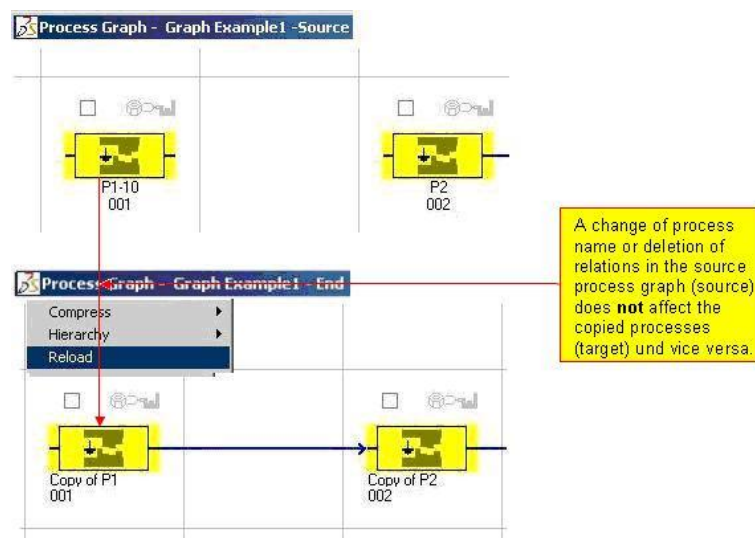


Figure 165: Changes of Graphs - applying to Entire Graph

5.2.3.4 Copying with Relations applying to the Entire Project

Copy processes with
relations applying to
entire project in the
source graph.

Relations applying to the entire project are identified by the two relation types **must precede** and **must succeed**.

Copying with relations applying to an entire project corresponds to copying with relations applying to an entire graph.

The example re-illustrates the principle procedure.

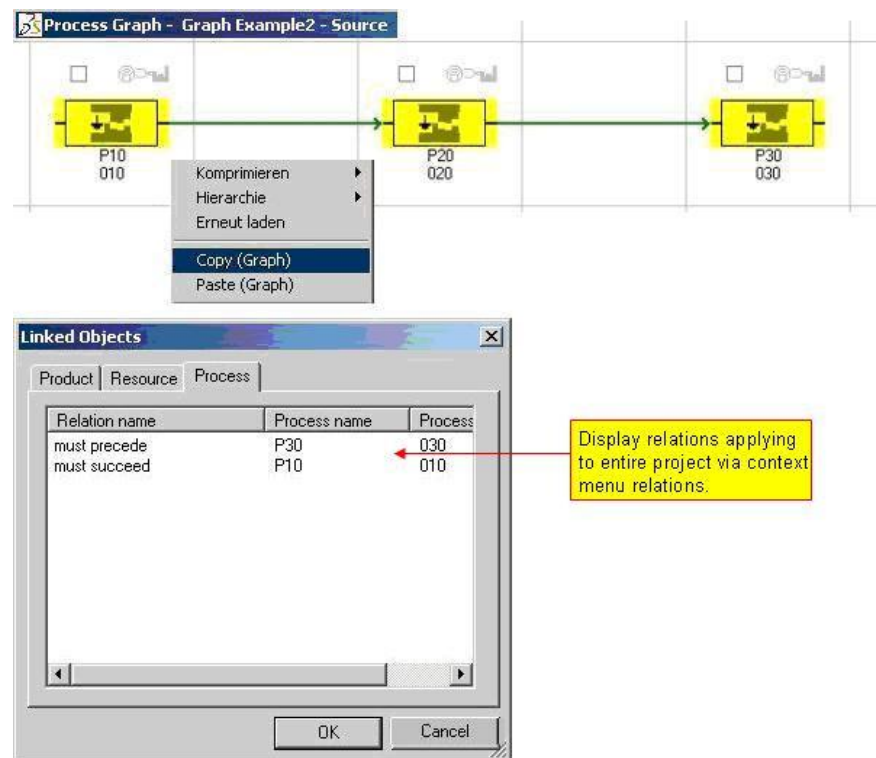
Example

Figure 166: Copy Processes in the Source Graph - applying to Entire Project

5.2.3.5 Pasting with Relations applying to the Entire Project

Example

Pasting with relations applying to an entire project corresponds to pasting with relations applying to an entire graph.

Paste processes with relations applying to entire project in target graph.

