



HOME

User Manual

DELMIA Process Engineer<sup>®</sup>

## Work Load Balancing - Application



# Foreword

This describes Process Engineer operation and basic functions you need to be familiar with when dealing with Work Load Balancing 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.

Nevertheless, there will certainly be some things that we could do even better. If you have any suggestions for improving our software, please be sure to let us know.

We look forward to receiving your constructive feedback. It helps us to make it even easier for you to work with the Process Engineer functions.

The same holds true for the manual that you are now reading. If, at any point when using these instructions, you feel you are not being provided with the clear, unambiguous, and proper guidance necessary to work with this application, please be sure to let us know. We look forward to receiving your comments and tips.

Please feel free to call, send us an E-mail, or contact our user hotline.

## **Please Send your Suggestions to:**

**DELMIA GmbH**

Raiffeisenplatz 4

D-70736 Fellbach

**Phone:** +49/711/27 300-0

**Fax:** +49/711/27 300-599

**E-mail:** [delmia.de.info@3ds.com](mailto:delmia.de.info@3ds.com)

## **User Hotline:**

If you have problems when using DELMIA products, please contact our user hotline at:

**Phone:** +49/711/27 300-400

**Fax:** +49/711/27 300-599

**E-mail:** [delmia.de.support@3ds.com](mailto:delmia.de.support@3ds.com)

## **No Liability or Guarantee**

Our programs and manuals have been compiled with great care and to the best of our knowledge. They have also been tested in a production setting. However, we assume no liability and provide no guarantee that the software and related descriptions are free of error or are suitable for special purposes.

DELMIA assumes no liability for any damage that may arise from the use of this software. By using this software, the user acknowledges this exclusion from liability and shall hold DELMIA exempt from all claims.

### **Copyright**

The information in our documents may be copied and distributed for internal purposes provided it is done free of charge and the contents are not altered or distorted.

Any other form of usage, especially the sale on CD-ROM or in any other publication in whole or in part is only permitted after prior written consent by DELMIA.

Some parts of this software are owned by Unigraphics Solutions Inc. and are copyrighted © 2010. All rights reserved.

Some parts of this software are owned by combit® GmbH and are copyrighted. Report-/Print module List and Label® Version 8.0: Copyright combit® GmbH 1991-2010.

### **Modifications**

Moreover, DELMIA retains the right to make modifications and improvements to the product described in this manual at any time without prior notification.

DELMIA and the 3DS logo are registered trademarks of Dassault Systèmes or its subsidiaries, in the United States or other countries.

© 2001-2010 Dassault Systèmes - All rights reserved

Thank you for your interest in our products

### **DELMIA GmbH**

Raiffeisenplatz 4

D-70736 Fellbach, Germany

**Phone:** +49 (-400)711/27 300-0

**Fax:** 49/711/27 300-599

# Table of Contents

<b>1.</b>	<b>Introduction</b>	<b>1</b>
1.1	How to Use this Manual	1
1.2	Documentation Conventions and Symbols	1
1.3	New Functions in Work Load Balancing	2
<b>2.</b>	<b>Work Load Balancing</b>	<b>3</b>
2.1	Work Load Balancing Results	3
2.2	Work Load Balancing Advantages	3
2.2.1	Workflow Support	4
2.2.2	Raw Balancing Views	4
2.2.3	Using Organizational Structures for Workload Balancing	6
2.3	Editing Views of the Work Load Balancing	6
2.3.1	Resource Structure in the PPR-Navigator	7
2.3.2	Process Structure in the PPR-Navigator	8
2.3.3	Balancinglist with Balanced Processes	9
2.3.4	Buffer for Non-Balanced Processes	11
2.3.5	Bar Chart	12
2.3.6	Area View	14
2.3.7	Setting Label Filters for Layout Processing	15
2.4	Workload Balancing Menu	16
2.4.1	Balancing Menu	19
2.4.2	Context Menu	19
2.5	Highlighting of Processes in the Workload Balancing	21
<b>3.</b>	<b>Raw Balancing</b>	<b>22</b>
3.1	Planning the Raw Balancing	22
3.1.1	Assigning Processes to the Balancing List	24
3.1.2	Assigning Processes between Buffer and Workload Balancing	25
3.1.3	Removing Processes from Stations	26
3.2	Determining Utilization	27
3.2.1	Displaying Utilization Results	29
3.2.2	Generating a Balancing Process for Several Variants	30
3.3	Saving the Workload Balancing with Effectivities	33
3.3.1	Effectivities Tests for Workflow Support	33

3.3.2	Important Message for Working in Work Load Balancing	35
3.3.3	Exporting a Balancing List	38
3.3.4	Printing a Balancing List	39
<b>4.</b>	<b>Workload Balancing with Workflow Support</b>	<b>41</b>
4.1	Planning 3-Level Balancing	41
4.1.1	Workflow Support – Scheme of the Functionality	44
4.2	Planning Area Workload Balancing	45
4.2.1	Opening the Area Workload Balancing	47
4.3	Planning Fine Workload Balancing	47
4.4	Deleting Workload Balancing	51
	<b>Appendix</b>	<b>54</b>
	<b>List of Figures</b>	<b>60</b>
	<b>List of Tables</b>	<b>63</b>
	<b>Index</b>	<b>64</b>

# 1. Introduction

This manual explains how to use the Process Engineer Work Load Balancing 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 Work Load Balancing. This manual briefly describes:

- How to start and exit the balancing process.
- Menus and views required for balancing.
- How to create and edit a balancing list.
- How to link the processes shown in the balancing list with the appropriate resources.

The Work Load Balancing program module is used to link processes with lines and stations. The result is a balancing list with indicators where you can view and edit all linked processes.



### Note

*When handling the Work Load Balancing 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 Work Load Balancing

No new functionality has been added to the version **PE 5.19**.

## 2. Work Load Balancing

The Work Load Balancing (WLB) in the Process Engineer is a module for the planning and assignment of processes to resources.

### **Balancing Importance for Planning and using Workstations Efficiently**

Lines and stations need to be assigned to processes that are carried out by a worker or a group. To manufacture a product in a cost-effective way, the assigned processes have to be executed in a logically linked order.

The new Work Load Balancing module links processes and resources such as lines, stations, and work processes to each other and illustrates them in a balancing list. Work Load Balancing allows you to assign work processes to workstations before production of a new product begins. It thus ensures the optimum use of resources in the planned production area.

### 2.1 Work Load Balancing Results

The achieved results provide the single planner as well as the managers with information at an early stage that can form the basis for future decisions. The information helps in the following areas:

- Taking organizational or technical measures.
- Revising the existing plant structure.
- Specifying the efficient utilization of resources and the number of workers.
- Set the number of stations for a line sequence.
- Change the cycle time.



#### **Note**

*Since Version PE 5.12, a demo project for Work Load Balancing is included in the setup. In the demo project you get all necessary data for Work Load Balancing functions.*

### 2.2 Work Load Balancing Advantages

Balancing and assigning processes to the corresponding area is closely linked to the structure which is generated in the PPR Navigator according to the operational requirements.



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

The Work Load Balancing (as of version PE 5.15) can be operated in two ways:

- As independent raw balancing
- With workflow support



**As Independent Raw Balancing:** In a raw balancing, the balancing is abstractly created as a standard for technical structures which by this point in time do not yet have a direct reference to an organizational structure. The raw balancing could also be directly created for an organizational structure without workflow support with a corresponding workflow balancing configuration.

**With Workflow Support:** In the workflow support, the individual workload balancings are derived from one another. The workflow support is used to create references to organizational structures.



### Note

*In the raw balancing, just as in the case with workflow support, stations, and workplaces can be balanced; the settings are set in the workload balancing configuration.*

## 2.2.1 Workflow Support

The work load balancing provides solid workflow support on the basis of the three possible levels of the workload balancing. All three levels have hierarchical dependence on one another. A complete workflow support is realized only if this hierarchical dependence is complied with the planning of the workload balancing. The three level balancing is shown with the help of technical (level 1) and organizational (level 2/3) structures that are linked to one another. The workload balancing configuration of the workflow support must reflect this fact accordingly. A separate workload balancing configuration must exist for every level:

- **Workload Balancing on the Basis of Level 1:** Raw balancing of the stations of a line with processes.
- **Workload Balancing on the Basis of Level 2:** Area workload balancing - management of processes via created organizational structures, carrying out capacity alignment of the structures, and if applicable, re-distribution of the processes to groups of the area. Level 2 workload balancing is the prerequisite for the workload balancing on the basis of the level 3 workload balancing.
- **Workload Balancing on the Basis of Level 3:** Group balancing - workload balancing of individual workplaces of the stations of a group.

## 2.2.2 Raw Balancing Views

A raw balancing is depicted in a technical structure. An assignment to organizational units is not carried out for the raw balancing.

There are two ways of using the raw balancing:

- As an independent workload balancing, in which the stations and workplaces that have no reference to organizational structures can be balanced. A workload balancing for workplaces is, just like the level 3 workload balancing, opened from the resource view and must also have three hierarchical levels.
- As level 1 workload balancing as the basis for the three level balancing. In a three level balancing, the organizational structures for level 2 and 3 are linked to the structure of the level 1 workload balancing.

The functionality of raw balancing

### Linking Processes

A raw balancing is generally started from a resource structure in the PPR-Navigator – exceptions includes the workload balancing of workplaces and variants of the raw balancing. In this case, the raw balancing can be started only from the two hierarchical levels: line sequence and line. A raw balancing is opened via the context menu of the right mouse button. The settings of the stations or workplaces are set in the workload balancing configuration.

As a rule, a station is the smallest unit for a line or a line sequence. The results of the linked object are displayed immediately in the open workload balancing - such as the capacity utilization of individual stations in the column diagram and the assigned processes in the workload balancing.



### Note

*A linkage of processes in the PPR-Navigator could lead to errors in the workload balancing that would be displayed via effectivities tests – for example, for the multiple usage of processes. Effectivities tests are carried out whenever variants of a raw balancing are saved. Please refer to the [Saving the Workload Balancing with Effectivities](#).*

The functionality of raw balancing

### Familiarization with the Balancinglist

Two views are available for the workload balancing apart from the column diagram and area views. The column diagram is the balancinglist in which the processes are assigned to the stations or workplaces. The area view act as a buffer to which processes are assigned that are supposed to be assigned to the stations or workplaces at a later point in time.



- A workload balancing is saved either via the menu or icon in the tool bar.
- The processes are linked to the resources of the balancinglist via drag and drop from the process view.
- A process that is linked to a resource in the PPR-Navigator is shown only after the workload balancing is restarted. Links should generally be made in the workload balancing since the linkage in the PPR-Navigator could lead to inconsistent data for the workload balancing.
- The processes are moved within the balancinglist by drag and drop.
- The processes are moved between the balancinglist and the buffer via the context menu.

### Editing of the Workload Balancing

For the processing of the workload balancing you can use the workload balancing menu and the context menu of the right mouse button.

- The workload balancing is printed and saved via the workload balancing menu.
- Processes are moved between the balancinglist and buffer, and the usage is shown or a balancinglist is exported into an Excel file, via the context menu.



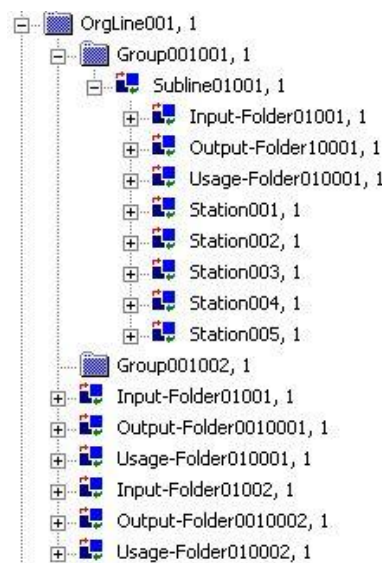
### Working with Processes

An unlimited number of processes can be inserted into the balancinglist. In the workload balancing configuration you can set whether a process is used several times in a workload balancing. Processes can be moved an unlimited number of times in the workload balancing and can be assigned to other stations.

## 2.2.3 Using Organizational Structures for Workload Balancing

As a rule, organizational structures are used to show the workload balancing on the basis of the workflow support, i.e. the three level balancing for the planning of areas and groups. The three level balancing functions only if the organizational structure of one **raw balancing is derived with level 1** and the stations set in the raw balancing are referenced.

The stations and processes planned in the raw balancing are assigned in an organizational structure to organizational areas and groups via the workload balancing. The workflow support is completely functional only if an organizational structure has four hierarchical levels as depicted in the below example: Orgline, Group, Subline, and Station. *Please refer to the [Figure 1](#).*



**Figure 1: Example of an Organizational Structure**

For the distribution of the processes there are input and output directories for the areas and groups of the organizational structure; these directories must be linked to one another so that every change can be executed in the respective input or output directory. *Please refer to the [Workflow Support – Scheme of the Functionality](#).*

A workload balancing for level 2 and level 3 can be created from the resource view. *Please refer to the [Planning Area Workload Balancing](#).*

## 2.3 Editing Views of the Work Load Balancing

Views of the  
workload  
balancing

The Work Load Balancing generally provides four views for the editing of the workload balancing:

- Balancinglist with balanced processes
- Savable buffer with non-balanced processes
- Column diagram
- Area view

The process and resource structures that form the basis of a workload balancing are planned in the PPR-Navigator.

