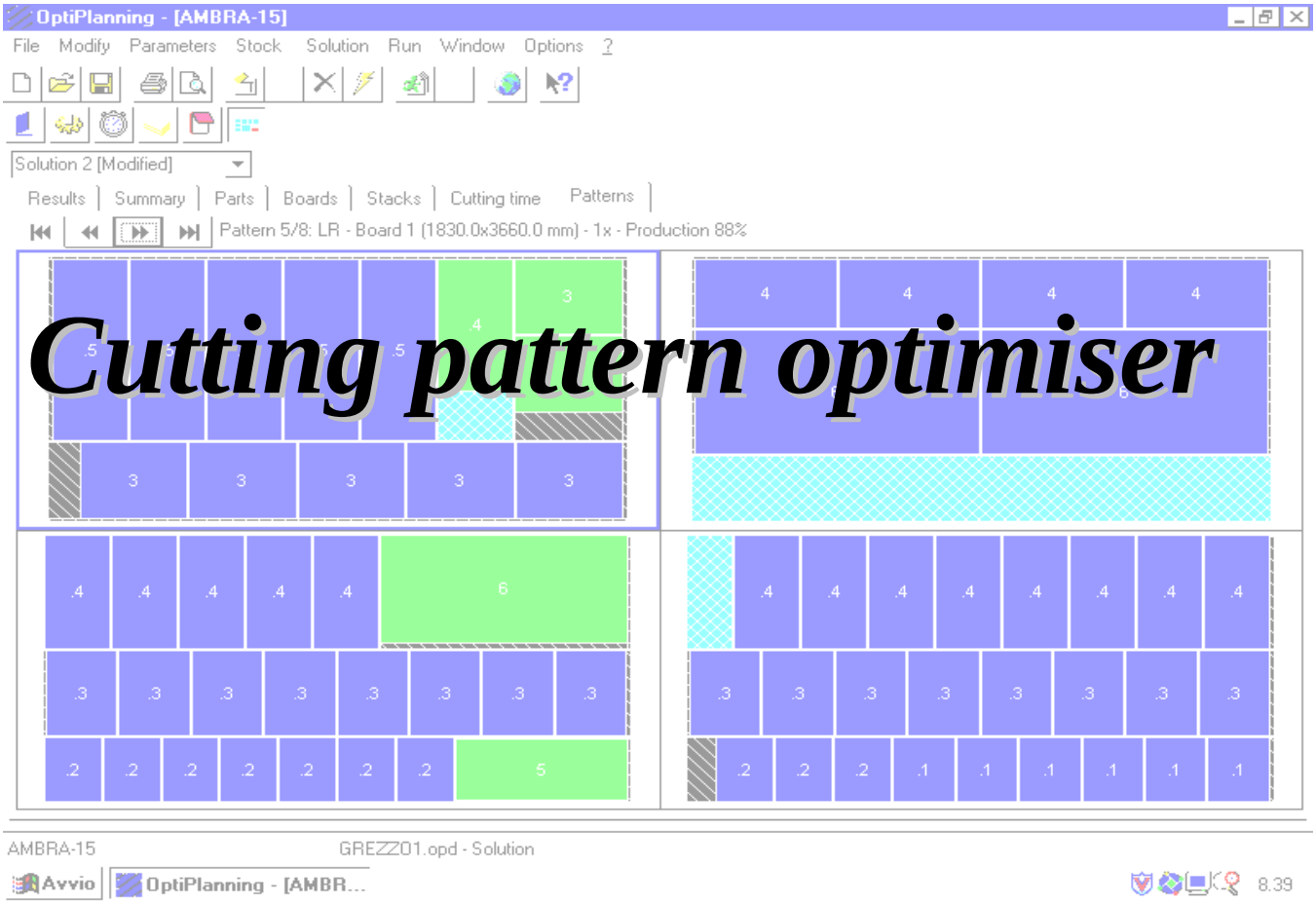
OPTIPLANNING



Cutting pattern optimiser

For Windows™

INSTRUCTION MANUAL

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CONTENTS

Chapter 1

INTRODUCTION

1.1 MATERIAL RECEIVED

An "OptiPlanning" CD and a Pros should accompany this manual.
The program only works if the key is connected to the USB port of the PC; if you want to use OptiPlanning from several work stations, you will need several protection keys (one for each PC).

1.2 HARDWARE REQUIRED

The minimum PC configuration for running the OptiPlanning program is as follows:
Operating system: Windows 98-SE, Me, NT 4.0, 2000, XP or Vista.
Microprocessor: **Pentium II, Celeron** (a multiprocessor PC is recommended)
RAM memory: **128Mb (512 for Windows XP, Vista)**
Hard Disk: at least **120 MB of free space**
CD-ROM Drive
Floppy Disk Drive (3.5")
Three **USB ports**
Video Resolution **800 x 600 with 256 colours**
Serial Port (if data is to be downloaded to the panel saw using a serial cable).
NB:
to use the program quickly and efficiently, you are advised to use a Pentium Quad Core microprocessor of at least 2.33 GHz, **2**GB RAM memory, and a video resolution of **1024 x 768 with 65000 colours**.

1.3 OPTIPLANNING VERSIONS

The program is available in two versions:

- STANDARD
- PROFESSIONAL

To be installed in one or more office PCs.

The differences between the 2 versions are shown in the table below.

CHARACTERISTICS S: Standard O: Optional	STANDARD	PROFESSIONAL
ALGORITHM FOR LOW VOLUMES	S	S
ALGORITHM FOR STRIPS	S	S
ALGORITHM FOR HIGH VOLUMES	S	S
ALGORITHM FOR MIXED LISTS	S	S
GRAPHIC EDITOR FOR PATTERNS	S	S
PRINTOUTS OF RESULTS	S	S
DATA DOWNLOAD TO PANEL SAW	S	S
PANEL AND REMAINDER MAGAZINE MANAGEMENT		S
AUTOMATIC DATA IMPORT		S
MACHINE TIMES CALCULATION AND 3-D SIMULATION		S
EDGES		S
CABINET		S
PATTERN SPLIT		S
MULTIPLE DATA TRANSFER		S
STACKING STATION MANAGEMENT		S
ONLINE PRINTING	O	O
OFFLINE PRINTING	O	O
UNSTRAIN CUTS		O
LAMINATES		O
SMART STACKING		O

Chapter 2

INSTALLATION

2.1 INSTALLING OPTIPLANNING

Place the CD in the CD-ROM drive and wait a few seconds until the first screen of the installation program appears (see Fig.2.1). If no such screen appears within approximately one minute, it is necessary to run the installation program using the *Start ->-Run* function of Windows and to type in the command "**D:\Install\Install.exe**" (assuming that D: is used to identify the CD-ROM drive).

The following is an illustration of the installation procedure, showing all the windows in which it is necessary to make selections.
When the first screen appears, choose the language setting and click on the icon in the top right-hand corner.

Figure 2.1

In the window shown in Fig.2.2 it is necessary to specify the licence file that will be used. The licence file is contained in the CD and it is usually sufficient to click on the *Next* button. Only when a different licence file is to be used will it be necessary to click on the "Edit" button to specify the name and path of the licence file.

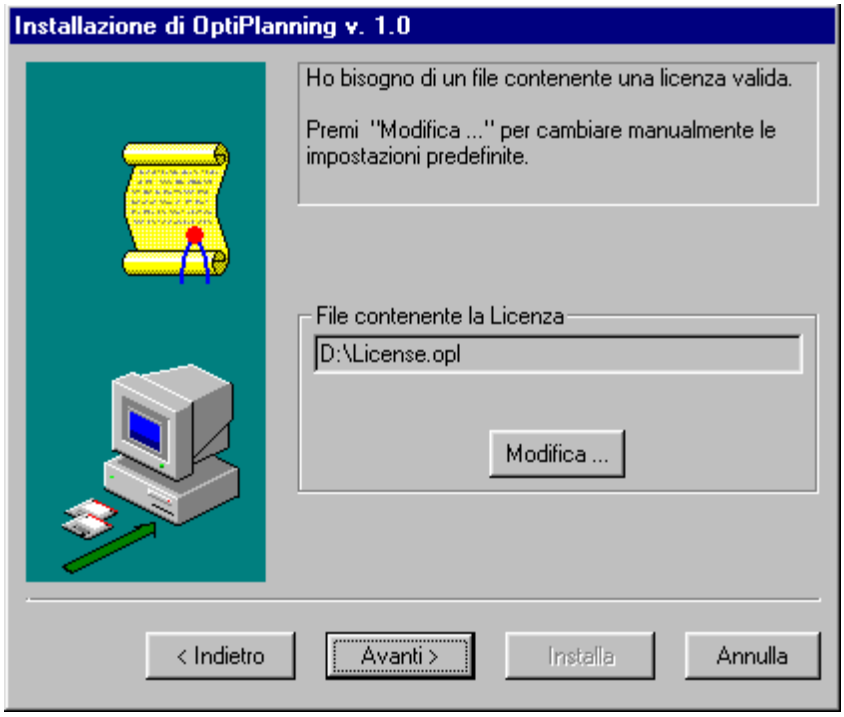


Figure 2.2

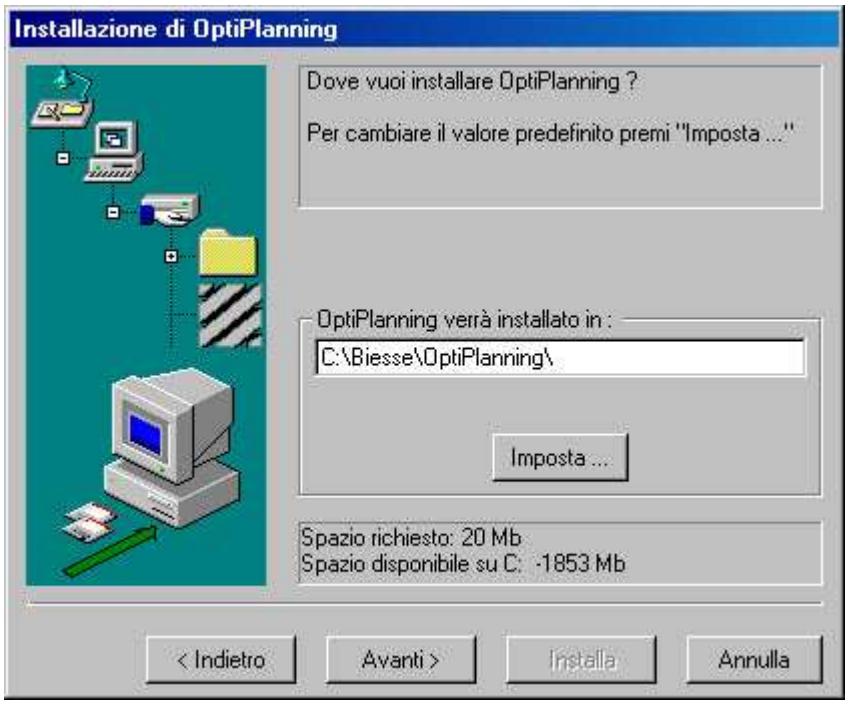


Figure 2.3

In the window shown in Fig.2.3 it is necessary to specify the drive and the directory in which to install the program. To confirm the default settings, simply click on the *Next* button.

Fig.2.4 shows the window that is used to specify which options are to be installed.
In particular:

- The *Word Viewer* program is used to print out results (it is, however, possible to use other word-processing files such as Microsoft ® Word for printing).
- The *Optimisation parameters* are used to save a set of predefined parameters for each machine model. If you have a previous version of OptiPlanning, the save procedure will not cause you to lose your own optimisation parameters.
- The *Smartkey* for Windows NT™ is necessary if the program is to be installed on a Windows NT™ system. This key installs the files for Pros management.

On Windows NT™ systems, it is possible that when OptiPlanning is run after installation, a message will appear indicating that no Pros has been found. Should this occur, it is necessary to carry out the "manual" installation of the drivers for Windows NT™. Use the *Resources Manager* to open the CD drive and the folder \Drv_nt\ of the OptiPlanning CD, and double click on the file **Gssadd.exe**. This operation will update the system and allow the problem-free start-up of OptiPlanning.

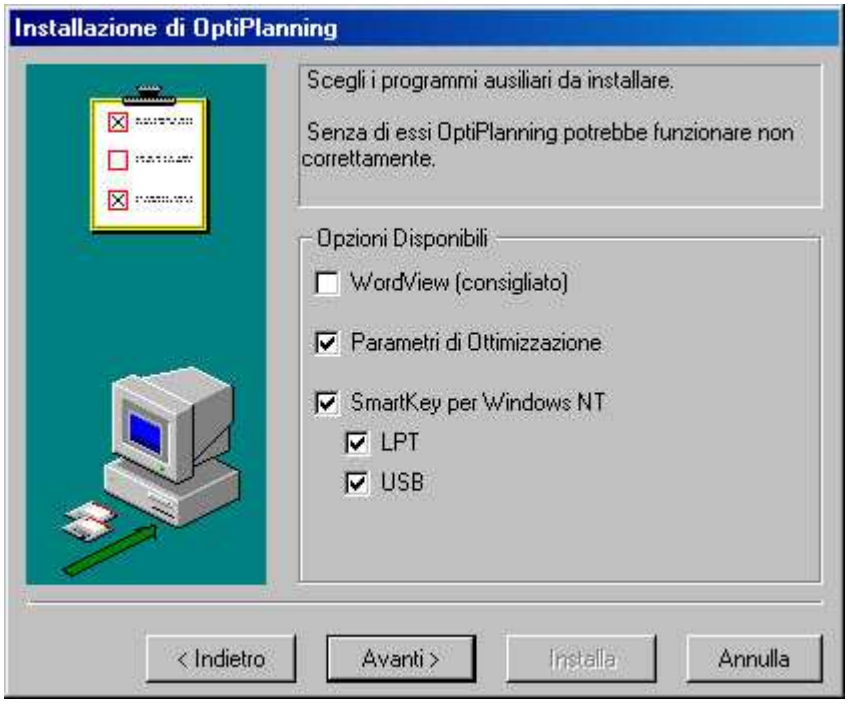


Figure 2.4

The menu shown in the following figure is used to choose the location for the OptiPlanning icon. To proceed, click on “Install”.

Figure 2.5

At the end of the OptiPlanning installation process, the following message will appear.

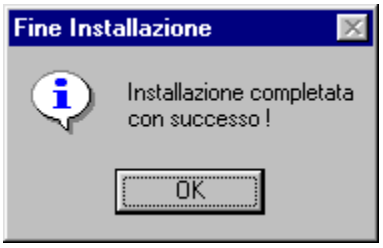


Figure 2.6

The following window will only appear if Word Viewer installation was selected from the menu shown in Fig.2.4. This window is used to confirm whether or not to install Word Viewer.

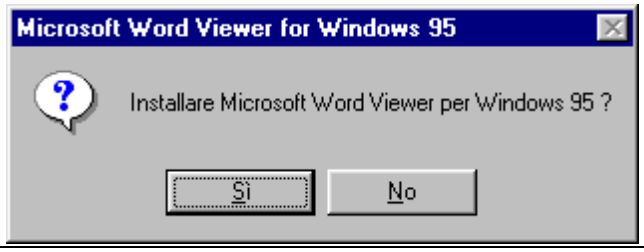


Figure 2.7

If Word Viewer is to be installed, the window shown in Fig.2.8 allows you to choose the installation drive and directory. To confirm the default file path, simply press “OK”.

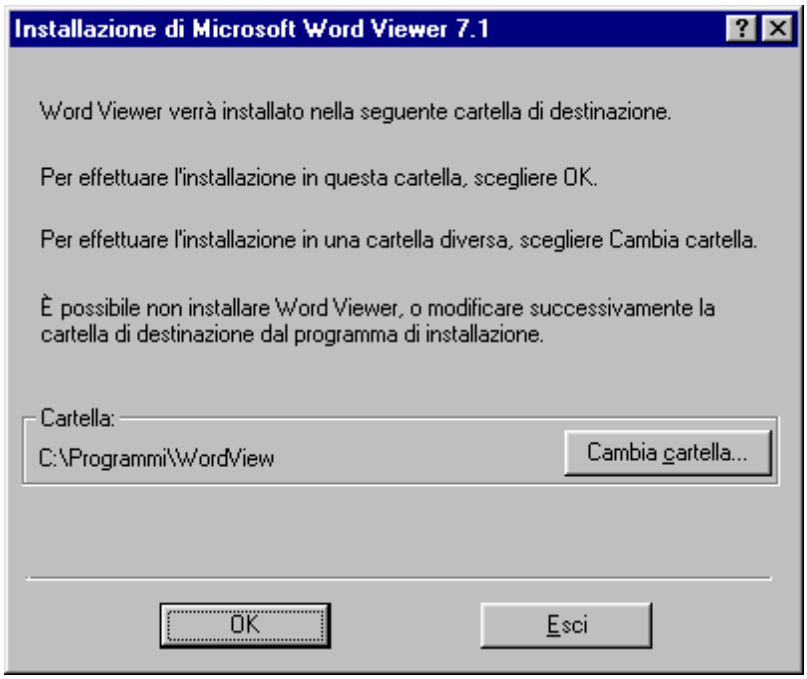


Figure 2.8

To continue the installation process, click on the top left-hand icon of the window shown in Fig.2.9

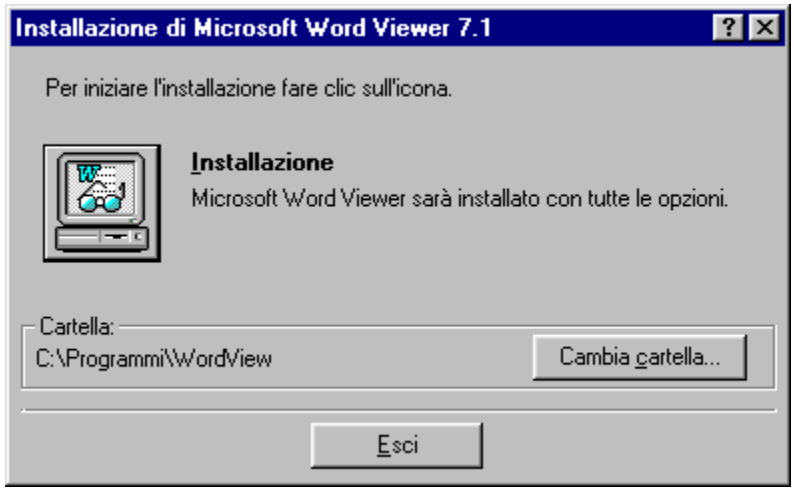


Figure 2.9

The following window will only appear if Microsoft ® Word has already been installed in the PC. In this case you can choose to open (for print previews) optimised order result files using Word or Word Viewer. We recommend you use Word, and click on the button marked “Open with Word”.

Figure 2.10

The following window appears at the end of the Word Viewer and OptiPlanning installation process.

Figure 2.11

2.2 UNINSTALLING OPTIPLANNING

To uninstall OptiPlanning it is necessary to insert the program CD into the CD-ROM drive. If the installation program starts automatically, close the first window (see Fig.2.1). Program removal procedures are as follows:

Select "*Settings*" followed by "*Control Panel*" from the "*Start*" Menu of Windows. Select "*Install*", followed by "*OptiPlanning*" and click on the "*Add/Remove*" button.

This will start the program removal procedure. To uninstall the program it is necessary to confirm the removal of the software through the successive windows that appear on the screen.

2.3 REGISTERING OPTIPLANNING

The first time OptiPlanning is run, a product registration form will appear. If you have an Internet connection, you can make an online registration. Alternatively, you can fill in the form and send it via e-mail or fax.
The compilation and sending of the registration form is an advantage for the product user, as it allows us to know in advance the relative data and therefore speed up the technical assistance procedures.

2.4 ONLINE CUSTOMER SUPPORT

If the computer on which OptiPlanning is installed is connected to the Internet, we can provide online support for your every need. To obtain online support, open the "*https://biesse.webex.com*" page via the button on the OptiPlanning toolbar, and call our help centre for the data needed to make the connection.

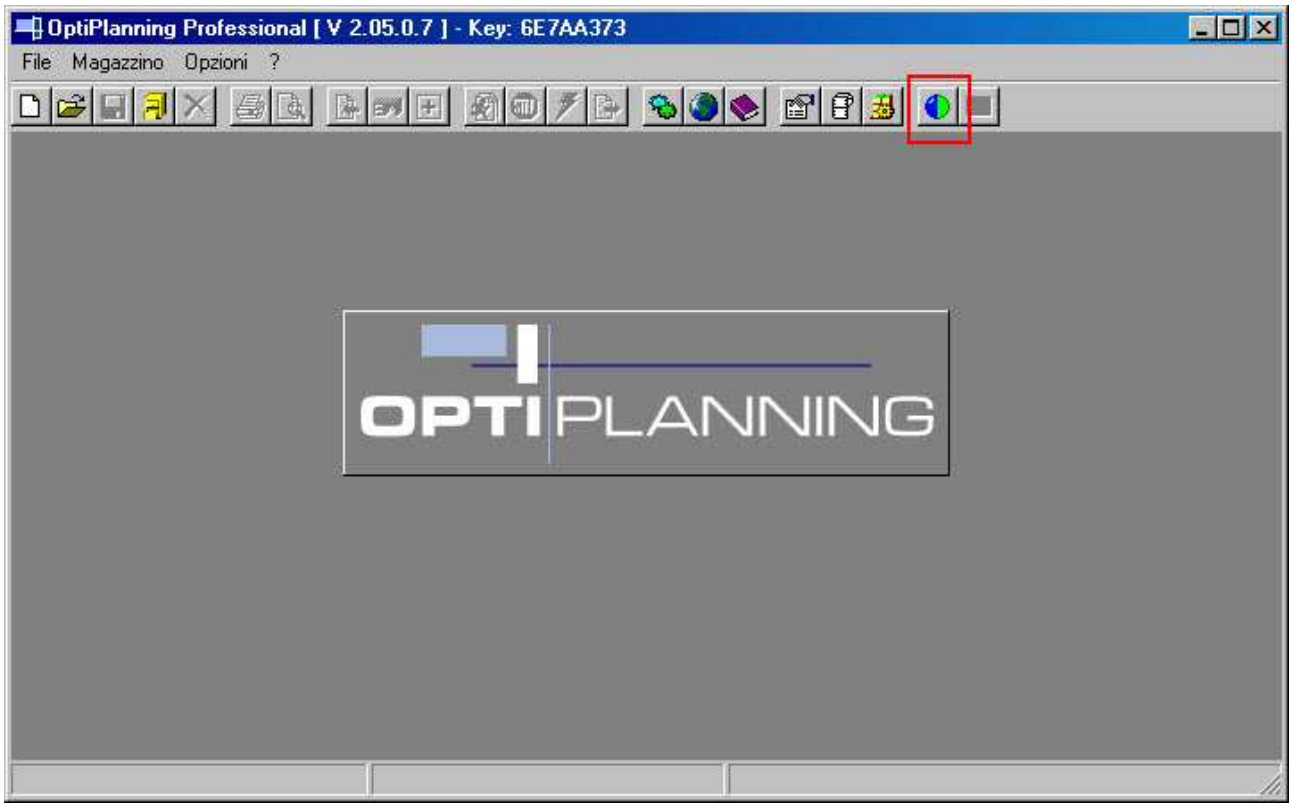


Figure 2.12

Chapter 3

GETTING STARTED

3.1 WHAT IS A CUTTING PATTERN OPTIMISER?

Before going on to describe the different functions of the OptiPlanning program, it is first necessary to explain what is meant by a *cutting pattern optimiser*.

The cutting pattern optimiser is a program able to create one or more cutting patterns to be executed by the panel saw, starting from a list of workpieces (parts) to be produced and from one or more boards to be sized. It is necessary to specify the length, width and quantity of each part to be produced. The cutting patterns will be created according to the "rules" defined in the optimisation parameters.

3.2 INTRODUCTION TO THE STEP-BY-STEP CREATION OF AN EXAMPLE

This section explains how to create a first optimisation example after completing the software installation procedure. We strongly recommend you follow these examples step-by-step, in order to acquire a certain familiarity with the program and learn its main functions and organisational layout.

3.3 STEP-BY-STEP CREATION OF AN EXAMPLE

Start the OptiPlanning program by clicking on the relevant icon: the installation program inserts one icon in the Windows Start Menu and another on the Desktop.

1. Entering the material

Select the *Stock* menu followed by the *New Material* option. It is now necessary to enter data in the new window as follows:

- *Name*: an alphanumeric material code that identifies the material in the magazine. Two types of material that differ in terms of structure, colour or thickness will have two different names.
- *Thickness*: the thickness of the panel.
- *Cost*: the cost per area unit of the material (for metric systems, this cost is calculated per square metre).
- *Density*: the density of the material in kg/m^3.
- *Description*: a text field where an optional description of the material can be entered.
- *Parameters:* this opens a drop-down menu for selecting the list of optimisation parameters to be used with the current material.
- *Minimum trim cut:* the minimum trim cut proposed when a new panel is created. There is one value for all the materials.

Use the ENTER or TAB keys to pass from one field to another.

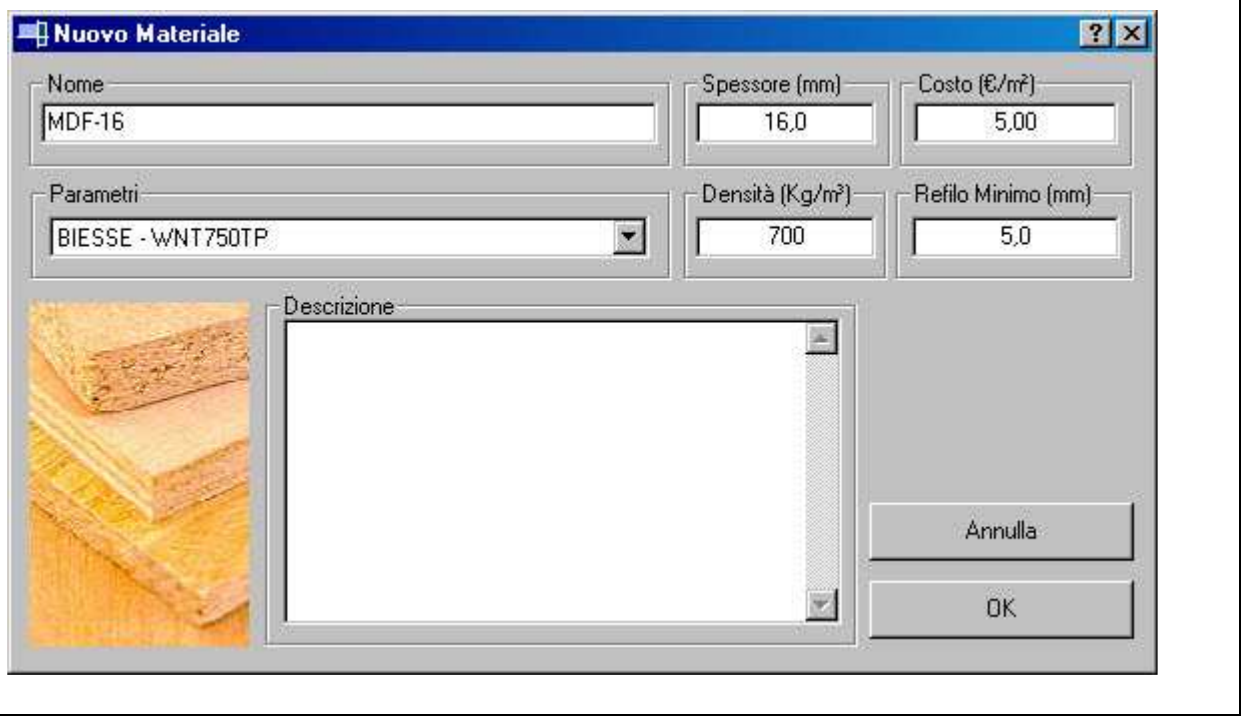


Figure 3.1

After entering the data, click on the *OK* button to confirm (the *Cancel* button can be used to close the window without updating the magazine).

At this point a new window will open, showing the panels magazine. In particular, in the upper part of the window, it is possible to read the name and cost of the material. To enter the measurement/s of the available panels, select the menu *Insert / Modify*. This will open a standard form for manual data entry. This form has the same structure and operating logic in all data entry menus.

Initially the form can be opened using view mode. In this mode it is possible to move through the different fields by using the four arrow keys. A selected field will become totally blue. By pressing ENTER it is possible to access data entry mode and then key in the required datum. The TAB, SHIFT + TAB or ENTER keys can be used to move from one field to another.

The data to be entered in this window are as follows:

- *Code*: a number that will identify the current panel.
- *Length*: the length of the panel.
- *Width*: the width of the panel.
- *Quantity*: the quantity of current panels available in the magazine. To specify an unlimited quantity of panels, use an asterisk.
- *Cost*: this field must contain the cost of the current panel. When the ENTER key is pressed, this cost is calculated automatically according to the area unit cost entered previously. It is also possible to insert costs manually. If an asterisk precedes the cost, the numerical value is interpreted as the cost per area unit; otherwise, it is interpreted as the cost per panel.
- *Minimum Trim Cuts* on the four sides of the panel. It is possible for the value of these fields to equal zero. In this case, a pattern may be created which contains one or more "risky" trims of a few millimetres in width (for further information, see the section about trim cuts management). The recommended value is 5 mm per side.
- *Board ID* and *Board Info* are two optional description fields.

- *Reorder Level*: this field can contain the minimum number of panels, below which it is necessary to make a new order (see also the section dedicated to panel magazine printouts).
- *Qty. to order*: this field can contain the quantity of panels to be ordered.
- *Value %*: this field contains the percentage value of the panel. This value is normally set at 100; by reducing it, you attempt to favour the use of the current format. The minimum value is 1.

IMPORTANT: if the measurement unit is metric, all dimensional data must be entered using millimetres, otherwise this data must be entered in inches.

Some of these fields may not be visible; to open them it is necessary to customise the panel magazine page, as explained in the chapter about customisation.

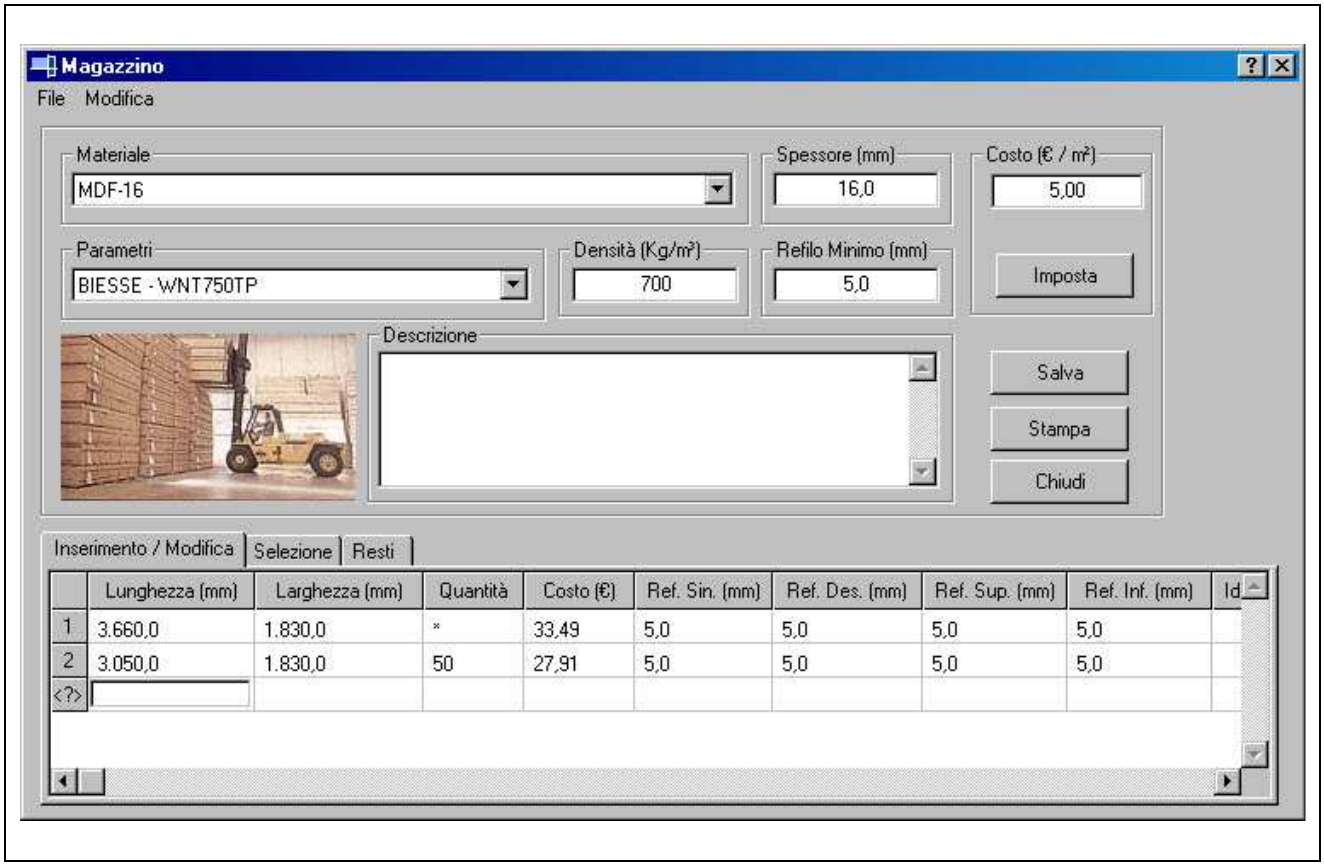


Figure 3.2

To confirm the data entered for the first panel, it is necessary to pass on to the second row. This is done by pressing ENTER from the last entry field or by pressing the plus (+) key on the numerical keyboard from any position (field). This option makes it possible to avoid having to scroll through all fields, from the first to the last, whenever new data is entered. Confirmation that a row has been correctly stored in the program memory is given when the question mark at the beginning of the row is replaced by a progressive number (the first row number will naturally be one).