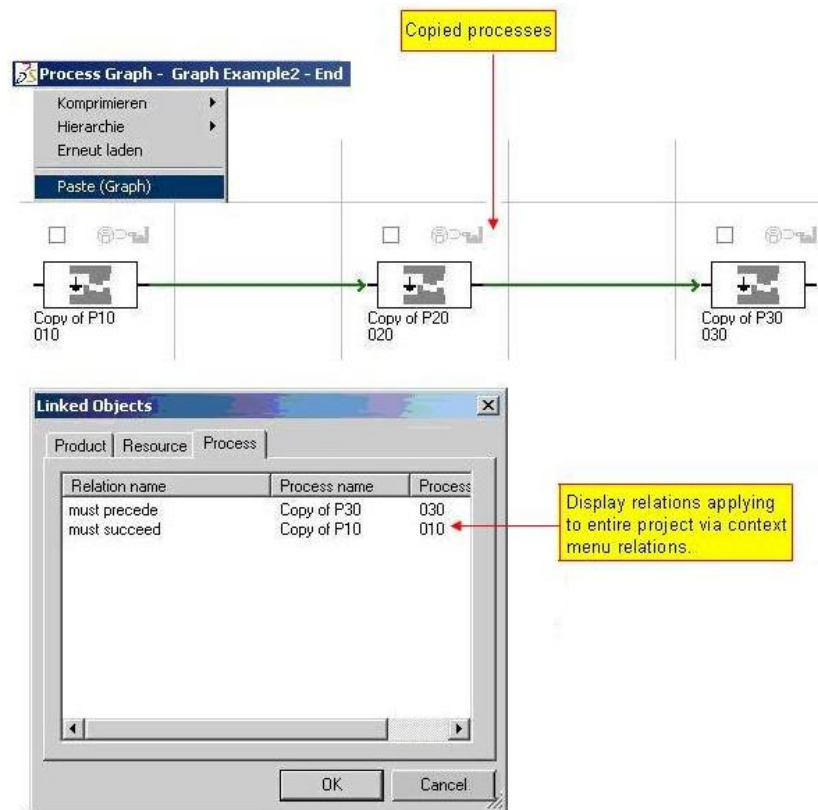


Figure 167: Paste Processes in the Target Graph - applying to Entire Project

5.2.3.6 Making Changes - applying to Entire Project

Example

Delete relations in the source graph.

Making changes in graphs after copying of objects with relations applying to an entire project corresponds to copying objects with relations applying to an entire graph.