Table 1: Workload Balancing Editing Views Overview

Editing Views	Overview																																																																																																																							
Balancinglist with balanced processes	<div><div>Austaktung: Linie001   Standard Grid View</div><table><thead><tr><th>Nr.</th><th>Name</th><th>Short Name</th><th>Time [min]</th><th>time with</th><th>Freq. [%]</th><th>Altern. Co</th></tr></thead><tbody><tr><td colspan="7">Station002</td></tr><tr><td>1</td><td>ProcessGroup003</td><td>tech.operation</td><td>0.71</td><td>0.709039</td><td>100</td><td>-</td></tr><tr><td>2</td><td>ProcessGroup004</td><td>tech.operation</td><td>0.86</td><td>0.862621</td><td>100</td><td>-</td></tr><tr><td colspan="7">Berechnete Zeit: 1.572</td></tr><tr><td colspan="7">Station001</td></tr><tr><td>3</td><td>ProcessGroup001</td><td>tech.operation</td><td>0.58</td><td>0.579620</td><td>100</td><td>-</td></tr><tr><td>4</td><td>ProcessGroup002</td><td>tech.operation</td><td>0.77</td><td>0.774742</td><td>100</td><td>-</td></tr><tr><td colspan="7">Berechnete Zeit: 1.354</td></tr><tr><td colspan="7">Station003</td></tr><tr><td>5</td><td>ProcessGroup005</td><td>tech.operation</td><td>0.36</td><td>0.364019</td><td>100</td><td>-</td></tr><tr><td>6</td><td>ProcessGroup006</td><td>tech.operation</td><td>0.05</td><td>0.053505</td><td>100</td><td>-</td></tr><tr><td colspan="7">Berechnete Zeit: 0.418</td></tr><tr><td colspan="7">Station004</td></tr><tr><td>7</td><td>ProcessGroup007</td><td>tech.operation</td><td>0.62</td><td>0.622698</td><td>100</td><td>-</td></tr><tr><td>8</td><td>ProcessGroup008</td><td>tech.operation</td><td>0.28</td><td>0.279343</td><td>100</td><td>-</td></tr><tr><td colspan="7">Berechnete Zeit: 0.902</td></tr></tbody></table></div>	Nr.	Name	Short Name	Time [min]	time with	Freq. [%]	Altern. Co	Station002							1	ProcessGroup003	tech.operation	0.71	0.709039	100	-	2	ProcessGroup004	tech.operation	0.86	0.862621	100	-	Berechnete Zeit: 1.572							Station001							3	ProcessGroup001	tech.operation	0.58	0.579620	100	-	4	ProcessGroup002	tech.operation	0.77	0.774742	100	-	Berechnete Zeit: 1.354							Station003							5	ProcessGroup005	tech.operation	0.36	0.364019	100	-	6	ProcessGroup006	tech.operation	0.05	0.053505	100	-	Berechnete Zeit: 0.418							Station004							7	ProcessGroup007	tech.operation	0.62	0.622698	100	-	8	ProcessGroup008	tech.operation	0.28	0.279343	100	-	Berechnete Zeit: 0.902						
Nr.	Name	Short Name	Time [min]	time with	Freq. [%]	Altern. Co																																																																																																																		
Station002																																																																																																																								
1	ProcessGroup003	tech.operation	0.71	0.709039	100	-																																																																																																																		
2	ProcessGroup004	tech.operation	0.86	0.862621	100	-																																																																																																																		
Berechnete Zeit: 1.572																																																																																																																								
Station001																																																																																																																								
3	ProcessGroup001	tech.operation	0.58	0.579620	100	-																																																																																																																		
4	ProcessGroup002	tech.operation	0.77	0.774742	100	-																																																																																																																		
Berechnete Zeit: 1.354																																																																																																																								
Station003																																																																																																																								
5	ProcessGroup005	tech.operation	0.36	0.364019	100	-																																																																																																																		
6	ProcessGroup006	tech.operation	0.05	0.053505	100	-																																																																																																																		
Berechnete Zeit: 0.418																																																																																																																								
Station004																																																																																																																								
7	ProcessGroup007	tech.operation	0.62	0.622698	100	-																																																																																																																		
8	ProcessGroup008	tech.operation	0.28	0.279343	100	-																																																																																																																		
Berechnete Zeit: 0.902																																																																																																																								
Savable buffers for processes which are not yet balanced	<div><div>Austaktung: Linie001   Additional Grid View</div><table><thead><tr><th>Nr.</th><th>Name</th><th>Short Name</th><th>Time [min]</th><th>time with</th><th>Freq.</th></tr></thead><tbody><tr><td colspan="6">Pool001</td></tr><tr><td>1</td><td>ProcessGroup012</td><td>tech.operation</td><td>0.10</td><td>0.103023</td><td>100</td></tr><tr><td>2</td><td>ProcessGroup015</td><td>tech.operation</td><td>0.41</td><td>0.410074</td><td>100</td></tr><tr><td>3</td><td>ProcessGroup014</td><td>tech.operation</td><td>0.28</td><td>0.278281</td><td>100</td></tr><tr><td>4</td><td>ProcessGroup024</td><td>tech.operation</td><td>0.98</td><td>0.979080</td><td>100</td></tr><tr><td>5</td><td>ProcessGroup023</td><td>tech.operation</td><td>0.27</td><td>0.269732</td><td>100</td></tr><tr><td colspan="6">Berechnete Zeit: 2.040</td></tr></tbody></table></div>	Nr.	Name	Short Name	Time [min]	time with	Freq.	Pool001						1	ProcessGroup012	tech.operation	0.10	0.103023	100	2	ProcessGroup015	tech.operation	0.41	0.410074	100	3	ProcessGroup014	tech.operation	0.28	0.278281	100	4	ProcessGroup024	tech.operation	0.98	0.979080	100	5	ProcessGroup023	tech.operation	0.27	0.269732	100	Berechnete Zeit: 2.040																																																																												
Nr.	Name	Short Name	Time [min]	time with	Freq.																																																																																																																			
Pool001																																																																																																																								
1	ProcessGroup012	tech.operation	0.10	0.103023	100																																																																																																																			
2	ProcessGroup015	tech.operation	0.41	0.410074	100																																																																																																																			
3	ProcessGroup014	tech.operation	0.28	0.278281	100																																																																																																																			
4	ProcessGroup024	tech.operation	0.98	0.979080	100																																																																																																																			
5	ProcessGroup023	tech.operation	0.27	0.269732	100																																																																																																																			
Berechnete Zeit: 2.040																																																																																																																								
Column diagram with capacity data	<div><div>Austaktung: Linie001   Diagram View</div><div><div>Max/ Durchschritz</div><div>Mittelwert</div><div>Anzahl Worker</div><div>5</div></div><div><div>Auslastung</div><div>56.636</div><div>Opt. Anzahl Worker</div><div>3</div></div><div><div>Leertaktzeit</div><div>3.295</div><div>Opt. Leertaktzeit</div><div>0.691</div></div><div></div><div><table><thead><tr><th>Name</th><th>002 - tech.res001</th><th>tech.res003</th><th>tech.res004</th><th>tech.res</th></tr></thead><tbody><tr><td>Gesamtzeit [min]</td><td>1.572</td><td>1.354</td><td>0.418</td><td>0.902</td></tr><tr><td>Auslastung [%]</td><td>52.369</td><td>90.284</td><td>27.805</td><td>60.136</td></tr><tr><td>Leertaktzeit [min]</td><td>1.426</td><td>0.146</td><td>1.062</td><td>0.598</td></tr><tr><td>Anzahl Worker</td><td>2</td><td>1</td><td>1</td><td>1</td></tr><tr><td>Line</td><td>Line001</td><td>Line001</td><td>Line001</td><td>Line001</td></tr><tr><td>Taktzeit [min]</td><td>1.500</td><td>1.500</td><td>1.500</td><td>1.500</td></tr><tr><td>Geändert</td><td></td><td></td><td></td><td></td></tr></tbody></table></div></div>	Name	002 - tech.res001	tech.res003	tech.res004	tech.res	Gesamtzeit [min]	1.572	1.354	0.418	0.902	Auslastung [%]	52.369	90.284	27.805	60.136	Leertaktzeit [min]	1.426	0.146	1.062	0.598	Anzahl Worker	2	1	1	1	Line	Line001	Line001	Line001	Line001	Taktzeit [min]	1.500	1.500	1.500	1.500	Geändert																																																																																			
Name	002 - tech.res001	tech.res003	tech.res004	tech.res																																																																																																																				
Gesamtzeit [min]	1.572	1.354	0.418	0.902																																																																																																																				
Auslastung [%]	52.369	90.284	27.805	60.136																																																																																																																				
Leertaktzeit [min]	1.426	0.146	1.062	0.598																																																																																																																				
Anzahl Worker	2	1	1	1																																																																																																																				
Line	Line001	Line001	Line001	Line001																																																																																																																				
Taktzeit [min]	1.500	1.500	1.500	1.500																																																																																																																				
Geändert																																																																																																																								
Area view with balanced processes and parts bins	<div><div>Austaktung: Linie001   Area View</div><div></div></div>																																																																																																																							

### 2.3.1 Resource Structure in the PPR-Navigator

#### Example

In this example a resource structure for the workflow support in the PPR-Navigator with corresponding stations is depicted.

The hierarchical assignment of plantypes to the resource structure is set in the plantype set.



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

A raw balancing for stations is opened via the resource structure. Please refer to the [Figure 2](#).

Resource structure  
view

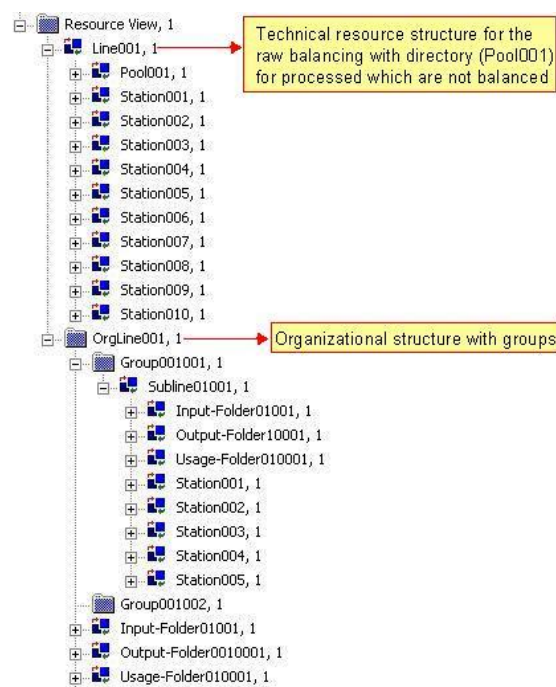


Figure 2: Resource Structure for Workflow Support

### 2.3.2 Process Structure in the PPR-Navigator

Process structure  
view

The processes that are assigned by drag and drop to the resources in the workload balancing are created in the process structure.

Either process groups or individual processes are used for a workload balancing. Whatever is to be used is set in the workload balancing configuration.

Individual processes are combined into process groups. For example, you could use process groups for the raw balancing on level 1 and use the individual processes of the process groups in the level 2 and level 3 workload balancing. *Please refer to the [Assigning Processes to the Balancing List](#) for example of a process structure in the PPR-Navigator.*



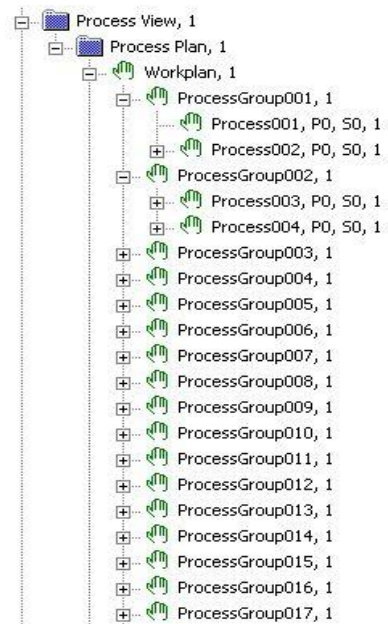


Figure 3: Process Structure in the PPR-Navigator View

### 2.3.3 Balancinglist with Balanced Processes

#### Example

Example of a  
balancinglist with  
stations

In the balancinglist view (Standard Grid View of the raw balancing), either stations or workplaces to which the processes are assigned are displayed.

#### Balancinglist Raw Balancing with Stations

Processes can be assigned to the stations, removed from stations, or moved between stations in this view.

Balancing: Linie001   Standard Grid View					
No.	Name	Short Name	Time[min]	Time with frequency	freq. [%]
	Station001	tech.resource			
1	ProcessGroup001	Process Group	0.58	0.58	100
2	ProcessGroup002	Process Group	0.77	0.77	100
3	ProcessGroup003	Process Group	0.81	0.81	100
4	ProcessGroup004	Process Group	0.41	0.41	100
	calculated time: 2.583				
	Station002	tech.resource			
5	ProcessGroup013	Process Group	0.95	0.95	100
6	ProcessGroup007	Process Group	0.77	0.77	100
7	ProcessGroup008	Process Group	0.47	0.47	100
8	ProcessGroup009	Process Group	0.65	0.65	100
9	ProcessGroup010	Process Group	0.83	0.83	100
	calculated time: 3.663				
	Station003	tech.resource			
10	ProcessGroup006	Process Group	0.11	0.11	100
11	ProcessGroup011	Process Group	0.91	0.91	100
	calculated time: 1.017				
	Station004	tech.resource			

Figure 4: Example of a Balancinglist with Stations

#### Balancing List Display

The number and description of the balancing list column headings is specified during the balancing configuration and can be varied according to your operational requirements.



Structure of a  
balancing list

For further information, Please refer to the Chapter Configuring the Balancing Process in the [Administraion Manual](#).

The structure of a **balancing list** is basically the same for any configured balancing process. The structure of the four different lines follows a chronological order, i.e. title bar, station designation, process data, and the calculated time.

### Title Bar

The column descriptions in the title bar are defined via the process attributes. These columns should display specific dates relating to the process. These data should contain characteristic features of a process, for example the process unit or the process names etc. that are required to edit the balancing process.

Station001

### Station Description

The column names for the station designation are assigned via the resource attributes. This line displays specific data relating to the station where the processes are performed.

Process

### Process Data

The specific process data are defined via the processes that have been included in the balancing list.

calculated time

### Sum of Process Times

The calculated time line indicates the sum of all process times required of all processes that have been assigned to the same station.

### Column Title of the Title Bar

As a standard, the column title shown in the image is configured and displayed. The respective process and station name is shown under the two column titles **Name** and **Short Name**; it is similar to the column heading **Short Name**.

Name	Short Name	Time [min]	time with frequency	Freq. [%]
------	------------	------------	---------------------	-----------

Figure 5: Standard Displayed Column Title



### Note

*The calculated and estimated time in the workload balancing can be used for the process time. The time to be displayed is set in the workload balancing configuration. The estimated time is used as a standard. The name of the column title is independent of how much time is displayed, but it can be configured freely, i.e. with the column title Calculated Time.*

The process time is displayed in the balancinglist with the help of the time attribute. The weighted process time is displayed under the attribute time with frequency: Time with frequency = process time multiplied by the weighting factor. The attribute frequency corresponds to the weighting factor. A weighting factor is pre-specified via the SA-Code for the process.

### Example

Example of a  
balancinglist with  
workplaces

### Balancinglist for Groups with Workplaces

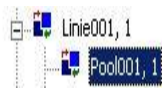
In this view you can assign processes from the input directory of the group to the workplaces. Processes can be removed and moved in this view. Processes that are removed are displayed in the output directory of the group.

The assigned processes are displayed under the station name and the workplace: The name Station001-1 is the process assigned to **workplace 1 on station 1**, etc.

No.	Name	Short name	Time [min]	Time with frequency	Freq. [%]
<b>Balancing</b> Group001001 (valid)   Standard Grid View   NO: DROP					
<b>Balancing</b> Group001001					
<b>Valid from (week)</b> 16 / 2005					
<b>Valid until (week)</b> 18 / 2005					
<b>Status</b> integrated					
<b>Configuration</b> Level 3 Balancing Configuration					
<b>Station001 - 1</b> tech.resource					
1	Process011	Process	0.09	0.09	100
2	Process012	Process	0.13	0.13	100
3	Process013	Process	0.01	0.01	100
4	Process014	Process	0.15	0.15	100
5	Process015	Process	0.07	0.07	100
6	Process016	Process	0.16	0.16	100
			calculated time: 0.614		
<b>Station001 - 2</b> tech.resource					
7	Process001	Process	0.07	0.07	100
8	Process002	Process	0.08	0.08	100
9	Process003	Process	0.00	0.00	100
10	Process004	Process	0.19	0.19	100
11	Process005	Process	0.18	0.18	100
12	Process006	Process	0.01	0.01	100
13	Process007	Process	0.22	0.22	100
			calculated time: 0.746		
<b>Station001 - 3</b> tech.resource					
14	Process017	Process	0.07	0.07	100
15	Process018	Process	0.07	0.07	100
16	Process019	Process	0.21	0.21	100
17	Process020	Process	0.15	0.15	100
18	Process025	Process	0.25	0.25	100
19	Process026	Process	0.17	0.17	100
			calculated time: 0.908		

Figure 6: Balancinglist with Workplaces

## 2.3.4 Buffer for Non-Balanced Processes



Buffers for non-balanced processes in the PPR-Navigator

In the buffer view (Additional Grid View) for non-balanced processes, you can save and display processes that have yet to be assigned.

By using this buffer you create a sort of planned work reserve which can be assigned to the workload balancing, depending on the status of planning. This buffer is also displayed as a directory in the PPR-Navigator. The processes not saved in the buffer are shown in the PPR-Navigator under the relation in the listview.

Processes between buffers, stations, and workplaces are assigned via the context menu of the respective balancinglist.



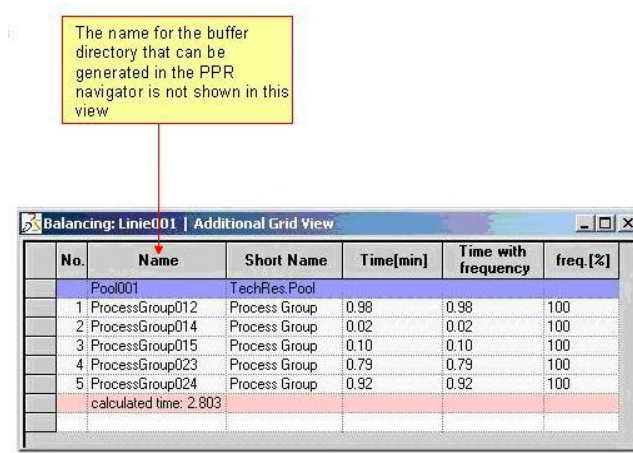
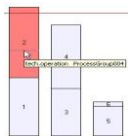


Figure 7: Buffer – Listview View

### 2.3.5 Bar Chart

Bar chart view



If you add new processes to the balancing list or move processes with this list, these changes in the bar chart are automatically reconstructed. The columns indicate the processes. The column height corresponds to the process time and the red line corresponds to the defined cycle time. The cycle time is entered in the **Properties** dialog of the line hierarchical level when the resource structure is generated in the PPR Navigator. The time is valid for all cycles (stations) which belong to the line. Press the mouse button to move the processes in the bar chart and to assign them to other stations. These changes are directly reconstructed in the balancing list. To display process data, drag the cursor to a process. A comments column display the most important process data.

#### Example

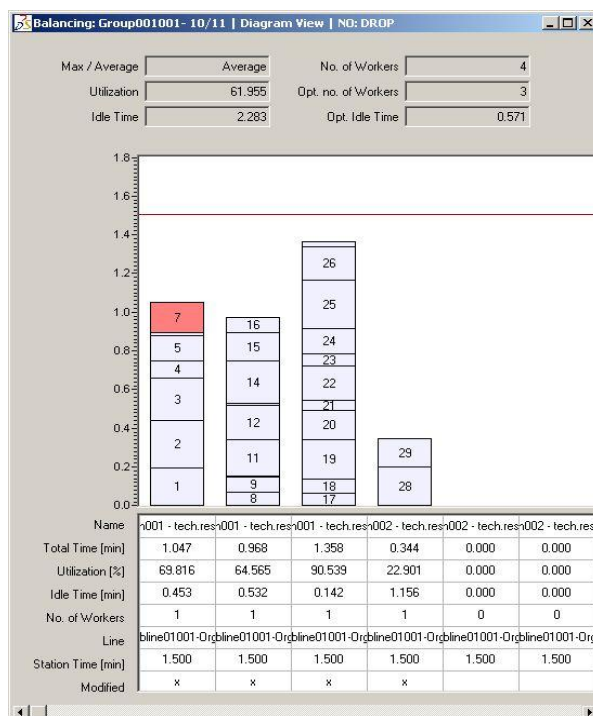
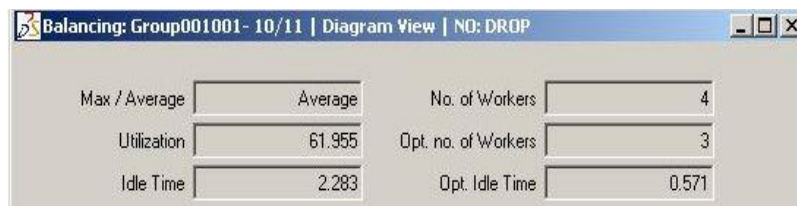


Figure 8: Example of a Bar Chart

## Heading Section of the Bar Chart

Bar chart heading section



Max / Average	Average	No. of Workers	
Utilization	61.955	Opt. no. of Workers	3
Idle Time	2.283	Opt. Idle Time	0.571

**Figure 9: Display in the Bar Chart Heading Section**

### Max/Average

Bar chart terms

This field displays the type of statistical method that is used to calculate a balancing process. The **Average** display indicates that the balancing process is calculated according to the average value of all times. It is only possible to calculate the balancing process on the basis of the estimated average value i.e. the average value for the existing variants for the assembly of a private car.

### Utilization

The calculated capacity utilization is shown in this field. The result of the calculated utilization is the average utilization of the cycles.