It is possible to enter different panel measurements for the same material by using different code numbers. In this case the optimiser will be able to select from different formats and, for this reason, it may occur that different patterns that use different sized boards are created.

The same window also contains an *Update* button, which can be used to update panel costs if the cost per area unit changes. The *Print* button is used to open the magazine printout management window (for more information, see the chapter on printouts).

Once the panels have been entered, close the magazine window by clicking on the *OK* button.

2. Worklist organisation

This section explains Optiplanning's internal organisation of optimised worklists.

OptiPlanning is structured into *Orders* and *Worklists/Jobs*. Each worklist that is to be optimised forms a list that is part of an order. This makes it possible to create a batch (order) that can contain one or more lists (worklists). The worklists that make up an order generally refer to different materials, but they are grouped together because they come under the same furniture item, batch or customer heading. It is always possible, however, to create orders formed of a single worklist.

3. Creating a new order

Select *New* (first button on the left) from the toolbar. This will open a new window in which it is necessary to specify the name of the new order, which must be entered in the *File Name* field. Use the *Save* function to confirm the file name. Clicking on the *Cancel* button will cause the window to close without saving the new file name; at this point it is necessary to close the unsaved order by clicking on the *Close* option of the *File* menu.

If the *Save* option is selected, a new window will open ("*New Worklist*"), in which it is necessary to specify the material and parameters to be used in the first list of the new order. The optimisation parameters (which will be fully explained in other sections of this manual) specify which rules to use when creating a cutting pattern. A series of standard parameters with the names of Biesse panel saw models is stored in the memory during program installation; these sets adapt reasonably well to the general requirements of most real cases. In this first example, select the list of parameters with the name of the available panel saw.

Under the heading *Material* it is necessary to indicate the name of the material previously stored in the memory. The *New* button allows a new type of material to be stored in the memory - a function that is not necessary for this example since the material has already been created.

Enable the "*Insert all available panels*" function so that all the panel formats previously defined for the current material are transferred from the magazine to the new worklist. Press *OK* to confirm.

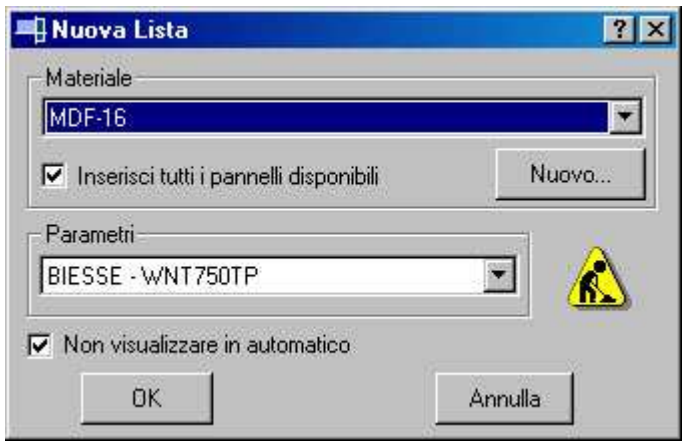


Figure 3.3

At this point a window will open for the definition of the name of the first worklist in the current order. Specify the name, then confirm by pressing *New*. The worklist name may also coincide with the order name: this is usually the case in the creation of orders formed of a single worklist. The name of the order appears in the *File Name* to facilitate data entry.

Once the list name has been entered, the typical layout within which OptiPlanning will be used is displayed. This layout is formed by a main toolbar (the *New* option of this bar has already been used), and a by a second toolbar that is specific to the order. This second toolbar is below the

general one and is used to open all the functions of the current cutting worklist. These functions are as follows:

- *Summary*: a catalogue of the worklists belonging to the order.
- *Parameters*: to view and edit optimisation parameters.
- *Panel Saw*: to view and edit machine parameters.
- *Boards*: to view, insert, and edit the panels to be used.
- *Parts*: to view, insert, and edit the parts to be produced.
- *Solution*: to view the solution obtained after data have been processed.

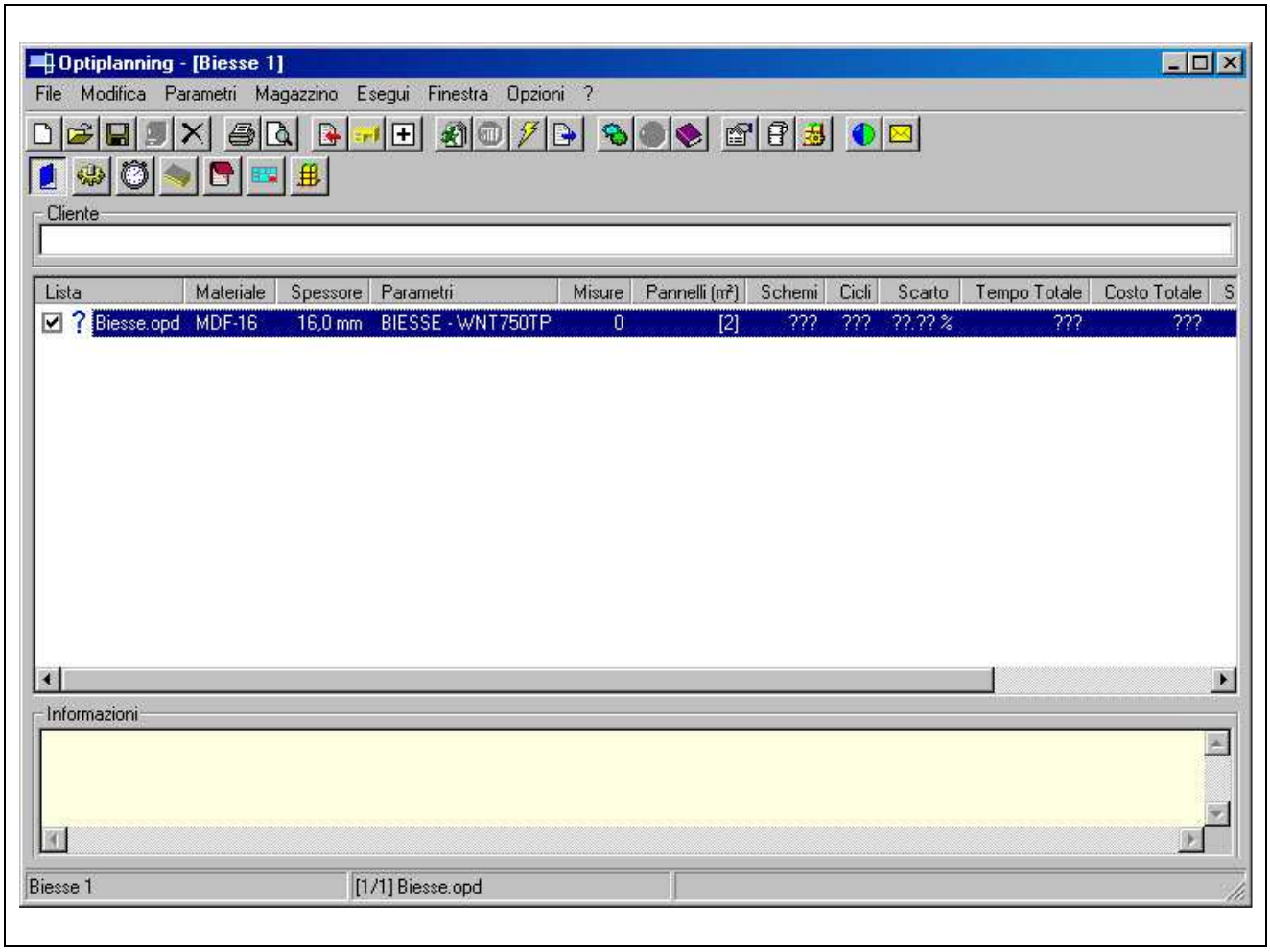


Figure 3.4

In this first example it is possible to see the contents of the *Summary*, which gives the name of the created worklist. The other data are: the optimisation and panel saw parameters (which have been assigned values from the *Default* list), and the panel(s) of material used.

If no measurement appears after you have clicked on *Boards*, this means the current list has had no panels assigned to it (this must not occur if the function *Insert all available panels* has been selected during the creation of the new worklist). In this case, after selecting *Boards* from the specific toolbar, it is necessary to click on the button *Add from Stock*. This opens the panel magazine window, where it is possible to enter new formats using the *Insert / Modify* function, or simply to transfer one or two of the already available formats to the current worklist. To carry out this last operation, choose *Select*, highlight the format(s) to be transferred, and click on the *Add to Current Worklist/Job* button (see Fig.3.5).

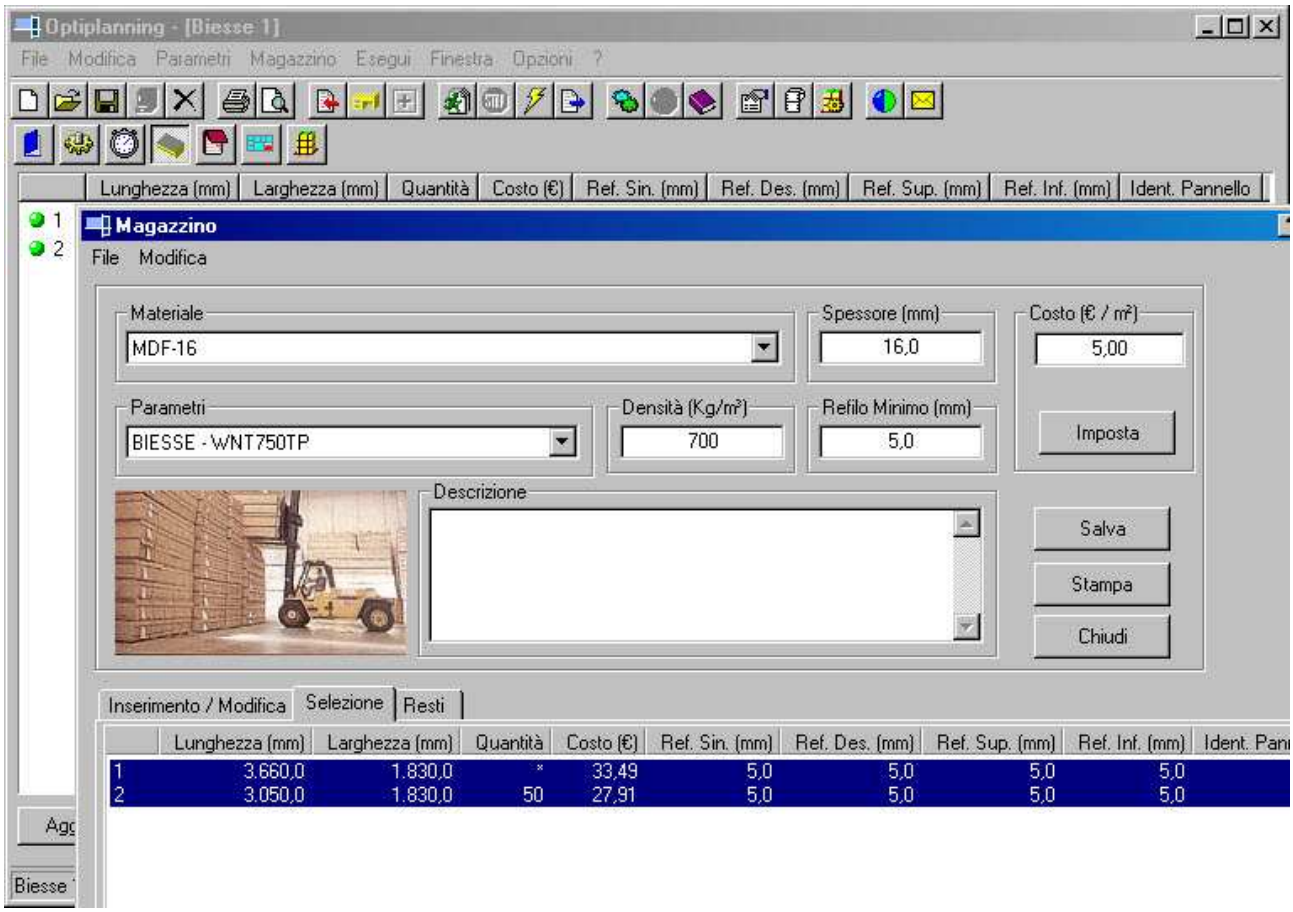


Figure 3.5

As well as *Add from Stock*, the *Boards* window also contains the following buttons:

- *Delete*: used to delete the selected panel(s) from the list (a panel is selected if the row is coloured blue).
- *Unlimited*: used to set the number of available panels to unlimited (in this case too, it is first necessary to select the panel(s)).
- *Balance*: used to balance the number of panels used. This parameter may only be used if the list contains at least two panel measurements. Let's suppose we select the first panel and click on the button. The window shown in Fig.3.6 will open. It is then necessary to select the second panel from the drop-down menu and set *Report* = 2; at this point, the solution obtained will use a quantity of panel number two which is double the quantity of panel number one.

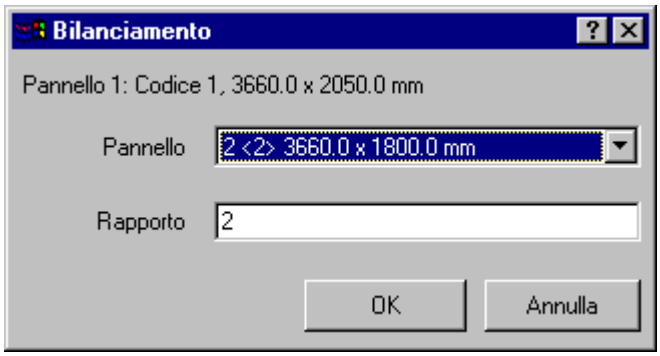


Figure 3.6

- *Value %*: is used to vary the percentage value of the selected panel(s) (see previous section).
- *Add New*: used to add a new panel to the list without accessing the magazine. In this case, a window will open for the entry of the panel data which will not, however, be saved in the panel magazine (see Fig.3.7). The same window can be opened by selecting a panel, right-clicking with the mouse, and selecting *Modify*. In this way it is possible to edit panel data without changing the magazine.

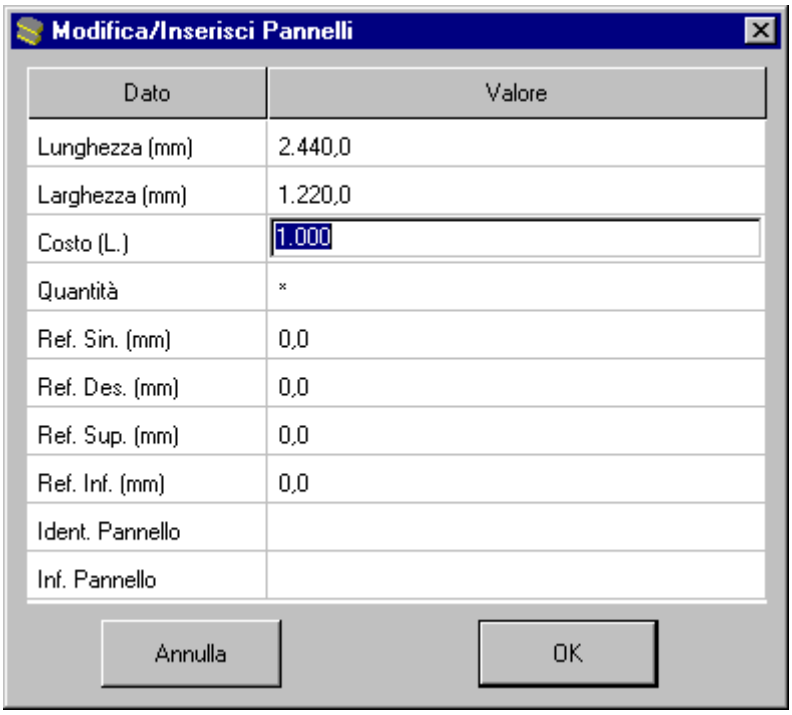


Figure 3.7

Now it is necessary to click on *Parts* to enter the cutting list to be optimised. This will open the *Insert / Modify* window. To enter part data, the same rules apply as for panel data entry.

The minimum data to be entered in this window are as follows:

- *Length*: the length of the part.
- *Width*: the width of the part.
- *Min. Q.*: the minimum number of pieces required (it is sometimes possible to produce more pieces than the minimum required quantity).
- *Grain*: specify *No* if the workpiece can be rotated or *Yes* if it cannot be rotated within the pattern. In the latter case, the workpiece will only be inserted with its length parallel to that of the panel. It is possible to specify grain by keying in *Yes* \ *No* or 1 \ 0.
- *Priority*: set this at a value of 100. A lower value will create a low-priority piece, i.e. a measurement for which no minimum production quantity is required; this piece will be inserted into the patterns in place of an offcut area. The higher the value set in this field, the greater the number of pieces that will be produced.

IMPORTANT: if the measurement unit is metric, all dimensional data must be entered using millimetres, otherwise this data must be entered in inches.

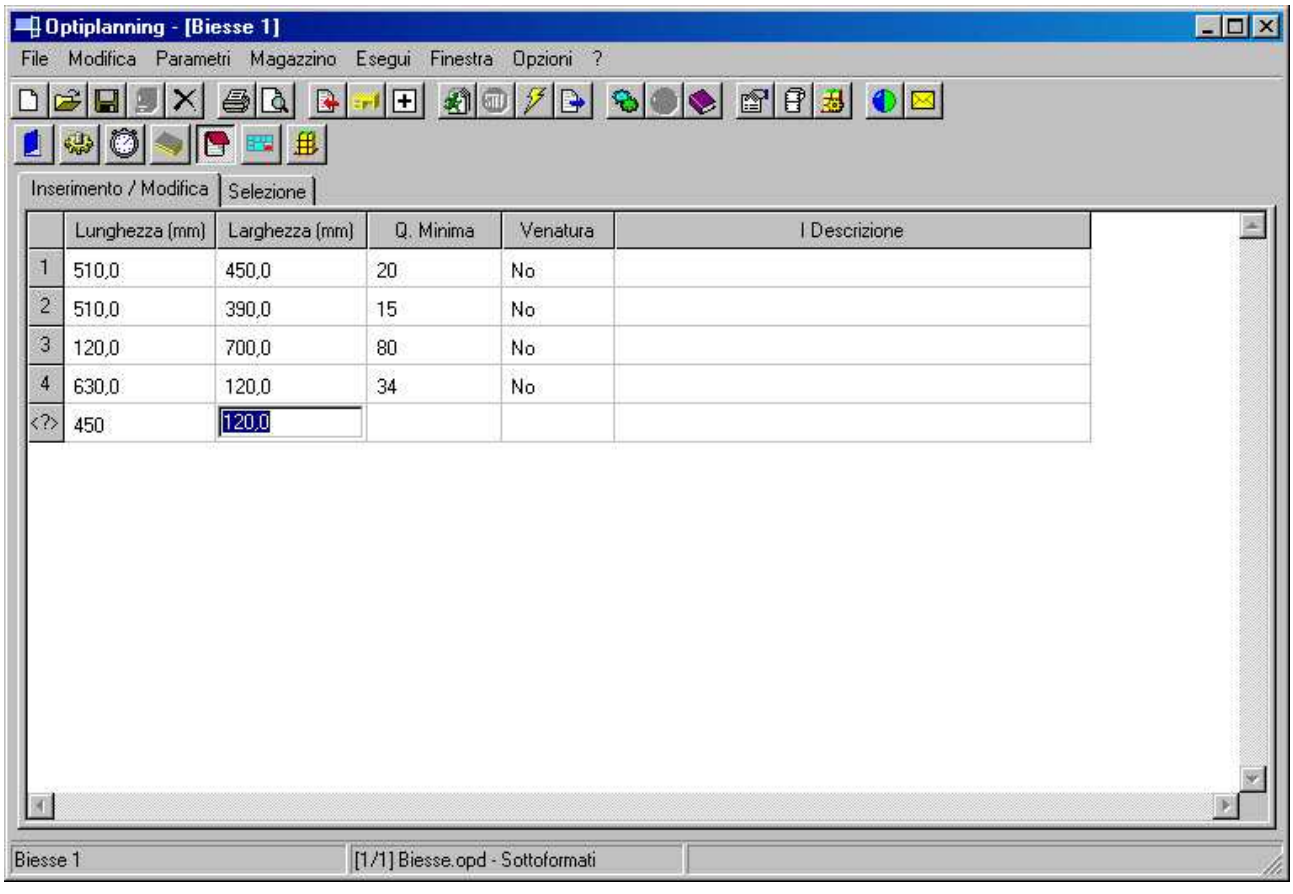


Figure 3.8

In this first example it is sufficient to enter data in the fields mentioned above. To memorise a part and pass on to the next one, press ENTER until the end of the row, or press the plus key (+) on the numerical keyboard. The part is only memorised if the first field contains a progressive number; it is not memorised if it contains "?".

The following is a complete list of all the available part fields.

- *Max. Q.*: the maximum quantity of parts to be produced.
- *Length Increase:* the increase in length of the part. This value, which might also be negative, will be added to the part length to get the cutting size.
- *Width Increase*: the increase in width of the part. This value, which might also be negative, will be added to the part width to get the cutting size.
- *Length tolerance:* the part length tolerance used to combine pieces of similar sizes. This value might also be negative.
- *Width tolerance:* the part width tolerance used to combine pieces of similar sizes. This value might also be negative.

In addition, the following part description fields are also available (these fields may contain supplementary descriptions that do not influence the calculation of the solution):

ExecutionDate, Part Code, Description 1, Description 2, Finish, I Description, II Description, Boring Program, Boring Code, Boring Info., Upper Laminate, Material, Lower Laminate, Edgebanding Code, Edgebanding Info., Upper Edgebanding Type., Upper Edgebanding Material, Upper Edgebanding Colour, Lower Edgebanding Type, Lower Edgebanding Material, Lower Edgebanding Colour, Left Edgebanding Type, Left Edgebanding Material, Left Edgebanding Colour, Right Edgebanding Type, Right Edgebanding Material, Right Edgebanding Colour, Cabinet Code, Cabinet Height, Cabinet Width, Cabinet Length, Cabinet Description, Cabinet Info., Des. 1, Des. 2, Des. 3, Des. 4, Des. 5, Info. 1, Info. 2, Info. 3, Info. 4, Stacking Layout, Stacking Area, Full Description 1.

4. Processing and viewing the results

At this point, all the data necessary for processing the list have been entered. By returning to the *Summary* window and clicking on *Save* (main toolbar), the symbol alongside the name of the list will change from a question mark (which means a list with incomplete data), to a green spot (which means a list complete with all data and ready to be optimised).

To process the list, click on *Optimise / Continue* (main toolbar). While the list is being processed, the word "*Already Running*" will appear next to the name of the current order in the top part of the OptiPlanning window.

As soon as processing has been completed, the first optimised pattern will appear automatically. This is because the program automatically selects the *Solution* function from the order toolbar and, from this function, it then selects the *Patterns* option.

The options given in *Solution* allow an analysis of the results produced for the current optimised list. These options are:

- *Results*
- *Summary*
- *Parts*
- *Boards*
- *Stacks*
- *Cutting Times*
- *Patterns*

For a detailed analysis of the results, refer to the relevant section of this manual. This section is limited to how to view the different patterns.
As already mentioned, once the *Patterns* option has been selected, the first pattern to be created will be displayed. Immediately above the pattern, it is possible to see the number of patterns that form the list.
For example: *Pattern 1/10* indicates that the first of ten patterns is being viewed. The two keys with double arrows (*Page Down* and *Page Up*) can be used to scroll through from one pattern to the next. A further two keys (*First Page* and *Last Page*) can be used to move directly to the first or last pattern.

3.4 EDITING AN OPTIMISED WORKLIST

Once the first solution has been obtained and its results have been analysed, it is possible to make simple and rapid changes to the data and then optimise the list again. Changes made to a list usually concern the optimisation or machine parameters, and are made to check whether or not it is possible to improve the previously obtained results. In any case, it is always possible to edit a list of parts (change data or add or remove a part) or panels.

To edit an optimisation parameter, click on the *Parameters* option on the specific toolbar and select the group of parameters required. For example, to delete the Z-cuts from patterns with an initial long cut, select the group of *Optimiser* parameters and disable the *Z-cuts* option below the *Long Cut (LC)* option.
At this point, it is possible to reprocess the list simply by clicking on *Optimise / Continue* (main toolbar). Before processing, the program will display a message to remind users that the operation in progress will delete the previously obtained solution in order to calculate a new one. To confirm that this operation is to be continued, press *Yes.* Processing will then begin.

3.5 PARAMETER STRUCTURE

As already mentioned, the OptiPlanning parameters that can be selected by clicking on the specific toolbar are divided into two sections:

- *Parameters*: to view and edit optimisation parameters. These parameters are used to define the processing algorithm to be used, to set the maximum complexity level for the patterns, and to define other important parameters for the best possible management of the panel saw area.
- *Panel Saw*: to view and edit machine parameters. These parameters are used to define the exact type of panel saw used, in order to make accurate machining time calculations. It is also possible to specify the percentage importance of processing times in the calculation of solutions.

The optimisation parameters are in turn divided into groups as follows:

- *Optimiser*: to select the type of algorithm and other fundamental options.
- *General*: to view and edit the general optimisation parameters.
- *Long Cut (LC)*: to view and edit the specific parameters of patterns with a first long cut.
- *Short Cut (SC)*: to view and edit the specific parameters of patterns with a first short cut.
- *Head cut (TP)*: to view and edit the specific parameters of the pre-cut part of patterns with a short head cut.
- *TP main part*: to view and edit the specific parameters of the main part of patterns with a short head cut.
- *Long head cut (TPL)*: to view and edit the specific parameters of the pre-cut part of patterns with a long head cut.
- *TPL main part*: to view and edit the specific parameters of the main part of patterns with a long head cut.
- *Z-cut*: to view and edit the specific parameters of Z-cuts.

- *Unstrain management*: to view and edit the parameters relating to the unstrain option for the cutting patterns.
- *Grouping management*: to view and edit the parameters relating to the piece grouping option.
- *Overproduction*: to viewing and edit the parameters that define the number of additional pieces to be produced with respect to the quantity required.
- *Board Stacks*: to manage the panel stacks that are to be sized at the same time in a single machine cycle.
- *Stacking Pile Management*: to manage the stacking stations for the processed workpieces.
- *Drops*: to manage the reusable remainders produced.
- *Pattern Penalty*: to define which patterns to prefer or penalise.
- *Inner Parameters*: to view and edit the optimum algorithm configuration.

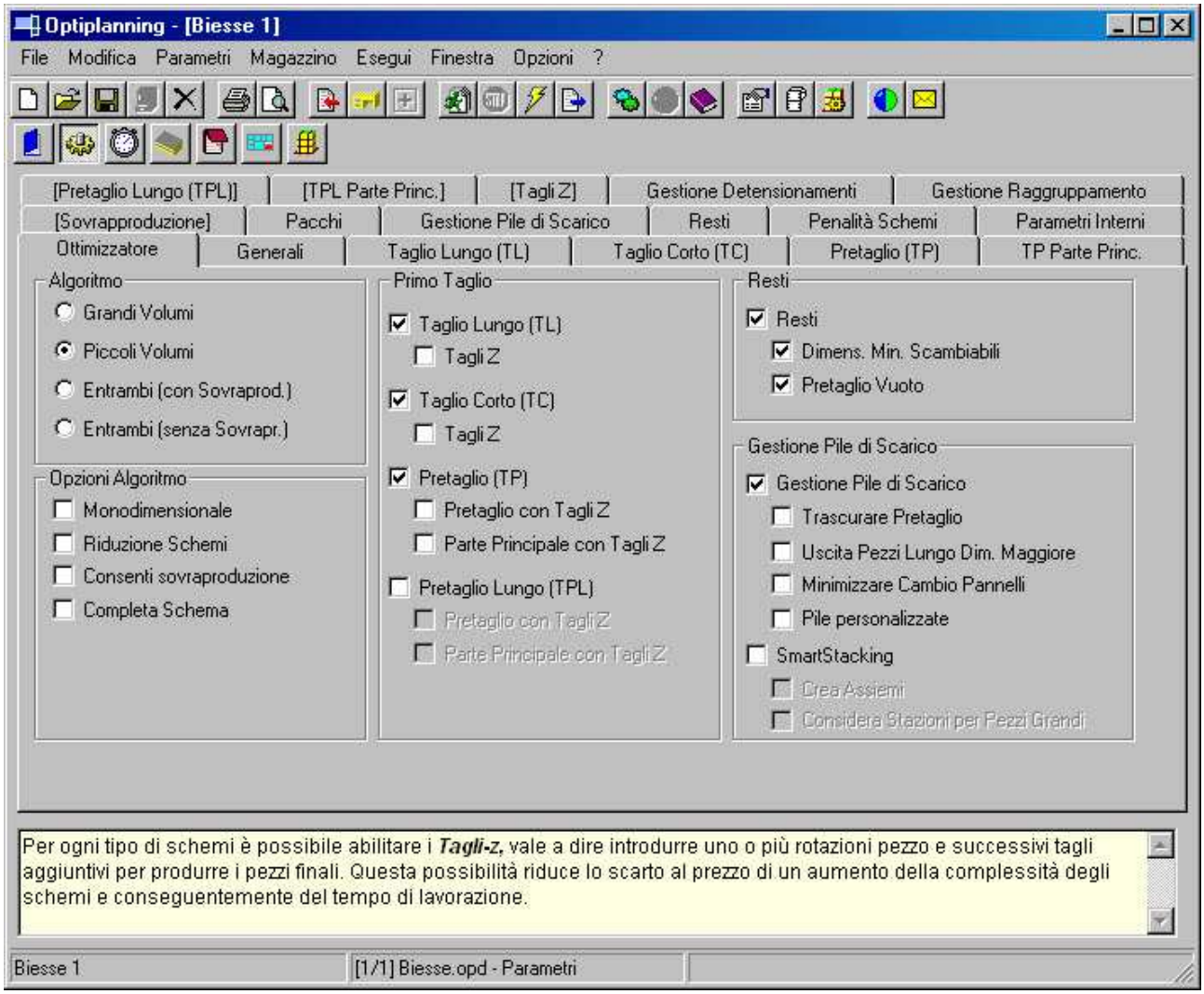


Figure 3.9

The panel saw parameters have been divided into the following groups:

- *Time Simulator*: to select the type of panel saw and the basic settings for the time simulator.
- *General Parameters*: to view and edit the general parameters that define the panel saw.
- *Blades and Trim Cuts*: to view and edit the saw blade thickness and the trim cuts chart.
- *Grippers*: to view and edit the position of the grippers.
- *Manual Times*: to view and edit the manual times of the machine operator.

- *First Axis*: to view and edit all specific parameters of the first cutting axis.
- *Second Axis*: to view and edit all specific parameters of the second cutting axis (angular systems only).
- *Shuttle*: to view and edit all specific parameters of the shuttle (angular systems only).
- *Lift Table*: to view and edit all specific parameters of the lifting table that contains the boards for sizing.
- *Vacuum*: to view and edit all specific parameters of a vacuum panel feeder.
- *Turning Table*: to view and edit all specific parameters of the turning station for the automatic rotation of panel stacks.