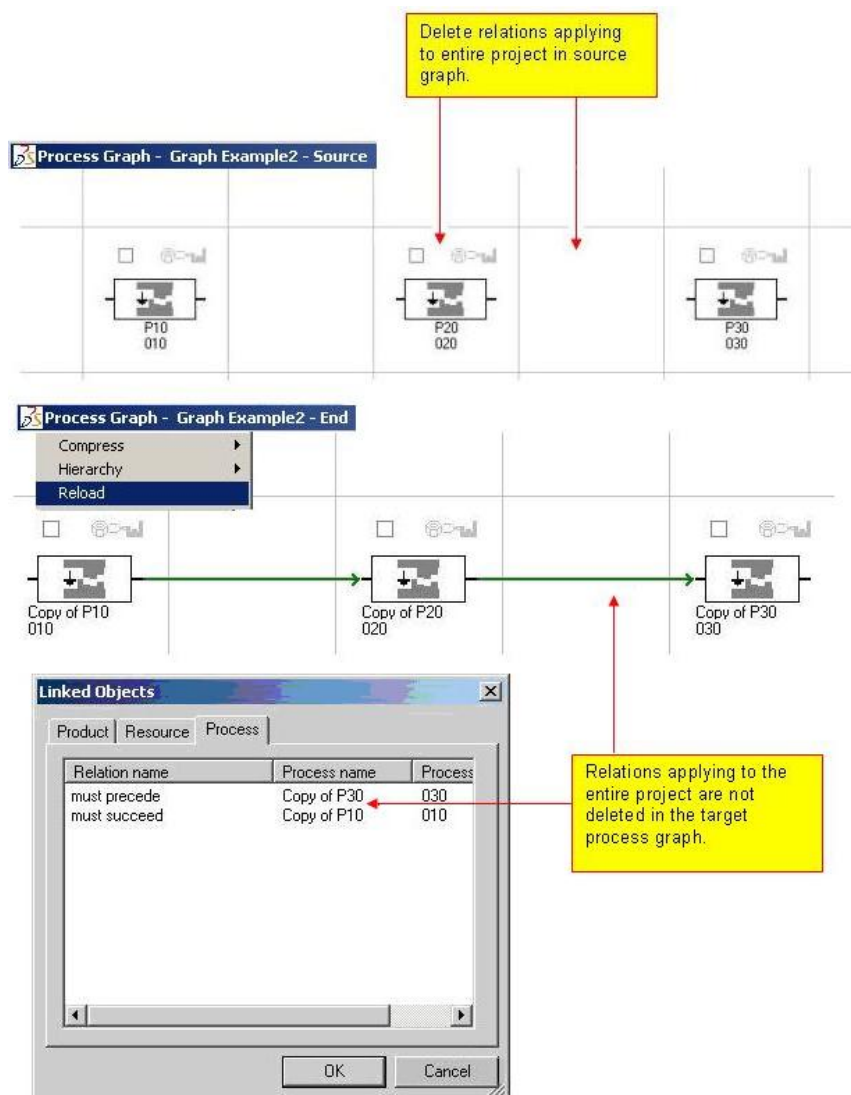


Figure 168: Changes of Graphs - applying to Entire Project

5.2.3.7 Pasting in Occupied Cells

Example

The example illustrates the pasting processes in a target process graph in which the cells are occupied.

Paste processes in target graph, cells are occupied.

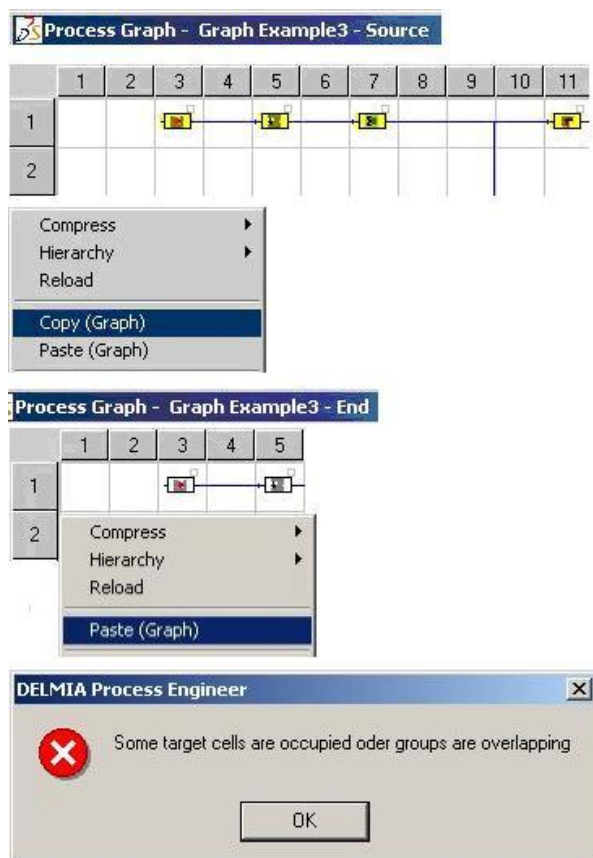


Figure 169: The Processes cannot be Pasted in the Target Process Graph

5.2.3.8 Pasting Processes in a Manufacturing Concept

The example shows that it is not possible to paste a process in a manufacturing concept with the two context functions.

Proc-

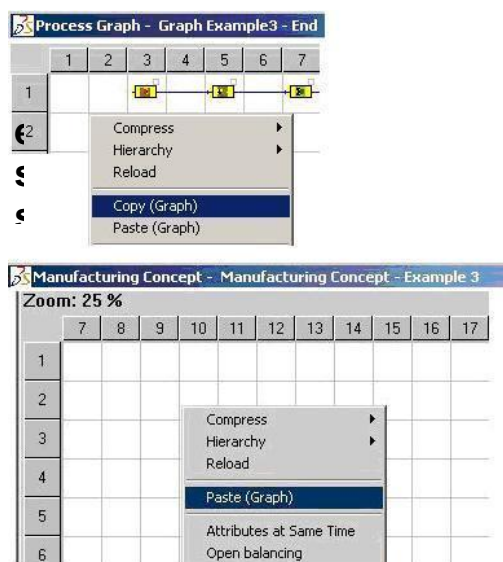


Figure 170: Processes cannot be Pasted

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