### Idle Time

The sum of the idle or waiting times of all calculated cycles is indicated in this field. Idle time or waiting time is the time possibly occurring (or even intended to occur) with stations that are balanced optimally. It is also the time that has to be reduced so that the result of the utilization ranges from 90 to 100%.

### No. of Workers

In this field, the calculated number of the workers is indicated. The [formula](#) below shows this relation:

**Formula:** Sum of all process times plus all idle times/cycle time = Number of workers.

### Opt. no. of Workers

The calculated number of the workers with theoretically optimised balancing is indicated in this field. The [formula](#) below shows this relation:

**Formula:** Sum of all process times/cycle time = optimised number of workers

Bar chart terms

The determined number of workers is rounded up to the next integer since it is obvious that there are no half colleagues who could be integrated in the work process. For calculations, *Please refer to the [Figure 8](#).*

### Opt. Idle Time

The optimised idle time indicates the theoretically possible reduction of idle times. The [formula](#) below shows this relation:

**Formula:** Optimised idle time = (optimised number of workers X cycle time) – sum of process time.

### Bar Chart List

Name	h001 - tech.res	h001 - tech.res	h001 - tech.res	h002 - tech.res	h002 - tech.res	h002 - tech.res
Total Time [min]	1.047	0.968	1.358	0.344	0.000	0.000
Utilization [%]	69.816	64.565	90.539	22.901	0.000	0.000
Idle Time [min]	0.453	0.532	0.142	1.156	0.000	0.000
No. of Workers	1	1	1	1	0	0
Line	blne01001-Or	blne01001-Or	blne01001-Or	blne01001-Or	blne01001-Or	blne01001-Or
Station Time [min]	1.500	1.500	1.500	1.500	1.500	1.500
Modified	x	x	x	x		

Figure 10: Bar Chart List Display

#### Name

The station name or the cycle names are displayed in this field. The name is entered when a cycle is generated in the **Properties** dialog. You can change the name in the **Properties** dialog at all times. Temporary changes are marked in the **Modified** field, for example if you move a process to another station.

#### Total Time [min]

The sum of all process times for a cycle is displayed in this field.

#### Utilization [%]

The utilization (%) for a cycle is displayed in this field.

#### Idle Time [min] – Waiting Time

The idle time for one cycle is displayed in this field. *Please refer to the [Figure 8](#).*

#### No. of Workers

The calculated number of workers for one cycle is displayed in this field. The calculated result is rounded up to the next integer.

#### Line

The name of the line sequence to which the station belongs is displayed in this field.

#### Cycle Time [min]

The cycle time is displayed in this field. The cycle time has to be entered in the **Properties** dialog of the appropriate line.

Modified x

Changes in the workload balancing are temporarily marked by an X

## 2.3.6 Area View

The stations with assigned processes and parts bins of the open workload balancing are displayed in the area view.

You can do two things in this view:

- Moving processes between workplaces or stations. The processes are moved automatically in the other two views (balancinglist and column diagram) of the workload balancing.
- In order to be able to graphically display the stations in the layout as an area, an Isegrim macro must be transferred to the plantype. The entry for the Isegrim macro is **balancing\_stationarea-default**. The attribute **graphicname** is used for the configuration, and the standard name in the properties dialog is graphic.

- For a manual entry the attribute must be shown in the properties dialog of the station, and the name – **balancing\_stationarea-default** - must be entered manually in the **Properties** dialog.
- As an alternative you can assign the Isegrim macro to the stations by using a script; in order to do this the attribute does not have to be displayed in the properties dialog.
- Moving parts bins to another position of the material supply area. Whenever parts bins are moved, the process is not moved along with it. Moving the parts bins has an effect only in the layout, and it is shown only after the workload balancing has been saved and the layout has been re-opened. Process and parts bins are moved by drag and drop in this view.

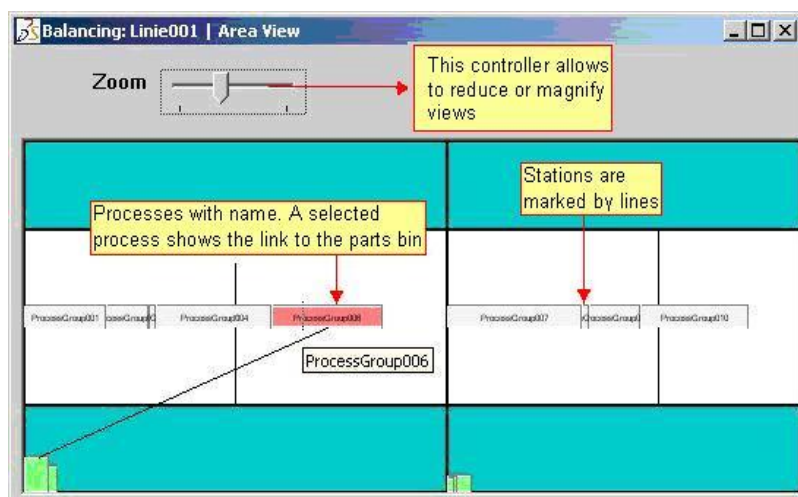


Figure 11: Area View - Station Balancing

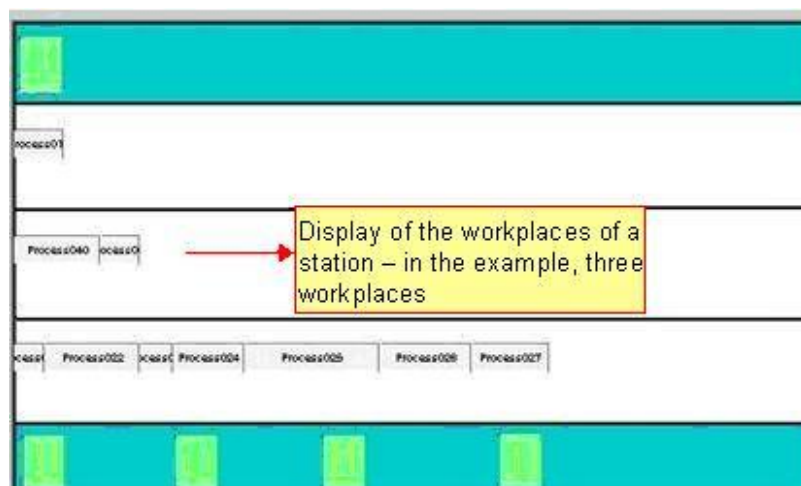


Figure 12: Area View - Workplace Balancing

### 2.3.7 Setting Label Filters for Layout Processing

A label filter is generated for every workload balancing when it is created. You have to set the label filter for the layout editing when opening a project. Open the project for the selected workload balancing with the help of the label filter.

A workload balancing is created for a structure like the layout. If the label filter has not been set for a workload balancing, the program can not recognize for

which workload balancing the layout was created: for example, you have hypothetically created two variants for a structure. In the layout of **Variant A**, a parts bin was assigned in the material supply to **Station 1**. In the layout of variant B, the same parts bin was moved to **Station 3**. If no filter was set when the project was opened, the bin is shown in the layout in both stations.

- To set the label filter, select the workload balancing in the Label Filter dialog. Variants are marked with names. Raw balancings for which a layout was created are marked with **NoBalancingObject**.

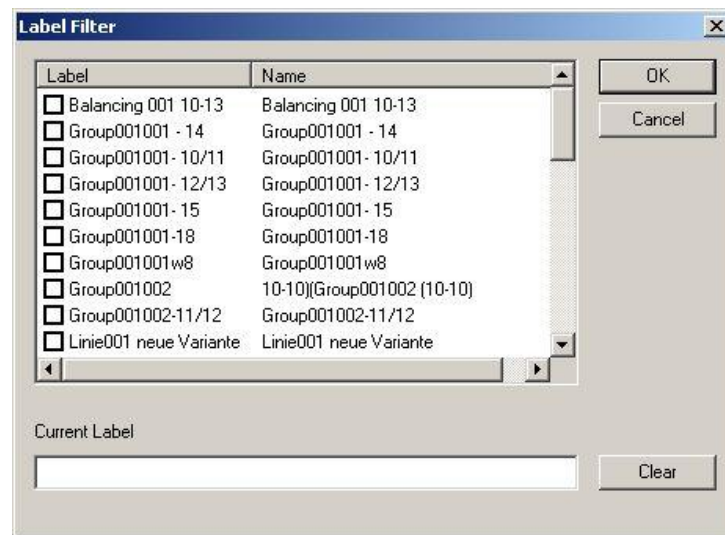


Figure 13: Label Filter Dialog

## 2.4 Workload Balancing Menu

Functions in the workload balancing menu

The menu WL-Balancing is available only if you open a workload balancing. The menu items in the WLB menu are provided accordingly, and they depend on what basis you edit a workload balancing.

The active menu items can be split into two general categories:

- Menu items those are available for every open workload balancing.
- Menu items those are available for a certain editing status in the editing of variants.

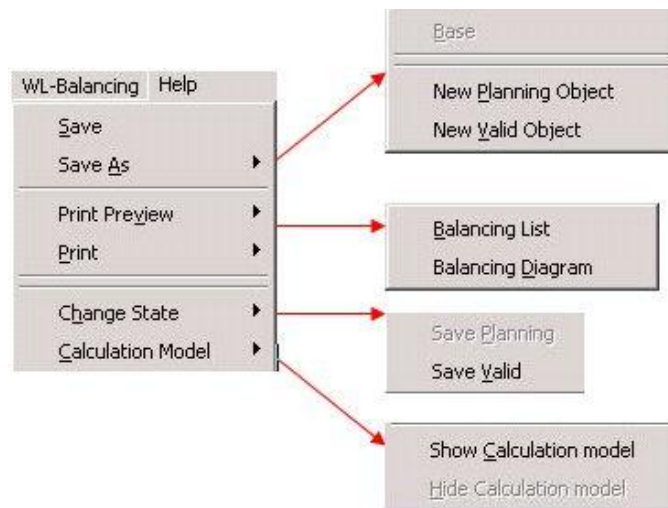


Figure 14: WLB Balancing Menu

### Active Menu Items for every Workload Balancing

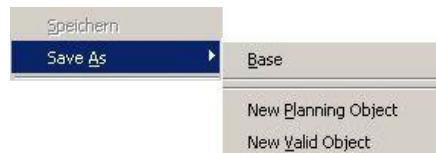
- **Save the balancinglist** is active whenever changes are made in the workload balancing.
- **Print and Print Preview** is always active for the balancinglist. *Please refer to the [Printing a Balancing List](#).*
- **Show Calculation Model** is active whenever the workload balancing is not displayed according to product variants. If you activate the menu item, the processes of the product variants are shown according to the assigned production program with a 100% weighting (weighted process time is 100%) in the balancinglist. Processes that are not required for these product variants are shown, but in these cases the weighted process time is always set to zero. You can not make any changes in the workload balancing in this view.
  - A prerequisite is that a production program is available in the project. The first calculation model included in the production program is used as a product variant. *Please refer to the [Determining Utilization](#) for information on production programs, SA-Codes, and calculation models.*
- **Hide Calculation Model** is active only if the workload balancing is shown according to product variants. You can use this menu item only to change the view; after activation all of the processes of the workload balancing are shown.

### Active Menu Items for Variants

All three menu items are active whenever a variant of the raw balancing is opened.

- 1) Save as Menu Item





**Figure 15: Save as Menu in the Workload Balancing**

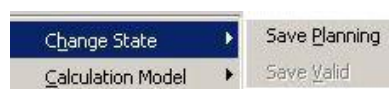
- With the help of the menu item **Save As Base**, you can set whether the variants are used as a basic balancing process, i.e. whether it is the valid workload balancing of the raw balancing that is opened in the PPR-Navigator. This menu item is not active for workload balancings of the organizational structure on levels 2 and 3.
- You can create an unlimited number of further variants of variants with the help of the menu item **Save As New Planning Object**.
- A new variant with the planning status integrated is saved with the help of the menu item **New Valid Object**, it is thus marked as a valid workload balancing.
- Variants can be set if the start date is a future date. When the variants are saved, the workload balancing is subject to an effectiveness test; for example, the time effectiveness of processes of the workload balancing are checked as to whether the name of the workload balancing is unambiguous.
- This menu item is available only if **Valid balancings possible** is activated in the workload balancing configuration. The planning status must have been created previously. You can create a planning status either in the project library or system library.



**Figure 16: Activate Planning Status for Workload Balancing**

## 2) Change State Menu Items

You can use these two menu items to change the planning status for an existing variant of the workload balancing. These two menu items are available only if **Valid balancings possible** is activated in the workload balancing configuration. *Please refer to the [Figure 16](#).*



**Figure 17: Change State Menu Item in the Workload Balancing**

Only one of the two menu items can be active. The active menu item depends on with which planning status the workload balancing is opened.

- **Save Planning:** Save Planning is active whenever the workload balancing is opened with the planning status integrated and the start date is in the future. The workload balancing is set to the planning status working after execution of this menu item. This menu item is never active for a valid level 3 workload balancing.

- If you set a valid **level 2 workload balancing** to the status working, all valid **level 3 workload balancings** that exist for this level 2 workload balancing is set to the planning status working.
- **Save Valid:** Save valid is active if the workload balancing is opened with the planning status working. The workload balancing is set to the planning status after this menu item is executed, as long as the start date is in the future.



### Note

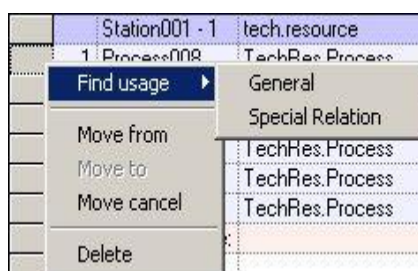
You can create several level 3 workload balancings for the same time period with the help of the menu function **Save as**. If you set one of these level 3 workload balancings with **Save Valid**, the previously **valid level 3 workload balancing** is set to the status **working** for this period of time. For more information on effectivities and planning states, Please refer to the [Saving the Workload Balancing with Effectivities](#).

## 2.4.1 Balancing Menu

- 1) Left-click **Balancing** menu item. The menu opens up.
- 2) To enable a menu item, draw the cursor to the corresponding menu item and then left-click this item. If there are arrows next to a menu item, further submenus are available for the respective item.
- 3) To enable these menu items, mark the arrow using the left mouse button. Left-click the menu items to enable them.

## 2.4.2 Context Menu

The context menu is opened using the right mouse button. The context menu is available in both views balancinglist and the buffer. You can move processes between the editing views with the help of the new context functions.



**Figure 18: Context Menu of the Right Mouse Button in the Balancinglist**

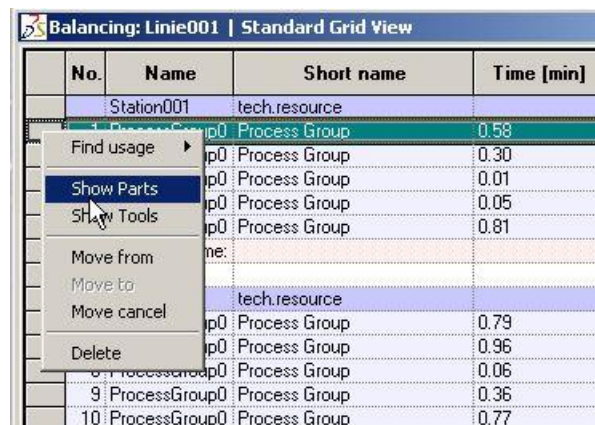
- The menu item **Move from** is active only if you select processes. The processes for moving are reserved (intermediately saved) with the help of this menu item.
- The menu item **Move to** is active only if you have saved previously selected processes with Move from. You can use the **Move to** menu item to insert these processes – either in the balancinglist or buffer views. Please refer to the [Assigning Processes to the Balancing List](#).



- **Move cancel** is used to cancel **Move from**. The processes in the clip board are removed.
- You can display the specific usage of the inserted processes using the two search functions (general and according to special relations).
- You can remove processes from the balancinglist with **Delete**. These processes are assigned to the buffer. Deleting processes in the buffer causes these processes to be completely removed from the workload balancing.

### Displaying Parts and Tools using the Context Menu

The WLB configuration allows to set if links to parts or tools are to be displayed.



**Figure 19: Context Menu Item – Show Parts**

Use the two context menu entries **Show Parts** and **Show Tools** to do so. Links to parts or tools are displayed in a dialog. They cannot be edited in this dialog.



For further information, *Please refer to the Configuring WLB in the Administration Manual.*

- If the menu item is activated in the WLB configuration, open the dialog via the context menu. *Please refer to the Figure 19*, the links of the process to parts are shown with the aid of the menu item **Show Parts**.

Additionally, the dialog displays parts bins which are linked to parts. *Please refer to the Figure 20.*

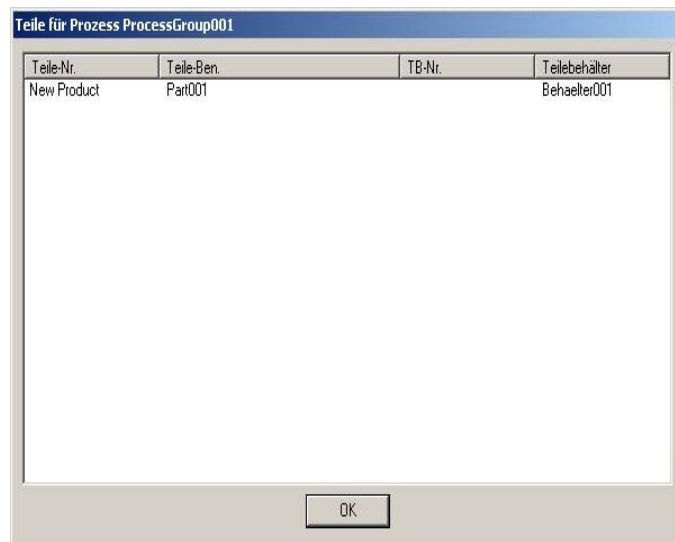


Figure 20: Dialog for Links – Parts

## 2.5 Highlighting of Processes in the Workload Balancing

Selected processes are automatically shown simultaneously in the three views balancinglist, column diagram, and area. Only individually selected processes or process groups are highlighted.