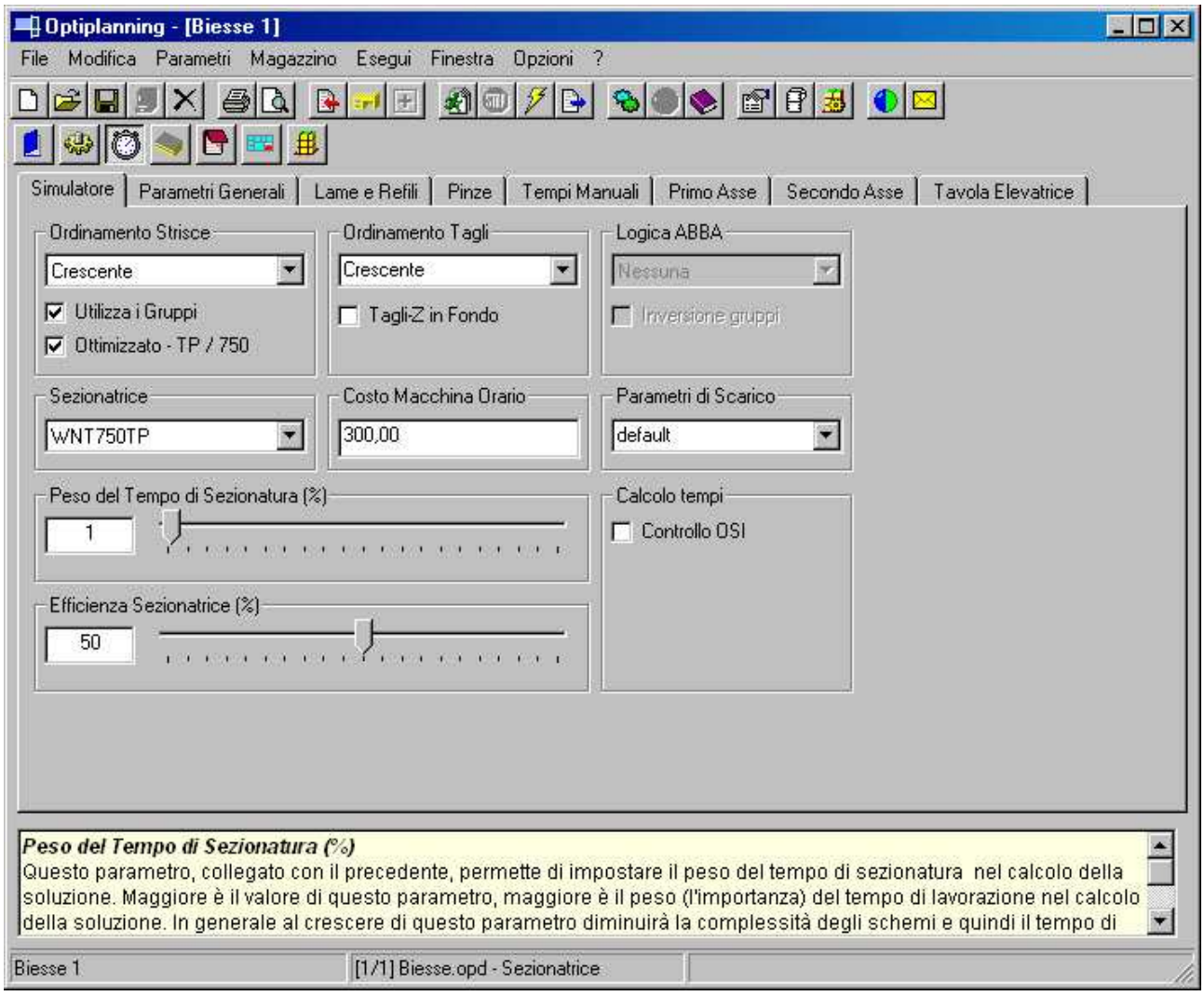


Figure 3.10

3.6 BASIC OPTIMISATION PARAMETERS

This section illustrates the basic optimisation and machine parameters required to enable the user, in the first trial example, to correctly set all data and to arrive at an acceptable solution. Technical terms will be used here to define a type or part of a cutting pattern; for further explanations of these terms, please return to the section concerning cutting pattern nomenclature.

1. Algorithms

The algorithm is the “motor”, which, using internal mathematical rules, creates the cutting patterns required starting with the available data (parts, panels and parameters). OptiPlanning has 5 different types of these motors. The choice of the correct algorithm is a fundamental operation if the desired result is to be achieved. It must be chosen according to the type of list to be optimised, and to the specifications that the result must satisfy. If an incorrect choice is made, the end results may not be up to standard or there may sometimes be no result at all.

The 5 algorithms are as follows:
- *High Volumes*
- *Low Volumes*
- *Both (with Overproduction)*
- *Both (without Overproduction)*
- *Mono-dimensional*

To access the algorithm selection function, click on *Parameters* and select *Optimiser.*

High Volumes must be selected to optimise a list where the required quantity exceeds 20 units for every part. The principal aim for lists containing high volumes is usually large-scale panel saw productivity and, as a result, patterns should be relatively simple. To achieve this aim, overproduction must be allowed; that is, it must be possible to produce more parts than required. This algorithm is not able to create results where the quantity of parts produced is equal to the quantity of parts required for all pieces in the list. This characteristic allows the algorithm to simplify patterns and reduce the number of different patterns - and therefore machine cycles - necessary for machining the optimised list.

Low Volumes must be selected to optimise a list where the required quantity is less than 20 units for every part. The principal aim for lists containing low volumes is that of reducing waste, and they never result in overproduction.

If the cutting list to be optimised is "mixed", i.e. it contains some parts with a required quantity in excess of 20 and others with a required quantity of less than 20, we recommend the use of both algorithms. This function mode can be used if the option *Both (with Overproduction)* or *Both (without Overproduction)* is chosen. As can be deduced from the names of these two algorithms, one produces parts in greater quantities than requested while the other does not.

The *Mono-dimensional* algorithm is used together with one of the other four algorithms described above. This new setting allows the creation of cutting patterns in a single dimension (either just cuts that are parallel to the length of the panel, or just cuts that are parallel to the width of the panel). This algorithm is used when it is necessary to cut strips (bands) from a panel, or if it is necessary to make cross cuts of strips.

2. Pattern geometry

In the *Optimiser* section of the *Parameters* menu, it is possible not only to choose the type of algorithm but also specify the geometry of the cutting patterns that may be produced. These functions, grouped together in “*First Cut*”, are as follows:

- *Long Cut (LC)*: to execute patterns with a first rip cut along the largest side of the panel (usually the length).
- *Short Cut (SC)*: to execute patterns with a first rip cut along the shortest side of the panel (usually the width).

- *Head cut (TP or TPL)*: to execute patterns with a head cut. Enabling patterns with head cuts means enabling more complex patterns than the first two; this may reduce waste, but it will increase cutting and list processing times.
- *Z-cut*: it is possible to enable Z-cuts for each of the three types of pattern listed. In particular, in patterns with head cuts it is possible to specify if Z-cuts are enabled on the head cut part (only if Z-cuts are also enabled in patterns with short cuts), in the main part (only if Z-cuts are also enabled in patterns with long cuts), or in both portions (only if Z-cuts are enabled in patterns with long cuts and in patterns with short cuts). Enabling patterns with Z-cuts means enabling more complex patterns than those without Z-cuts. This may reduce waste, but it will increase cutting and list processing times. In particular, the list processing time may increase significantly if Z-cuts are enabled in patterns with head cuts.

For further explanations of these terms, refer to the section concerning cutting pattern nomenclature.

3. Drops

A drop, or remainder, is an offcut of significant dimensions that can be used in subsequent optimisation operations or, in general, in subsequent machining operations. This piece is therefore not discarded but stored. To manage remainders, just enable this function in the *Optimiser* section of the *Parameters* menu. Once enabled, it is possible to define the minimum dimensions of an offcut that can be reused (remainder). This setting is defined in the *Drops* section of the *Parameters* menu, by varying the following parameters:

- *Min. Drop Length (mm)*
- *Min. Drop Width (mm)*
- *Min. Drop Area (m^2)*

Please note that the most stringent condition between the dimensions and the minimum area will be taken into consideration. If it is possible to invert the length and width, it is necessary to enable *Min. Exchangeable Sizes* in the *Optimiser* section of the *Parameters* menu. The *Head Cut w/o Parts* parameter allows the creation of a remainder on the head cut part of a pattern that includes a head cut.

4. Stacking management

OptiPlanning also allows the management of the stacking area for the parts selected. At times, different parts are piled up at the stacking stations (pallets): in particular, parts of different dimensions end up on different pallets. The number of stacking stations is usually limited, so to avoid not knowing where to deposit "new" workpieces during the execution of a list, it is advisable not to begin processing more types of part than there are pallets available. This important function can be enabled using the *Stacking Management* option, found in the *Optimiser* section of the *Parameters* menu.

Once *Stacking Management* has been enabled, the parameter *Maximum Number of Stacks* (in the *Stacking Management* section of the *Parameters* menu) can be used to specify the number of pallets available. A further two parameters are used in order to avoid having to count "small" parts, of an area less than that specified in the *Minimum Part Area (m^2)*, or parts produced in limited quantities (less than the value of the *Minimum Part Quantity* parameter).

It is also possible to exclude from the count all those parts produced on the head cut part of patterns with head cuts, by enabling *Avoid Head Cut* in the *Optimiser* section of the *Parameters* menu.

5. Time Simulator parameters

Before illustrating the fundamental parameters of the time simulator, it is necessary to explain their basic functions. OptiPlanning uses the simulator to determine machining times for each optimised list. These times, as well as providing useful indications regarding panel saw productivity and management of the entire panel sizing area, can be used to process optimum required solutions. The chosen algorithm can, in fact, process a solution and try to reduce both the costs of the material used (reducing the number of panels used and waste produced), and the machine costs. The machine costs are given by the product of the hourly cost of machining times and the number of machining hours necessary. The machine cost amount depends upon the value of the two parameters *Machine Cost per Hour* and *Percentage of Panel Saw Time (%)*, which will be illustrated below, together with all of the basic parameters of the *Panel Saw* menu. Many of these parameters must have the same values as those of similar parameters present in the panel saw NC.

Simulator section:
- *Panel Saw*: set the panel saw model that will be used for machining.
- *Machine Cost per Hour*: set the hourly cost of panel sizing operations. This is the hourly cost of machining, and takes into account the cost of the panel saw, operators, and machine running and maintenance costs (use the same unit of measure as used for the panel magazine when setting the material costs).
- *Percentage of Panel Saw Time (%)*: this parameter, which is linked to the previous one, is used to set the percentage importance of panel saw time in the calculation of solutions. The higher the value of this parameter, the higher the importance of machining times will be in the calculation of solutions. Generally speaking, as this parameter increases, the complexity of patterns decreases, leading to a reduction in machining times and an increase in the material used. Set this parameter to zero if, when processing the solution, only the cost of the material is to be taken into account. The typical values to be used are zero and one.
- *Panel Saw Efficiency (%)*: the calculation of machining times is displayed using two values: a time obtained by totalling operator mechanical and manual handling (time with 100% efficiency), and a second and longer time. This increased time takes into account the periods in which the panel saw is kept idle by the operator during a job. Reasons for these downtimes are varied and unpredictable, and they can be considered as a percentage of the first time described. The percentage of this time increase is specified in this parameter.

General Parameters section:
- *Maximum Thickness*: the maximum height of the stack of panels that can be simultaneously cut in a single machine cycle (see the panel saw NC parameters).

Blades and Trim Cuts section:
- *Blade thickness for sectioning (mm):* the thickness of the blade that will be used to section the panel.
- *Blade thickness for grooves (mm):* the thickness of the blade that will be used to create the grooves.

First Axis section: (see the panel saw NC parameters):
- *Blade Carriage Cutting Speed (m/s)*

Chapter 4

VIEWING AND PRINTING RESULTS

4.1 INTRODUCTION

OptiPlanning has various possibilities for viewing and printing the optimised lists. Many of the displayed reports can be printed with the same structure as the one displayed and, for this reason, this chapter will describe both functions.

4.2 VIEWING WORKLIST SUMMARIES

If a job containing one or more stored lists is opened, OptiPlanning will automatically display the *Summary* window (first button on the secondary toolbar). As well as the worklists catalogue, this window also contains the fundamental data describing the status and characteristics of the lists. In particular, starting from the left, it is possible to note (see Fig.4.1):

a) The box for enabling a list. This is used for optimisation operations, printouts or multiple data downloads, in order to identify the worklists to be processed (for more information, refer to the sections that describe printouts and data downloads).
b) The symbol identifying the worklist status. Possible symbols are as follows:
   - a blue diamond indicates an optimised worklist
   - a double yellow rule indicates an optimised, manually edited worklist
   - a sheet of paper indicates an optimised list with a completed panel magazine update
   - a question mark indicates an incomplete worklist
   - a white cross against a red background indicates an optimisation error or interruption
   - a green circle indicates that the worklist has been saved and is ready to be optimised
   - a blue circle indicates that optimisation is in progress.
c) The worklist name. Left-clicking the mouse on the name allows it to be modified.
d) The material code of the worklist.
e) The thickness of the material.
f) The name of the set of parameters used.
g) The number of pieces with different measurements that are on the worklist.
h) The number of panels used. If the worklist has not been optimised, the number of panels with different measurements contained in the worklist will appear inside square brackets.
i) The number of patterns produced.
j) The percentage of total waste.
k) The machining time with machine efficiency at 100%.
l) The total cost of the job (material cost plus machining cost).
m) The panel saw model used.
n) The number of the machine to which data should be downloaded.
o) The data download date.

Furthermore, job descriptions can be entered in the *Customer* and *Information* fields.

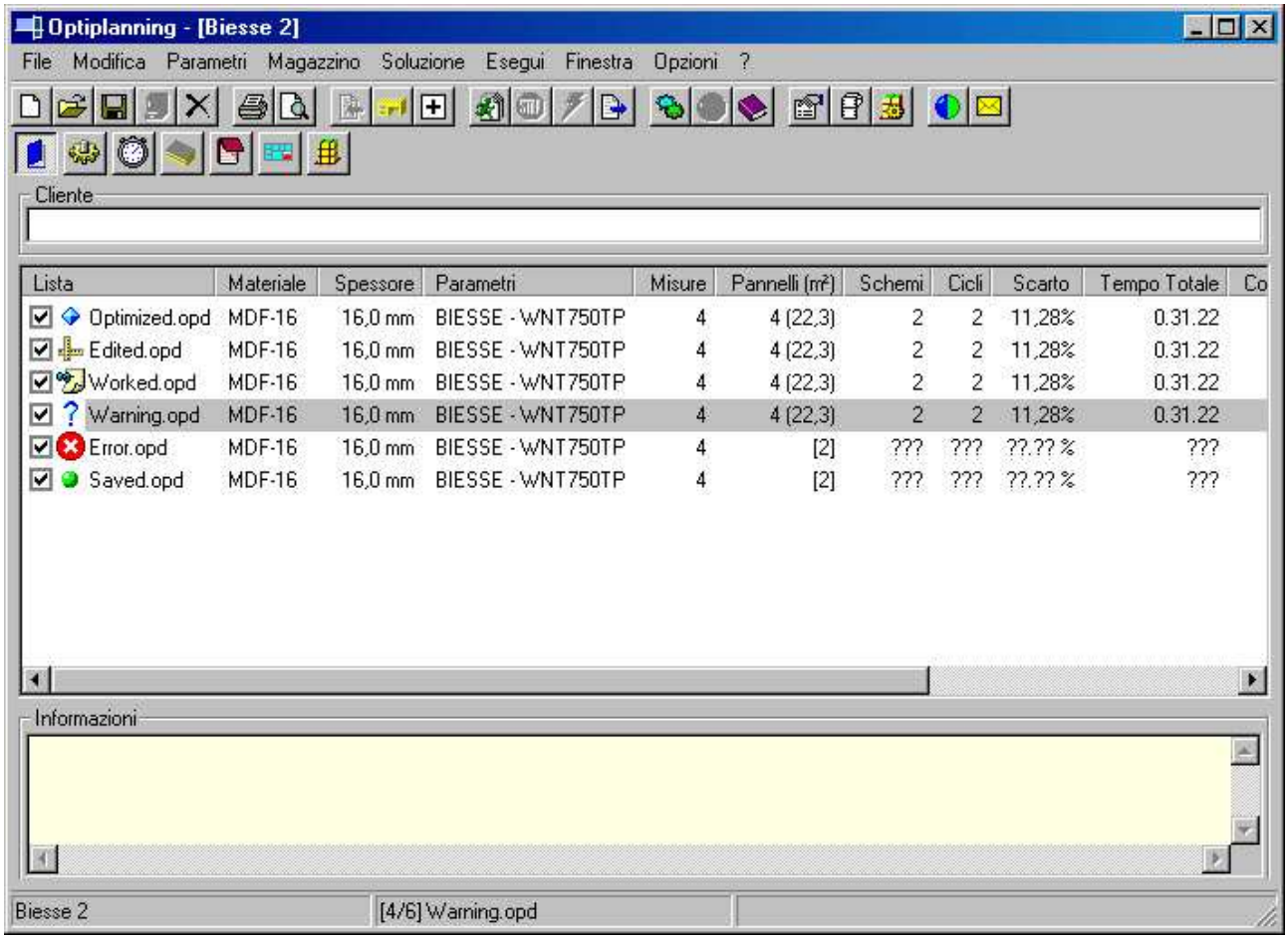


Figure 4.1

4.3 VIEWING THE SOLUTION

Once worklist optimisation has been completed, OptiPlanning will automatically display the *Solution* window (sixth button on the secondary toolbar). This section contains a series of items used for viewing the different reports and optimisation results. These reports can be printed exactly as viewed. In particular, this section contains the following items (see Fig.4.2):

- *Results*: to view a general summary of the worklist. This summary includes data concerning the material used, parts, remainders and waste produced, panel saw productivity (including machining times) and production statistics.
- *Summary*: to view a more detailed summary of the list in terms of the material required and produced.
- *Parts*: this function can be used to view two lists. The first contains the pieces produced and the second contains the parts produced (remember that the pieces list, unlike the parts list, does not include several items with the same measurements; two or more parts with the same measurements form a single piece). The piece list includes data concerning the cost of material and machining. In the parts list it is possible to view the data about any overproduction and two descriptions (*I Description* and *II Description*), together with the list of patterns that contain them. These lists are ordered according to the dimensions of the pieces/parts.

- *Boards*: to view the list of panels used.
- *Stacks*: to view the piece stacking stations (see following sections).
- *Cutting Time*: to view machining times. This report displays the following times: cycle with pattern at running speed, pattern start and end times, partial rip cut times, partial cross cut times and partial head cut times.
- *Patterns*: for the graphic display of the cutting patterns produced (see following sections).

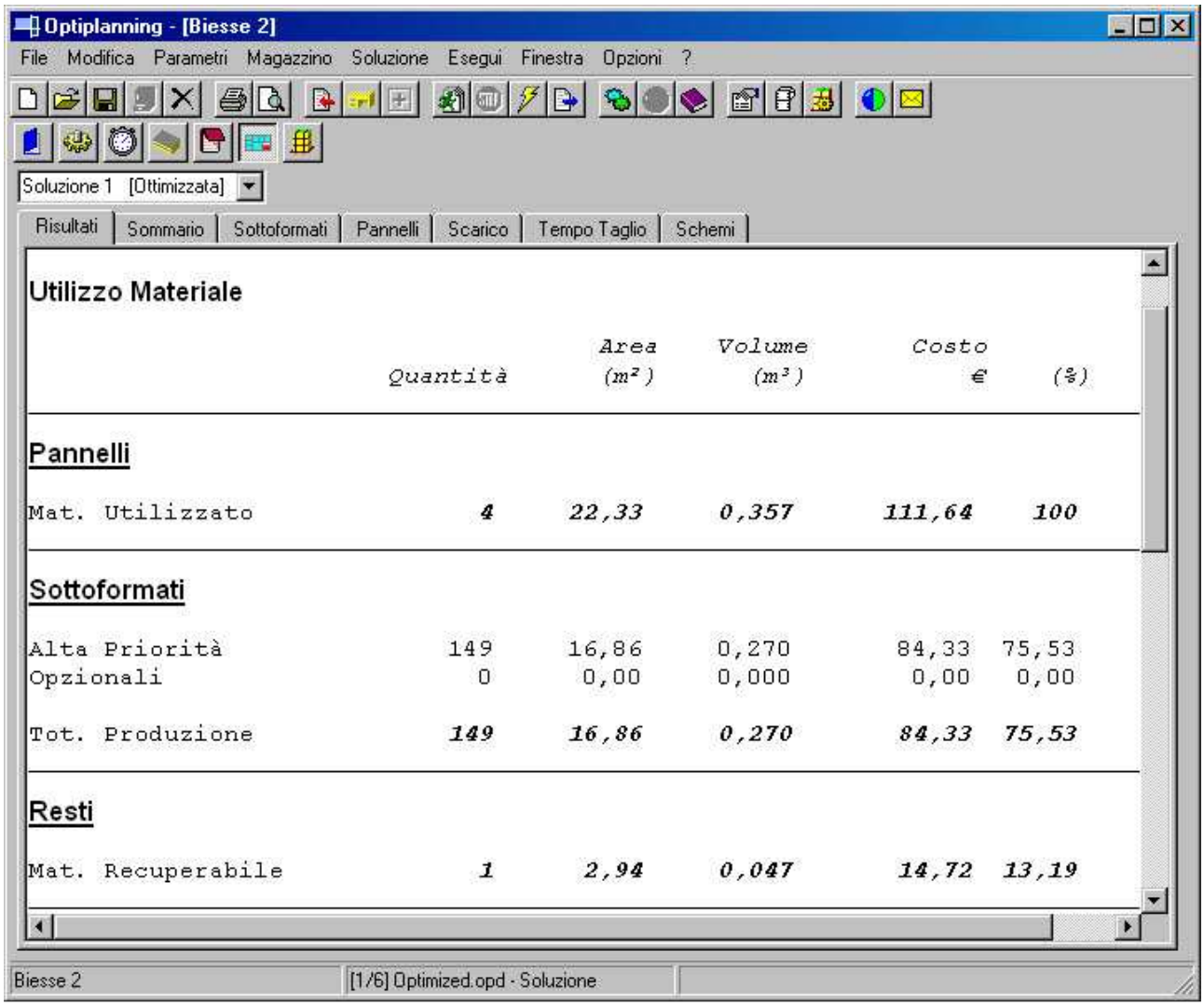


Figure 4.2

4.4 VIEWING/PRINTING THE STACKING STATIONS

If the *Stacks* item is selected from the *Solution* section (or the stacking piles are printed), it is possible to view three reports for the management of the stacking stations for the cut pieces.

The first report is that shown in Fig.4.3, in which the number of rows is equal to the number of different pieces, and the number of columns is equal to the number of patterns produced. To see when piece production started or ended, just read what is written in the corresponding row. In particular, the "+" symbol indicates the start of the piece in the current pattern, "*" indicates the end of the piece in the current pattern, and "-" indicates that the piece is not produced in the current pattern but in a previous or following one (thus, with the current pattern enabled, a stacking station is engaged by the piece concerned).

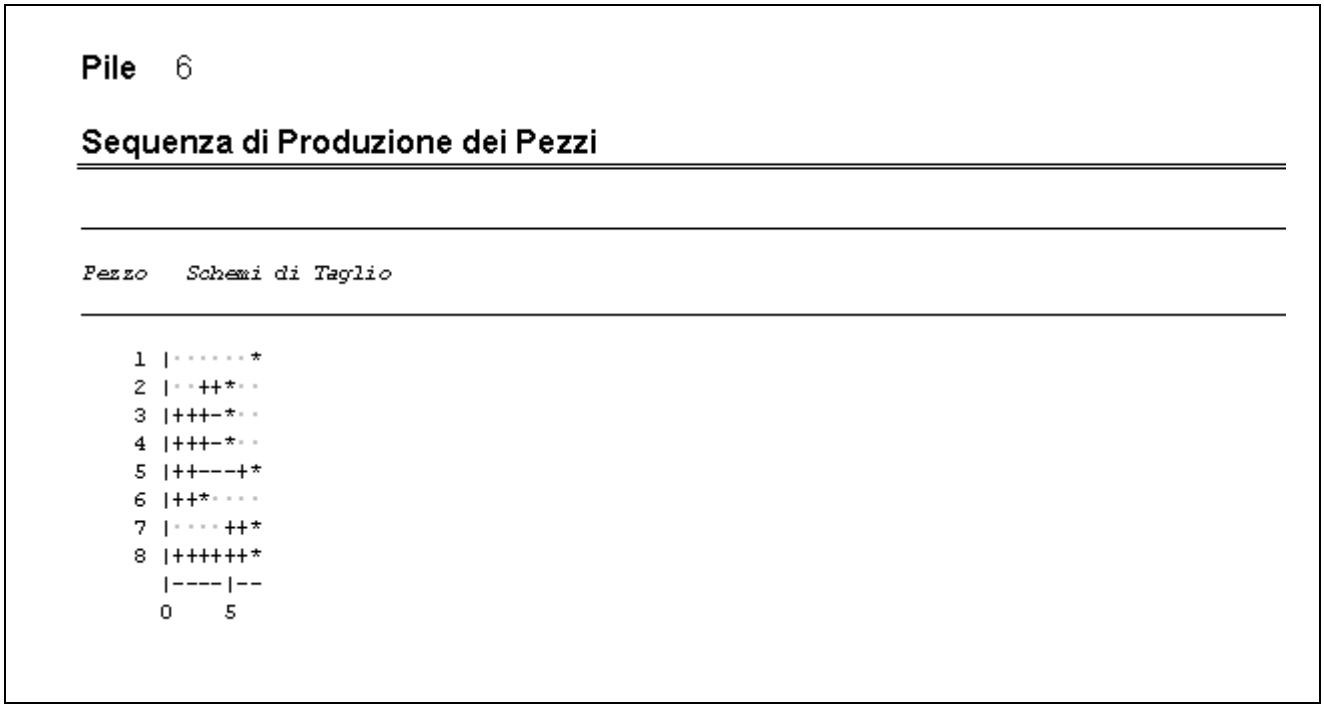


Figure 4.3

The second report is that shown in Fig.4.4, and it includes a number of rows equal to the number of patterns produced. The patterns are then shown in succession (organised into rows): the order number of the panel used, the number of stacks opened as far as the current pattern, the order number of the pieces that will engage a pile up to the current pattern (the pieces produced in the current pattern appear in bold type).

The third report shows, for each stacking station, which pieces will be deposited and the amount of time they will occupy the relevant station.

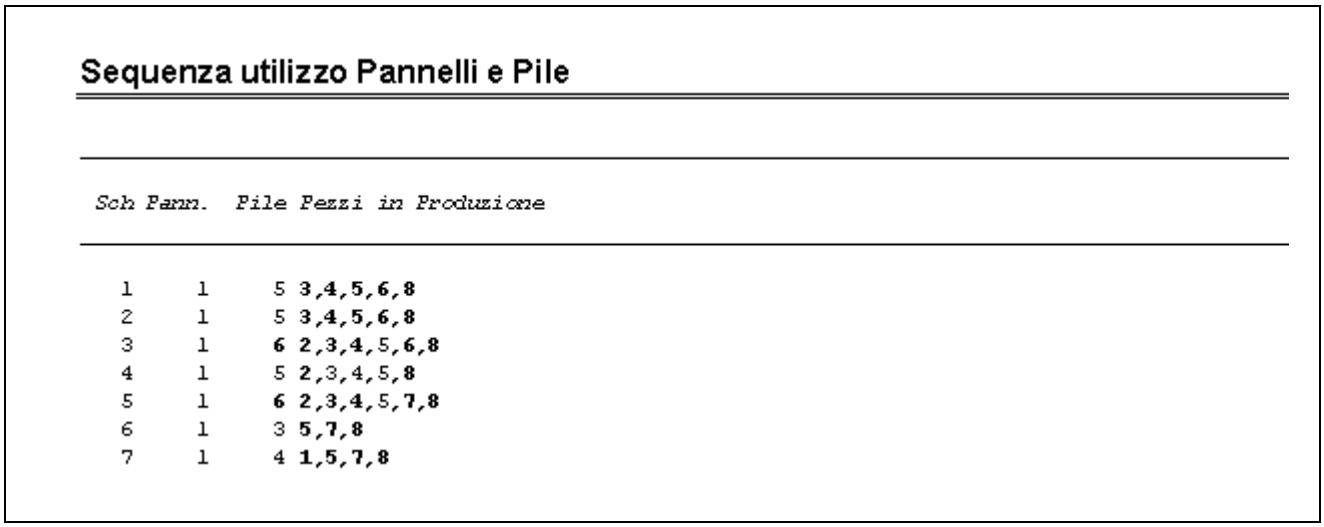


Figure 4.4

4.5 VIEWING CUTTING PATTERNS

If the *Patterns* item is selected in the *Solution* section, it is possible to view the cutting patterns produced.

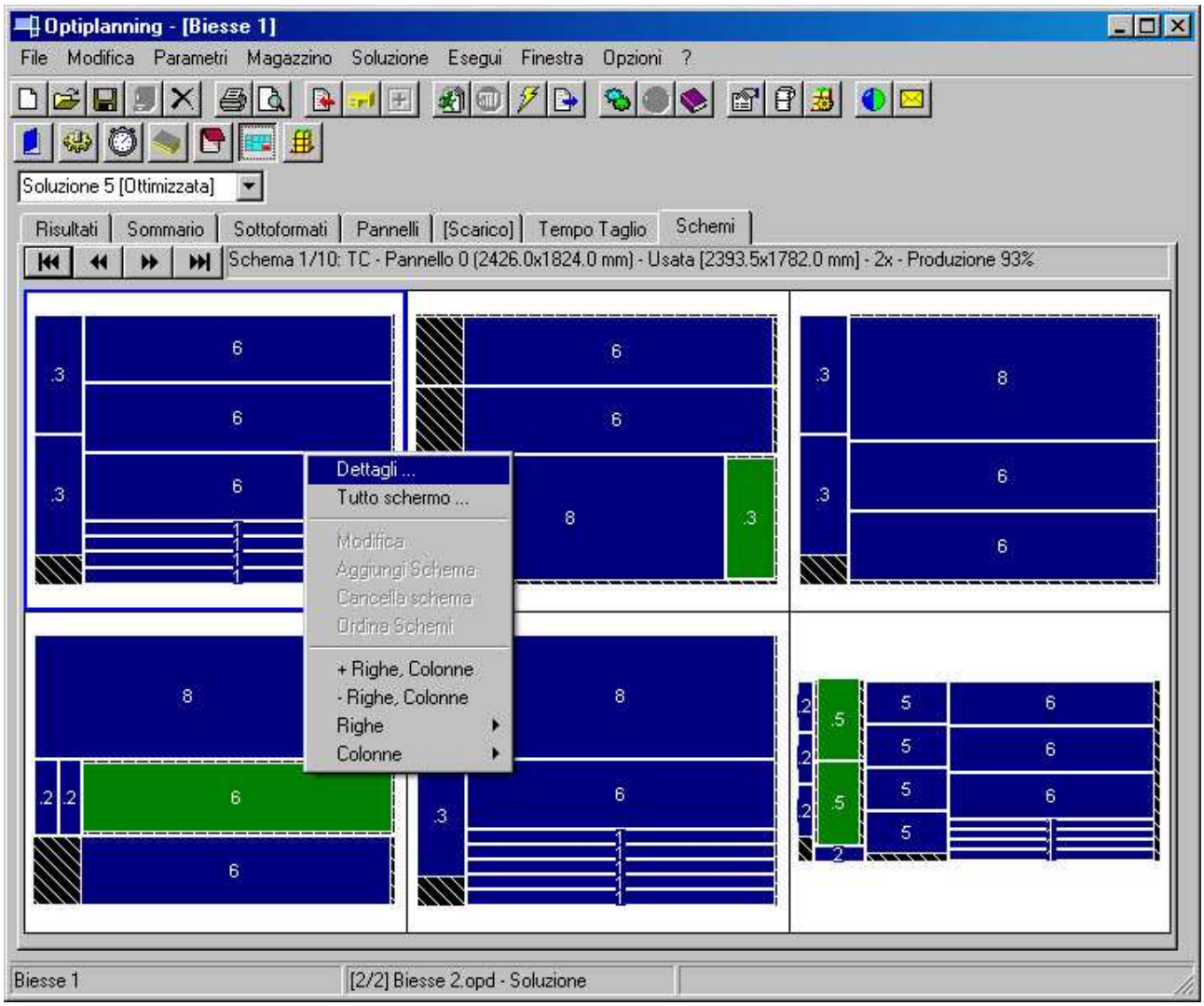


Figure 4.5

In the top part of this window it is possible to scroll through any pattern viewing pages, and note the salient data for the selected pattern (to select a pattern, click on the pattern itself). That is:

- the number of the selected pattern and the total number of patterns
- the pattern type
- the dimensions and area of the panel used
- the number of panels used
- the percentage area used to produce the required pieces

As can be seen in Fig.4.5, the window displays several patterns at the same time. To modify the number of patterns displayed, right-click with the mouse and select "*+ Rows, Columns*" to increase and "*- Rows, Columns*" to decrease. The last two items can be used to define exactly the number of rows or columns to view in the window.

A double left click on a pattern, or the selection of the *Full Screen* option after right clicking, makes it possible to have a full-screen display of a pattern. In this new window it is possible to view

the dimensions of a piece or remainder by moving the mouse onto the required object. At this point, the measurements will be viewed in the bottom left-hand part of the window.

4.6 INITIAL PRINT SETTINGS

This section explains how to make the initial settings necessary for printing out results. These settings are to be made after installing the program, or immediately after creating and processing the first example.

Select the *Options* menu, followed by *Reports*. At this point the "*Reports to Print*" window will open. The first part, which is known as the *Print Set-up,* foresees a choice between the following:

a) Use Word Viewer
b) Use licensed program

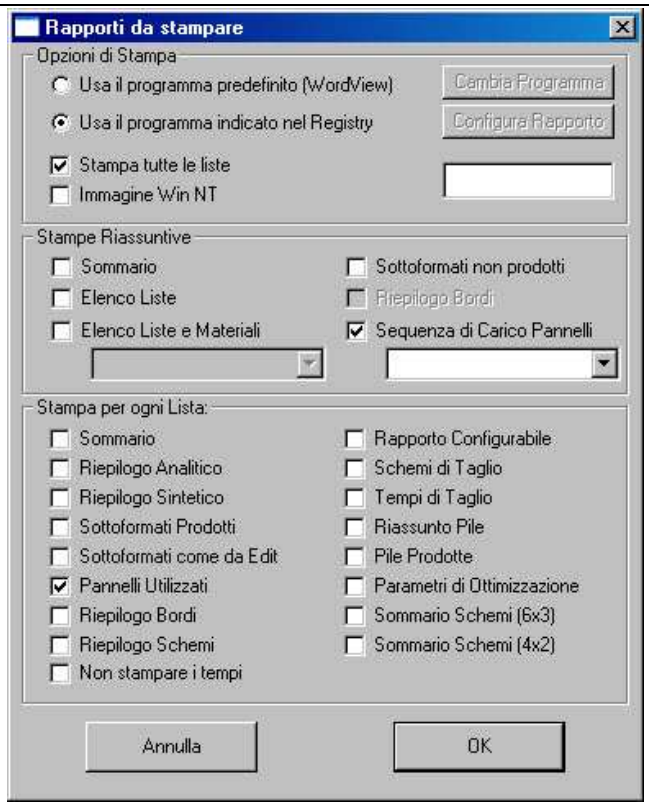


Figure 4.6

By specifying the program name and path, option *a)* allows the definition of the program to use when printing out results.

In particular, you can choose to use Word Viewer if this program was previously installed (see Chapter 2). In this case, it is necessary to click on *Change Program*. A window containing two rows - *Print Preview* and *Print* - will open. For both of these options it is necessary to double click below *Program*; the new window that opens will allow the specification of the file name and path to be used for print previews and printouts of results.

If Word Viewer is going to be used, pass on to the folder containing the file WordView.exe and select it (this file is usually found in *C:\Programs\WordView*). Use the folder with ".." to go down a

level in the directory selection. Once the program has been selected, confirm this by clicking on *Open*, then *OK*.

Microsoft ® Word can be selected in the same way.

Option *b)* allows the program predefined in the settings registry of Windows to be used to print out results. This pre-definition occurs automatically when the more common word processing software is installed. In particular, if Microsoft ® Word has been installed, the choice of this option allows the program to be used automatically without having to specify any file name or path.

Sometimes, when selecting the *Use Licensed Program* option, the printout or print preview is not run. This occurs if the word processing software intended for use has not been properly installed. In this case, use option a*)* and select the program manually.

At this point, to make a printout or to run a print preview of one or more optimised worklists, just click on *Print* or *Print Preview* (toolbar) to run the word processing program previously selected and open the file containing the data to be printed.

4.7 PRINT OPTIONS

What follows is a detailed explanation of all of the options available to suitably customise the result printouts. In general, the majority of printable data is that which can be viewed using the *Solution* function of the order toolbar.

To define what is to be printed, select the *Options* menu followed by *Reports*. At this point the "*Reports to Print*" window will open (see Fig.4.6). The previous section explained, for the *Print options*, the functions *Use Default Program (WordView)* and *Use the Program indicated in the Registry*. This section also includes:

- *Print any Worklists/Jobs*: allowing the automatic sequence printout of the results of one or more worklists belonging to the current order. In particular, the data of all enabled and optimised worklists (i.e. enabled in the box located before the worklist names in the *Summary* section) will be printed (see Fig.4.1).
- *Win NT Images*: allowing the use of an advanced code to print out patterns. This option produces a better printing quality on PCs with Windows NT or 2000 operating systems.

4.8 PRINT SUMMARY

If the function *Print all Worklists/Job* is enabled, the following options to print a series of summary reports will become available. These data concern the whole group of worklists that have been optimised and enabled, and which belong to the current job.

- *Summary*: to print a summary of the total of all enabled and optimised worklists for the current job.
- *Worklists/Job Catalogue*: to print a chart containing a catalogue of all of the enabled and optimised worklists of the current job. This chart includes a series of fundamental data that sum up the general characteristics of the worklists.
- *Worklists and materials*: to print a table with all the enabled and optimised worklists for the current job, also showing the name of the material selected for the list.
- *Parts not produced*: to print information about the parts not produced.
- *Edges Report*: to print data concerning the banding material used in the enabled and optimised worklists of the current job. This option can be selected only if *Edges Management* has been enabled (see the relevant chapter for more details).
- *Board Loading Sequence*: to print a list of the stack of panels to be loaded onto the panel saw for all of the enabled and optimised lists of the current job. This report is normally used to

obtain information concerning the different stacks to be loaded onto the panel saw lifting table. The list of stacks is divided according to the maximum stack height, the type of material and the worklist to be executed (see the description of the *Panel Saw – Lifting Table – Maximum Stack Height* parameter).

4.9 PRINTOUTS FOR EVERY WORKLIST

In this section of *Print Options*, the data to be printed for a single worklist are enabled. As already mentioned, most of these data can be viewed by using the *Solution* function on the job toolbar, and they are also immediately interpreted. These functions are as follows:

- *Summary*: for printouts of general worklist summaries. This summary includes data concerning the material used, parts, remainders and waste produced, panel saw productivity (including machining times) and production statistics.
- *Analytical Summary / Brief Summary*: to print a more detailed summary of the worklist regarding the material requested and produced.
- *Parts Produced*: this function prints two lists. The first contains the pieces produced and the second contains the parts produced (remember that the pieces list, unlike the parts list, does not include several items with the same measurements; two or more parts with the same measurements form a single piece). The piece list includes data concerning the cost of material and machining. In the parts list it is possible to view the data about any overproduction and two descriptions (*I Description* and *II Description*), together with the list of patterns that contain them. These lists are ordered according to the dimensions of the pieces/parts.
- *Edit Parts List*: for printouts of lists of parts in the same sequence as the data input (without any order).
- *Boards Used*: for printouts of the lists of panels used.
- *Banding material Summary*: to print a summary of the banding materials used in the cutting list.
- *Pattern Summary*: this prints a brief summary of the cutting patterns, without viewing them. This summary contains the data for the panels used and the parts produced in the different patterns.
- *Do not print the times*: if enabled, this function allows you to print the various reports selected without indicating the machining times and the consequential data.
- *Customisable Report:* for printouts of customised reports of the parts produced (see following sections).
- *Patterns*: for graphic printouts of the cutting patterns produced. This report prints one pattern per page (see following sections).
- *Cutting Time*: to print the machining times. This report displays the following times: cycle with pattern at running speed, pattern start and end times, partial rip cut times, partial cross cut times and partial head cut times.
- *Summary of Stacks / Stacks Produced*: for a printout of the piece unloading stations in the same style as used for the visualisation.
- *Optimisation Parameters*: for printouts of all optimisation parameters and panel saw parameters.
- *Summary of Patterns 6x3 / Summary of Patterns 4x2*: for a brief printout of the cutting patterns. This report includes more than one pattern per page.

4.10 CUSTOMISED PARTS PRINTOUT

If *Customisable Report* is selected in *Printouts for every worklist*, it is possible to print a customised list of parts. This means that you can define which part description fields to view. The choice of fields to print is made by simply clicking on the *Report Configuration* button, which will open the window shown in Fig.4.7.

To add a field to the printout, select it from the drop-down menu and click on *Insert*; the name of the field will appear in the table below. It is possible to define the width of the field using the box to

the right of the drop-down menu (to give more space to fields that can contain longer strings). The *Area Used* bar shows, moment by moment, the percentage of the row used by the selected descriptions.

The *Edit* button allows the dimension of a field that has already been selected to be modified, while *Delete* allows it to be deleted (in order not to print it).

Once the setting operation is complete, use the *OK* button to save the changes, or *Cancel* to exit without saving.

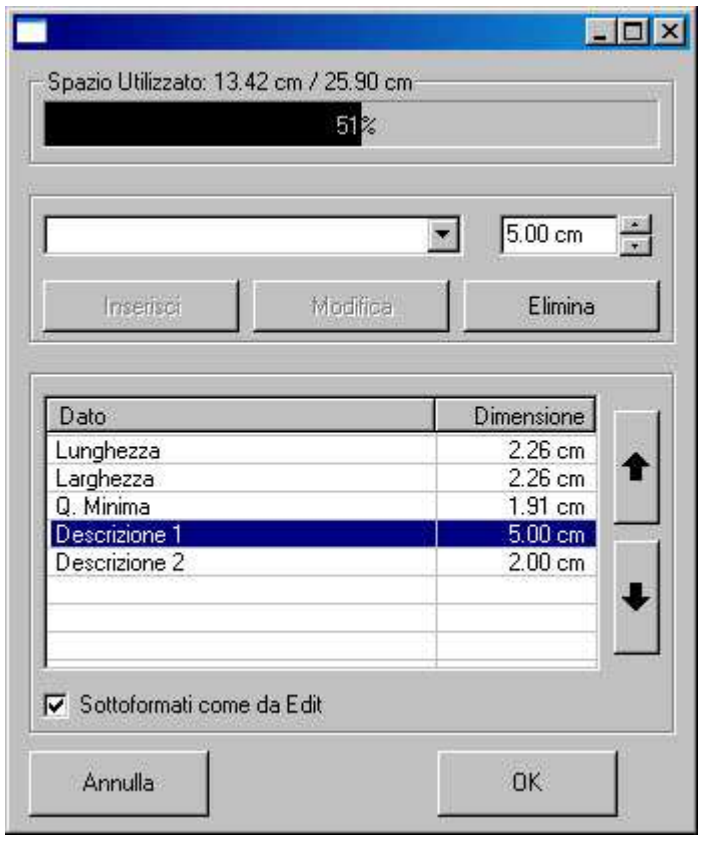


Figure 4.7

4.11 PATTERN PRINTOUTS

If *Patterns* is selected in *Printouts for every worklist*, it is possible to print the patterns created in the optimised worklist. To define what is to be printed on the page containing the pattern drawing, select the *Options* menu followed by *Patterns*. The new window will contain a *Print* section with the following options (see Fig.4.8):

- *Measures*: to print the measurements of the parts contained in a pattern.
- *No decimals*: by not printing the decimal figures, it is possible to use a larger character format.
- *Code*: to print the order number (code) of the parts contained in a pattern.
- *Description*: to choose one of the descriptions that can be edited on the parts page.
- *Edgebanding data*: to choose what banding material information to visualise in the cutting pattern. The options are: Type, Material, Colour.
- *Pattern Properties*: to print a summary of the pattern main data (material used, cycles, offcuts, and reused remainders).
- *Part List*: to print the list of parts produced in a pattern.

- *Cut Codes*: to print the machine codes that identify how to program the panel saw NC to create the current pattern.
- *Print patterns as viewed*: to make a colour printout of the pattern. The colours to be used in viewing and printing can be defined in the upper section *View.*
- *Print Patterns with Saw Thickness*: to print cutting patterns that contain the blade thickness (the printout is completely in scale).
- *Pattern Layout Reduction %*: to define whether - and to what percentage - to reduce the dimensions for the cutting patterns printed.
- *Print pattern name / Print worklist name*: to print - together with the cutting patterns - the name (in the form of a barcode) of the pattern or worklist.

The *Origin* function in the top part of the window can be used to define the origin position for the viewing and printing of cutting patterns.

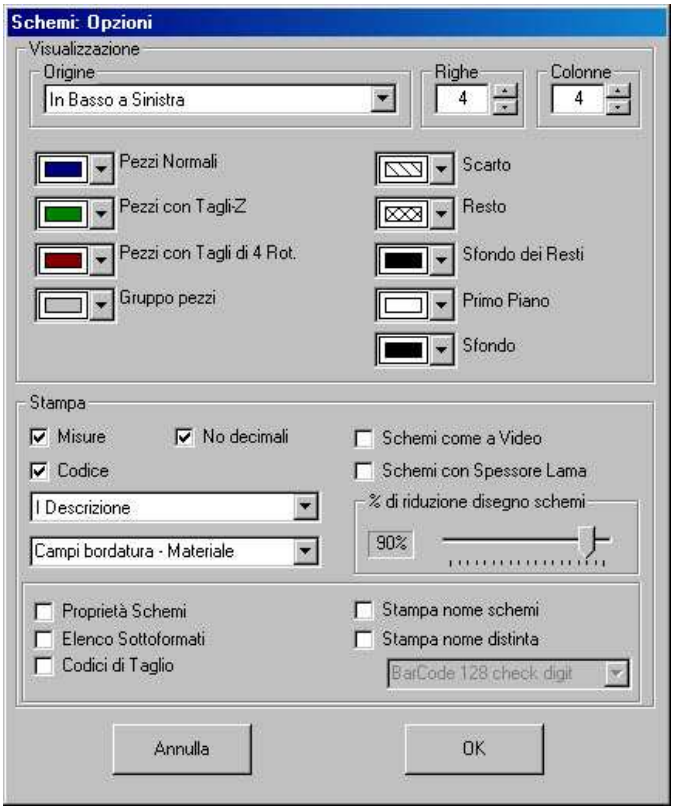


Figure 4.8

4.12 PANEL MAGAZINE PRINTOUTS

To print the data contained in the panel magazine, select the *Stock* menu followed by *Stock Management*. This will open the panel magazine management window. In this window it is possible to change current material and, if necessary, to edit data regarding available panels. To print, click on *Print*, or select *File* followed by *Print*. At this point, the window shown Fig.4.9 will open and the available print options are as follows:

- *Print All Existing Materials*: to print data regarding all material present in the magazine.
- *Print Current Material*: to print data regarding current material only.

- *Print Reorder Panels*: to print data concerning only the panels to be reordered. This means panels with a *Reorder Level* lower than the number of panels currently in the magazine.
- *Material List*: to print a list of the main characteristics of the different materials in the magazine. This option is only available when printing data for all material in the magazine.
- *Boards*: to print data regarding panels (dimensions, quantity available, area and value).
- *Print Drops*: to print data regarding recovered remainders (dimensions, quantity available, area and value).

This window also contains three buttons to run the print and print preview functions as well as to return to the panel magazine.

Figure 4.9

Chapter 5

DATA TRANSFER AND LABEL PRINTING

5.1 DATA TRANSFER CONFIGURATION

Once one or more lists have been optimised, it is possible to transfer the results to the panel saw NC, where it will be sufficient to recall, from the *Worklist* menu, a list to be enabled for the automatic sequence execution of all the cutting patterns it contains.

To configure data transfer, optimise a list and then select the *Options* menu followed by *Data Transfer*. At this point a window will open containing the first three items that can be selected or deselected simply by clicking upon them. These items, which are linked to data transmission, are:

- *Download to Machine*: to enable data transfer to the panel saw. To transfer data, this option must naturally be enabled.
- *Download all Worklists/Jobs*: to enable the transfer, in automatic succession, of all enabled worklists that form the current job. To enable/disable a worklist, it is necessary to click on the *Summary* function (first button on the relevant toolbar) and select/deselect enabling in the box in front of the worklist name.
- *Automatic Download:* for the automatic transfer - after optimisation - of one or more processed and enabled worklists.
- *No NC Download*: to enable the creation of an ASCII export file without transmitting any data to the panel saw control. This function is enabled if it is necessary to use an additional program to process the results of the optimised worklist. This occurs when downloading to NC481, RT480 or Assist Line controls as well as for three-dimensional off-line simulation of the worklist. In this case, when transferring data, an ASCII format file of the CPOUT type (with the name of the worklist and the extension ".cpo") will be created. This file will then be processed by one of the above-mentioned programs.
- *Automatic XML Export*: to enable the automatic creation of XML format worklist export files after a worklist has been optimised. For more information, see the Appendix.
- *Version XML 2.0*: to specify which internal version to use in order to transmit the worklist data as an xml. file

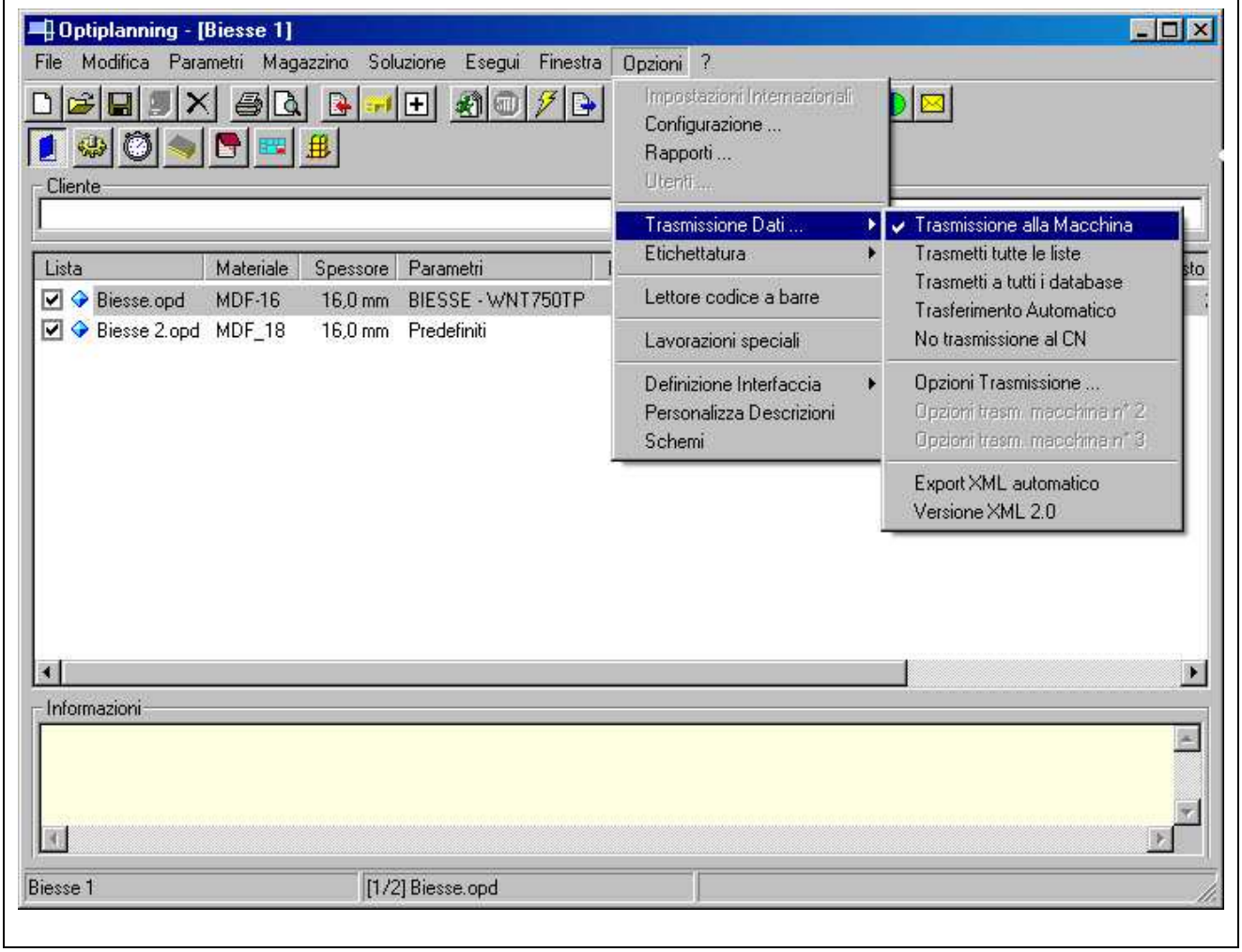


Figure 5.1

As well as the functions already described, there is also a *Transfer Options* item that is used to open further settings for transferring data to the numerical control. Up to three independent items are available to add different settings in the event of downloading to more than one panel saw. In particular, if the *Pattern Split* or *Add Trim after Laminate* functions are enabled, there are two *Transfer Options* windows because these machining operations include the transmission of two worklists for each optimised worklist. There are three *Transfer Options* if the optimised worklist contains the parameter *Panel Saw – General Parameters – Data Transfer to Machine No.*, which is set at 1, 2 or 3.

5.2 TRANSFER OPTIONS

The transfer options window contains different sections: the first, *Destination Path*, enables the transmission method to be set in a drop-down menu:

- *By Disk*: indicates that data is downloaded using a floppy disk or network. If this option is enabled, it is necessary to specify the destination path by clicking on the *Change* button. If data is to be downloaded to a disk, select "A:\". This type of download can be selected for NC500 or NC300 numerical controls.
- *Com1*: to download data by serial cable using serial port no.1. This type of download can be selected for NC410 or NC400 numerical controls.

- *Com2*: to download data by serial cable using serial port no.2. This type of download can be selected for NC410 or NC400 numerical controls.
- *E-mail*: to download data by e-mail. In this case, the files to be sent will be attached to a new e-mail message.
- *Downloading Confirm*: to enable a further confirmation from the user prior to starting the download.

If you want to transfer the data via the network, you must first share (on the PC acting as numerical control for the panel saw) the directory containing the numerical control program, which is usually "C:\BIESSE\OSI\"); then, on the office PC where OptiPlanning is installed, connect this directory as a network unit ("C:\ BIESSE\OSI\"), thus making it available as a drive (for example "H:\"). This is the drive to specify in the *Destination Path*. If the optimiser is installed in the PC acting as a numerical control, you must specify - in Copy Path - the directory containing the numerical control program (usually "C:\ BIESSE\OSI\").

If the numerical control of the panel saw is "OSI", and you have a network connection, you can transfer the cutting lists directly to the database, avoiding the need to import the xml. files into the control. In this condition, it is necessary to specify the path of the folder where the file dbLav.mdb. is installed.

The *Common Options* field contains three functions:

- *Connect the worklists to the following ones*: to be selected to enable the automatic running of more than one list in succession. In this case, open the first list of the order in the *Worklists* menu of the NC to run all lists without having to call them up. This function is only effective if several lists are downloaded to the panel saw at the same time (these lists will be executed in automatic sequence).
- *Cutting speed download*: the cutting speed (see *Panel Saw* parameters) is only downloaded to the NC if this function has been enabled; if not, the cutting speed specified in the NC will be used.
- *Download Trims to NC:* the trim cuts parameters (see *Panel Saw* parameters) are only sent to the NC if this function is enabled; if not, the parameters specified in the NC will be used.
- *One Size per Cut:* if enabled, this option sends cutting patterns that produce a single measurement using a cross cut to the NC. This function can facilitate sized piece stacking operations.
- *481 Controller*: to be enabled only for downloading data to the numerical controls NC481, RT480 and Assist Line.
- *One Size per Cut:* if you have an automatic unloading system, this option allows you to generate cutting patterns in which the system rotates the pieces upon unloading, when they become part of the logical cuts.

The *Worklist/Job Options* section enables a series of options for defining the worklist machining modes. The options are: *P1*, *C1*, *C2*, *B0*, *A0*, *R0*, *S1*, *L1*, *E1* and *Material Damping Factor*. It is possible to select one or more of these options at the same time. For more information, refer to the corresponding section in the instruction manual of the panel saw NC. There are also two further fields: *Max. Length for Workl. Options* and *Max. Width for Workl. Options*, which only enable the transfer of the selected option(s) if the dimensions of the sized panel are less than the value in each of the two fields.

Once the setting operation is complete, use the *OK* button to save the changes or *Cancel* to exit without saving.

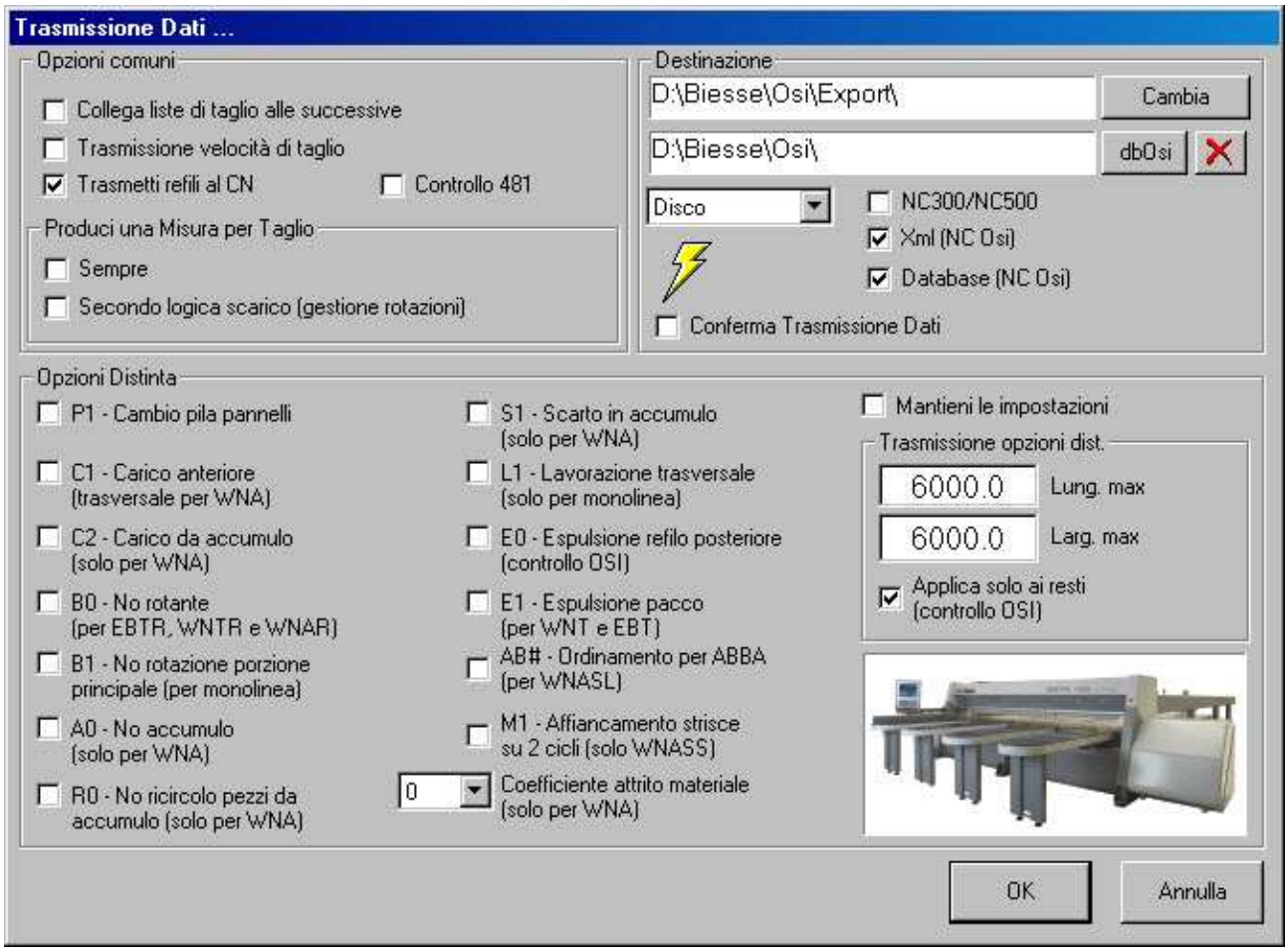


Figure 5.2

5.3 LABELLING OPTIONS

If the built-in label printing option is available, then the labelling options must be configured.

To configure the labelling options, it is necessary, after optimising a list, to select the *Options* menu followed by *Labelling*. At this point a window will open; the first item is *Enter Labelling Data*. This must be enabled in order to transfer labelling data as well as data relevant to cutting patterns or worklists.

The second item (*Labelling Options*) is used to open a window containing the following:

- *Label layout*: to specify the name of the label module generated on the numerical control (the module defines the layout of the label that will be printed on the machine).
- *Pieces per Label*: to specify, for pieces of the same dimensions and description, just how often a label is to be printed.
- *Label Step*: this parameter can be used if lists containing several parts of the same dimensions but with different descriptions are to be processed. In this case it is possible to specify how many labels are to be printed with one description before passing on to the following one. This means that it is possible to "alternate" different description printouts for pieces of the same dimensions, as these pieces are cut.
- *DOS text*: this must be enabled in order to print characters from the extended set (for example: ñ, ä, ì, ç etc.).

If these functions are not specified (the fields are left blank, or at zero for numerical fields), the settings defined by the NC will be used.

Just as for the *Transfer Options*, up to three independent windows are available in the *Labelling Options*, in order to download data to more than one panel saw.

All the parameters not described in this chapter, and disabled in figure 5.3, relate to the LPrint printing program. They can be enabled via the “Use LPrint” control. These parameters can be configured in the printing program; for a description of their meaning, refer to the LPrint "help" section.

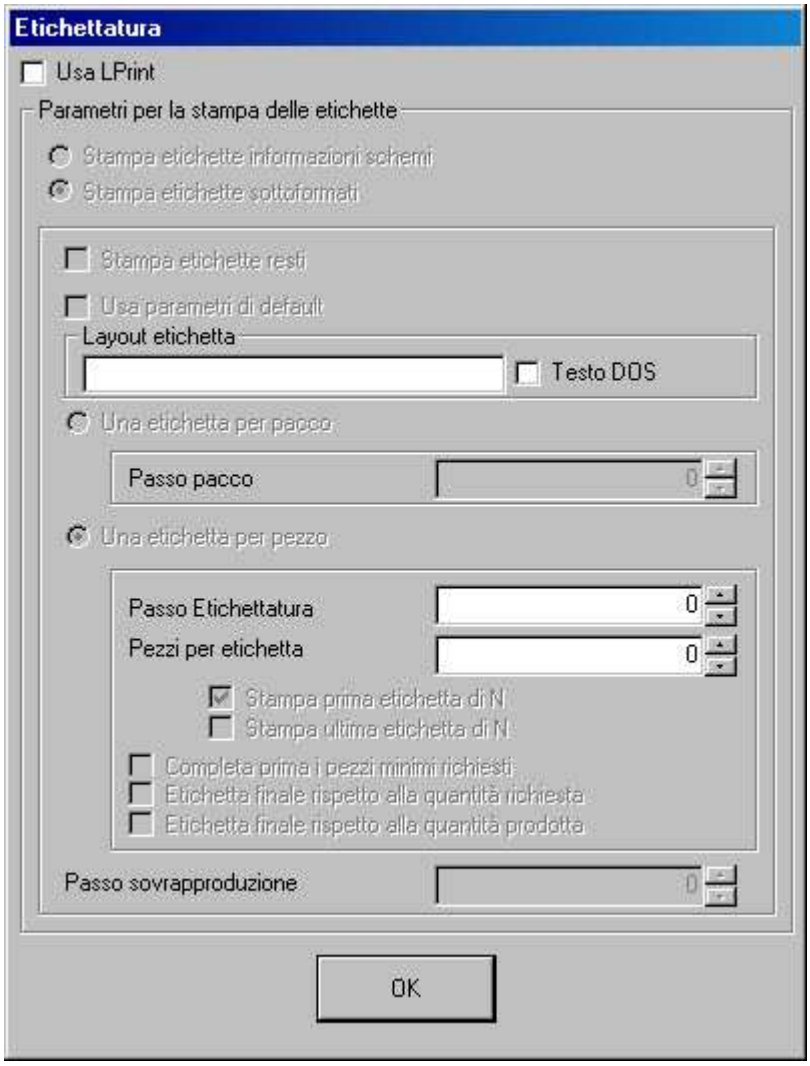


Figure 5.3

5.4 DATA ENTRY

Once the data transfer and label printing configurations have been set (these operations must be completed after opening an order with an optimised worklist), it is possible to transfer the data to the panel saw (by floppy disk, serial cable, network or e-mail).

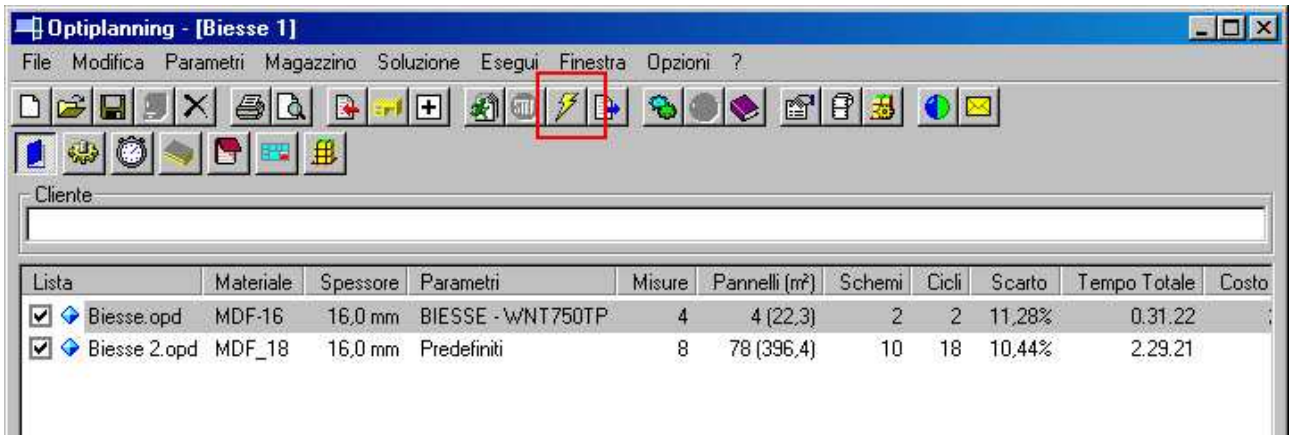


Figure 5.4

To transfer data, open an order that contains at least one optimised and enabled list and click on the *Download* button of the toolbar. This will begin to download data or to copy one or more lists onto a floppy disk (see data download configuration). At this point a window will open to indicate, second by second, the cutting pattern that is being downloaded. In the event that data are being transferred by floppy disk, first make sure that it has been MS-DOS formatted.