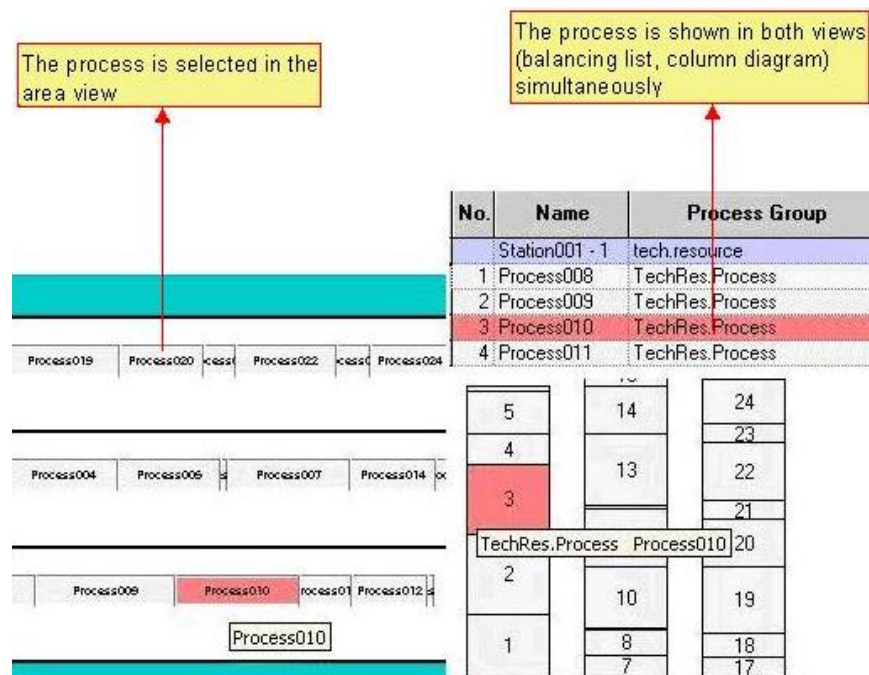


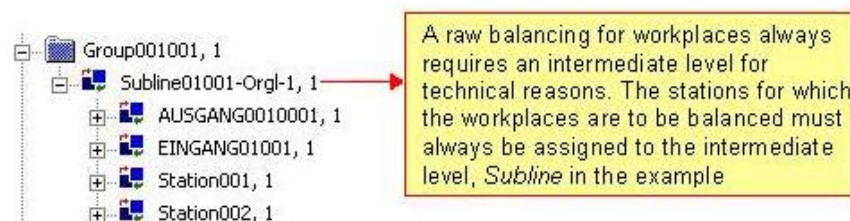
Figure 21: Highlighting Processes Simultaneously in Views

### 3. Raw Balancing

By using the raw balancing, the utilization of the technical resources of a structure are planned without necessitating a concrete assignment to organizational structures in this planning phase.

- Whenever you use a raw balancing for the workflow support, the raw balancing forms the basis of the area workload balancing on level 2 in the organizational structure.
- Only one raw balancing can be used for the same structure in the PPR-Navigator.
- An unlimited number of variants can be planned for a raw balancing.
- Every one of the planned variants can be saved as basis variants. A basis variant replaces the previously used raw balancing. *Please refer to the [Generating a Balancing Process for Several Variants](#).*

A raw balancing can be planned for stations or workplaces. The structure must have at least three hierarchical levels for a workload balancing based on workplaces. The workload balancing is always opened from the highest hierarchical level (example Group) in the resource view. *Please refer to the [Planning Area Workload Balancing](#).*



**Figure 22: Example of Three Hierarchical Levels**

#### Using Script Actions

In Version PE 5.11, script actions can be used for balancing. Scripts can be used for the following events:

- Starting the balancing process
- Inserting processes into the balancing list by using drag and drop
- Ending the balancing process



For more information on the scripts and script actions, *Please refer to the [Scripting Manual](#).*

### 3.1 Planning the Raw Balancing

A valid raw balancing can be opened in the PPR-Navigator in the resource structure. As a rule you can use the raw balancing to plan individual production lines i.e. assembly lines or entire production areas to which an unlimited number of production lines can be assigned.

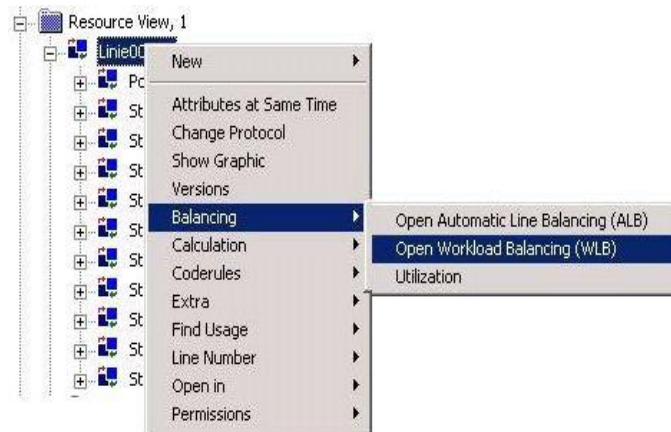
A raw balancing can generally be opened from two hierarchical levels defined with the help of plantypes, such as **Linesequence** and **Line**. Which plantypes

are used for the workload balancing and what they are called is determined in the plantype set and in the workload balancing configuration.

In the following examples of the workflow support, the workload balancing is opened for both levels 2 and 3, for example on the plantypes **OrgLine** and **Group**; this allows a corresponding configuration. The used plantypes must be created in the plantype set accordingly.

Resources must be able to be assigned on the next lower hierarchical level to both of the two plantypes used. The stations of a production line which are to be balanced with processes are defined with the help of the resources.

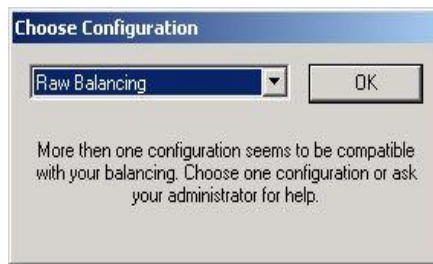
Workload balancing  
from the resource  
structure



**Figure 23: Starting a Balancing from the Context Menu**

### Open WLB from PPR Navigator

- 1) Open the context menu in the PPR-Navigator on the selected hierarchical level (line sequence or line) of the resource structure.
- 2) Select **workload balancing** < **Open Workload Balancing (WLB)**. The raw balancing is, as a rule, opened with four views. You can set with which views the raw balancings are opened in the workload balancing configuration. *Please refer to the [Editing Views of the Work Load Balancing](#).*
- 3) If there are several configurations for one of the two plantypes (Linesequences and Line), the dialog **Choose Configuration** appears, *Please refer to the [Figure 24](#)*. In the dialog select the corresponding configuration for the raw balancing. This dialog also appears if new variants or level 2 and level 3 workload balancings are created, and several configurations exist for the start object (area and group). This dialog does not appear if the attribute **Customization Name** has been configured and released for the properties dialog of the plantype and the name of the balancing configuration has been entered in the properties dialog of the start object (Linesequences or Line) with which the raw balancing is to be opened from the PPR-Navigator.



**Figure 24: Dialog Select Configuration**



### Note

*Automatic saving in the Process Engineer is switched off while the workload balancing is open. All data must be saved manually.*



For more information on configuring the workload balancing and plantype set, Please refer to the [Administration Manual](#).

## 3.1.1 Assigning Processes to the Balancing List

Assigning  
processes to the  
balancing list

Each planning process must consider the objective to display transparent production processes. With its balancing list and the bar chart, Work Load Balancing provides an excellent planning tool to display stations and line sequences in a transparent manner. The balancing list and the bar chart allow for a flexible handling of processes. Processes that are included in the balancing list can also be assigned to the bar chart and other stations. All steps are processed simultaneously in the three views (balancing list, bar chart, and area view). Furthermore, the bar chart provides important information on the balancing process. Please refer to the [Figure 8](#).



### Note

*In the workload balancing configuration you can set whether the same process can be used several times or only once in the workload balancing. As of version PE 5.15, the same process can be used several times in one workload balancing.*

*Processes can be inserted into a balancinglist only if these processes correspond to the plantypes prespecified in the workload balancing configuration.*

### To Assign Processes to the Balancing List

- 1) Open the Process View and select the required process.
- 2) Use drag and drop to insert the processes into the balancing list.

No.	Name	Short Name	Time[min]
	pre-assembly new plant	tech.resource	
1	transport	Process Group	0.58
	calculated time: 2.583		
	assembly new plant	tech.resource	
2	pre-assembly body	Process Group	0.95
	calculated time: 3.663		
	check new plant	tech.resource	
3	assembly body	Process Group	0.11
4	check	Process Group	0.91
	calculated time: 1.017		

**Figure 25: Dragging Processes into the Balancing List by using Drag and Drop**

Assigning  
processes to the  
balancing list

- 3) Drag the process on the balancing list and release the mouse button.
- 4) To move a process within a balancing list, select the required process and left-click the left column of the balancing list. A selected process is always marked black.
- 5) You can also select and move multiple processes simultaneously. Multiple processes which immediately follow one another are selected with the shift key. Multiple individual processes are selected with the control key.
- 6) Drag the process(es) to the station and release the mouse button. *Please refer to the [Figure 25](#).*



Saving a  
balancing list

### Saving a Balancing List

Balancing processes can be saved either using the **Balancing** menu or the appropriate icon in the toolbar. *Please refer to the [Figure 14](#).*

## 3.1.2 Assigning Processes between Buffer and Workload Balancing

By using the two context functions **Move from** and **Move to** you can move and insert processes between both of the views balancinglist (**Standard Grid View**) and the buffer (**Additional Grid View**) in both directions. You can use the function **Move cancel** to abort the moving or inserting.

Several processes can be moved and inserted at the same time. Use the shift or control key in order to select several processes.



### Note

*Moved processes are saved in a clip board. Processes are deleted from the clip board after they are entered. Copied processes can thus be inserted only once.*

### Example

#### Example of Copying and Inserting

- 1) Select the process(es) and open the context menu.
- 2) Select **Move from**. The selected processes are saved to the clipboard.



No.	Name	Short Name	Time [min]	time with	Freq. [%]
	Station001	tech.resource			
1	ProcessGroup0	tech.operation	0.58	0.579520	100
	Find usage				
	tech.operation		0.77	0.774742	100
	tech.operation		0.81	0.814492	100
	Move from				
	tech.operation		0.41	0.414034	100
	Move to				
	tech.operation		0.37	0.373537	100
	Move cancel				
	Delete				
	tech.resource				
6	ProcessGroup0	tech.operation	0.95	0.949559	100
7	ProcessGroup0	tech.operation	0.77	0.767113	100
8	ProcessGroup0	tech.operation	0.47	0.468701	100
9	ProcessGroup0	tech.operation	0.65	0.647822	100
10	ProcessGroup0	tech.operation	0.83	0.829803	100
	calculated time:				

Figure 26: Moving Processes – Example with Balancinglist

- 3) Open the context menu in the buffer view. Select **Move to**.

No.	Name	Short Name	Time [min]	time with	Freq. [%]
	Pool001	TechRes.Pool			
1	New ProcessGr	New Process	5.00	5.000010	100
	sGr	New Process	8.00	8.000016	100
	me:				
	Move from				
	Move to				
	Move cancel				
	Delete				

Figure 27: Insert Selected Processes – Example of Buffer

- 4) The selected processes are inserted from the clip board into the buffer. Saved processes remain available in the buffer until they are either removed from the buffer or are assigned to the workload balancing – via the two context functions **Move from** and **Move to**.

No.	Name	Short Name	Time [min]	time with	Freq. [%]
	Pool001	TechRes.Pool			
1	ProcessGroup0	tech.operation	0.58	0.579520	100
2	New ProcessGr	New Process	5.00	5.000010	100
3	New ProcessGr	New Process	8.00	8.000016	100
	calculated time:				

Figure 28: Inserted Processes are shown in the Buffer

### 3.1.3 Removing Processes from Stations



You can remove processes from the balancinglist, by pressing the **backspace** key, **Delete** key on the keyboard, and using the menu item **Delete** in the workload balancing menu. These processes are automatically assigned to the buffer. These processes can be saved in the buffer and at a later point in time can be assigned to the workload balancing (balancinglist with balanced processes). Processes deleted in the buffer are removed from the workload balancing. These processes continue to be available in the process structure.


☒ Enable Locking

## Note

If the option *Enable Locking* is activated in the WLB configuration other users cannot delete processes which are used in the open balancing. The option is only available for level one balancing.



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

You can remove single or several processes from a station at the same time.

- 1) Select the processes in the left column with the mouse button.
  - Several processes that directly follow one another can be selected by using the **Shift** key. Please refer to the [Figure 30](#).
  - You can also select individual processes with the **Control** key, even if they are in different stations.
- 2) After selecting, the processes that use the context menu, **backspace** key or **delete** key can be used.

No.	Name	Short name	Time [min]	Freq. [%]
1	assembly 1	P1 - New Plant 001	2.00	100
		calculated time: 2.000		
2	assembly engin	P2 - New Plant 001	3.00	100
		calculated time: 3.000		
3	preassembly en	P3 - New Plant 001	2.00	100
		calculated time: 2.000		

Figure 29: Selecting a Process

## Example

### Example with the Shift Key

Select several processes at the same time with the shift key and add them to the unbalanced processes.

1	clean	New Process	1.00	100
2	P2	New Process	2.50	100
3	P1	New Process	1.50	100
4	assembly engin	001	3.00	100

Figure 30: Several Processes at the Same Time

## 3.2 Determining Utilization

The process times for calculation models corresponding to the OPT codes assigned to the processes are determined with the help of the utilization. The calculation models are defined in an external file and used for determining the utilization via a production program. You can determine utilization only if a



corresponding configuration has been defined for balancing. The utilization and balancing access the same configuration.



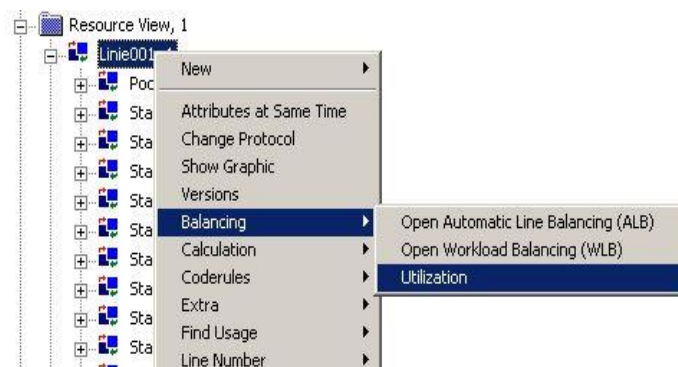
For more information, *Please refer to the [Administration Manual](#).*

It is not necessary to open the balancing process in order to determine utilization. Utilization is always determined for a resource structure generated in the PPR Navigator i.e. for stations which are assigned to a line or line sequence. You must link the station to processes. The relations linking the processes to the station are defined in the configuration of the balancing process.

### Starting Utilization

Utilization is started from the popup menu in the resource structure in the PPR Navigator on the line hierarchical level.

- 1) Select the hierarchical level in the resource structure.
- 2) Press the right mouse button. Select the menu item **Utilization**.



**Figure 31: Starting Utilization**

- 3) Select the production program in the **Utilization** dialog.
- 4) Click button for production program. Select the production program in the dialog. Click **OK**, and the production program is assigned to the utilization.
- 5) Click **Start evaluation** to get the results of the evaluation.



**Figure 32: Utilization Dialog – Selecting the Production Program**



For more information, *Please refer to the chapters [OPT Codes](#), [Calculation Models](#), and [Production Programs](#) in the [Project Library Manual](#).*

### 3.2.1 Displaying Utilization Results

#### Example

In the example, the results of the process times are shown in seconds. Other output values can be set in the configuration, for example, minutes or TMU. The sum of the process times is shown in the stations according to the OPT codes used.

- Processes **A** and **B** are assigned to station A. Process A has the **OPT code a** and process B has the **OPT code b**. **Process A** has a process time of 3 minutes and **process B** has a process time of 2 minutes.
- The corresponding OPT codes are listed in the external calculation file. Please refer to the [Figure 33](#).

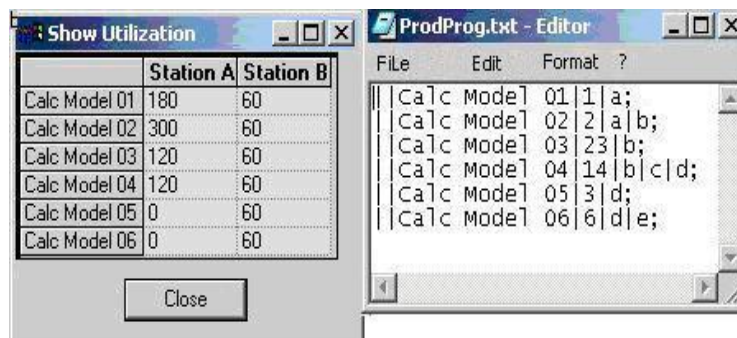


Figure 33: Display of the Utilization Results – External Calculation File

#### Example

#### To Read the Results

- Hundred percent of process A is used for **Coderule a**: this corresponds to **Calc Model 01**, equal to 180 seconds.
- Hundred percent of process B is used for **Coderule b**: this corresponds to **Calc Model 3**, equal to 120 seconds.
- Both Coderules **a** and **b** are 100% valid for **Calc Model 2**: this then corresponds to the sum of both process of station A, equal to 300 seconds.
- Conversely, neither of the two OPT codes are valid for either of the **calculation models five or six**; the process time is therefore zero: this means that if these variants of OPT codes are set, neither of these two processes are used for manufacturing. Please refer to the [Figure 33](#).