If the *Automatic Download* option has been enabled (see data download configuration), data is automatically downloaded at the end of a list processing operation (this means that it is not necessary to click on any button). This option is usually enabled when the optimiser is installed in a built-in PC.

5.5 JOB E-MAILS

OptiPlanning can be used to transfer job data by e-mail. This function is useful for solving any problems that may be encountered. In fact, the program is able to automatically create a message containing all the files that form the job, and to insert the address of the Biesse Assistance Department. The files attached to the message will be automatically compressed to reduce transmission times. The operator has merely to confirm the sending of the message, to ensure that all the data required to reproduce the situation on another PC will be sent.

To create this message, it is sufficient to have e-mail software that is connected to the Internet, open an OptiPlanning job and click on the *Send* button, as shown in the following figure.

In some cases, the e-mail will not be created correctly; this occurs if the e-mail software is incompatible with the files installed by OptiPlanning. If this occurs, it is necessary to delete or rename the “Mapi32.dll” file installed by OptiPlanning and found in the directory “\OptiPlanning\System\”. At this point, the system will use the file of the same name created by the e-mail software. This operation is only enabled if the “Mapi32.dll” file is already present in the directory that manages “.dll” files.

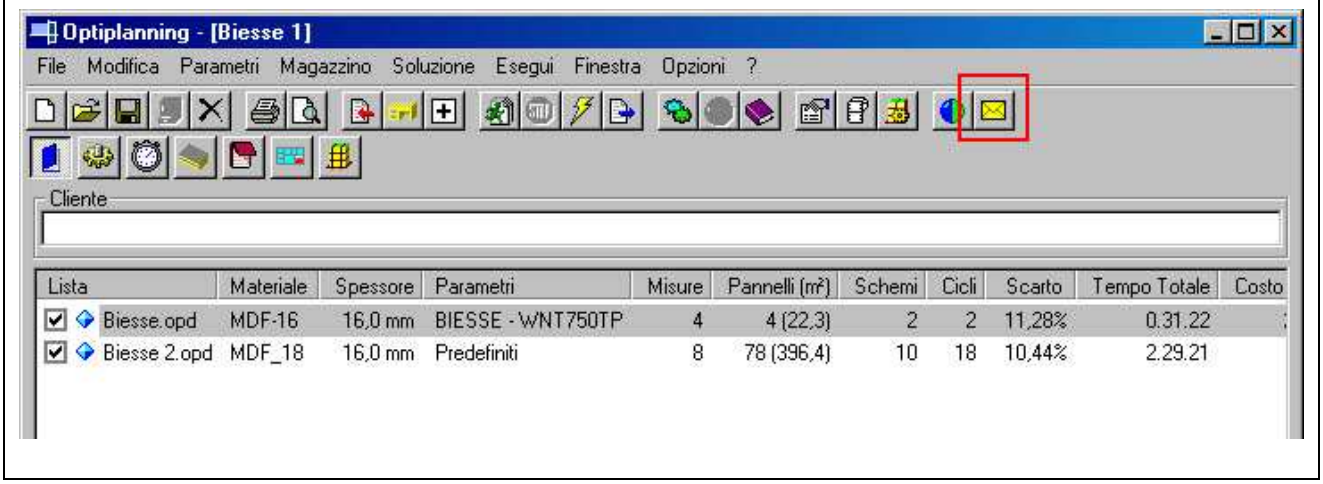

Optiplanning - [Biesse 1]
File Modifica Parametri Magazzino Soluzione Esegui Finestra Opzioni ?
Cliente
Lista Materiale Spessore Parametri Misure Pannelli (m²) Schemi Cicli Scarto Tempo Totale Costo
Biesse.opd MDF-16 16,0 mm BIESSE - WNT750TP 4 4 (22,3) 2 2 11,28% 0.31.22
Biesse 2.opd MDF_18 16,0 mm Predefiniti 8 78 (396,4) 10 18 10,44% 2.29.21

Figure 5.5

Chapter 6

AUTOMATIC DATA IMPORT

6.1 INTRODUCTION

Entering order data, in other words the panels available and - more importantly - the list of parts, can be very time consuming. The repetitive nature of the actions required can lead to the entry of incorrect values. Fortunately, OptiPlanning can enter the order data for you, if there is a *file* containing the data to be imported and another with the correct instructions on how to read the data. The time required to read through this chapter will therefore be well compensated by time saved in the future, when new orders need to be optimised.

6.2 TO START

Before describing how to create a file with the instructions for OptiPlanning, it will be useful to outline the criteria that the *files* with the order data must have:

1. contain ASCII characters only, for printing or tabulation;
2. contain the necessary data for creating the order, in other words: the descriptions, measurements and quantities to be produced (if parts) or available (if panels);
3. be organised by rows, i.e. the relative data for each part and/or panel must be contained in the same row;
4. the data contained in each row must be separated by a character (which obviously must not be present in the descriptions) or must be in a fixed position (in each row);
5. the data can consist of numbers (with or without decimals), measurements (in mm or inches), descriptions or set sequences of characters (discriminators);
6. all the rows containing data must have the same format: for example, in each row first the length is specified, then the width, quantity to be produced, the description, and so on for the remaining information.

As regards point 1, it should be specified that the numerical codes for the special characters (i.e. letters with accents) used by Windows™ and by OptiPlanning are different from those used by MsDos™ programs. Certain descriptions may therefore not appear to be correct. In such cases the "Dos text" option can be activated to solve the problem (see p.40 Fig.6.4).
The *file* with the data to create the order (point 2) can contain parts and/or panels of different materials and thickness. In this case OptiPlanning will create various worklists, each of which will contain parts and/or panels made of the same material. Some data are essential for the success of the operation. As regards parts, OptiPlanning must find at least the *length*, the *width* and the *quantity* to be produced, while for the panels at least the *length*, *width* and *availability* must be indicated. OptiPlanning does not however oblige the operator to supply all the information regarding parts and/or panels, as the common values can be present in the header of the data *file*, or they may be specified in files containing the "read" instructions. In this case all parts and/or panels will have one or more pieces of data in common.
Automatic data entry is based on the data being divided into rows (point 3.) separated by the end-of-row character (*newline*). OptiPlanning reads each row separately, checks whether it contains valid

data and, if what it has read corresponds with the instructions received, adds a new object (part or panel) to the order. If your data are organised differently, it will therefore be necessary to convert them to the format described.
The data contained in each row must be organised, so that only those rows with a correct and uniform structure will be recognised and used. There are basically two ways of organising data (point 4). The first, the origins of which are found in the use of perforated cards, assigns each piece of data a space of a fixed size; while the more recent method uses a character to separate the pieces of data. Characteristics of the two formats: in the first case (rows with a set format), the descriptions can contain any character but are of the same length, while in the other (rows with separators) the descriptions cannot contain the separator character, but can be of any length. Apart from the format in which the data are organised, their type is important too (point 5). Types recognised are: character (used mainly for descriptions), number (used for quantities and sizes in mm), measurements in inches (expressed as both fractions and thousandths of an inch) and discriminator. This last type is only important when we wish to define several instructions for the same piece of data, as its value allows OptiPlanning to choose the most suitable conversion instruction for the row processed. A separate paragraph with real examples will be dedicated to this and other advanced features of OptiPlanning.

6.3 CREATING AN ORDER FROM A TEXT FILE

To import a file it is necessary to create a new order, or to open one which has already been saved. If creating a new order, specify the name then select *Cancel* in the *New Worklist/Job* window (see p.15 - Fig.3.3). Now click on the *Import* button (the sixth from the left at the top), as shown in Figure 6.1.

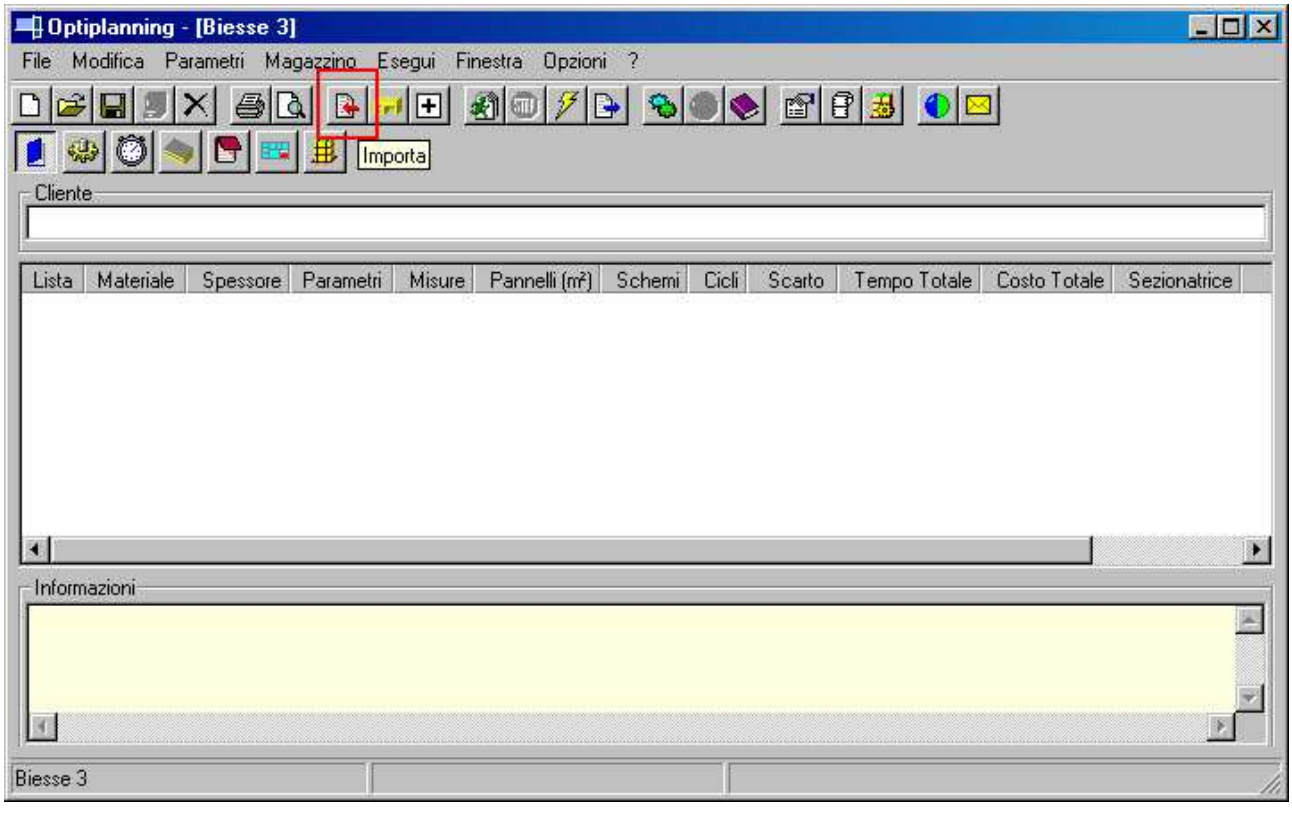


Figure 6.1

After either clicking on the *Import* button or selecting *Import* from the *File* menu, OptiPlanning will show a dialogue box which will help the user through the whole operation (see Figure 6.2). The first thing to do is to select the complete path of the file containing the parts data. The text field contains the last choice made in order to simplify things when carrying out the operation for the first time, or when the program generating the data always updates the same file in the same position. If the text field is empty, or if it contains a path other than the one required, it can be modified by clicking on the *Select* button. Bear in mind also that the window used to select the data *file* limits selection to the *files* contained in the current folder only. If you wish to take data from a different folder, the heading *Configuration…* must first be selected from the *Options* menu, and the heading *Folder containing the data to be imported* must be modified accordingly.

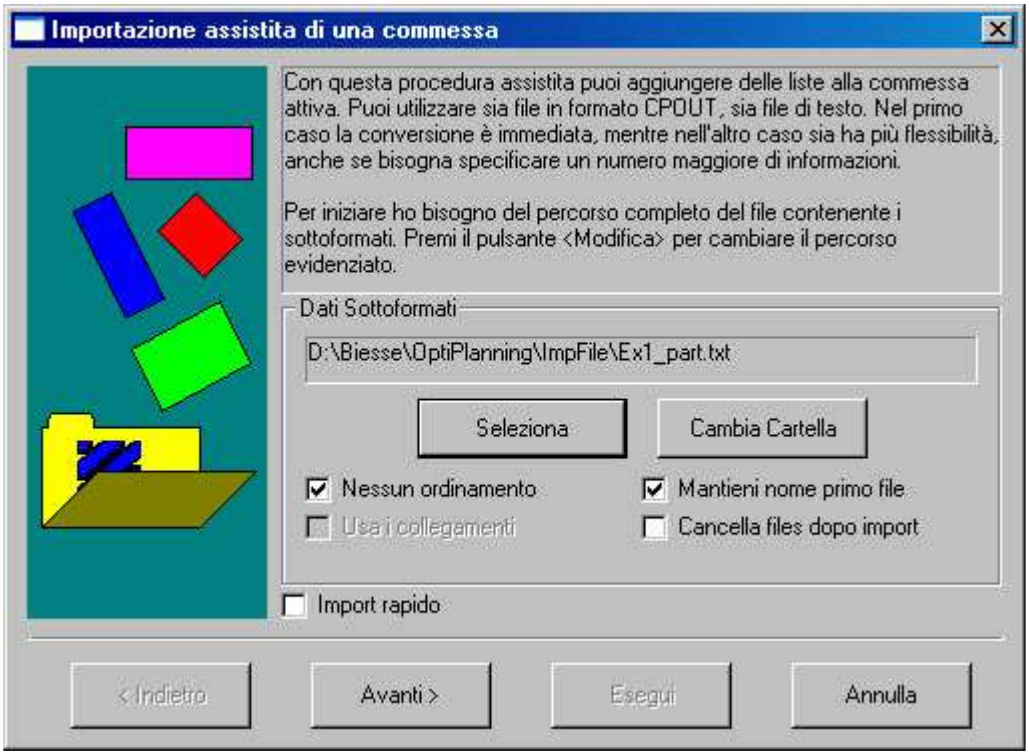


Figure 6.2

If a file with a ".cpo" extension has been selected, i.e. a file in CPOUT format (the CPOUT format is one generated by different optimisers and can be read without having to define the import rules), the *Execute* button becomes active. In this case, clicking on *Next* or *Execute* will call up a window which requests the name of the new worklist/job to be added to the current order and, if the contents of the *file* are correct, automatic entry is carried out successfully.
If, on the other hand, the file selected has a different extension and format, by clicking on *Next* the window in Figure 6.3 will appear, in which it is possible to tell OptiPlanning where to "read" the panels to be used for producing the parts required.

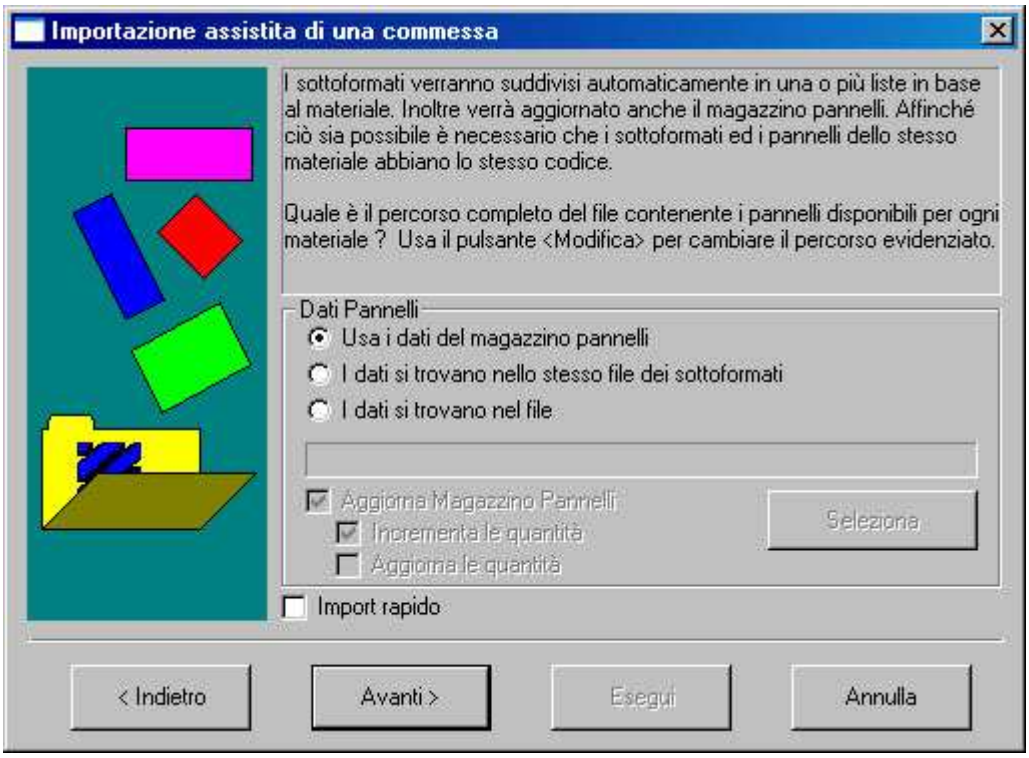


Figure 6.3

By selecting the heading *Use data of the panel stockage*, the lists which will be added to the current order will count all the panels in stock with the same material code as the parts. The material code can consist of either numbers, or numbers and letters. In the latter case, OptiPlanning will make a search of the descriptions of the panel magazine.
By selecting the heading *Data are in the same file relevant to parts*, OptiPlanning will analyse the parts file to find the panel data. This presumes that the parts data are memorised in separate rows from those of the panels, and in a different format.
By selecting the heading *Data are in the file*, it is possible to select a *file* containing the panel data. In this case the format of both *files* can be the same, as long as the two paths are separate.
The *Update panel stock* option becomes active when one of the last two headings are selected. If it is active, the panels present in the data *files* will be entered in the panel magazine.
By clicking on *Next*, the window in Fig.6.4 appears, in which the instructions for converting the data can be specified.

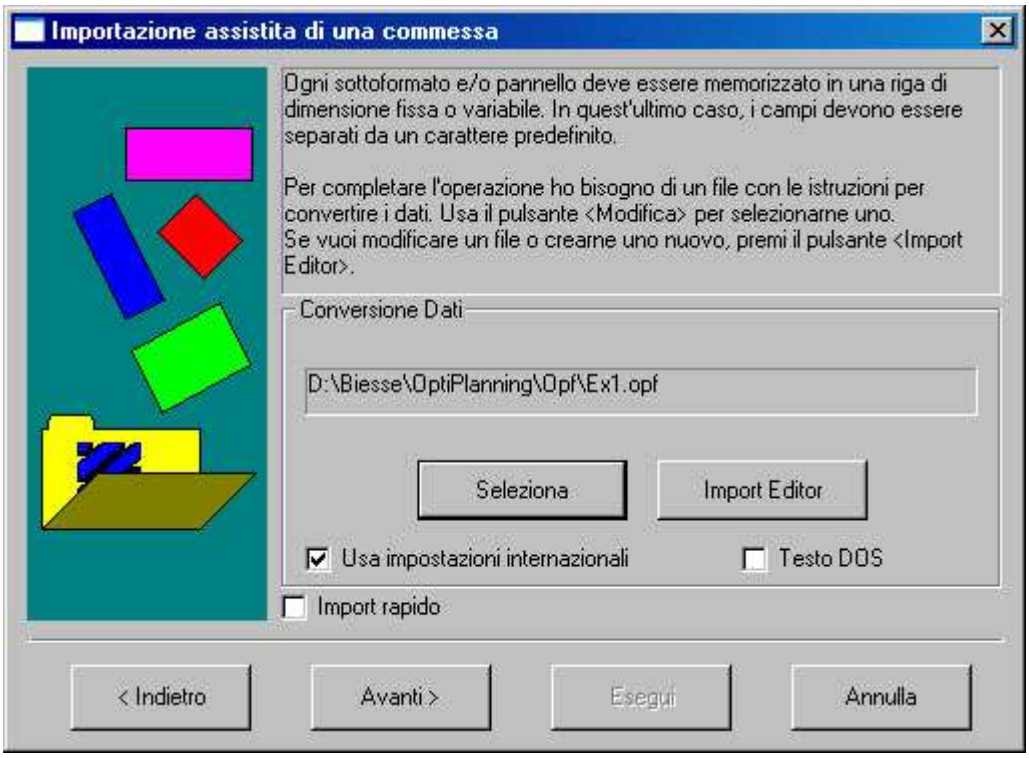


Figure 6.4

The text field contains the complete path of the last instruction file used to enter data in automatic mode.
By clicking on *Select*, a different file from among those in the same folder can be chosen. If you want to change the position of the folder, just select the heading *Configuration…* from the *Options* menu. It is, however, strongly recommended that just one folder be used to contain the "import rules" files with ".opf" extension to make things easier.
Clicking on *Import Editor* activates a program for modifying files with ".opf" extensions, which tell OptiPlanning the operations (import rules) it must carry out on the data to create the new objects (parts and/or panels) to be added to the current order. How to use this program will be explained in the next paragraph.
The *Use international setup* option changes the way in which OptiPlanning interprets numbers. If it is not active, all numbers will be read considering the '.' character as a decimal separator and the ',' character to separate thousands (optional). This convention reflects the practice in English-speaking countries, and the system used in most programs. Nevertheless, certain programs (e.g. Microsoft Excel™) prefer to adopt the number-writing conventions used in the country where they will be used. By activating the *Use international setup* option, OptiPlanning therefore interprets as decimal and thousands separators the characters shown in the *Properties - International settings* window of the Microsoft Windows™ Control Board (Figure 6.5)

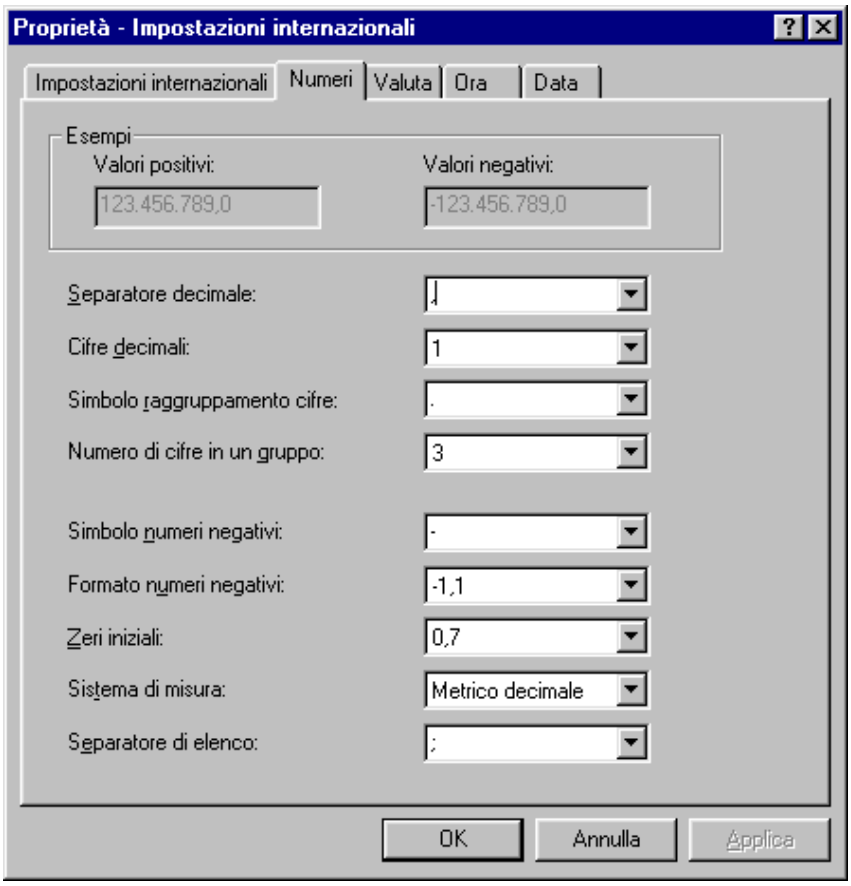


Figure 6.5

The “DOS text” option can be activated when the descriptions in the data files contain characters with accents or special characters (i.e.: à, è, ì, ò, ù, ß, …) generated by MsDos™ programs. If, after automatic data entry, the descriptions contain incomprehensible characters, the problem can be resolved by repeating automatic data entry after activating this option.
When the *Next* button is clicked on, OptiPlanning processes the selected files. If during this operation no part and/or panel can be created using the data contained in the files shown, the window in Figure 6.6. will appear.

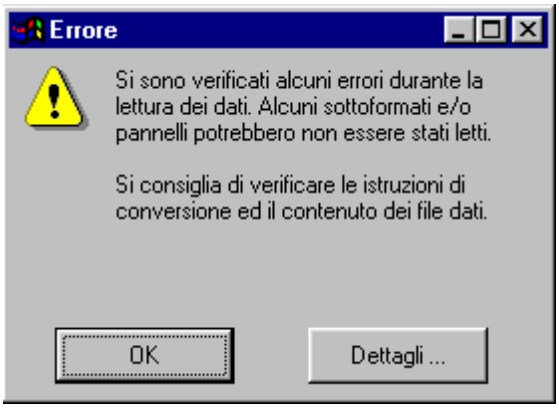


Figure 6.6

The cause of the error is a data *file* which is either empty or structured differently from the one described in the rules *file*, or (something which happens frequently when using the program for the first few times) because of an incomplete rules *file*. To remedy the problem, just check the data *files* and correct the rules *file* using the information supplied, by clicking on the "Details…" button. For further explanation, refer to the "Troubleshooting" paragraph at the end of this chapter.
If, on the other hand, the parts have been correctly recognised, but some of them refer to a material code not present in the panel magazine, OptiPlanning will display the window shown in Figure 6.7. In this case, a new material can be created by entering the required data, or alternatively you can use a substitute material in the order by selecting it from those listed in the *Material* field.

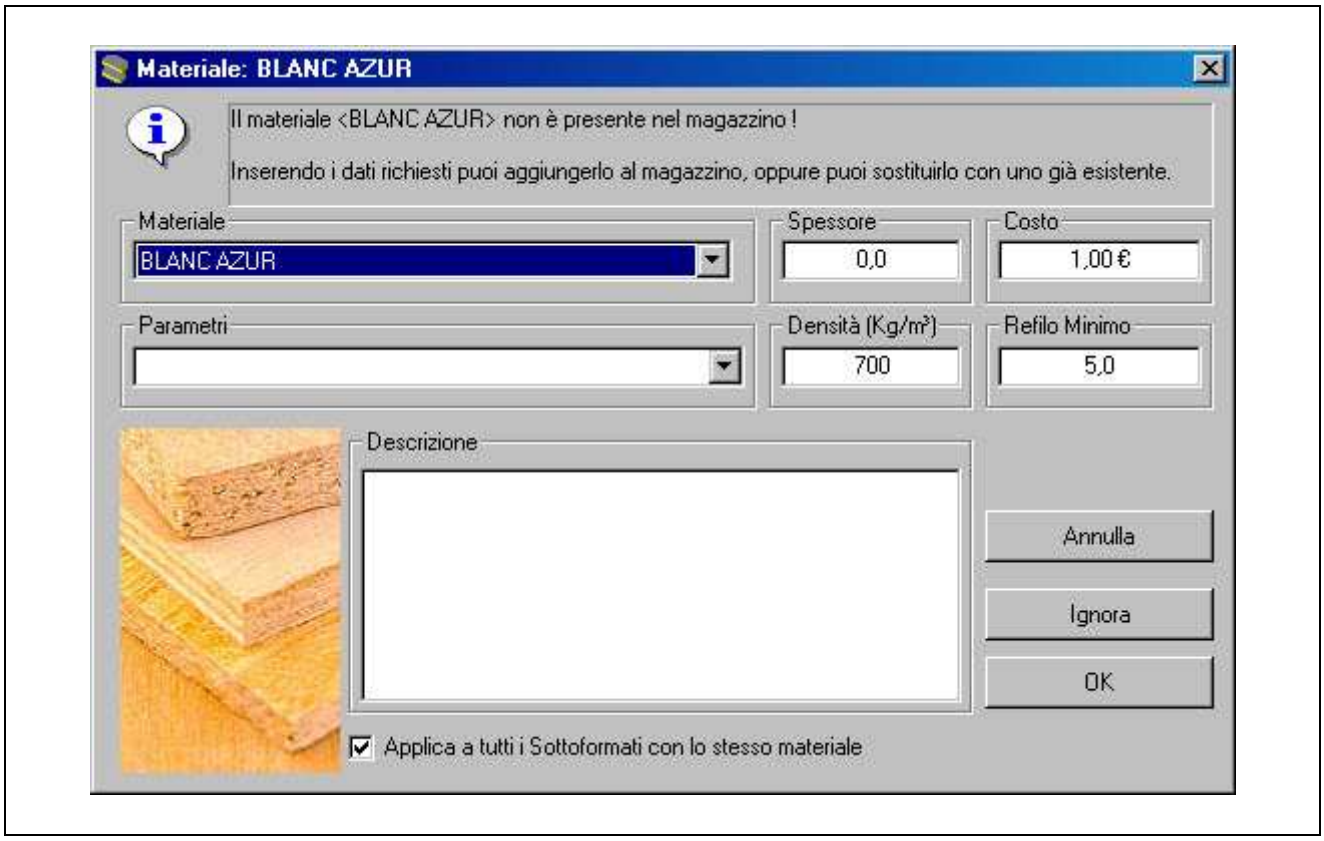


Figure 6.7

If the *files* with the data to be entered automatically have been processed successfully, OptiPlanning will display the window used to conclude the automatic data entry operation (Figure 6.8). You can now check if the parts, panels and materials have been read and converted correctly before finally executing the operation.

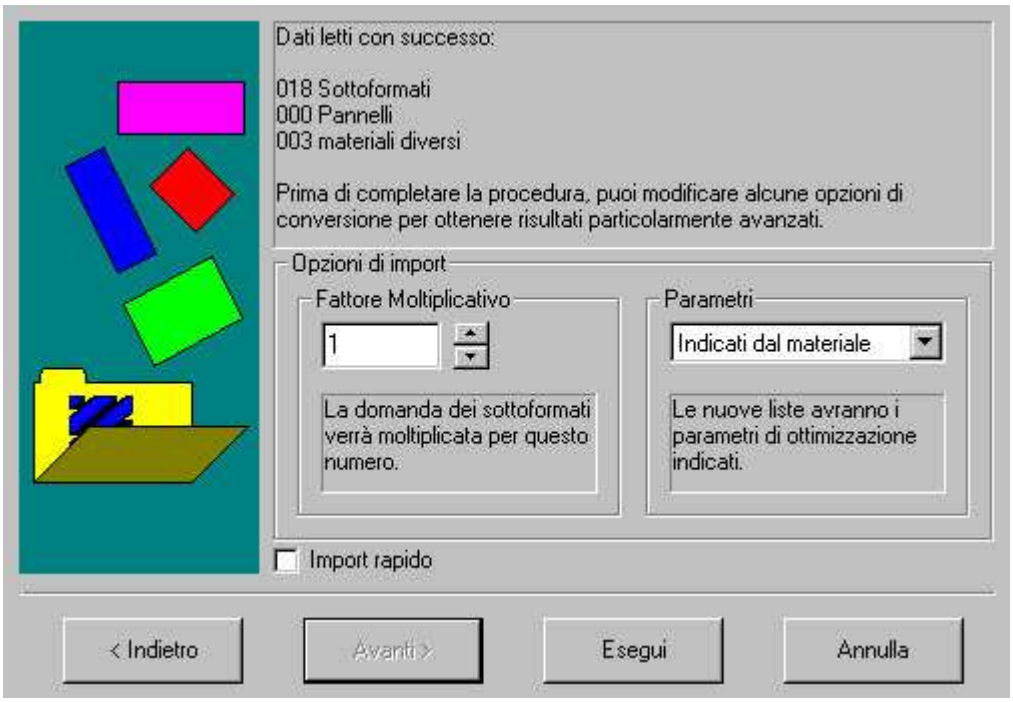


Figure 6.8

OptiPlanning also makes available some advanced options via which it is possible to select the parameters to be associated with the worklists added to the order (one for each material recognised) and/or to multiply the quantity of individual parts to be produced. This last option proves useful when the *file* with the parts to be entered automatically contains parts of a cabinet. If a certain number of them must be produced, it is simply necessary to multiply the factor to create a list with the correct quantities. This is not, however, the only way of achieving this end. An alternative is to use the *Insert Cabinet* function, which can be activated using the button immediately to the right of the one indicated in Figure 6.1.
By selecting the *Execute* button, OptiPlanning will create a list for each material that has been identified. Before creating a new worklist however, OptiPlanning checks whether the order already contains a worklist with the same material. If it does, you are given the chance to better exploit the material by adding the new parts to it (Figure 6.9).

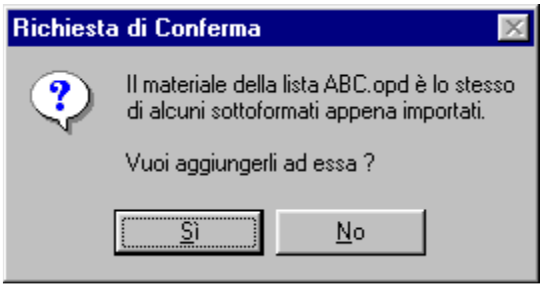


Figure 6.9

At this point, it can be seen how OptiPlanning makes data entry for an order very simple. In fact, having defined a suitable instruction *file*, all it takes is a few "*clicks*" to achieve the required results with minimum effort. The next paragraph describes how it is also very easy and intuitive to construct an instruction *file* which will allow OptiPlanning to avoid long (and boring) data entry operations.

6.4 THE "IMPORT EDITOR" PROGRAM

To create or to modify a file with the instructions for automatic data entry, the "Import Editor" program is used. To illustrate its functions, we will use the "DESK2.TXT" file shown in Figure 6.10.

```
Code:→RD1 - RD4 →    →   Quantity: → 1 →    →   CLIENT→Selco→   →    →    →    →   ¶
Description:→"Rectangular Desk, slab ended"  →    →    →    →    →   LOCATION  →    →    →    →    →    →    ¶
   →    →    →    →    →    →    →    →    →    →    →    →    ¶
   →   Length→Width→Height→   →    →    →    →    →    →    →    →    ¶
Size:→1800 → 900 → 720 →    →    →   System Number:    →    →    →    →    →    →   ¶
   →    →    →    →    →    →    →    →    →    →    →    →    ¶
TOPS → F/GREY→   →    →    →    →    →    →    →    →    →    →    ¶
ENDS/BACK  →  F/GREY→   →    →    →    →    →    →    →    →    →    →   ¶
Part → Length→Width→ Thickness  →  Quantity  →  Material  →  Edging Detail→Colour→thkn → Borer Program→Remarks  →   ¶
Top  → 1795 → 895  → 25  →  1   →  F/GREY→"All round, 2 short edges first"  →  F/GREY→2mm  →    →    →    →    →   ¶
End  → 695  → 885  → 25  →  2   →  F/GREY→2S  →  F/GREY→2mm  →    →    →    →    →   ¶
Modesty1740 → 465 → 18  →  1   →  F/GREY→None →    →    →    →    →    →    →   ¶
¶
   →    →    →    →    →    →    →    →    →    →    →    →    ¶
   →    →    →    →    →    →    →    →    →    →    →    →    ¶
```

Figure 6.10

This contains a description of three parts (rows 10 - 12) used to make up a desk. There is also a header (rows 1 - 5) with the common data (Code, Customer, Description, Length, Width and Height) which must be automatically entered in each part.
By taking a close look at the file, we can see that:

- each row is divided into 13 sections (also called "fields") separated by the tabulation character (denoted by the sign "→" or "->")
- the first field contains the part description (rows 10-12)
- the second field contains the part length (rows 10-12)
- the third field contains the part width (rows 10-12)
- the fourth field contains the thickness (rows 10-12)
- the fifth field contains the quantity to be produced (rows 10-12)
- the sixth field contains the material code (rows 10-12)
- the seventh field contains the edgebanding detail (rows 10-12)
- the eighth field contains the banding material colour (rows 10-12)
- the ninth field contains the banding material thickness (rows 10-12)
- the tenth field contains the boring program code (rows 10-12)
- a remarks field concludes the data that define a part (rows 10-12)

Once the file structure and the fields position are known, writing the instructions *file* for OptiPlanning is very simple. By executing the program to modify and/or create instructions (by clicking on the *Import Editor* button in Figure 6.4 or directly from Windows™), the window shown in Figure 6.11 appears on the screen.

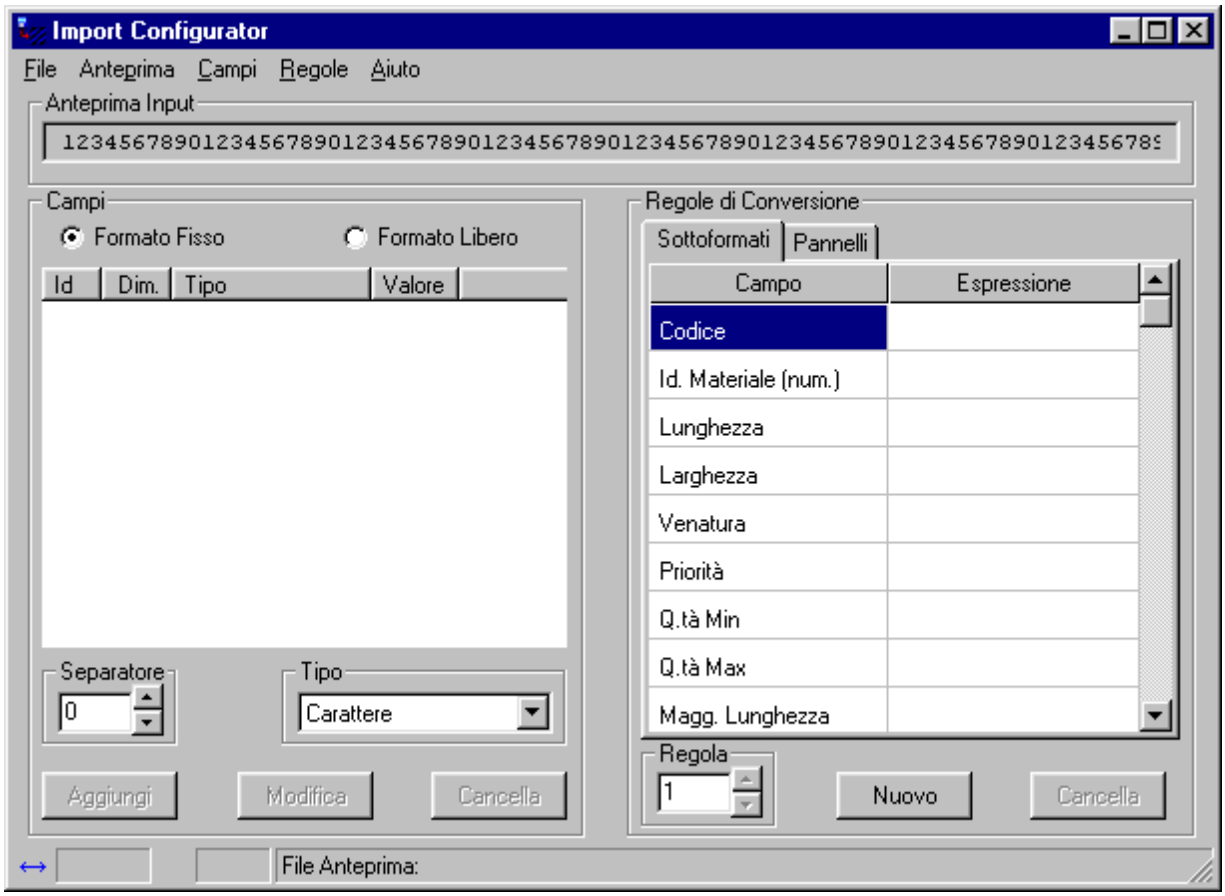


Figure 6.11

Because the fields of the DESK2.TXT *file* are in free format (i.e. of no fixed length), the *Free format* option must be activated. When this operation is carried out, the "Field" box changes as shown in Figure 6.12. It is then necessary to tell OptiPlanning which character will be used to separate the fields, by modifying the *Separator* text field accordingly. In this case, as the tabulation character cannot be entered directly, click on the right mouse button while the cursor is inside the text field and select *Tabulator (Tab)* from the pull-down menu that appears (see Figure 6.12).

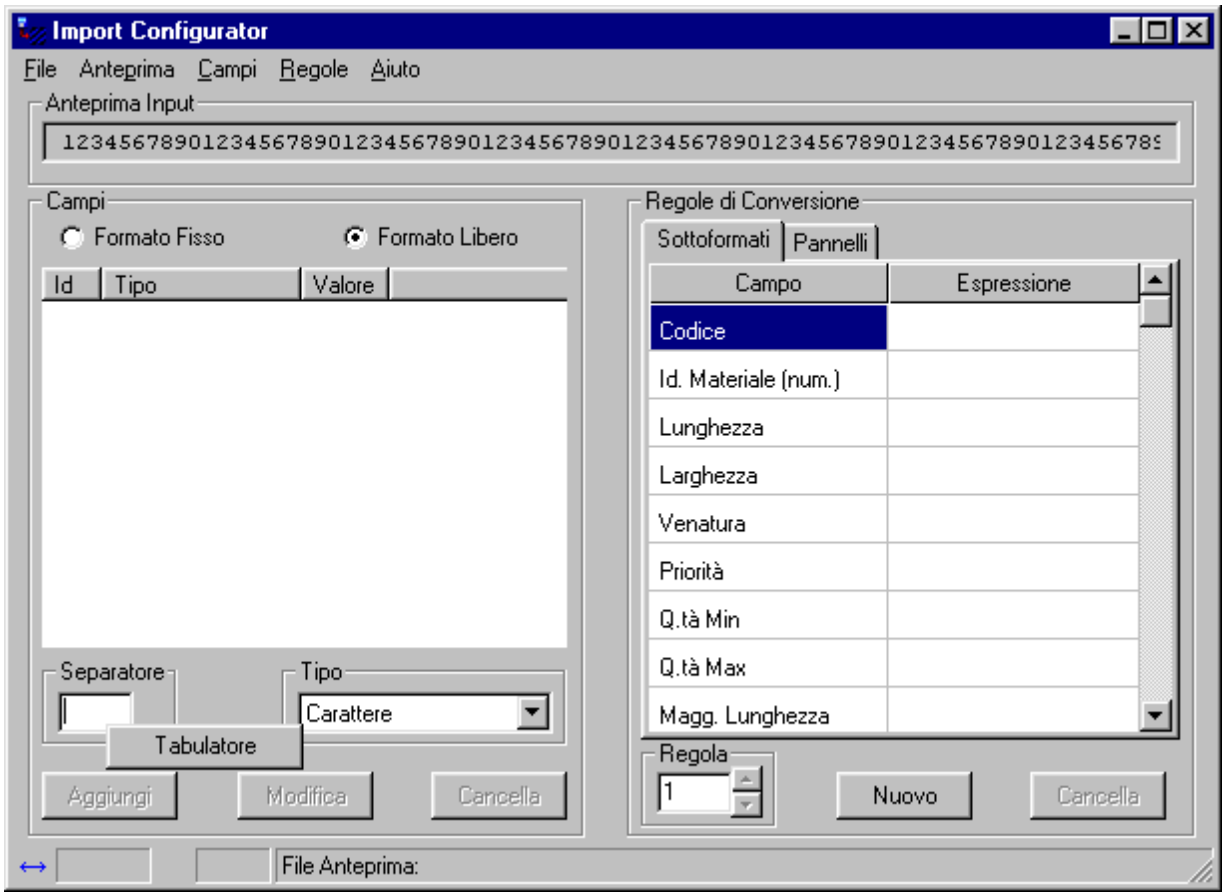


Figure 6.12

The definition of the fields which must be read, recognised and entered automatically can now be entered.
The first field, which in this case coincides with the part description, is of the "character" type, as it is made up of letters and numbers. All we need to do then is to click on the *Add* button to obtain a screen display like the one in Figure 6.14. In this way, each time OptiPlanning reads a row of text, it will create an object called “$1” that contains the characters present in the first field.
To define the second field (part length), we will change the type of field to *Number* (because a measurement is expressed as a number) before clicking on the *Add* button (see Figure 6.14).
By entering in the same way the definitions of the remaining fields, the result shown in Figure 6.15 is obtained. What has been entered forces OptiPlanning to reject all the rows with fewer than eleven fields, or those in which the second, third, fourth and fifth fields do not contain numbers.

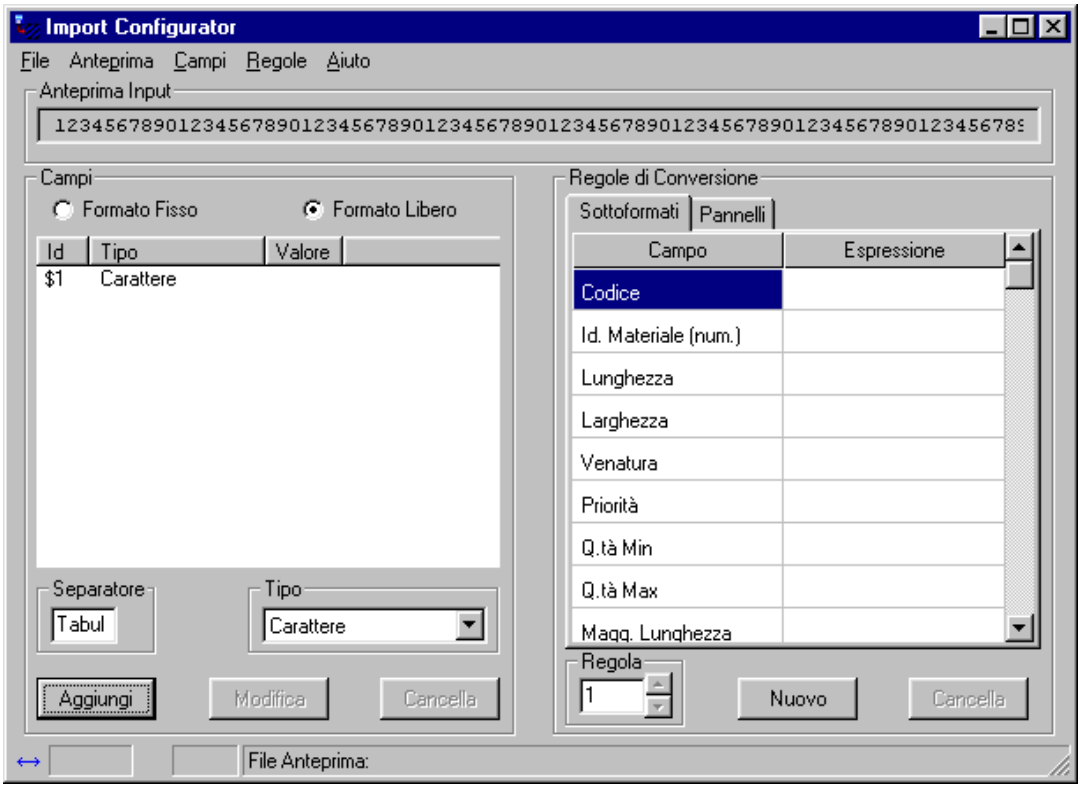


Figure 6.13

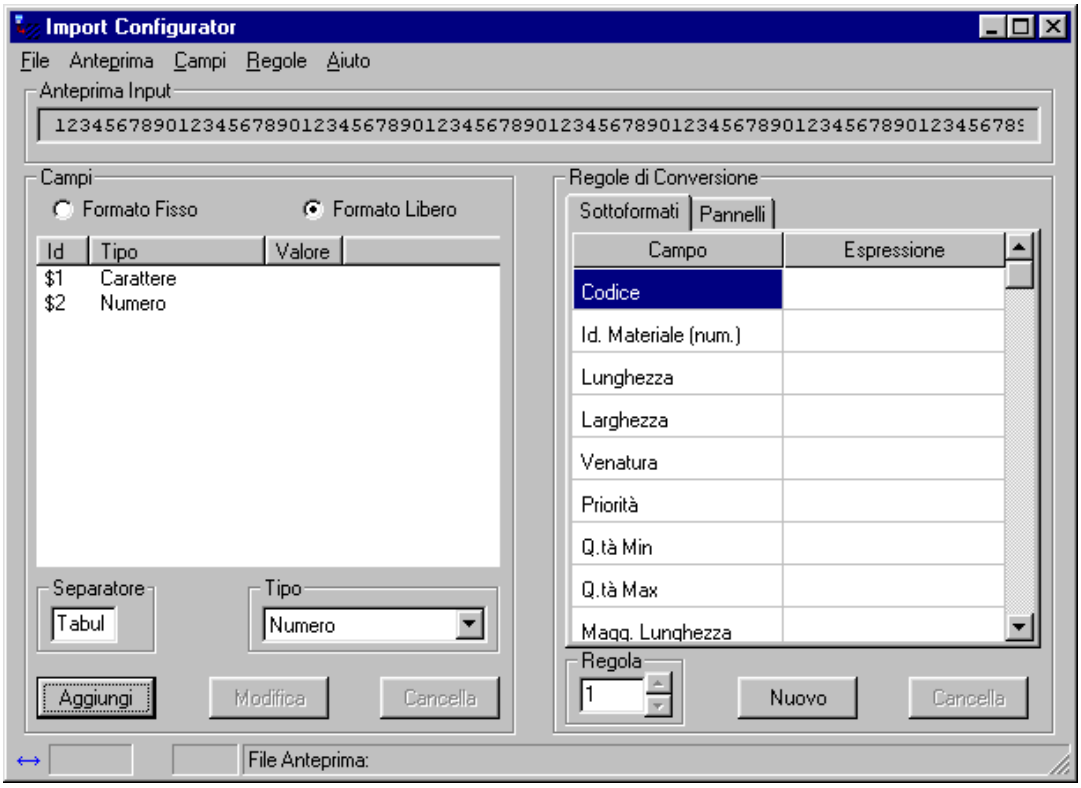


Figure 6.14

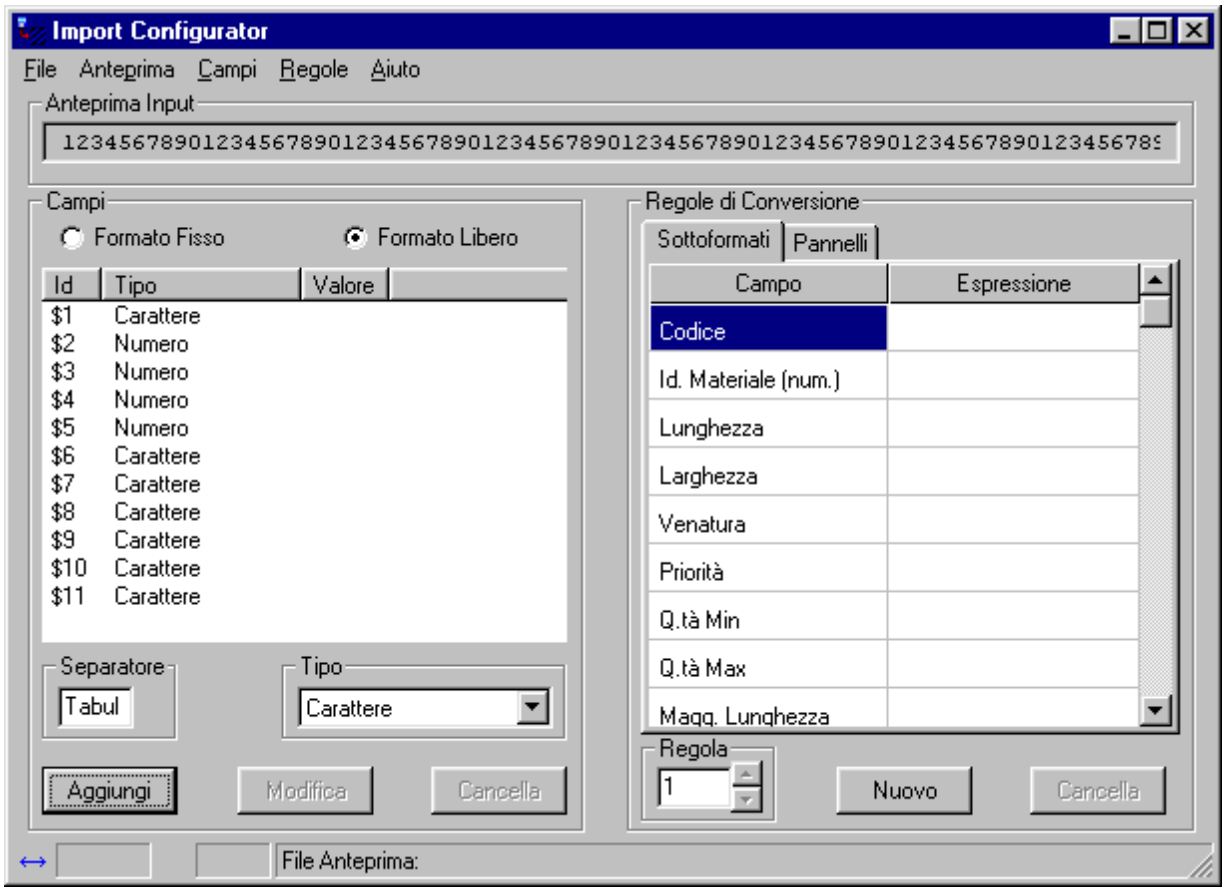


Figure 6.15

Once the fields which must be recognised have been defined, OptiPlanning must be told where to enter the values read and which transformations, if any, must be made before creating a new object. For this purpose the table contained in the *Conversion rules* box is used. The left hand column shows all the data (fields) stored by OptiPlanning for each part, while the "Expression" column allows the values read to be assigned to them.
Going back to our desk example, the part description must be entered in field *I Description*. To do this we just type in $1 (which represents the description read by the *file*) in the column beside *I Description*. We carry on in the same way for the other values. Some fields do however require special treatment: for example, the measurements of a part must be expressed in tenths of a millimetre (the unit used internally by OptiPlanning). If the measurements are in millimetres, they must be converted (NB: for measurements in inches, the conversion is automatic). In this example the conversion is simple: just multiply the values read by 10. This is done by entering the expressions 10*$2 and 10*$3 respectively in the columns next to "Length" and "Width" (see Figure 6.16).

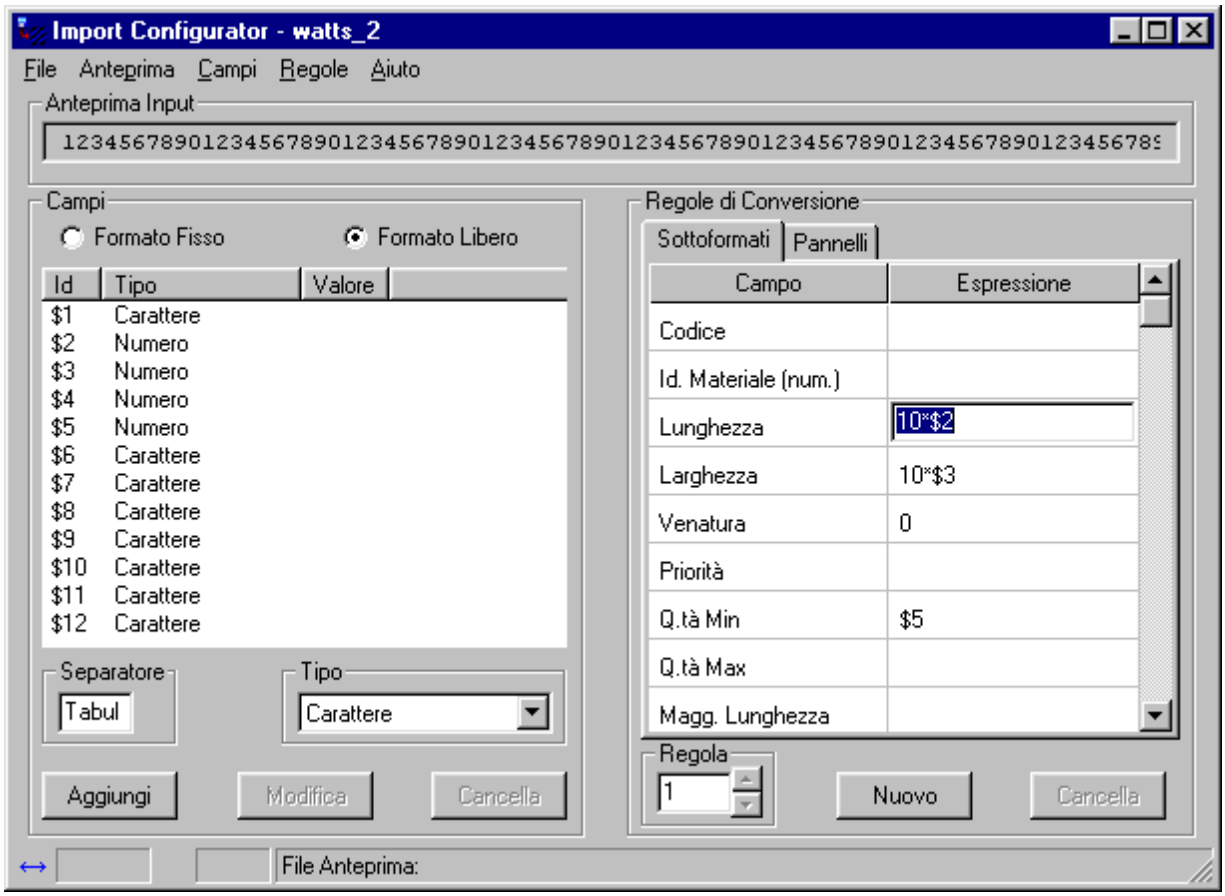


Figure 6.16

In general, complex expressions can be entered in the *Expression* column which, in the case of numerical fields, can contain constants, variables (e.g. $2), signs for addition '+', subtraction '-', multiplication '*' and division '/' and brackets with the usual algebraic meaning. In fields made up of characters, it is possible to enter constants (fixed texts) and variables. To obtain the "$" character, it must be preceded by "\". Furthermore, if two variables are put side by side in a field (e.g. $6$7), the two strings will be chained together so as to create descriptions made up of data read in different fields.
In some cases the *file* does not contain all the data (e.g. the "Grain" and "Priority" fields) needed to create a part. OptiPlanning in these cases uses predefined values. If the outcome is not what is required, constant values can be entered, as can be seen in the *Grain* field in the example.
NB: for the grain, zero stands for "No Grain " while 1 stands for "Grain yes".
By clicking on "Boards" inside the "Conversion rules" window, the rules for reading the panels can be entered in exactly the same way.
After saving the file created with the simple operations described above, the data can be imported as described previously.

6.5 ADVANCED FUNCTIONS FOR ENTERING DATA IN OPTIPLANNING

At the beginning of the previous paragraph, we mentioned the possibility of using the constants contained in the first rows (header) of the data *file*. This is another operation made simpler with OptiPlanning. By selecting *Parts file header* from the *Field* menu on the *Import Editor* page, a window appears (see Fig.6.17) with which it is possible to define the structure of the header in a similar way to the rows containing the parts.

Figure 6.17

For the header, we proceed row by row, indicating the fields to be read and in which "Macro" their value is to be saved. The macros are the "variables" used for reading the header data. The *macros*, just like "normal" variables, store (memorise) a value. The main difference between a macro and a variable lies in the fact that the value of the macro is determined while reading the header, after which it can no longer be modified; while the value of the variables changes each time a row referring to a part or panel has been read.
The box at the top left shows the number of the header line which is being described. The arrows next to the text field can be used to move to the next row, or back to the previous one. OptiPlanning presumes that the header is made up of as many different rows as those defined (after which the remaining rows are processed normally, as described in the previous paragraphs).
Like the data rows, the header can be of free or fixed format. In the former case (see Figure 6.17) a character to separate the fields must be specified, while in the second case (see Figure 6.18) the dimensions of each field need to be specified.

Figure 6.18

Returning to the DESK2.TXT file example (in free format), from the first row we have to extract the fields code (the second) and the customer (the eighth) with which the macros of the CODE and CUSTOMER names will be associated respectively, as in Figure 6.19. As can be seen, all the fields of the first row have been defined as characters.

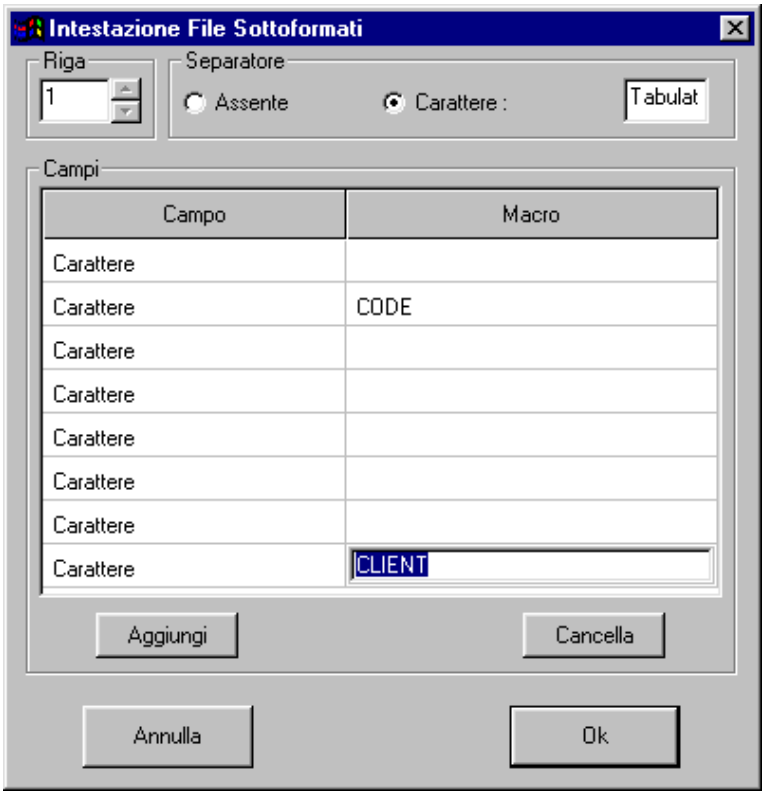


Figure 6.19

Finding the value for the DESCRIPTION macro from the second row by the same process, we reach the third row, which is empty. As it is not possible to leave the definition of a row in the header void, a “fictitious” macro must be used (see Fig.6.20) in order to be able to define the remaining rows.

Figure 6.20

After defining the last row of the header (Fig.6.21), the macro values can be used in the expressions of the parts fields in the same way as the variables (see Figure 6.22).