The OPT codes assigned to the processes are displayed in the balancing list, if the title bar is configured accordingly.

No.	Name	Shortname	Time [min]	Frequency [%]	Coderule
<b>Station A</b>					
1	process A	op 1	3.00	100	+a.
2	process B	op2	2.00	100	+b.
			calculated time: 5.000		
<b>Station B</b>					
3	process general	op3	1.00	100	
			calculated time: 1.000		

Figure 34: Example of a Balancing List – with Assigned Processes

### 3.2.2 Generating a Balancing Process for Several Variants

Further plan variants for a balancing process can be generated for a resource structure (for example, line or line sequence). Any number of plan variants can be generated until the optimal result for balancing has been found. New plan variants can be created at any time.

Plan variants can be saved as real plan variants (object of a balancing list) and as basic balancing processes. A basic balancing process (used raw balancing after the processes are planned in the stations) replaces a previously existing raw balancing generated in the PPR-Navigator, for a hierarchical level in the resource structure.

Variants can also be created for the workload balancing with workflow support. *Please refer to the [Generating Plan Variants for a Balancing List](#).*

The number of possible variants is set in the workload balancing configuration for variants of level 3 workload balancing that are created with the help of the menu item **Save as** for the same period of time.

#### **To Generate Plan Variants for a Balancing List**

Perform the following steps to generate plan variants in the resource view:

- 1) The resource view is opened by clicking **Open Process Engineer** in the PPR Navigator, specifically in the popup menu on the hierarchical level in the resource structure (line or line sequence).

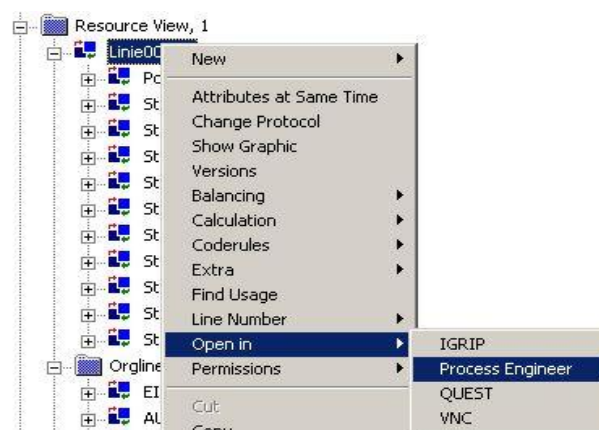
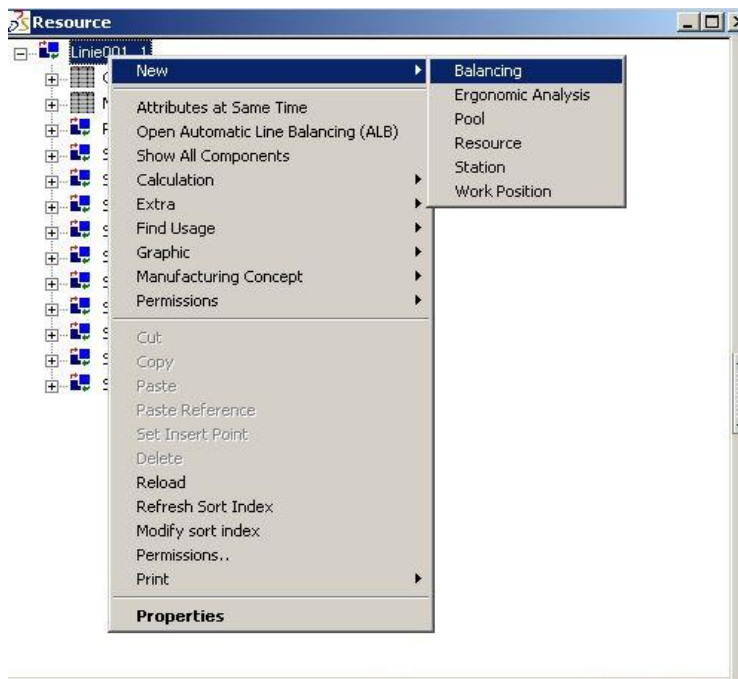


Figure 35: Open Resource View

You must always generate the first plan variant with the menu item **New < Balancing**. All further plan variants can be generated in the Balancing menu. *Please refer to the [Workload Balancing Menu](#).*

- 2) Open the context menu. Select the menu item **New** and click **Balancing**.

- If there are several configurations for the plantype, select the corresponding configuration from the dialog. *Please refer to the [Figure 24](#).*



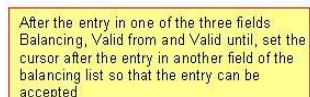
### Figure 36: Generating Plan Variants of a Balancing List

- 3) Name the plan variants in the field **Name** and click in another field so that the name is applied.



- 4) Save the plan variant.

- A plan variant can be edited. You can add processes from the process view or remove processes from stations. All functions for editing a balancing list are available.



**Balancing: Linie001 - new balancing** | Standard Grid View

**Balancing** Linie001 - new balancing

**Valid from (day)** 01.10.2005

**Valid until (day)** 01.12.2005

**Status** Working

**Configuration Filling** Level 1 Resource Configuration

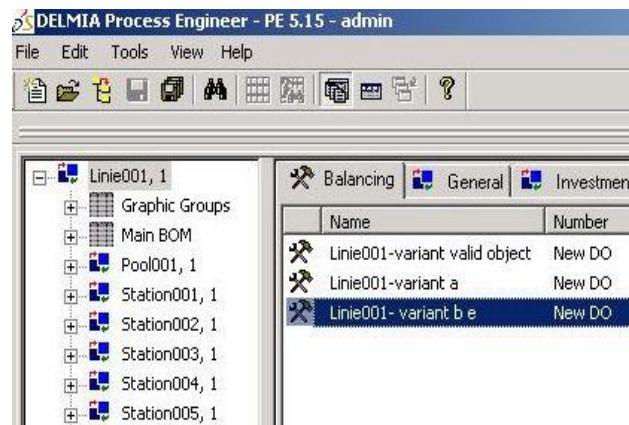
No value found.

No.	Name	Short Name	Time [min]	time with	Freq. [%]
	Station001	tech.resource			
1	ProcessGroup0	tech.operation	0.58	0.579520	100
2	ProcessGroup0	tech.operation	0.77	0.774742	100
3	ProcessGroup0	tech.operation	0.81	0.814492	100
4	ProcessGroup0	tech.operation	0.41	0.414034	100
5	ProcessGroup0	tech.operation	0.37	0.373537	100
	calculated time:				
	Station002	tech.resource			
6	ProcessGroup0	tech.operation	0.95	0.949559	100
7	ProcessGroup0	tech.operation	0.77	0.767113	100
8	ProcessGroup0	tech.operation	0.47	0.468701	100
9	ProcessGroup0	tech.operation	0.65	0.647822	100
10	ProcessGroup0	tech.operation	0.83	0.829803	100
	calculated time:				

### Figure 37: Balancing List Plan Variants – Save as New Name



The generated plan variants are displayed in the listview of the resource view under the **Balancing** tab.



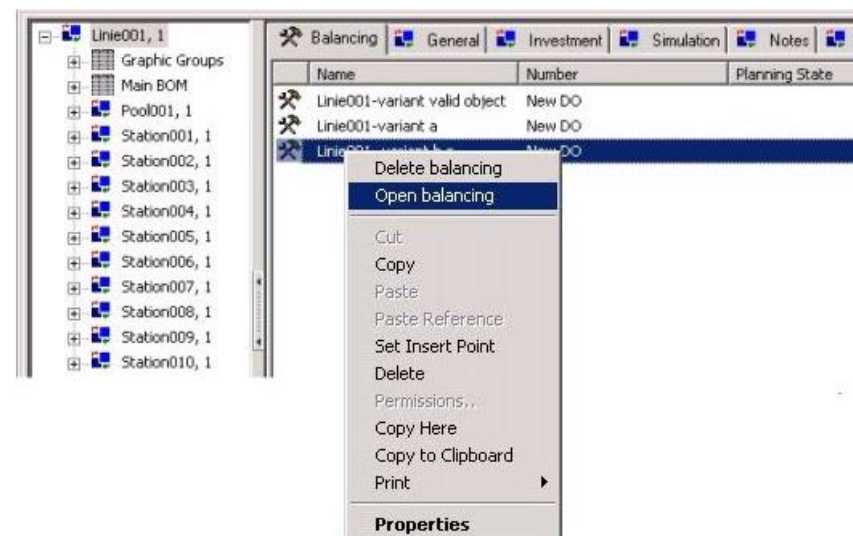
**Figure 38: Listview of Resource View – Displaying Plan Variants**

### Opening Plan Variants and Generating Others

From one plan variant you can generate any number of further plan variants. You can save a plan variant as other plan variants or as a basic balancing process.

#### To Open Plan Variants

- 1) Select the plan variant in the listview of the resource view.
- 2) Open the popup menu and select **Open balancing**.



**Figure 39: Opening Plan Variants in the Popup Menu**

### Saving a Plan Variant

Both menu items **Base** and **New Planning Object** are active only if a plan variant is opened.



**Figure 40: Saving Plan Variants**

- 3) Name the plan variant and then save it via the menu **WL Balancing < Save As**. Please refer to the [Figure 40](#).



- If you select **Base**, the plan variant is saved as a basic balancing process.
- If you select **New PlanningObject**, the plan variant is saved as another plan variant.
- If you select **New Valid Object**, the plan variant is saved as a valid plan variant. This menu item is active only if the configuration allows it. *Please refer to the [Figure 16](#).*

### 3.3 Saving the Workload Balancing with Effectivities

A valid workload balancing is marked with the planning status **integrated**. The name of the valid planning status is set in the workload balancing configuration. Only variants of a raw balancing and workload balancings on levels **2** and **3** can be set with validity.



#### Caution

*After entering set the cursor in one of the three fields Workload balancing, Valid from and Valid until, and then into another field, or you can press the enter key so that that entry is accepted.*

*Whether the date is entered as a week (as in the example) or as a day is set in the workload balancing configuration.*

Balancing: Variante1 (valid)   Additional Grid View	
Balancing	Variante1
Valid from (week)	19 / 2005
Valid until (week)	21 / 2005
Status	integrated
Configuration	Level 2 Balancing Configuration

**Figure 41: Marking the Workload Balancing**

- The current planning status of the workload balancing is displayed in the line. Two planning states available for the workload balancing are **working** and **integrated**. The planning status must have been created in the project.
- The valid configuration used for the workload balancing is displayed in the line Configuration. A workload balancing can be opened only as long as the valid configuration of a workload balancing exists in the project: if only the name of the configuration is changed, all workload balancings created with this configuration can no longer be opened.



#### Note

*Whenever setting as valid or saving a new valid workload balancing, all structure elements affected by this, such as line, group, station, and processes, must also be valid for the duration of the valid workload balancing. All structure elements are set to the planning status **integrated**.*

#### 3.3.1 Effectivities Tests for Workflow Support

Both tables show which effectivities tests take place for workload balancings of the workflow support; they have the planning status **working** or **integrated**:

- Level 1 - workload balancing = raw balancing
- Level 2 – workload balancing = area workload balancing

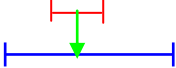
- Level 3 – workload balancing = fine workload balancing
- Effectivities tests for workload balancings that have the planning status **working** take place when the workload balancing is saved.
- Effectivities tests for workload balancings that have the planning status **integrated** take place when saved with this status and when a workload balancing is set as valid.
- There are no effectivities tests for the raw balancing on level 1. Both planning states **working** and **integrated** are not taken into consideration.

Table 2: Effectivities Tests for Level 2 - Workload Balancing

Restrictions	New Workload Balancing		Existing Workload Balancing	
	Working	Integrated	Working	Integrated
The starting date must be later than the current date.		X		X
The starting date must not be in the past unless it has been set as such in the configuration.	X		X	
The starting date must not be changed.			X	X
The starting date of the following workload balancing must not be before the end date of the previous workload balancing.	X	X		
The end date of the previous workload balancing must not be after the start date of the subsequent workload balancing.	X	X		
The end date must not be changed or set in the future.			X	X
There must not be any time gaps between multiple workload balancings.	X	X		

Table 3: Restrictions for Level 3 Workload Balancing

Restrictions	New Workload Balancing		Existing Workload Balancing	
	Working	Integrated		Working
The starting date must be later than the current date.		X		X
The starting date of the valid master workload balancing on level 2 must not be in the past.		X		X
The starting and end date of the workload balancing must always be within the time period of the valid master workload balancing on level	X	X	X	X

Restrictions	New Workload Balancing		Existing Workload Balancing	
	Working	Integrated		Working
2.				
The first valid level 3 workload balancing must begin with the starting date of the master workload balancing.		X		X
The starting and end date can not be within a previously existing workload balancing 	X	X	X	X
The master workload balancing on level 2 must be valid: for example, must have the planning status integrated.		X		X
The number of variants must not exceed the number of possible variants specified in the configuration, it must be within the permissible range.	X		X	

### 3.3.2 Important Message for Working in Work Load Balancing

Messages in the Work Load Balancing refer to working circumstances. Messages that are of a purely informative character are marked with a question mark. Messages for impermissible procedures are marked by an exclamation mark.

#### Synchronize Input Directory of Level 2 Workload Balancing

Workload balancing on level 2 and level 3 has a direct connection to one another that is defined via a planning time period of the level 2 workload balancing. The processes are assigned to the individual groups of an area in a level 2 workload balancing. Multiple workload balancings can exist for one group. The input directory of a workload balancing contains all the processes for planning on level 3 that have been assigned via the input directory of the level 2 workload balancing of the group.

The message appears when opening a level 3 workload balancing processes which are located in the input directory of the level 2 workload balancing and workplaces have already been assigned in the level 3 workload balancing.



#### Note

*If you answer this message with Yes, processes from the workload balancing gets opened that are simultaneously located in the input directory of the level 2 workload balancing are deleted. Answer this message with No if you do not want any Synchronization.*





**Figure 42: Synchronization Message**

Several level 3 workload balancings that follow each other temporary can exist for a group. Every one of the existing level 3 workload balancings of a group is planned individually.

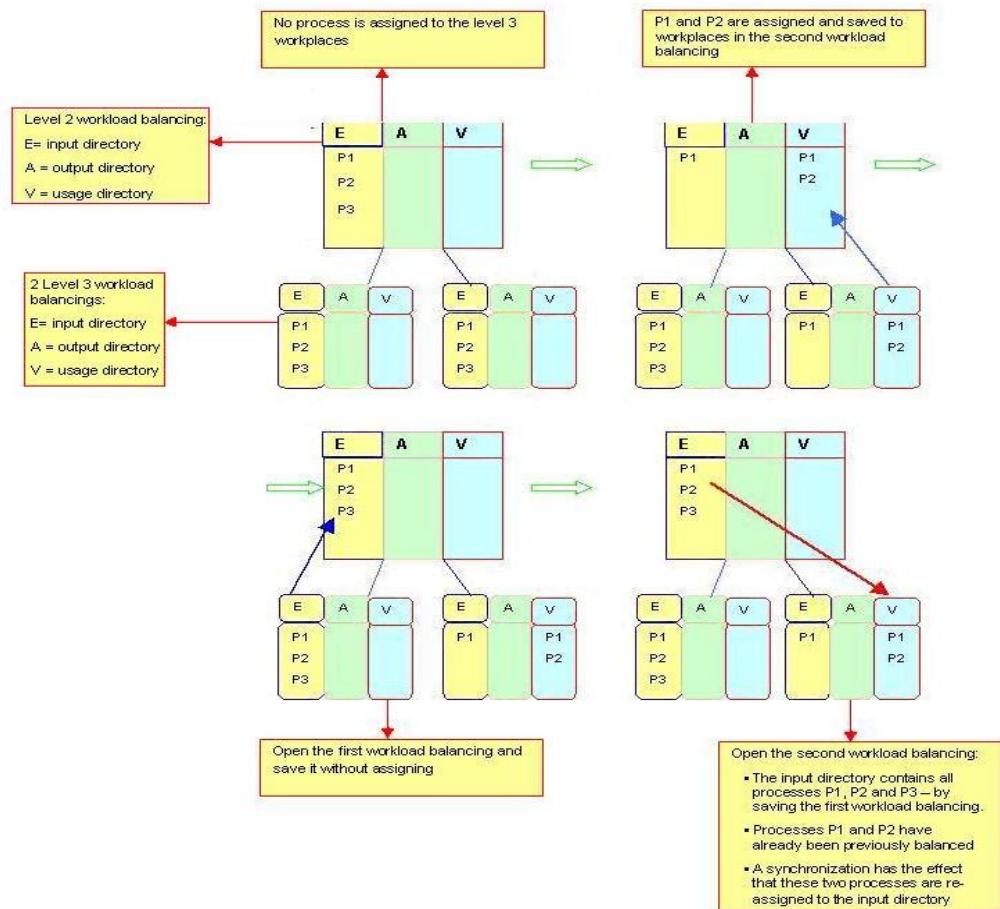
All existing level 3 workload balancings of a group access the same input directory of level 2. The assignment of processes to workplaces changes the situation in the input directory of the group. A synchronization of the input directory is necessary only if several workload balancings exist for the group and when opening a workload balancing there is a discrepancy between the input directory and the usage of the opened workload balancing.



**Note**

*The state of the most recently saved level 3 workload balancing is displayed in the input directory of the group of the level 2 workload balancing.*

**Principal Scheme for Synchronization**



**Figure 43: Scheme for Synchronization Level 2 Input Directory**

### Error Message in Work Load Balancing

- Workload Balancing can not be Saved

This message appears if a workload balancing already exists for this point in time. The workload balancing can not be saved in this case.