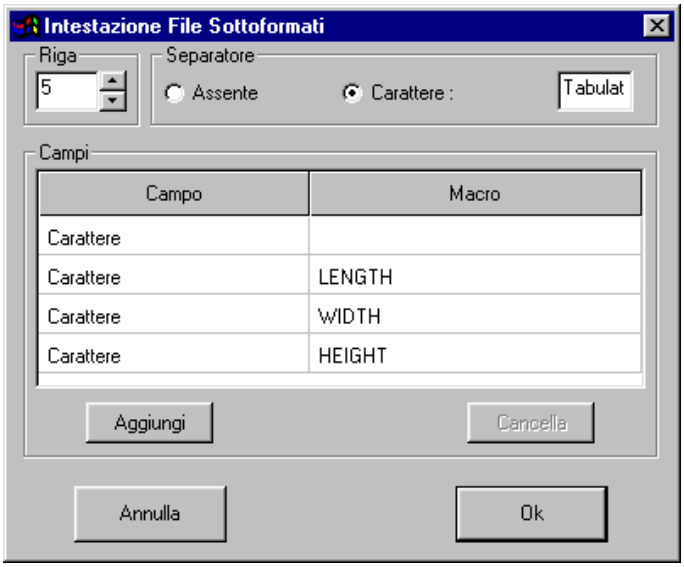


Figure 6.21

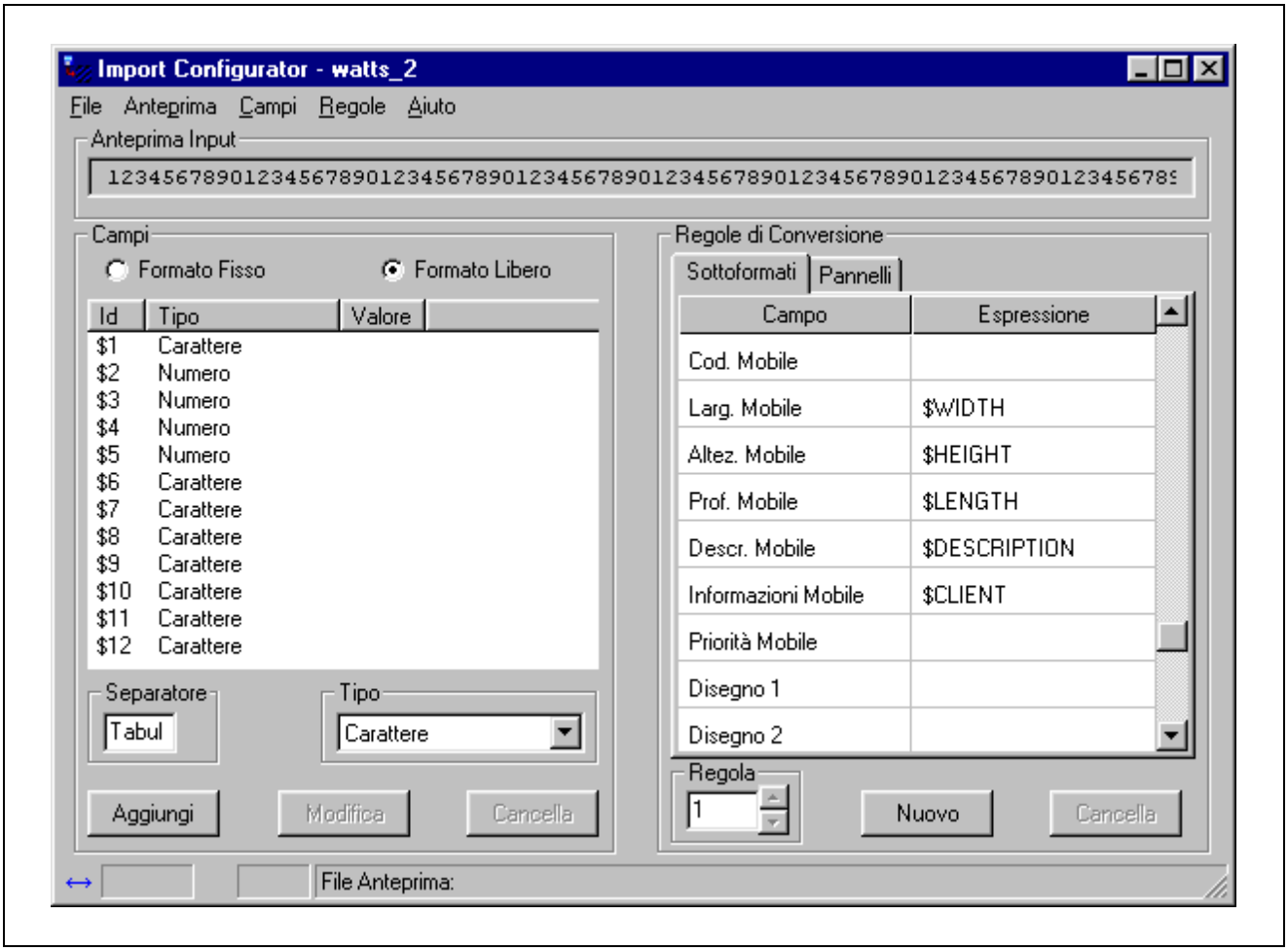


Figure 6.22

The instructions file we have just created solves the problem of entering data contained in DESK2.TXT: OptiPlanning does not generate error messages, all the data are entered in the correct position and a worklist is created automatically. By looking more closely at the result, we can see that the three parts end up in the same worklist because they have the same material code. This may seem correct, but the third part has a thickness of 18mm which is different from the ones that precede it (25mm). Evidently the program that has created DESK2.TXT and OptiPlanning process the material code differently. In the first program, all the boards in grey fibreboard have the same material code (F/GREY). OptiPlanning, on the other hand, uses one material code for all the panels of the same material and thickness, in other words it does not consider 25mm thick panels in grey fibreboard the same as those which are 18mm thick!
Here too, the solution is simple: since DESK2.TXT contains both the material code and the thickness, all we need to do is enter the expression $6+"/"+$4 in the column by the side of "Material code": the material code of the parts will be F/GREY/25 for the first two and F/GREY/18 for the rest. This "trick" can be used by those with version 1.05 or later; however, those with earlier versions can also obtain the same result by making use of the "discriminators" and the possibility of defining different conversion rules.

A discriminator field contains a series of characters which must be present in the row if it is to be recognised and used. OptiPlanning, in fact, processes the rows, checking that:

- all the fields defined are present;
- each field contains data which is consistent with the definition;
- the value of the discriminators is the same as that of the definition.

If the check is positive, OptiPlanning generates a new object (part or panel), entering the values of the expressions in the fields indicated. All this information (checks to be made, expressions to evaluate and fields to modify with the values obtained) constitute conversion rules.
If the check proves negative, OptiPlanning considers the next rule and repeats the check. If all the conversion rules have been used, OptiPlanning ignores the row.
Going back to the example contained in DESK2.TXT, the F/GREY/25 material code must be assigned when the sixth field contains "F/GREY" and the fourth "25". To do this, just write "F/GREY/25" in the column next to *Material* and transform fields 6 and 4 into discriminators (see Figure 6.23). With this modification, the first two parts (rows 10 and 11 of Fig.6.10) will be read correctly, while the third cannot be recognised because the fourth field of its description contains "18" instead of "25". To convert this last part too, a new conversion rule is defined by clicking on the *New* button inside the *Conversion rules* box. The new rule will be identical to the previous one, except for the presence of the value "18" as the first discriminator field and the expression "F/GREY/18" at the side of the *Material code* column (see Fig.6.24).

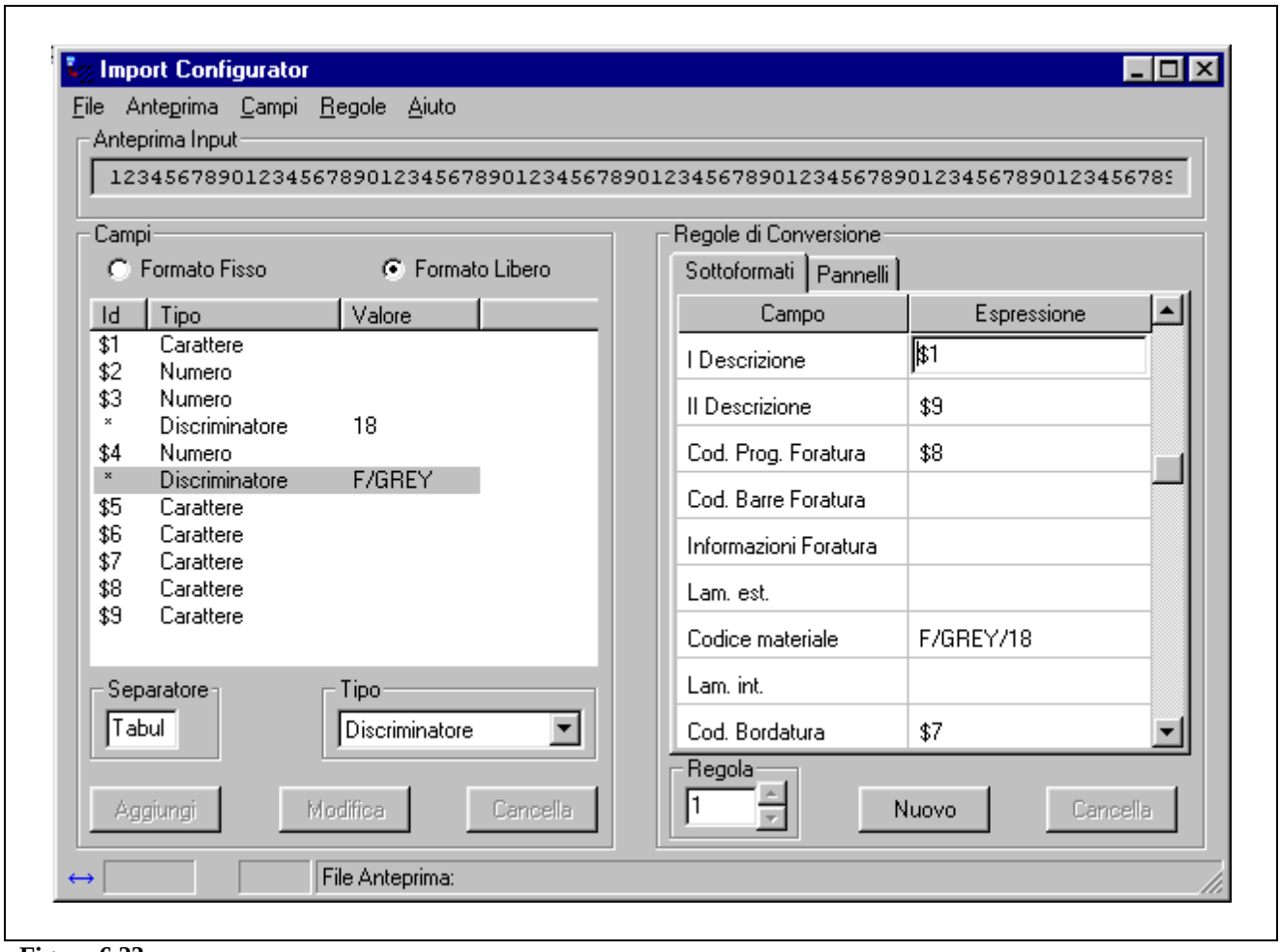


Figure 6.23

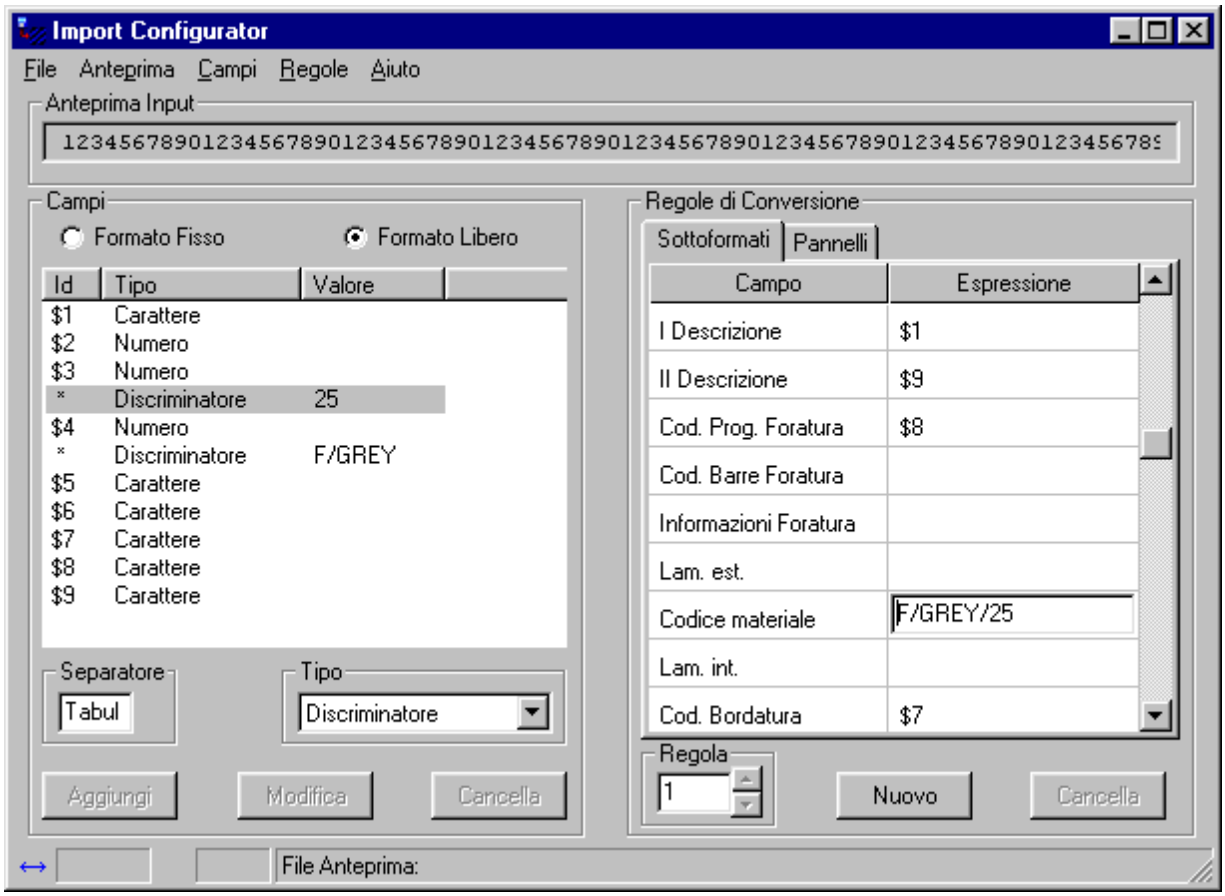


Figure 6.24

The procedure for modifying / entering a discriminator depends on the format which the fields in the rows that contain the data are structured with. If the format is free, all it takes is a "*double click*" on it: a window appears in which the value can be defined. If the format is fixed, the operation is different. First of all, we need to highlight a row with the data to be read in the *Input preview* box. This can be done by clicking on *Select File* in the *Preview* menu. If the file selected is the right one, the first row containing the data to be imported will appear in the *Input preview* box. After using the "up arrow" or "down arrow" to move to the row containing the discriminator, the contents of the discriminator will be automatically linked to what is shown in the box: each change in length of the previous fields has immediate effect on its value. This seemingly complex procedure is instead very useful when dealing with fields of fixed length, because it allows the fields to be defined in an interactive manner.

By analysing what is outlined above, it can be seen that in *Input preview* the data files to be imported can be displayed row by row. This is also true of files in free format.

- Troubleshooting for errors visualised while carrying out an import

To understand the cause of errors, it may be useful to click on the *Details* heading in Figure 6.6 and to examine the contents of the window that opens. DESK2.TXT could look like this:

```
>>> Reading Conversion Rules ...

<<< Conversion Rules Reading is finished !

>>> Reading Parts ...
1> part request is nil.

2> error
TOPS    F/GREY
        #
3> error
ENDS/BACK     F/GREY

            #
4> error
Part      Length   Width    Thickness          QuantityMaterial Edging Detail      Colour   thkn
             #
8> error

 #
9> part request is nil.
10> part request is nil.
11> error

<<< Parts Reading is finished !
```

Figure 6.25

The first three rows show that the conversion rules have been read correctly. From the fourth row onwards, the DESK2.TXT file is analysed. The symbol "1>" shows that there is an error in the first row of the file. In fact, as the sixth row of DESK2.TXT contains empty fields (NB: the first five rows make up the header), OptiPlanning shows that the part request is nil. There is an error in the next row too: OptiPlanning expects a number (the length of the part) in the second field, but finds "F/GREY". In this case, OptiPlanning shows the "offending" row and prints the character '#' in the field that does not comply with the conversion rules.
By looking at what happens in the rows where data are entered automatically, it is easy to see which field was responsible for the error.

NB: the same screen display shown in Figure 6.25 can be obtained by starting from the page shown in Figure 6.8 and positioning the mouse in the area with the text "Data read successfully" and clicking on the right mouse button. In this way it is possible to analyse the result of the import before generating the worklist automatically.

Chapter 7

PARAMETERS

7.1 INTRODUCTION

The parameters inform the OptiPlanning software about the characteristics that an optimised cutting list must have. These characteristics are divided into two groups: optimisation and machine characteristics. The former control the operation of the mechanism (also known as algorithm) which creates the cutting pattern, while the latter describe the panel saw that will execute the cutting patterns. To obtain satisfactory results, it is of fundamental importance to understand and set these parameters correctly.

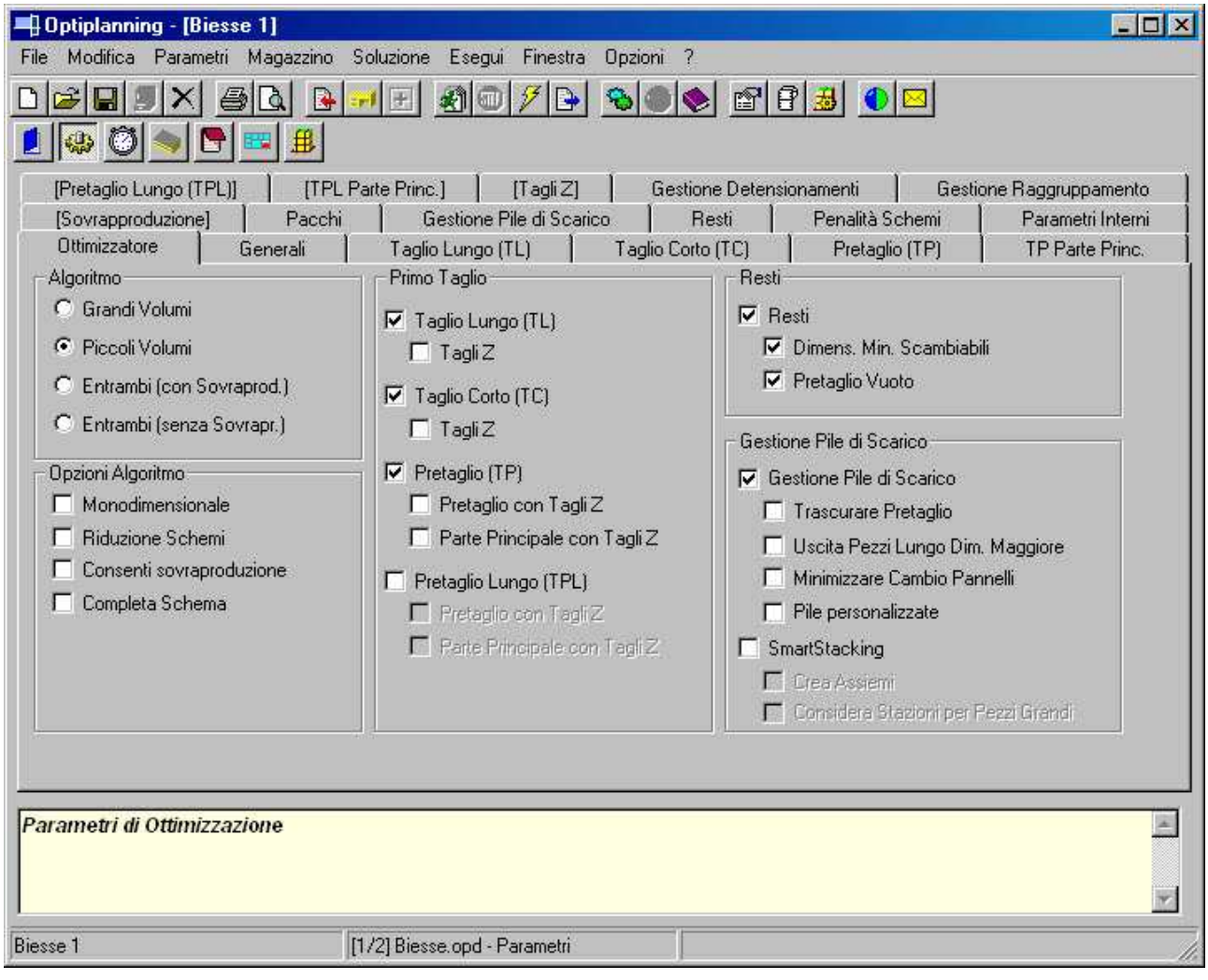


Figure 7.1

7.2 OPTIMISATION PARAMETERS

The button (*Parameters*) on the specific job toolbar (second from left) gives access to the various optimisation parameters that are available with OptiPlanning. Once *Parameters* has been selected, it is possible to open a series of sections that divide the different optimisation parameters into a host of logical groups. For each parameter, a detailed description is visualised in the lower part of the page when the parameter itself is selected. What follows is a detailed description of all of these sections.

1. Optimiser

The *Optimiser* page is the most important. From this page it is possible to select the optimisation algorithm and the type of pattern, and also to enable the management of remainders and stacking piles.

The *First Cut* box allows the selection of the types of pattern that are to be created. *Long Cut* patterns (see Figure 7.2) are formed of rip cut strips (lengthways along the panel) and for these patterns the first cut is made along the panel length. *Short Cut* patterns (see Figure 7.3) are formed by cross cut strips (along the width of the panel) and for these patterns the first cut is made across the panel width. Patterns with head cuts (see Figure 7.4) are formed by two parts: the first (*Head Cut*) has cross cut strips that are machined in the same way as the strips which form a short cut; the second *(Main Part*) has rip cut strips that are machined in the same way as the strips which form a long cut.

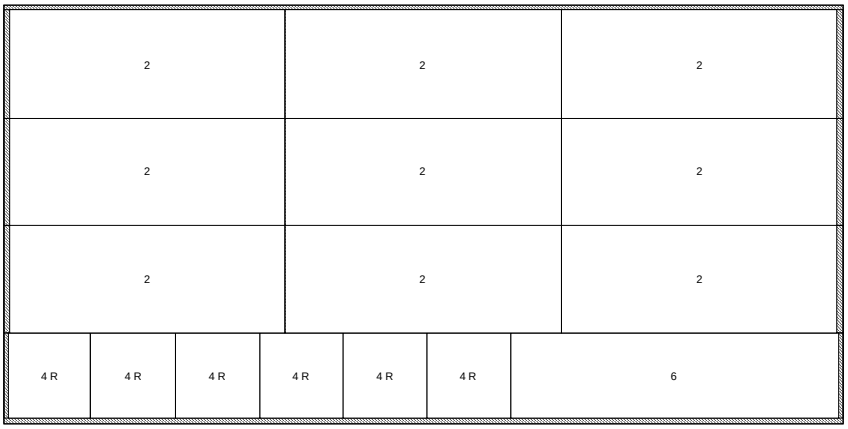


Figure 7.2– Example of a pattern with *Long Cut*

OptiPlanning can also create patterns with a *Long Head Cut*, where the head cut part is formed by rip cut strips and the main part by cross cut strips.

For each type of pattern it is possible to enable *Z-cuts;* that is, to introduce one or more workpiece rotations with subsequent additional cuts to produce finished pieces (see Figures 7.3 and 7.4). This possibility reduces waste although it increases the complexity of the cutting patterns and, as a result, machining times.

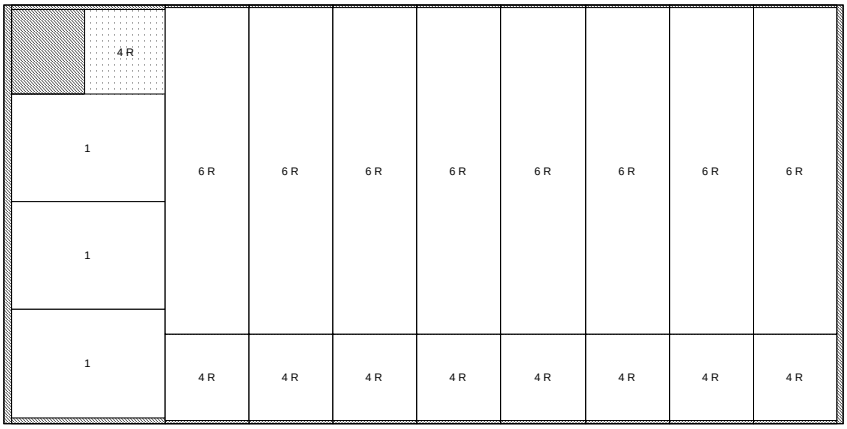


Figure 7.3– Example of a pattern with *Short Cut* and *Z-cut*

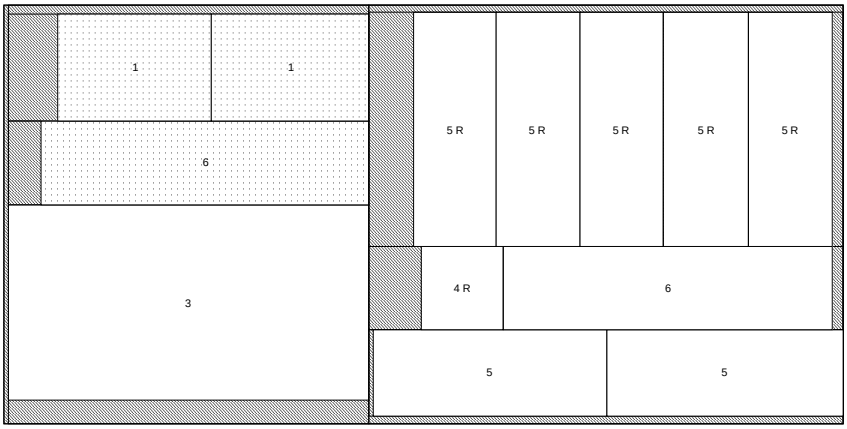


Figure 7.4– Example of a pattern with *Head Cut* and *Z-cuts*

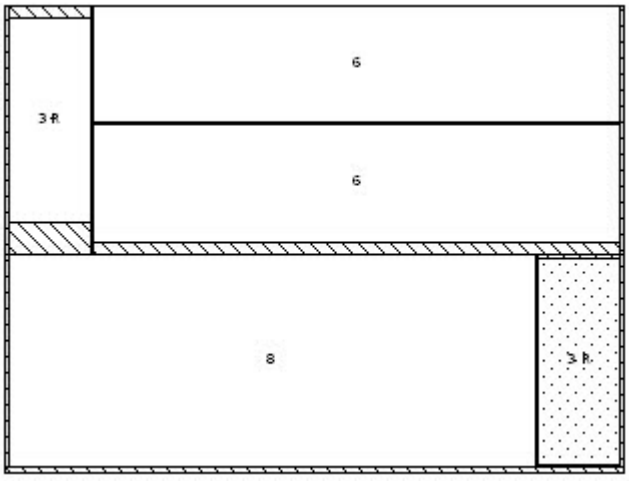


Figure 7.5– Example of a pattern with *Long Head Cut* and *Z-cuts*

Also in the *Optimixer* page is the *Algorithm* box, which shows the possible choices for optimisation algorithms. The item *High Volumes* enables an algorithm that is suited to large production volumes (unit requirements of more than 30 - 40 pieces for each different measurement),

where it is possible to reduce waste by producing more pieces than those required. The item *Low Volumes* selects an algorithm that is suited to small production volumes (unit requirements of less than ten or so pieces for each different measurement), in which it is necessary to produce the exact number of pieces indicated. For the remaining lists, characterised by pieces where the unit requirements vary between a few pieces and a few hundred pieces, it is possible to obtain satisfactory results by selecting the item *Both (with Overproduction)* if overproduction is allowed, or the item *Both (without Overproduction)* if it is not possible to produce more pieces than those required.

Users may also enable specialist algorithms. The item *Mono-dimensional* selects the algorithm for bars. A bar is formed by a piece that is as large or as wide as a panel. In the former case, only patterns with long cuts (in the First Cut box) will be created, while in the latter, the patterns will only include short cuts (in the First Cut box) (see Figure 7.5). When the *Mono-dimensional* option is selected, OptiPlanning disables Z- cuts and patterns with head cuts. Furthermore, before saving the list, it checks that the entered measurements for the pieces are compatible with those of the panels.

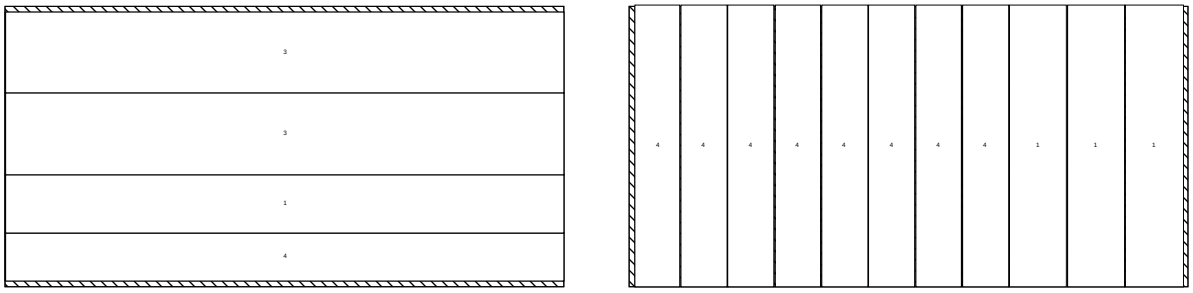


Figure 7.5– Bar patterns with *Long Cut* (left) and *Short Cut* (right)

When the *Pattern Reducing* option is enabled, the algorithms give priority to a reduction in the number of patterns (and therefore in cutting times) rather than to a reduction in waste.

The *Overproduction Reducing* option acts on overproduction, while if the *Fast Optimisation* option is enabled, the algorithms reduce optimisation times and adapt internal mechanisms to the speed of the computer. Optimisation algorithms are being developed on a continuous basis and, for this reason, it is possible that future releases of OptiPlanning will introduce further options.

In the *Drops* box, the user can enable remainders management. In this case, when OptiPlanning creates a pattern with an offcut that is sufficiently large for re-use, it will mark this piece as a remainder and make it available for further optimisation when the list is machined. If the material has no grain, it is useful to enable the *Min. Exchangeable Sizes* option, as this can reduce the minimum requirements of a remainder and thereby increase the possibility to create reusable offcuts. In this case, the values given for the parameters *Minimum Length* and *Minimum Width* for a remainder may be exchanged in order to increase the number of reusable offcuts (see *Optimisation Parameters – Drops* section). The option *Head Cut w/o Parts* allows the recovery of the offcuts produced from several strips in a pattern with a long cut, by creating a head cut without parts (see Figure 7.6). This option should only be enabled if you are certain that the panel saw is able to make cuts of this type.

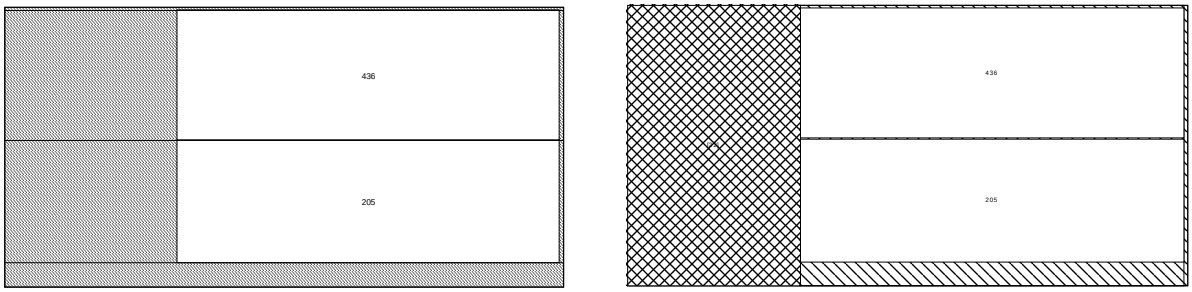


Figure 7.6 – Example of how to use a pattern with *Head Cut w/o Parts*

The *Stacking Pile Management* box enables the management of stacking stations. The number of piles that can be stacked is the number of finished pieces of a certain size where production has been started but remains to be completed. This value varies as the machine passes from one cutting pattern to another. Due to stacking problems (especially for high volumes), this value must often be limited (usually it will be < 10). This limit greatly influences the overall solution (increase in waste, increase in the material required to produce the optimisation required and variations in the number/complexity of the cutting patterns). If the number of stacking stations is limited, OptiPlanning is able to create a solution that will not require more stations than are actually available. This condition often forces OptiPlanning to considerably increase offcuts. If this condition is not acceptable, it is advisable to enable the *Pattern Reducing* option and modify the parameters of the patterns by restricting the maximum number of parts and/or strips allowed in the same pattern. If head cuts are cut separately from the respective main parts, the pieces they contain may be ignored since they finish in a separate stacking area. The option *Avoid Head Cuts* is used to enable this latter function, which reduces the offcuts in a solution according to the number of stacking stations available. The management function *Outfeed of Pieces along their Largest Part* allows the pieces to emerge from the panel saw with their longest side perpendicular to the cutting line. To define a tolerance for identifying the longest side, refer to the parameter *Longer Side Tolerance for Piece Outfeed Management* in the *Stacking Pile Management* area.
If the cutting list contains at least two different panel measurements, the option *Minimise Panel Changes* allows you to generate a solution that minimises the panel format changes. In other words, when observing the sequence of the patterns produced (starting from pattern no.1 and continuing until the last one), if you begin with a certain panel format and then move on to a second format, no pattern using the first format will subsequently appear. The selection of the *SmartStacking* option allows you to optimise the list, determining a customised stacking solution via the program of the same name. By enabling the *Create Assemblies* option, you can create patterns formed of "blocks" of pieces (Assemblies) with the same structure as the stacking layout. The assemblies will be created for all parts for which a *Stacking Layout* with "square brackets" has been indicated. Example: [2 x 2].
If you have stacking stations of different sizes, and the cutting list contains several "large" pieces that can only be stacked in a limited number of stations, it is possible to generate a solution with a sequence of outfeed pieces that takes this additional restraint into account: enable the *Consider Stations for Large Pieces* option. The dimensions of the stacking stations are defined in the "SmartStacking" program.

The *Parameters* button opens further pages that contain the optimisation parameters subdivided into homogeneous groups that can only be displayed if several options on the *Optimiser* page have been enabled.

2. Long Cut

The *Long Cut (LC)* page, which is displayed only if the corresponding patterns have been enabled, contains the dimensional limit parameters of this type of pattern. In this paragraph, "length" is taken to mean the dimension that is parallel to the length of the panel, while "height" is taken to mean the dimension parallel to the width of the panel.