**Figure 44: Workload Balancing can not be Saved**

- Level 2 Workload Balancing in the Past

This message appears if date is in the past when a new level 2 workload balancing is created. The workload balancing can not be created.



**Figure 45: Workload Balancing can not be Created**

- Workload Balancing is within a Time Period

This message appears if end and starting date are within a time period of an existing workload balancing. Therefore, you can not save the workload balancing. Set either the starting date or the end date outside this time period. This message always appears whenever there is temporal overlapping with previously existing workload balancings.



**Figure 46: Starting and End Date are within a Time Period**

- Change End Date

This message appears if the end date of the level 2 workload balancing must not be changed to the future. Create a new level 2 work load balancing for this envisioned planning.



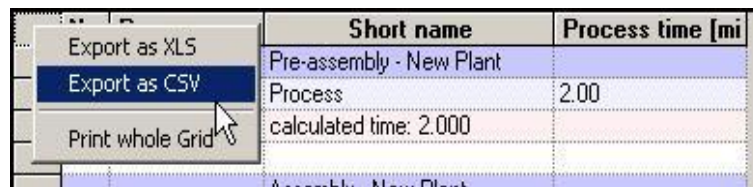
**Figure 47: End Date of the Level 2 Workload Balancing**

### 3.3.3 Exporting a Balancing List

Exporting a  
balancing list

Balancing lists can be directly exported or printed using a context menu.

- 1) To obtain a context menu, left-click the left column of the title bar.
- 2) Press right mouse button to open the context menu. *Please refer to the [Figure 48](#).*



**Figure 48: Opening a Context Menu – Exporting a Balancing List**

A balancing list can be export in the following ways:

- As an excel file (Export as XLS)
- In connection with a common editor (Export as CSV): For example, this format (CSV) can be exported into an Excel file. The file is unformatted and only separated by commas. However it can be exported into a common spreadsheet program.
- Print out unformatted (**Print whole Grid**): Unlike the well-structured and formatted printout you get using the Balancing menu, this printout is limited to the contents of the balancing list.

### Example

### 3.3.4 Printing a Balancing List

The results of a balancing process are shown in the balancing list and in the bar chart. There are two different functions provided for printing out a balancing list: **Print Preview** and **Print**. To enable both functions, you have to open the corresponding balancing process.



**Figure 49: Printing Balancing List**

## Example

Printing a  
balancing list

Print Preview

1/1

**Balancing List**

Text: Balancing: Line sequence 2      Last Modified:      Utilization: 70.00  
Resp. User:      Idle Time: 4000.000

No.	No.	Process name	Short name	Process time [min]
0			Pre-assembly - New Plant	
1	1	transport	Process	2.00
2	2	pre-assemblybody	Process	1.20
3	3	check	Process	1.20
4			calculated time: 4.400	
5				
6			Assembly - New Plant	
7	4	punchclamb	New Process	0.00
8	5	assemblybody	Process	1.20
9			calculated time: 1.200	
10				
11			Check - New Plant	
12	6	cap injection moulding	New Process	0.00
13	7	final assembly	New Process	0.00
14			calculated time: 0.000	
15				

Department      Date      Created By      Checked By      Valid Until      Page  
Delmia Process Engineer Copyright © 2002 Delmia GmbH      1

C:\DDKUME~1\gwin.DS\LOKALE~1\Te...

**Figure 50: Example of a Balancing List Printout**

### To Print a Balancing List

- 1) Click **Print Preview** menu item to view the balancing process on the screen. This allows you to make corrections to the balancing list before printing. *Please refer to the [Figure 50](#).*
- 2) Click **Print** menu item to print the balancing list. *Please refer to the: [Figure 50](#).*

## 4. Workload Balancing with Workflow Support

The basis of the workflow support (3-level balancing) forms the technical and organizational structures that have an unambiguous hierarchical relation to one another. A workload balancing configuration in which the relations are set must exist for every level.



For more information on this topic, *Please refer to the chapter Workload balancing configuration in the [Administration Manual](#).*

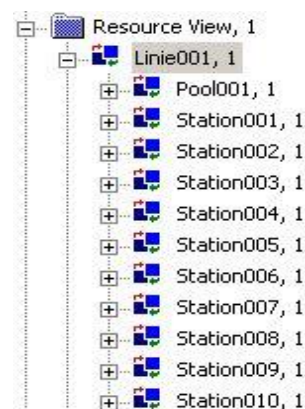
### Definitions of terms for 3-level balancing:

- Level 1 – workload balancing = raw balancing
- Level 2 – workload balancing = area workload balancing
- Level 3 – workload balancing = fine workload balancing

### 4.1 Planning 3-Level Balancing

#### Using Level 1 Workload Balancing

- Plan the technical resources with the help of the **level 1 workload balancing**. The processes are assigned to the stations of the technical structure on the basis of the level 1 workload balancing; these processes are planned in more detail in the organizational structure on **level two** and **three**. The planning on level 1 essentially corresponds to the raw balancing except that the **level 1** workload balancing must be the master configuration of level 2. *Please refer to the [Raw Balancing](#).*
- The organizational structures must be linked to the technical structure of the raw balancing on level 1. *Please refer to the [Figure 53](#).*



**Figure 51: Example of the Technical Structure for Raw Balancing**

#### Using Level 2 Workload Balancing

In contrast to the workload balancing on levels 2 and 3, the raw balancing is a purely abstract workload balancing in which processes are assigned to the stations for which a temporal effectivity is not absolutely necessary, as is the case for a workload balancing on level 2.

- With the help of the **level 2** workload balancing, you can check the workload balancing of the processes made in the raw balancing and



distribute it as necessary to the organizational groups of the area. The assignment of the processes to the individual groups are managed in the area workload balancing: this applies to the assigned processes of the raw balancing as well as for processes not yet planned with the fine workload balancing on level 3.

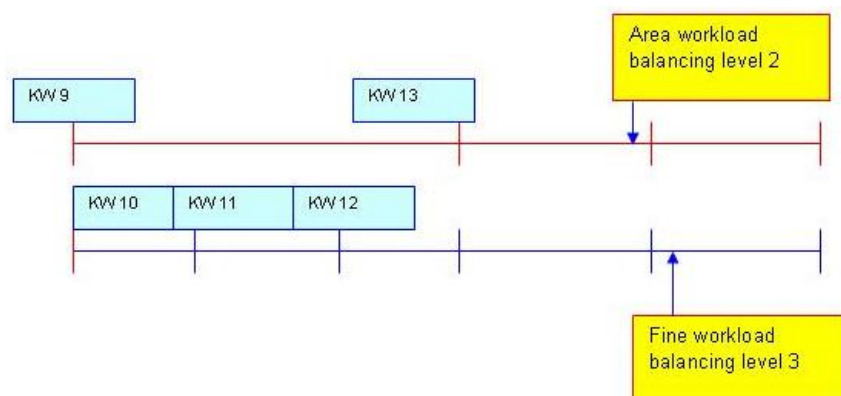
- You can plan an area workload balancing on level 2 for an unlimited time period (either days or weeks, as specified in the workload balancing configuration). The temporal sequence of the consecutive area workload balancings must not have any gaps; if, for example, the end of the previous area workload balancing is planned for the ninth calendar week, the following area workload balancing must start with the tenth calendar week; a start marked for the eleventh calendar week would therefore not be possible.
- The **level 1** workload balancing configuration must always be the master configuration of the level 2 configuration

### Using Level 3 Workload Balancing

- You can use the level 3 workload balancing to assign the processes to the workplaces of a station of the group. The fine workload balancing is used to manage the processes exclusively in the group. Processes in the group which have not been assigned to a workplace are re-distributed via the level 2 workload balancing.
- Fine workload balancing is derived from an area workload balancing on level 2. Multiple temporally consecutive fine workload balancings on level 3 can be created for an area workload balancing. An area workload balancing on level 2 should be valid for a time period of three weeks, for example, the tenth to thirteenth calendar weeks; then a fine workload balancing could be generated for every week (10<sup>th</sup>, 11<sup>th</sup>, and 12<sup>th</sup> calendar weeks). *Please refer to the [Scheme](#).*

### Scheme

Level 2 and level 3 workload balancings are planned for the same time period. A time period specified in the level 2 time period can be partitioned more finely in the level 3 balancing.



**Figure 52: Level 2 and Level 3 Workload Balancings**

- The level 2 workload balancing configuration must always be the master configuration of the level 3 workload balancing configuration.



## Directory for the Management of Processes

### Note

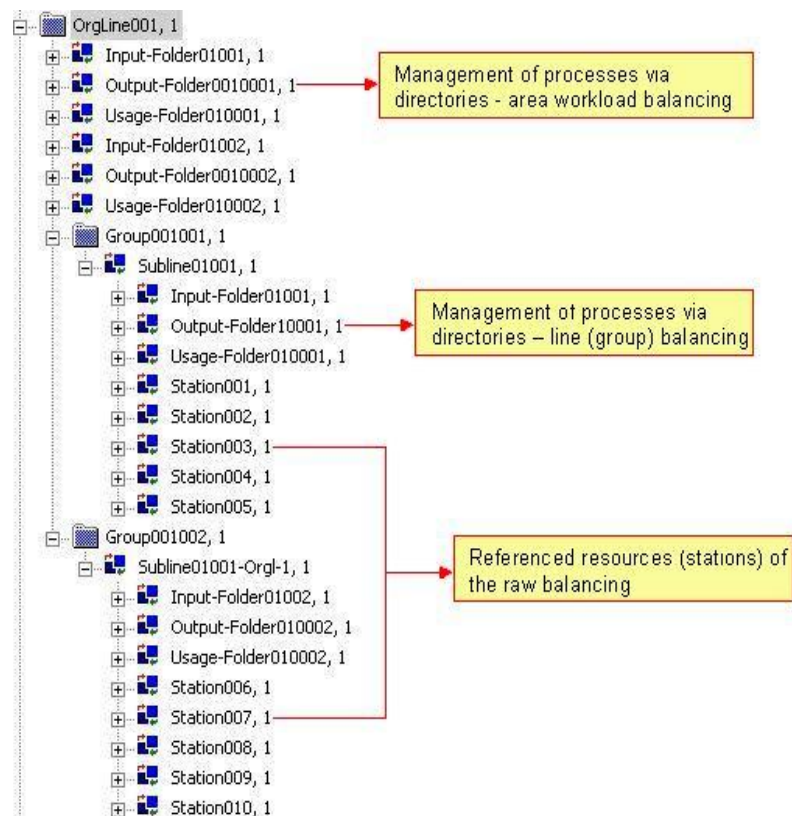
*Processes planned on the basis of level 2 remain in the input directory of the group until the processes in the fine workload balancing are planned on level 3 are assigned to the workplaces.*

*The objective of the fine workload balancing is to plan all processes in the usage directory and to empty the input and output directory.*

Three different directories are available for the management of the processes in the area and fine workload balancing:

- Input directory
- Output directory
- Usage directory

The directories are used for the area workload balancing and fine workload balancing, and must always be linked to one another. Technically these are the same directory, and are referenced in the following organizational structure.



**Figure 53: Example of an Organizational Structure**

### Area Workload Balancing

Use the input and output directories for the area planning:

- The processes assigned in the raw balancing are allocated to the group via the input directory of the area workload balancing. The processes are assigned via the input directory of the group.
- The processes that were not planned in the fine workload balancing of the group are marked via the output directory. This signals to the area

workload balancing that the processes are to be moved to another input directory of a group.

The usage directory has only an informative function for the area workload balancing.

#### **Fine Workload Balancing**

All three directories are used for planning in the fine workload balancing. The processes are assigned to the workplaces via the input directory of the group. These assigned processes are shown in the usage directory of the level 2 workload balancing. Processes that cannot be assigned to any workplace in the group are assigned to the output directory and are re-distributed via the area workload balancing. *Please refer to the [Workflow Support – Scheme of the Functionality](#).*

### **4.1.1 Workflow Support – Scheme of the Functionality**

The scheme shows the links and relations between configuration and workload balancing in the workflow support.

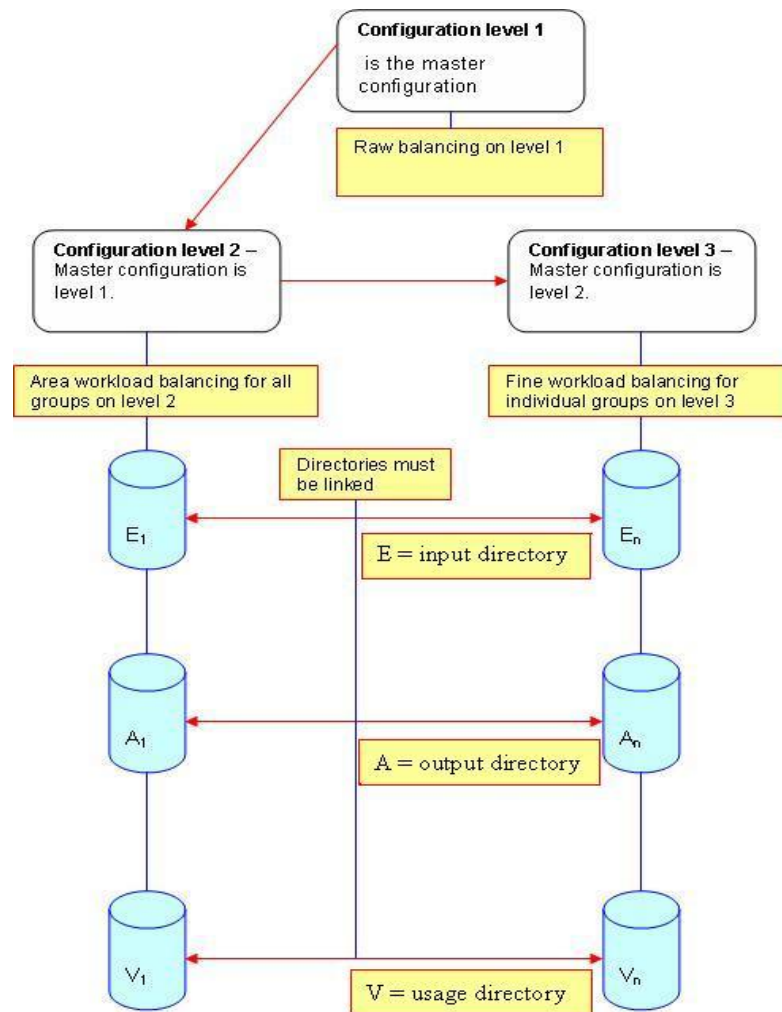


Figure 54: Workflow Support

## 4.2 Planning Area Workload Balancing

Switch to the resource view in order to plan the area workload balancing. An area workload balancing on level 2 is planned on the highest hierarchical level of the organizational structure.

### To Plan for the Area Workload Balancing

- 1) Open context menu. Select **Open in < Process Engineer**.

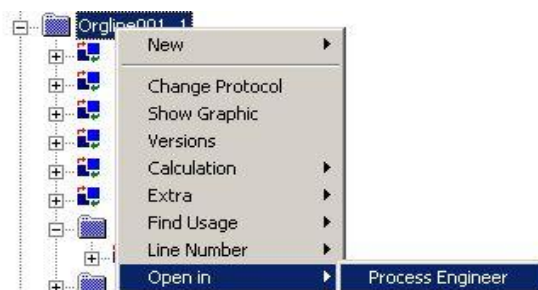
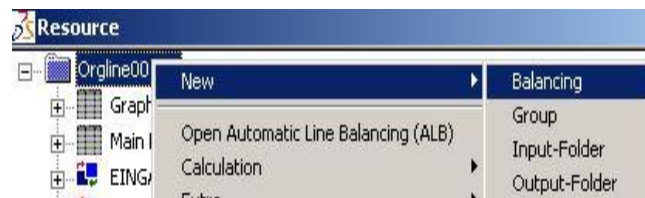


Figure 55: Switch to Resource View

- 2) Open context menu in the resource view. Select **New** workload balancing.



**Figure 56: Create Area Workload Balancing**

- 3) Set the valid time period. You can open a workload balancing even without a set effectivity date. In order to be able to save the workload balancing, at least the start date must be specified. The effectivity range must always be in the future.

- All processes valid at the time period of the start date of the workload balancing are shown in the workload balancing.



**Figure 57: Setting the Valid Time Period**

The area workload balancing in level 2 is opened with two views as a standard:

- **Additional Grid** on level 2 - balancinglist with the input directories of the groups and the balanced processes of the raw balancing on level 1. And output directories for processes which have not been assigned to a workplace in the fine workload balancing. These processes can be re-distributed. This view is empty in a new area workload balancing, since there is not yet a fine workload balancing.
  - **Standard Grid** on level 2 - usage directory with the balanced processes of the fine workload balancing on level 3. This view is empty in a new area workload balancing, since there is not yet a fine workload balancing. This view has an informative function only.
- 4) You can distribute the processes to the input directory of the area in the balancinglist. Processes can be assigned either by drag and drop or in the context menu.
  - You can set the effectivity range as week/year or as day/month/year. At least the starting date must be specified.
  - 5) Save the workload balancing. In the fine workload balancing you can then plan the processes planned in the area workload balancing for the workplaces of the station of a line or group.



Balancing: Variante1 (valid)   Additional Grid View					
<b>Balancing</b>		Variante1			
<b>Valid from (week)</b>		19 / 2005			
<b>Valid until (week)</b>		21 / 2005			
<b>Status</b>		Integrated			
<b>Configuration</b>		Level 2 Balancing Configuration			
No.	Name	Short name	Time [min]	Time with frequency	Freq. [%]
Input-Folder01001 TechRes.Input-Folder					
1	Process005	Process	0.18	0.18	100
2	Process006	Process	0.01	0.01	100
3	Process007	Process	0.22	0.22	100
4	Process008	Process	0.20	0.20	100
5	Process011	Process	0.09	0.09	100
6	Process012	Process	0.13	0.13	100
7	Process013	Process	0.01	0.01	100
8	Process014	Process	0.15	0.15	100
9	Process015	Process	0.07	0.07	100
Output-Folder0010001 TechRes.Output-Folde					
calculated time: 0.000					
Input-Folder01002 TechRes.Input-Folder					
35	Process052	Process	0.11	0.11	100
36	Process051	Process	0.23	0.23	100
37	Process053	Process	0.13	0.13	100
38	Process054	Process	0.13	0.13	100
39	Process055	Process	0.09	0.09	100
40	Process056	Process	0.10	0.10	100
41	Process057	Process	0.01	0.01	100
42	Process058	Process	0.06	0.06	100
43	Process059	Process	0.02	0.02	100
44	Process060	Process	0.10	0.10	100
45	Process061	Process	0.04	0.04	100
46	Process062	Process	0.12	0.12	100
Output-Folder0010002 TechRes.Output-Folde					
calculated time: 0.000					

Figure 58: Balancinglist with Processes

### 4.2.1 Opening the Area Workload Balancing

A saved area workload balancing is shown in the listview of the resource view.

- 1) In order to open an area workload balancing, select **Open balancing** in the context menu.

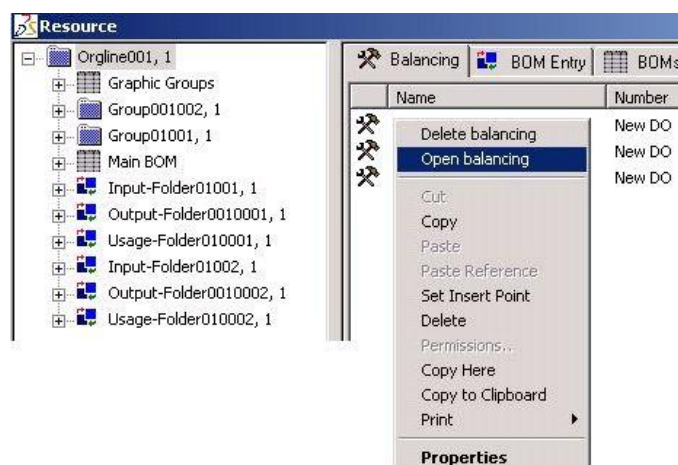


Figure 59: Opening the Area Workload Balancing

## 4.3 Planning Fine Workload Balancing

For every individual group of the organizational structure, a fine workload balancing must be created on level 3.



All of the processes assigned from level 2 are shown in the input directory (Additional Grid View) of the respective group; the processes can be assigned to the workplaces from this view (Standard Grid View).

The fine workload balancing is opened with the four views as a standard:

- **Additional Grid View** – It shows input directory and output directory. All of the assigned processes can be found in the input directory when new planning takes place. The output directory is empty.
- **Standard Grid View** – In this stations are subdivided according to workplaces. The view is empty when new planning takes place. The processes are assigned to one workplace in this view.
- **Column diagram** – It shows stations with capacity data. The view is empty when new planning takes place. As soon as a process is assigned to a workplace via the Standard Grid View, the process is shown at the corresponding workplaces. The view is continuously updated without saving.
- **Area view** – It shows stations with workplaces. The view is empty when new planning takes place. The view is continuously updated without saving.

You can create a new fine workload balancing for a group of the organizational structure in the resource view. The procedure corresponds to the area workload balancing. *Please refer to the [Planning Area Workload Balancing](#).*



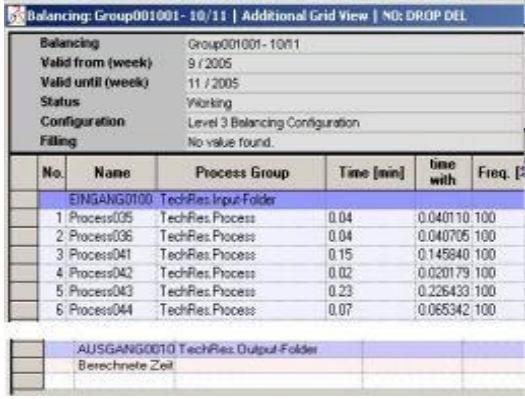
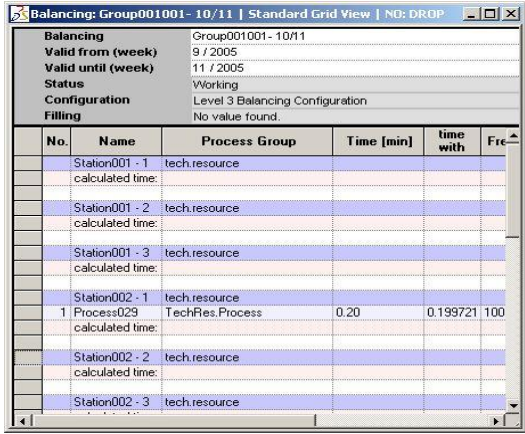
### Note

***You can set a level 3 workload balancing as valid (planning status integrated) if the level 2 workload balancing to which the level 3 workload balancing refers has previously been set as valid, i.e. also has the planning status integrated.***

The [Table 4](#) shows the Additional Grid and Standard Grid views before the assignment of processes. These two views are used in the first step in order to assign the processes to the workplaces in the fine workload balancing.

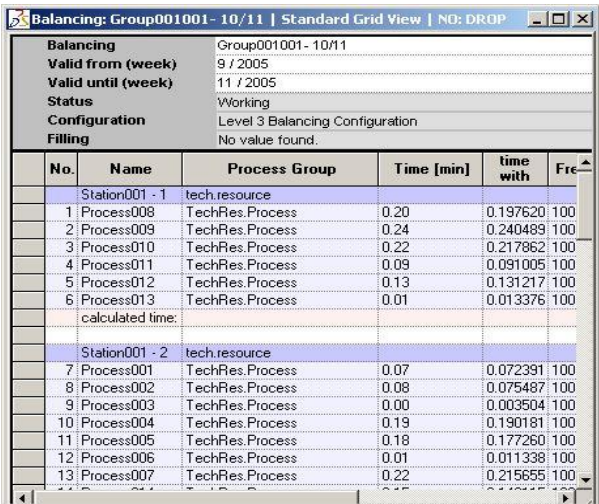
After the processes are assigned, they can be moved within one view – for example, in the column diagram or in the area view, the other views affected by this are automatically updated.

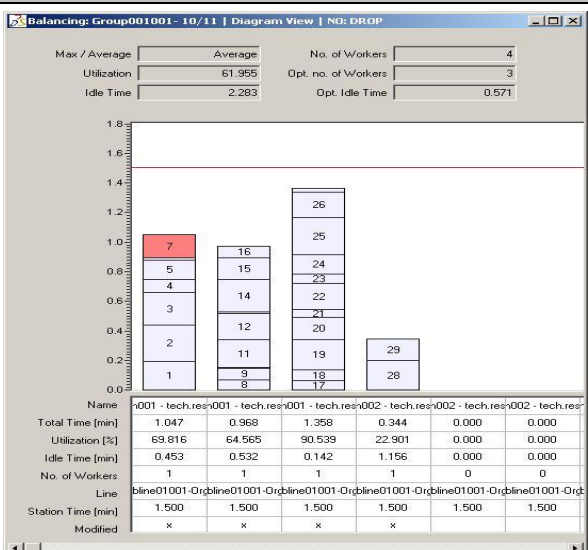
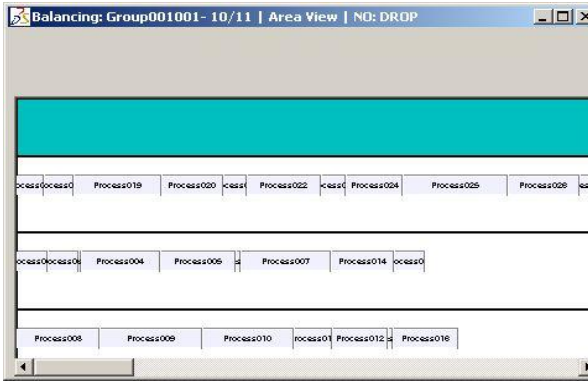
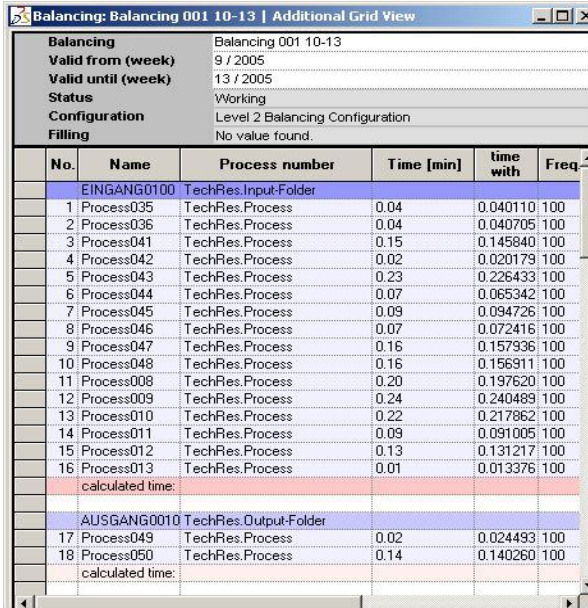
Table 4: Views of the Fine Workload Balancing for Level 3 – New Planning

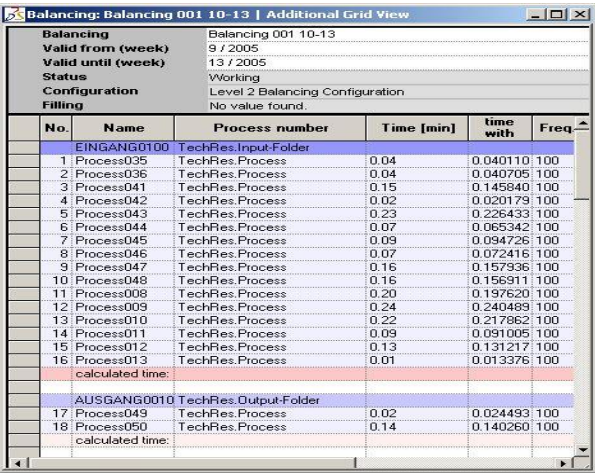
Levels 3	Views
<p>View Additional Grid - input directory of the line / group with assigned processes from the area workload balancing on level 2.</p> <p>From this view you can assign the processes to the workplaces via the context menu (Move from/Move to).</p> <p>Use drag and drop to assign processes to the output directory in this view.</p>	
<p>The Standard Grid view - balancinglist with workplaces of the stations.</p> <p>The processes are assigned from the input directory in this view.</p> <p>This view is empty when new planning takes place – as seen in the picture. The workplaces are shown per station in the view.</p> <p>For example, <b>Station002 – 2</b> means <b>workplace 2</b> in station 2.</p> <p>or <b>Station002 –3</b> means <b>workplace 3</b> in station 2, etc.</p>	

Views of level 2 and 3 are shown in the [Table 5](#) after the first processes have been assigned to workplaces in the fine workload balancing. The moving of processes in a view is updated in the other views of a workload balancing.

Table 5: Views for Levels 2 and 3 - Processes Balanced in the Fine Workload Balancing

Levels 2 and 3	Views
<p>Standard Grid level 3</p> <p>View with workplaces and assigned processes.</p> <p>Processes can be moved within this view by drag and drop.</p>	

Levels 2 and 3	Views
<p>Column diagram level 3</p> <p>Assigned processes are displayed for the workplaces.</p> <p>Capacity data are ascertained.</p> <p>Processes can be moved within this view by drag and drop.</p>	
<p>Area view level 3</p> <p>Assigned processes are displayed in the workplaces of the stations.</p> <p>Processes can be moved to new workplaces by drag and drop.</p>	
<p>View Additional Grid on Level 2:</p> <p>In the input directory of the line/group, the processes of the raw balancing not assigned in the fine workload balancing are displayed and can be assigned.</p> <p>The output directory of the line/group shows the processes that have not been assigned by the line/group to a workplace. These processes can be re-distributed in the area workload balancing.</p>	

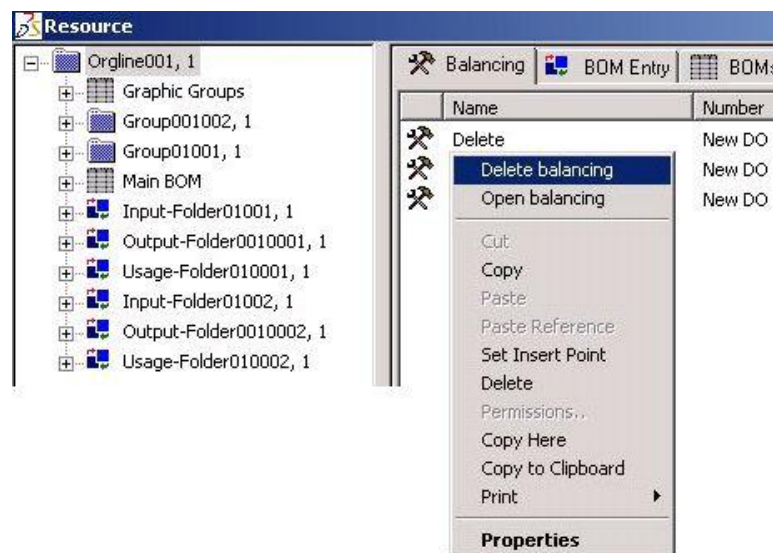
Levels 2 and 3	Views
<p>Standard Grid on level 2</p> <p>The usage directory displays all processes that have been assigned to workplaces in the fine workload balancing.</p> <p>This view can not be changed.</p>	

## 4.4 Deleting Workload Balancing

You can delete a workload balancing by using the context menu in the resource view. A workload balancing is shown in the listview of the resource view under the tab Workload balancing.

### To Delete a Workload Balancing

- 1) Select the workload balancing and open context menu.
- 2) Select **Delete balancing**.

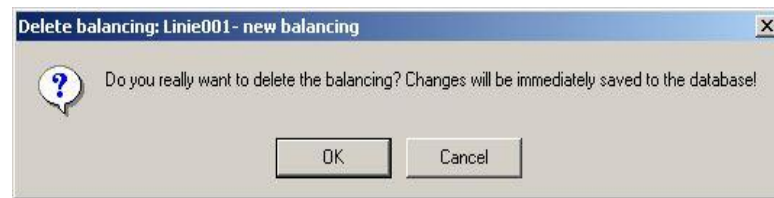


**Figure 60: Deleting a Workload Balancing using the Context Menu**

A general message with which you can still cancel the deleting appears upon deleting workload balancings for which there are no special restrictions.

- 3) If you confirm the message with **OK**, the workload balancing is deleted from the database. *Please refer to the [Figure 61](#).*









**Figure 61: General Message for Deleting Workload Balancings**

In the following table you get important information on deleting workload balancings:

**Table 6: Restrictions on Deleting Workload Balancings**

Restrictions	Messages
Deleting a level 2 workload balancing is <b>not possible</b> , regardless of the planning status, if the start date of the workload balancing is currently valid or in the past; the starting date and point time of deleting are on the same day.	Deleting is cancelled with the message: 
Deleting a workload balancing, regardless of planning status, which is temporally between two valid workload balancings for the same structure is generally possible;    deleting such a workload balancing has the effect of creating a gap between valid workload balancings in the temporal planning, and the subsequent workload balancing would have no direct reference to the first workload balancing.	Message when deleting a level 2 workload balancing  This message appears for level 2 workload balancings, regardless of the planning status, whenever a gap would result between existing level 2 workload balancings upon deleting.  This message also appears whenever a gap would result only for valid level 3 workload balancings.  
Whenever deleting a level 2 workload balancing, level 3 workload balancings derived from this level 2 workload balancing are deleted regardless of the planning status.	<b>Messages when deleting</b>  If there are further level 3 workload balancings for the level 2 workload balancings, they are deleted. In the first message, the level 3 workload balancings affected by this are shown.

Restrictions	Messages
	<div><div><div>Delete balancing: Variante 1</div><div>Following slave balancings depend on the balancing: Group001001a</div><div>Continue</div></div><div><div>Delete balancing: Variante 1</div><div> Do you really want to delete the 2nd-level-balancing and all depending 3rd-level-balancings? Changes will be immediately saved to the database!</div><div>OKCancel</div></div></div>



# Appendix

## Using Change Management with Work Load Balancing

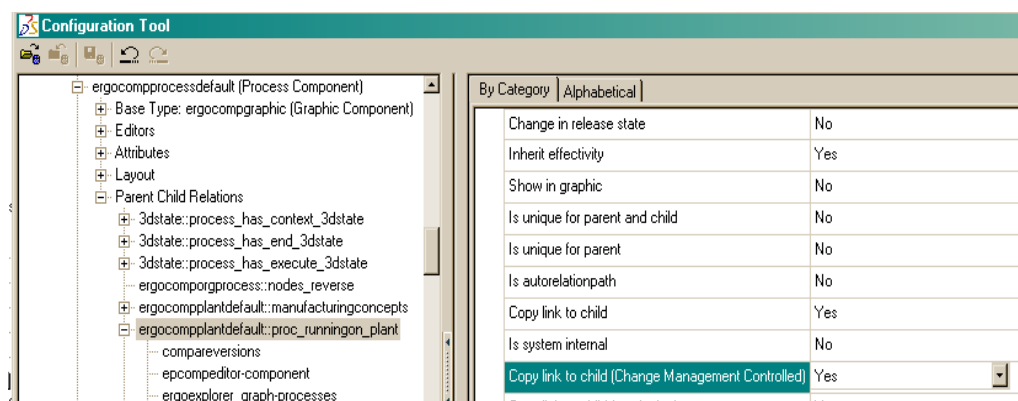
### 1 Change the Project Mode to MCM

#### To Configure the Project Mode to MCM

- 1) Click **Tools < Database Utilities < Configuration Manager**.
- 2) Right-click **ConfigDB < Sort types by < Type name**.

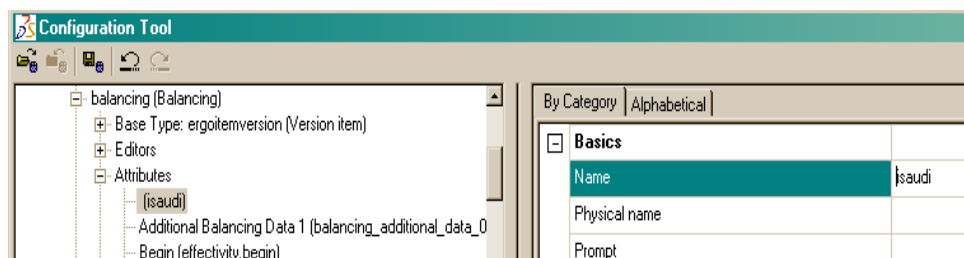
In the Configuration Tool, select the **ergocompprocessdefault** and select the **PC-Relation configDB < Types < ergocompprocessdefault < Parent Child Relations < "ergocomplantdefault::Proc\_runningon\_plant"**

- 3) Set **Copy link to child (Change Management Control)** to **Yes**.



**Figure 62: Copy link to child (Change Management Control)**

- 4) Repeat the step at the reverse relation **ergocomplantdefault (configDB < Types < ergocomplantdefault < Parent Child Relations < ergocompprocessdefault: :Proc\_runningon\_plant\_reverse)** and set **Copy link to child (Change Management Control)** to **Yes**.



**Figure 63: PTEditor**

- 5) In PTEditor at Planttype **ProcessGroup** set the flag **Is configured** to **Yes**.

#### To Select the MCM Project

- 1) Close the Project.
- 2) In main tool bar select **Tools < Regular Project <-> MCM Project**.

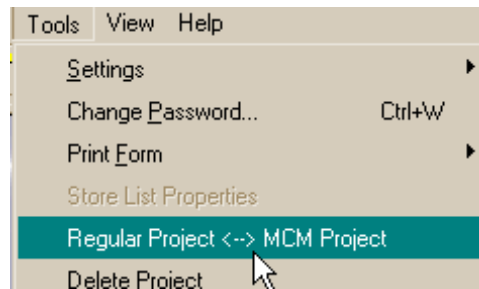


Figure 64: Select MCM Project

- 3) Select the check box **MCM Project**.

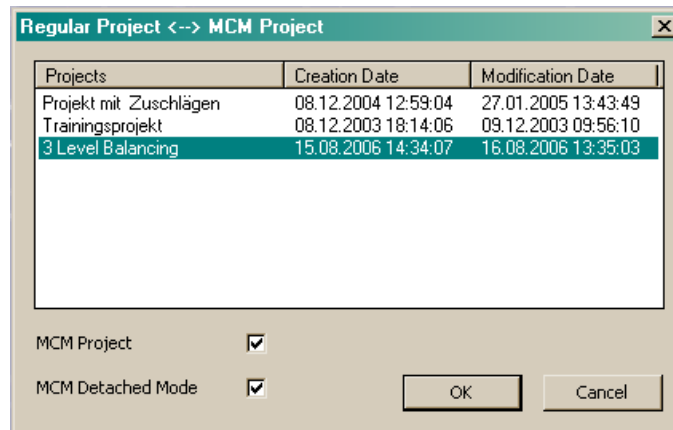


Figure 65: MCM Project Checkbox

- 4) Open the dialog box a second time and select the check box **MCM Detached Mode**.

### To Create Planning States

- 1) Select the planning state **Working**; open its properties, and enter a **Corresponding Action state: Working**.

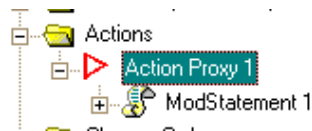


Figure 66: Planning States

- 2) Create an additional planning state **Released** and enter **released** as **Corresponding Action state**.

### To Create Action and Mod-Statement

- 1) At **Actions**, create a **Action Proxy 1** and select the **Is usable** check box.



**Figure 67: Action Proxy 1**

- 2) Also create a **ModStatement 1** with **Extended Effectivity**; enter **R(1-oo)** in the box.

**Figure 68: Create Modstatement  
To Reopen Project in MCM Mode**

- 1) Select **Action Proxy 1** and **ModStatement 1** to open the project.

Projects	Creation Date	Modification Date
Trainingsprojekt	08.12.2003 18:14:06	08.12.2003 09:56:10
Projekt mit Zuschlägen	08.12.2004 12:59:04	27.01.2005 13:43:49
3 Level Balancing	15.08.2006 14:34:07	16.08.2006 15:35:01

**Figure 69: Open Project MCM Mode**

- 2) The project opens in MCM-mode.

## 2 Version Checkout and Work Load Balancing

### To Show Version in Grid of Work Load Balancing

- 1) Open the Work Load Balancing configuration.
- 2) Go to **Planttype Forms** and click >> button at the planttype **ProcessGroup**.

Figure 70: Plantype Process-Group

- 3) In **Attributes Configuration** click **New** button.
- 4) In **Attribute Name**, select **versionnumber**; select the **Show Attribute in Grid** check box, and enter **8** in the **Col no in grid** field.

Figure 71: Insert Attribute

- 5) The version is shown in the Standard Grid View of Work Load Balancing.

Freq. [%]	Version
50	1
100	1

Figure 72: View Version in Standard Grid View

### To Open Work Load Balancing

- 1) Expand the project node to **Line 001**. Right-click and select **Balancing < Open Workload Balancing (WLB)**.

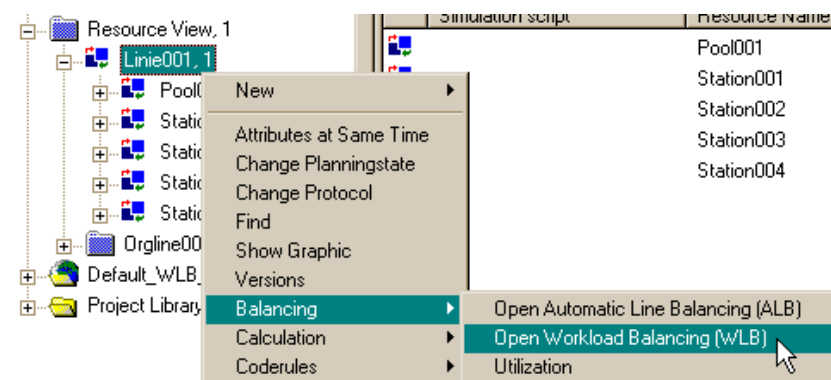


Figure 73: Open Workload Balancing

- 2) Accept all values offered by the software. In Standard Grid view, the versions are shown. *Please refer to the [Figure 74](#).*

No.	Name	Short name	Time [min]	Time with	Freq. [%]	Version
	Station001	tech.resource				
1	ProcessGroup0	Process Group	0,58	34,77	100	1
2	ProcessGroup0	Process Group	0,77	46,48	100	1
	calculated time:					

Figure 74: Standard View

**To Change MCM Mode**

- 1) Create **ModStatement 2 ( R(1-oo))**.

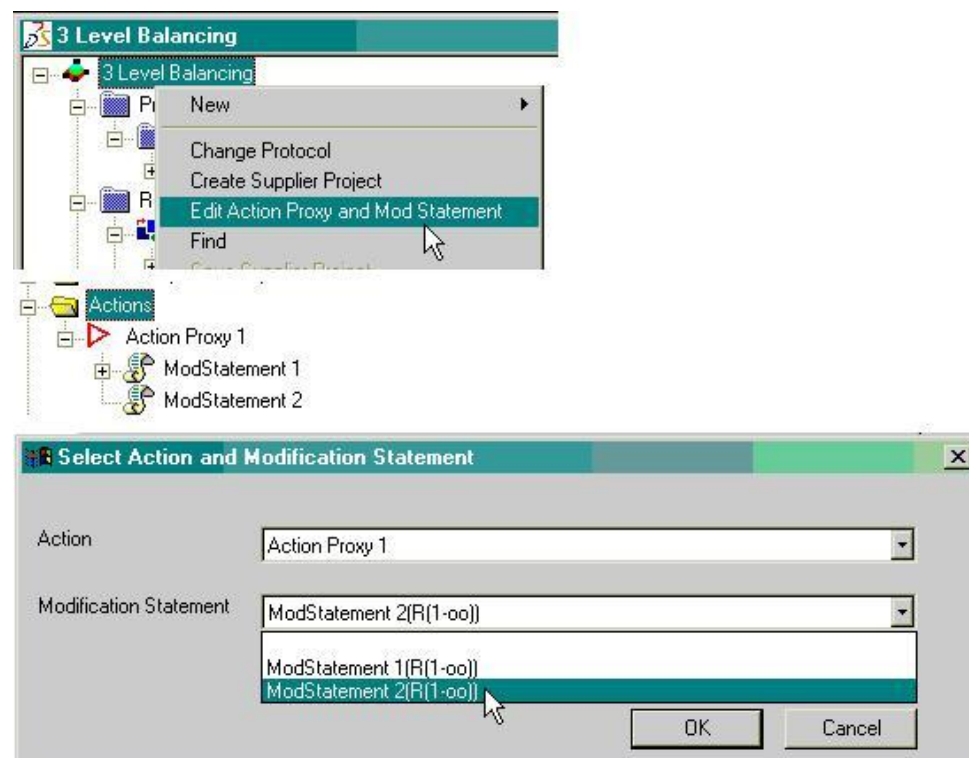


Figure 75: Modstatement 2

- 2) Change the project into that mode.

**To Check out a New Version of a Process**

- 1) In PPR-Navigator, call the properties of **ProcessGroup002**, and create a new version by clicking the **New Version** button.
- 2) Save on a single disk.

**Note**

Work Load Balancing must remain open while creating the new version. To show the New Version button, select **Tools < settings < maintenance tools. (View) Local Machine. ErgoPlan < option-configuration < versioning**. Set to 1 the value for Activate notification mechanism.

**To Check Result**

- 1) Switch back to Standard Grid view of balancing. The Version number 2 appears:

Balancing: Linie001   Standard Grid View							
	No.	Name	Short name	Time [min]	Time with	Freq. [%]	Version
		Station001	tech.resource				
	1	ProcessGroup001	Process Group	0.58	34.77	100	1
	2	ProcessGroup002	Process Group	0.77	46.48	100	2
		calculated time: 1.3					

Figure 76: Version Number 2



### Note

To make more than one new version of a process, select **configDB < Types < ergocompprocessdefault < Parent Child Relations < ergocompprocessdefault:nodes**. Set to yes **Copy link to child (Change Management Control)**. Do the same to **ergocompprocessdefault::nodes\_reverse**



# List of Figures

Figure 1: Example of an Organizational Structure .....	6
Figure 2: Resource Structure for Workflow Support .....	8
Figure 3: Process Structure in the PPR–Navigator View .....	9
Figure 4: Example of a Balancinglist with Stations .....	9
Figure 5: Standard Displayed Column Title .....	10
Figure 6: Balancinglist with Workplaces .....	11
Figure 7: Buffer – Listview View .....	12
Figure 8: Example of a Bar Chart.....	12
Figure 9: Display in the Bar Chart Heading Section .....	13
Figure 10: Bar Chart List Display .....	14
Figure 11: Area View - Station Balancing.....	15
Figure 12: Area View - Workplace Balancing .....	15
Figure 13: Label Filter Dialog .....	16
Figure 14: WLB Balancing Menu .....	17
Figure 15: Save as Menu in the Workload Balancing .....	18
Figure 16: Activate Planning Status for Workload Balancing.....	18
Figure 17: Change State Menu Item in the Workload Balancing .....	18
Figure 18: Context Menu of the Right Mouse Button in the Balancinglist .....	19
Figure 19: Context Menu Item – Show Parts.....	20
Figure 20: Dialog for Links – Parts .....	21
Figure 21: Highlighting Processes Simultaneously in Views.....	21
Figure 22: Example of Three Hierarchical Levels .....	22
Figure 23: Starting a Balancing from the Context Menu .....	23
Figure 24: Dialog Select Configuration.....	24
Figure 25: Dragging Processes into the Balancing List by using Drag and Drop .....	25
Figure 26: Moving Processes – Example with Balancinglist.....	26
Figure 27: Insert Selected Processes – Example of Buffer .....	26
Figure 28: Inserted Processes are shown in the Buffer .....	26
Figure 29: Selecting a Process .....	27
Figure 30: Several Processes at the Same Time .....	27
Figure 31: Starting Utilization .....	28
Figure 32: Utilization Dialog – Selecting the Production Program.....	28
Figure 33: Display of the Utilization Results – External Calculation File .....	29
Figure 34: Example of a Balancing List – with Assigned Processes.....	30
Figure 35: Open Resource View .....	30

Figure 36: Generating Plan Variants of a Balancing List .....	31
Figure 37: Balancing List Plan Variants – Save as New Name .....	31
Figure 38: Listview of Resource View – Displaying Plan Variants .....	32
Figure 39: Opening Plan Variants in the Popup Menu.....	32
Figure 40: Saving Plan Variants.....	32
Figure 41: Marking the Workload Balancing.....	33
Figure 42: Synchronization Message .....	36
Figure 43: Scheme for Synchronization Level 2 Input Directory .....	37
Figure 44: Workload Balancing can not be Saved.....	37
Figure 45: Workload Balancing can not be Created .....	38
Figure 46: Starting and End Date are within a Time Period.....	38
Figure 47: End Date of the Level 2 Workload Balancing .....	38
Figure 48: Opening a Context Menu – Exporting a Balancing List.....	39
Figure 49: Printing Balancing List.....	39
Figure 50: Example of a Balancing List Printout.....	40
Figure 51: Example of the Technical Structure for Raw Balancing .....	41
Figure 52: Level 2 and Level 3 Workload Balancings .....	42
Figure 53: Example of an Organizational Structure .....	43
Figure 54: Workflow Support.....	45
Figure 55: Switch to Resource View .....	45
Figure 56: Create Area Workload Balancing .....	46
Figure 57: Setting the Valid Time Period.....	46
Figure 58: Balancinglist with Processes .....	47
Figure 59: Opening the Area Workload Balancing .....	47
Figure 60: Deleting a Workload Balancing using the Context Menu .....	51
Figure 61: General Message for Deleting Workload Balancings .....	52
Figure 62: Copy link to child (Change Management Control .....	54
Figure 63: PTEditor.....	54
Figure 64: Select MCM Project .....	55
Figure 65: MCM Project Checkbox .....	55
Figure 66: Planning States.....	55
Figure 67: Action Proxy 1.....	56
Figure 68: Create Modstatement .....	56
Figure 69: Open Project MCM Mode.....	56
Figure 70: Plantype Process-Group.....	57
Figure 71: Insert Attribute .....	57
Figure 72: View Version in Standard Grid View.....	57
Figure 73: Open Workload Balancing .....	57

Figure 74: Standard View .....	58
Figure 75: Modstatement 2 .....	58
Figure 76: Version Number 2 .....	59

## List of Tables

Table 1: Workload Balancing Editing Views Overview .....	7
Table 2: Effectivities Tests for Level 2 - Workload Balancing .....	34
Table 3: Restrictions for Level 3 Workload Balancing .....	34
Table 4: Views of the Fine Workload Balancing for Level 3 – New Planning .....	49
Table 5: Views for Levels 2 and 3 - Processes Balanced in the Fine Workload Balancing .....	49
Table 6: Restrictions on Deleting Workload Balancings .....	52

# Index

## C

### Creating a Balancing List

- Assigning Processes to the Balancing List.... 24
- Exporting a Balancing List..... 38
- Saving a Balancing List..... 25

## D

### Deleting Workload Balancing

- Restrictions on Deleting ..... 52

### Determining Utilization

- Results of the Utilization..... 29
- Starting Utilization..... 27

## E

### Editing Views

- Area with Loading Units ..... 14
- Balancinglist with Balanced Processes ..... 9
- Buffer for the Workload Balancing ..... 11
- Highlighting Processes..... 21

## G

### Generating Balancing Lists

- Printing a Balancing List..... 39

## M

### Menu

- Context Menu of the Workload Balancing ..... 19
- WLB Balancing Menu ..... 16

## N

- Nonliability ..... ii

## P

### Plan variants

- Plan Variants for Balancing ..... 30

### Plan Variants

- Opening and Editing Plan Variants..... 32

### Planning the Raw Balancing

- Introduction..... 22
- Opening the Balancing Process..... 22

### Process structure in the PPR-Navigator 8

## R

### Raw balancing

- Linking Processes ..... 5

### Raw Balancing

- General Information..... 4
- Views..... 5

### Resource Structure in the PPR-Navigator7

## U

- Using Script Actions for Balancing..... 22

## V

### Views in the Work Load Balancing ..... 6

### Views of the Balancing Process

- Bar Chart ..... 12
- Bar Chart List Display..... 13
- Heading Section of the Bar Chart..... 13

## W

### Work Load Balancing

- Balancing Results ..... 3
- Menus of the Workload Balancing..... 5
- Why Balancing? ..... 3
- Work Load Balancing Advantages ..... 3

### Workflow Support

- General Information..... 4
- Operating Mode ..... 44
- Organizational Structures ..... 6
- Planning 3-Level Balancing ..... 41
- Planning Area Workload Balancing ..... 45
- Planning Fine Workload Balancing..... 47