- *Minimum Part Length*
  This parameter forces the optimiser to create strips with pieces that are longer than the entered value. If this value is high, the cutting list may display an error during optimisation as some pieces may not be produced.
- *Maximum Part Length*
  This parameter forces the optimiser to create strips with pieces that are shorter than the entered value. If this value is low, the cutting list may display an error during optimisation as some pieces may not be produced.
- *Minimum Length of Last Part*
  This parameter forces the optimiser to create strips with at least one part (the last) that is longer than the entered value. If this latter is very high, there may be no solution or there may be an excessive offcut. In this way it is possible to manage the mechanical limits of the panel saw that are linked to the minimum size of the penultimate cut.
- *Minimum Strip Height*
  This parameter forces the optimiser to create strips with a greater height than the entered value. If this value is very high, the solution may not exist.
- *Maximum Strip Height*
  This parameter forces the optimiser to create strips with a lower height than the entered value. If this value is very low, the solution may not exist.
- *Minimum Height of Last Strip*
  This parameter forces the optimiser to create at least one strip (the last) that is larger than the entered value. If this latter is very high, there may be no solution or there may be an excessive offcut. In this way it is possible to manage the mechanical limits of the panel saw that are linked to the minimum size of the penultimate cut.
- *Maximum Number of Different Parts per Strip*
  This parameter indicates the maximum number of different-sized pieces that can form a strip. When stacking pile management is enabled, it is advisable to reduce this value in order to create simpler patterns, even if the offcut is larger.
- *Maximum Number of Parts per Strip*
  This parameter indicates the maximum number of pieces (that is, cross cuts) that can form a strip. When this value is reduced, the offcut and/or overproduction will increase but there will also be a reduction in cross cutting times for the pattern.
- *Maximum Number of Different Strips*
  Two strips are different if they contain different cross cuts and/or if they are of different sizes. This parameter indicates the maximum number of different strips that can form a pattern. When this value is reduced, the offcut and/or overproduction will increase, but there will also be a reduction in cutting times. For angular systems, this parameter is often set at two / three to increase the possibility to use the deposit area and to maintain adequate panel saw productivity.

- *Maximum Number of Strips*
  This parameter indicates the maximum number of strips (that is, rip cuts) that can form a pattern. When this value is reduced, the offcut and/or overproduction will increase but there will also be a reduction in cutting times for the pattern.
- *Maximum Number of Groups of Strips*
  This parameter indicates the maximum number of groups of strips (that is, of one or more strips with the same cross cuts) that can form a pattern. When this value is reduced, the offcut and/or overproduction will increase but there will also be a reduction in cutting times. Since the panel saw makes all cross cuts for a group of strips at the same time, cutting time should be reduced mainly using this parameter (reducing it).
- *Minimum Height of Groups of Strips*
  This parameter influences the minimum dimension of a group of strips. Its efficiency depends upon piece dimensions. If the pieces are small, it is possible to use the value of this parameter to force the optimiser to group together narrow strips, even if this will lead to an increase in offcuts or overproduction.
- *Maximum Height of Groups of Strips*
  This parameter influences the maximum dimension of a group of strips. If the pieces are very high, it is possible to use the value of this parameter (reducing it) to create groups with a single strip and thus to force the optimiser to leave enough space for other groups. This may cause an increase in offcuts and/or overproduction.

For further clarification with regard to pattern nomenclature, see the pattern shown in Figure 7.7. This pattern contains three groups of strips that have been placed in increasing order according to height (from low to high). The first group is formed by a strip A, which contains three pieces of different types (2, 5 and 7). The second group is formed by a strip B, which contains three pieces of different types (21, 22 and 25). The third group is formed by two different strips (C – D) and contains two pieces of different types per strip (strip C: pieces 52 and 53; strip D: pieces 32 and 33).

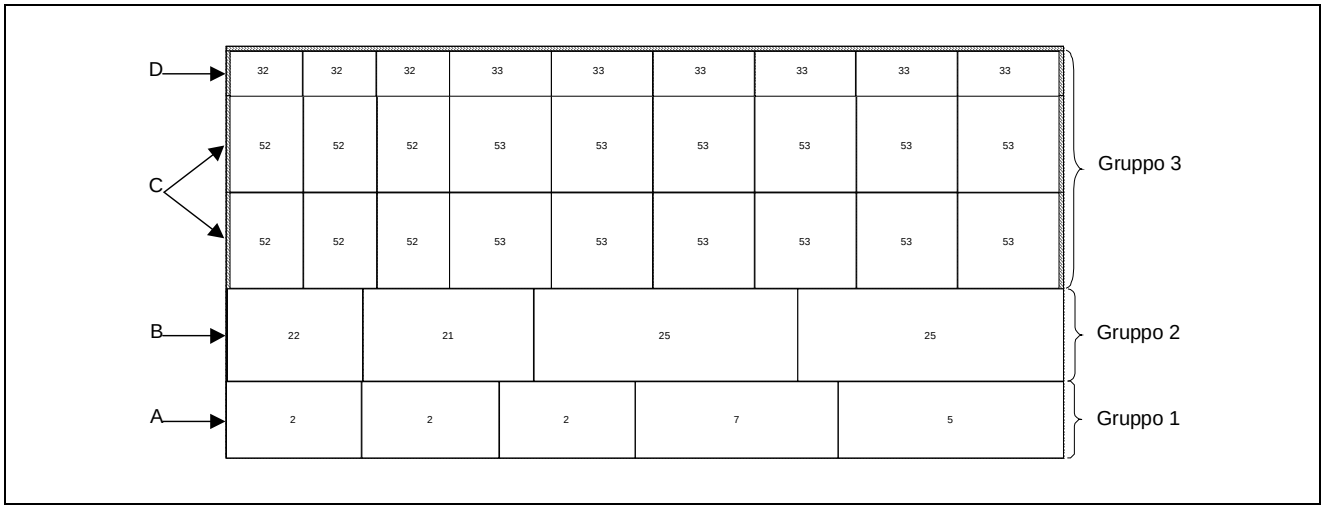


Figure 7.7

3. Short Cut

The *Short Cut (SC)* page, which is only displayed if patterns with a short cut have been enabled, contains the parameters that describe the dimensional limits of this type of pattern. In this paragraph, "width" is taken to mean the dimension that is parallel to the length of the panel, while "height" is taken to mean the dimension that is parallel to the width of the panel.

- *Minimum Part Height*
  This parameter forces the optimiser to create strips with pieces of a greater height than the entered value. If this value is high, the cutting list may display an error during optimisation as some pieces may not be produced.
- *Maximum Part Height*
  This parameter forces the optimiser to create strips with pieces of a lower height than the entered value. If this value is low, the cutting list may display an error during optimisation as some pieces may not be produced.
- *Minimum Height of Last Part*
  This parameter forces the optimiser to create strips with at least one part (the last) that is higher than the entered value. If this latter is very high, there may be no solution or there may be an excessive offcut. In this way it is possible to manage the mechanical limits of the panel saw that are linked to the minimum size of the penultimate cut.
- *Minimum Strip Height*
  This parameter forces the optimiser to create strips with a greater height than the entered value. If this value is very high, the solution may not exist.
- *Maximum Strip Width*
  This parameter forces the optimiser to create strips with a lower width than the entered value. If this value is very low, the solution may not exist.
- *Minimum Width of Last Strip*
  This parameter forces the optimiser to create at least one strip (the last) with a width that is greater than the entered value. If this latter is very high, there may be no solution or there may be an excessive offcut. In this way it is possible to manage the mechanical limits of the panel saw that are linked to the minimum size of the penultimate cut.
- *Maximum Number of Different Parts per Strip*
  This parameter indicates the maximum number of different-sized pieces that can form a strip. When stacking pile management is enabled, it is advisable to reduce this value in order to create simpler patterns, even if the offcut is larger.
- *Maximum Number of Parts per Strip*
  This parameter indicates the maximum number of pieces (that is, cuts) that can form a strip. When this value is reduced, the offcut and/or overproduction will increase but there will also be a reduction in cutting times for the pattern.
- *Maximum Number of Different Strips*
  Two strips are different if they contain different cross cuts and/or if they are of different sizes. This parameter indicates the maximum number of different strips that can form a pattern. When this value is reduced, the offcut and/or overproduction will increase but there will also be a reduction in cutting times. For angular systems, this parameter is often set at two / three to increase the possibility to use the deposit area and to maintain adequate panel saw productivity.

- *Maximum Number of Strips*
  This parameter indicates the maximum number of strips (that is, cuts) that can form a pattern. When this value is reduced, the offcut and/or overproduction will increase but there will also be a reduction in cutting times for the pattern.
- *Maximum Number of Groups of Strips*
  This parameter indicates the maximum number of groups of strips (that is, of one or more strips with the same cross cuts) that can form a pattern. When this value is reduced, the offcut and/or overproduction will increase but there will also be a reduction in cutting times. Since the panel saw makes all cross cuts for a group of strips at the same time, cutting time should be reduced mainly using this parameter (reducing it).
- *Minimum Width of Groups of Strips*
  This parameter influences the minimum dimension of a group of strips. Its efficiency depends upon piece dimensions. If the pieces are small, by acting on the parameter value (i.e., reducing this value) it is possible to produce groups with a single strip and therefore to force the optimiser to group together narrow strips, even if this will lead to an increase in offcuts or overproduction.
- *Maximum Width of Groups of Strips*
  This parameter influences the maximum dimension of a group of strips. If the pieces are very long, it is possible to use the value of this parameter to force the optimiser to leave sufficient space for other groups. This may cause an increase in offcuts and/or overproduction.

For further clarification with regard to pattern nomenclature, see the pattern shown in Figure 7.8. This pattern contains three groups of strips that have been placed in increasing order according to length (left to right). The first group is formed by strips containing piece 1. The second group is formed by strips containing piece 4. The third group contains two pieces of different types (23 and 18).

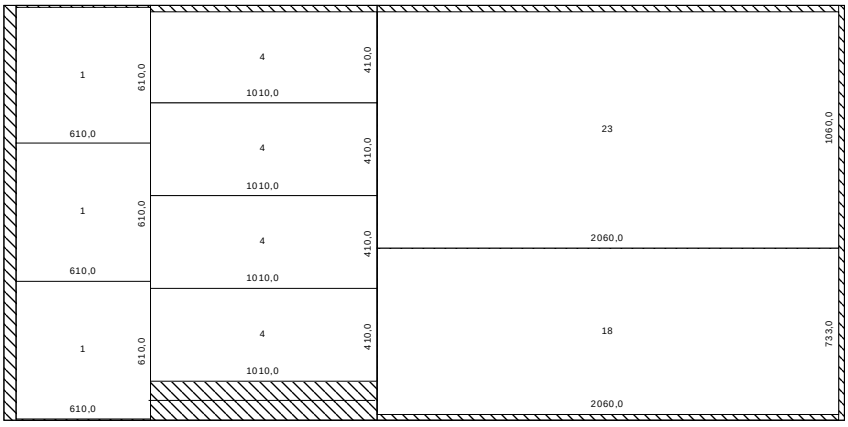


Figure 7.8

Note:

By reducing the value of the parameter *Maximum Width of Groups of Strips* to 2,000.0, the pattern can no longer be created by the optimiser. In this case, pieces 18 and 23 will have to be produced using patterns of a different type. If only patterns with short cuts are enabled, these pieces may no longer be produced with the panel used (which, in this case, is 3,770.0 × 1,860.0). For this reason, it is advisable to modify parameters for minimum and maximum dimensions only in the event of real necessity, such as a structural limit on the panel saw.

4. Head Cut

The *Head Cut (HC)* page, which is displayed only if patterns with head cuts have been enabled, regards the head cut part (*Head Cut*) of a pattern that includes head cuts. It contains the same parameters as those of the patterns with short cuts, plus the following:

- *Maximum Head Cut Length*
  This parameter indicates the maximum dimension of the head cut (see Figure 7.9).
- *Minimum Head Cut Length*
  This parameter indicates the minimum dimension of the head cut (see Figure 7.9).

The remaining parameters on the *Head Cut* page are the same as those on the *Short Cut* page but they are independent and, for this reason, it is possible to enter values that are different from the head cut parameters and from the pattern parameters which include short cuts.

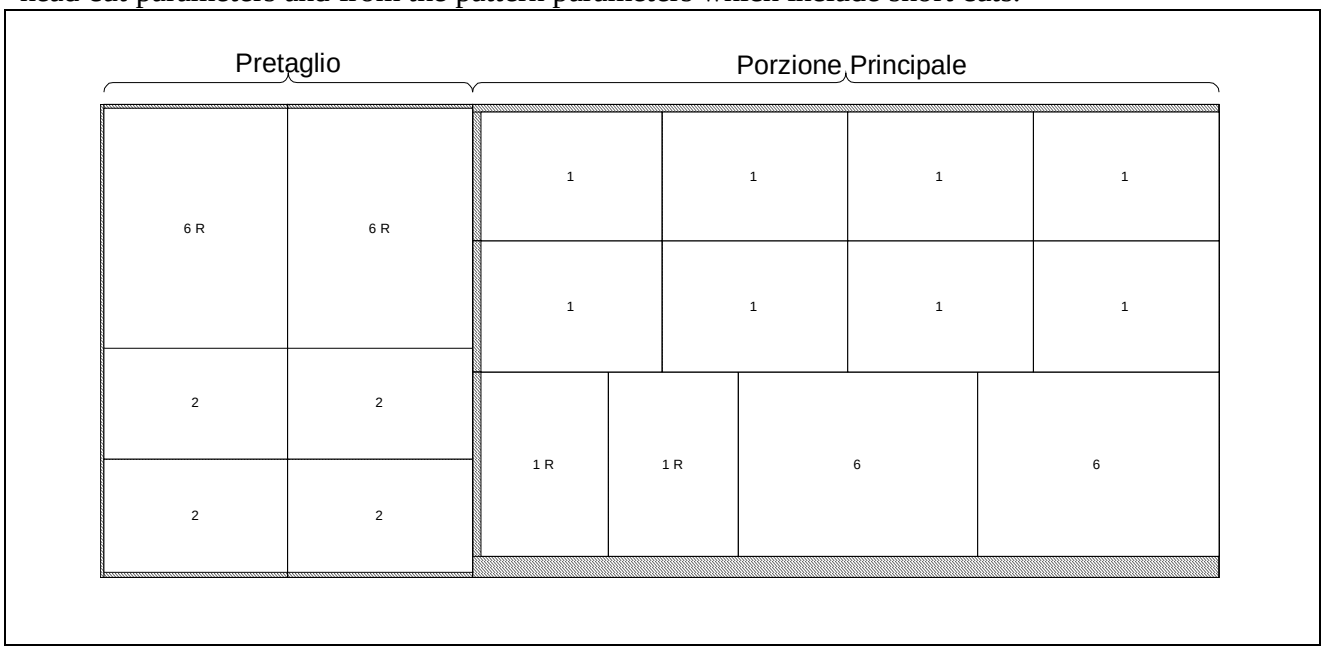


Figure 7.9

5. Main Part

The *Main Part (MP)* page, which is displayed only when patterns with head cuts have been enabled, is used for the main part of a pattern with head cut. It contains the same parameters as those found in patterns with long cuts, plus the following:

- *Minimum Length of Main Part*
  This parameter indicates the minimum dimension of the main part (see Figure 7.9). Note that, given the format of a panel, setting the minimum dimension of the main part is equivalent to limiting the maximum dimension of the head cut.

In the pattern shown in Figure 7.9, the head cut is formed by a group of two strips, while the main part is formed by two groups of strips. A pattern with head cut is different from one with short cuts due to the different machining logic. This machining operation varies with the panel saw model (for further information, refer to the panel saw NC manual), and with the presence of a trim cut whose value is controlled by the *Minimum Head Cut Trim* parameter on the *Blades and Trim Cuts* page (see *Panel Saw Parameters*).

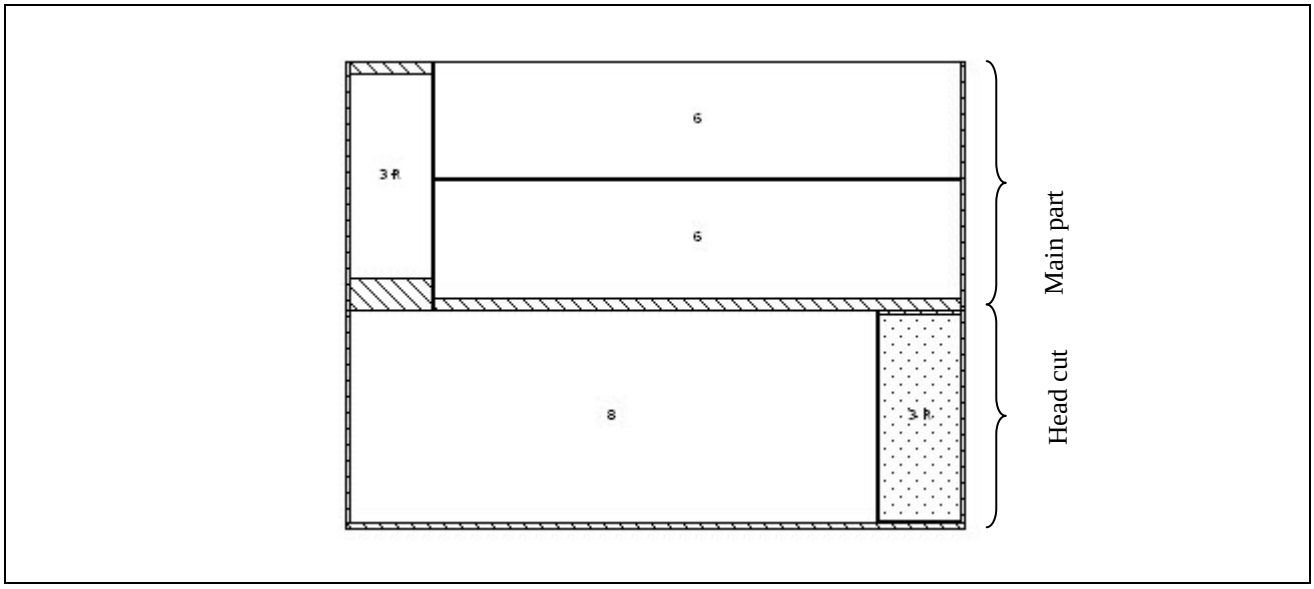


Figure 7.10

6. Long Head Cut

The *Long Head Cut (TPL) page*, which is displayed only if patterns with long head cuts have been enabled, regards the head cut part (*Head Cut*) of a pattern that includes head cuts; it contains the same parameters as those of the patterns with long cuts, plus the following:

- *Maximum Head Cut Height*
  This parameter indicates the maximum dimension of the head cut (see Figure 7.910).
- *Minimum Head Cut Height*
  This parameter indicates the minimum dimension of the head cut (see Figure 7.910).

The remaining parameters on the *Long Head Cut* page are the same as those on the *Long Cut* page but they are independent: it is therefore possible to enter values that are different from the long head cut parameters and from the parameters of patterns which include an initial long cut.

7. Main Part

The *Main Part (TPL) page*, which is displayed only when patterns with long head cuts have been enabled, is used for the main part of a pattern with a long head cut. It contains the same parameters as those of the patterns with short cuts, plus the following:

- *Minimum Height of Main Part*
  This parameter indicates the minimum dimension of the main part. Note that, given the format of a panel, setting the minimum dimension of the main part is equivalent to limiting the maximum dimension of the head cut.

In the pattern shown in figure 7.10, the head cut is formed of a group of one strip, while the main part is formed of two groups of strips. A pattern with a long head cut is different from one with a long cut due to the different machining logic. This machining operation varies with the panel saw model (for further information, refer to the panel saw NC manual), and with the presence of a trim cut whose value is controlled by the *Minimum Head Cut Trim* parameter on the *Blades and Trim Cuts* page (see *Panel Saw Parameters*).

8. Z-cuts

The *Z-cuts* page, which is only opened if Z-cuts have been enabled, contains the parameters relating to cuts obtained through three or more rotations.

A 3rd rotation (or Z1) cut is obtained by rotating and further sizing a piece obtained from a cross cut. Overall, the material must be cut in three distinct stages, which are not simultaneous: rip cut, cross cut and 3rd rotation cut. This type of cut is necessary when, after creating a strip, a part with a lower height than that of the strip is required. However, 3rd rotation cuts cannot modify previously obtained rip or cross cuts. If a piece obtained from a 3rd rotation cut is rotated once more, the cut obtained is a 4th rotation (Z2).

Patterns with more than one rotation generally have less waste but require increased cutting times. The available parameters are:

- *Maximum Number of Rotations*
  This parameter limits the complexity of the patterns (see Figure 7.10). Although the rotations in a pattern may be unlimited, the increased panel sizing costs will, above a certain limit, outweigh the savings in material. For this reason, it is useful to limit the maximum number of rotations. This number is 4 for current panel saws.

- *Minimum Cut Length*
  This parameter ensures that a block with Z-cuts is sufficiently large to be clamped by the grippers. This can be useful to avoid cutting blocks that are too small (see Figure 7.10 – Dimension "A").

- *Maximum Cut Length*
  This parameter allows the exclusion of manual rotations for extremely "cumbersome" blocks (see Figure 7.10 – Dimension "A").

- *Minimum Distance Between Two Cuts*
  This parameter is used to exclude pieces that are narrower than the given value. This can be useful to avoid inserting many pieces for a Z-cut (see Figure 7.10 – Dimension "T").

- *Maximum Distance Between Two Cuts*
  This parameter ensures that a block with Z-cuts does not contain pieces that are higher than the value given. This can be useful to avoid inserting pieces that are handled with difficulty (see Figure 7.10 – Dimension "T").

- *Minimum Distance of Last Cut*
  This parameter avoids the problems that may arise when it is necessary to cut a block that is too small to be firmly clamped by the grippers (see Figure 7.10 – Dimension "U").

- *Maximum Number of Different Cuts per Block*
  This parameter limits the number of different pieces that can be fitted by the optimiser into a Z-cut.

- *Maximum Number of Cuts per Block*
  This parameter limits the total number of pieces present in a Z-cut.

- *Minimum Trim Cut*
  This parameter indicates the minimum size of a trim cut present in a Z-cut (see Figure 7.10).

- *Maximum Trim Cut*
  This parameter indicates the maximum size of a trim cut present in a Z-cut. This can be useful to avoid Z-cuts with excessive offcuts.

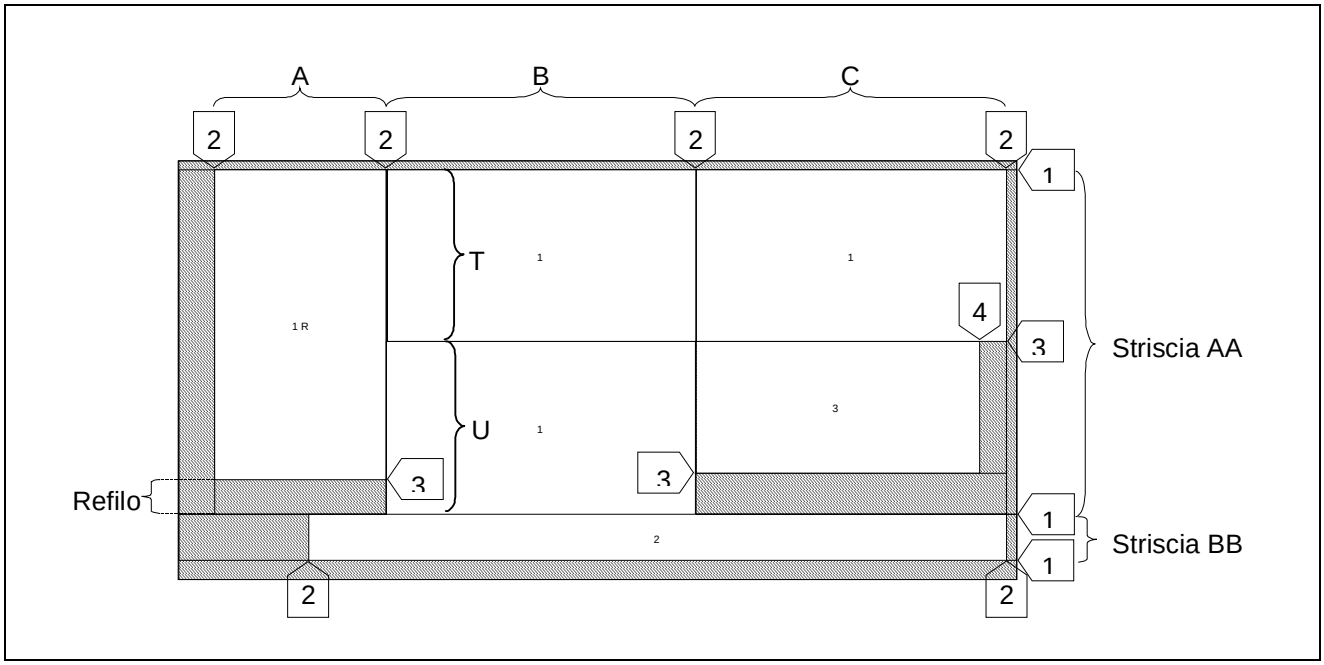


Figure 7.11

The pattern in Figure 7.10 shows a sequence of cuts and rotations. Cuts marked 1 are the first to be made. Subsequently the two strips obtained are rotated and the cuts marked 2 are made. The pieces contained in the strip AA must be further rotated in order to carry out the cuts marked 3 (3rd rotation Z1 cuts). Lastly, the block containing the piece marked 3 must be rotated again in order to carry out the cut marked 4 (4th rotation Z2 cuts). The pattern contains three blocks with Z-cuts. The first (A) is comprised of piece 1 rotated and requires a Z1 trim cut. The second (B) requires a Z1 cut to separate the two type 1 pieces. The third block (C) contains pieces 1 and 3 and has a 4th rotation cut (Z2).

Block C has the maximum number of rotations (four), the maximum number of cuts per block (two) and the maximum number of different cuts per block (two).

9. Overproduction

The *Overproduction* page, which is displayed if an algorithm that can produce more pieces than those required has been chosen, contains the following parameters:

- *Max. Number of Additional Pieces for Each Part*
  This parameter indicates the maximum overproduction (in pieces) allowed for each measure. OptiPlanning tries to create a solution that is compatible with the indicated value. If this value is extremely low however (less than ten), it may occur that some measurements do not respect the parameter. OptiPlanning will only accept parameter values equal to or more than 5.
- *Total Overproduction Quantity (%)*
  This parameter indicates the maximum overproduction (in pieces) allowed for the total number of pieces to be produced. OptiPlanning will only accept parameter values of more than 5%.
- *Total Overproduction Area (%)*

This parameter indicates the maximum overproduction (in area) allowed for the total number of pieces to be produced. OptiPlanning will only accept parameter values of more than 5%.

10. Board Stacks

The *Board Stacks* page contains the stack management parameters; that is, the number of sheets of material that can be cut at the same time. Obviously this number is linked to the thickness of the material (managed in the panel magazine) and to the maximum stack that can be sized in a machining cycle (managed in the *General Parameters* page of the machine).

- *Minimum Number of Boards per Stack*
  This parameter indicates the minimum number of sheets that must be present in a stack. The value of this parameter is usually one. To increase the productivity of the panel saw however, (tolerating an increase in offcuts and/or overproduction), it is possible to increase this value within the limits of the machine. Values of more than one are usually foreseen for thin material (thickness less than eight millimetres).
- *Maximum Number of Boards per Stack*
  This parameter indicates the maximum number of sheets that form a stack. If the parameter is zero, its value is calculated automatically by dividing the maximum thickness that the panel saw can cut (managed in the *General Parameters* page of the machine) by the thickness of the material. A particular case is when the minimum and maximum values are the same, and greater than one. In this case the stack is "forced" to the value given, and this means that patterns will be created with a number of panels that equals or is a multiple of the two parameters.

11. Stacking Pile Management

The *Stacking Pile Management* page, which can be opened if the option of the same name is enabled from the *Optimiser* page, contains the parameters for stacking station management. If these parameters are limited, OptiPlanning can produce a solution that does not require more stations than those indicated. OptiPlanning creates a new pile when production of a new part begins. This pile remains "open" (that is, in use) until the production of the corresponding part is terminated, after which time the pile is "closed" (that is, removed from the stacking area), leaving space for a new pile of a different part. The parameters for stacking pile management are:

- *Maximum Number of Stacks*
  This parameter indicates the maximum number of piles that can be used to stack parts at the same time. The parameter should be equal to the number of stacking stations that are actually available since, if this parameter is reduced, there may be a considerable increase in offcuts for the solution created.
- *Minimum Part Area (m^2)*
  This parameter excludes from stacking pile management those parts which require less area than the set value for production.
- *Minimum Part Quantity*
  This parameter excludes from stacking pile management those parts with lower demand than the set value.

12. Drops

When the *Drops* option is selected from the *Optimiser* page, it is possible to open the Drops page, which contains the parameters regarding this type of management. OptiPlanning considers an

unused portion of a panel, with sufficient requirements to be reused in future machining, as a remainder.

- *Minimum Length for a 1st Choice Drop* (not implemented)
- *Minimum Width for a 1st Choice Drop* (not implemented)
- *Minimum Length for a 2nd Choice Drop* (not implemented)
  (This parameter must be less than the same parameter for 1st choice pieces).
- *Minimum Width for a 2nd Choice Drop* (not implemented)
  (This parameter must be less than the same parameter for 1st choice pieces).
- *Minimum Drop Length.* This parameter defines the minimum length of a reusable offcut or remainder. It must be less than the same parameter for 1st and 2nd choice pieces.
- *Minimum Drop Width.* This parameter defines the minimum width of a reusable offcut or remainder. It must be less than the same parameter for 1st and 2nd choice pieces.
- *Minimum Drop Area*
  This parameter indicates the minimum area that an unused portion must have to be considered a remainder.
- *Drop Value (%)*
  The value of this parameter mainly influences the creation of patterns using the low volumes algorithm. If the residual value of the unused part (expressed as a percentage of the original panel value) is high, OptiPlanning will try to recuperate as much areas as possible, while if it is low, OptiPlanning will tend to use the unused area to produce low priority pieces or remaining pieces, even if this reduces the amount of material recuperated. Therefore, as the value of this parameter increases, as do the remainders produced.

13. Pattern Penalty

The *Pattern Penalty* page contains the parameters that privilege one type of pattern as against another. It is possible to add a "penalty" time for each pattern and this will be added to that calculated by the algorithm. In this way the machining costs for a pattern can be increased, producing a total cost (material costs plus machining costs) that is different from another pattern which thus becomes more convenient. Since the values of these parameters are expressed in seconds, the hourly costs for the panel saw must be exact (see *Time Simulator* page). If this is not the case, the parameters will seem not to have effect. Indeed, the optimiser will use the lower-cost alternative: the time saved with one type of pattern has to balance out the extra material it requires. The available parameters are:

- *Long Cut Pattern Penalty*
  With this parameter a set time (and therefore, a cost) is added to patterns of this type
- *Short Cut Pattern Penalty*
  With this parameter a set time (and therefore, a cost) is added to patterns of this type
- *Head Cut Pattern Penalty*
  With this parameter a set time (and therefore, a cost) is added to patterns of this type
- *Long Head Cut Pattern Penalty*
  With this parameter a set time (and therefore, a cost) is added to patterns of this type

- *Z-cut Pattern Penalty*
  With this parameter a set time (and therefore, a cost) is added to patterns that contain Z-cuts.

14. Inner Parameters

The *Inner Parameters* page contains several parameters that control the optimisation algorithms. Modification of these parameters is recommended only if explicitly recommended by an expert from Biesse. The parameters displayed are:

- *Approximate Job Cost*
  The value displayed is calculated inside the algorithm and cannot be modified.
- *Total Execution Time*
  The value displayed is calculated inside the algorithm and cannot be modified.
- *Run Level*
  The value displayed is calculated inside the algorithm and cannot be modified.
- *Run Level Modification Threshold (HV)*
  This parameter controls the optimisation speed of the algorithms *High Volumes* and *Both* when the *Fast Optimisation* option has been enabled. When the value of this parameter is increased, optimisation times generally increase also.
- *Run Level Modification Threshold (LV)*
  This parameter controls the optimisation speed of the algorithms *Low Volumes* and *Both* when the *Fast Optimisation* option has been enabled. When the value of this parameter is increased, optimisation times generally increase also.
- *Pre-processing Threshold*
  When the list to be optimised has more pieces than the value of this parameter, OptiPlanning will try to reduce execution times by temporarily modifying the list parameters before creating the patterns.
- *Head Cut Creation Threshold*
  When OptiPlanning tries to reduce execution times, it may decide not to create patterns with head cuts. The value of this parameter controls this option.
- *Z-cut Creation Threshold*
  When OptiPlanning tries to reduce execution times, it may decide to create patterns without Z-cuts. The value of this parameter controls this option.
- *Problem Dimension*
  When OptiPlanning tries to reduce execution times, it may temporarily break down the list into several lists. The value of this parameter controls this option.
- *Time for Each Part in Rounds*
  The value of the parameter controls optimisation times when the *Overproduction Reducing* option has been enabled. By increasing the value, the optimisation algorithm has more time to attempt to reduce overproduction.
- *Low Volumes Threshold*
  When the *Both* algorithm has been enabled, the algorithm used to create the patterns is automatically chosen according to demand. Parts with demand that is lower than this parameter will only be optimised with the *Low Volumes* algorithm.

- *Fast Algorithm Threshold (LV)*
  OptiPlanning contains two versions of the *Low Volumes* algorithm: one which is faster and another which is more precise (but slower). When the number of pieces is higher than this parameter, OptiPlanning will use the fast algorithm.
- *Delta Solution: one part out of 10,000,000*
  This parameter serves to reduce execution times when the *High Volumes* algorithm has been enabled. Generally, reducing the value of the parameter leads to a reduction in optimisation times but the created solution may not be as good.
- *Post-Optimisation Patterns*
  When the *Low Volumes* algorithm is enabled, this parameter allows waste to be further reduced, even if the solution may violate some limits.

7.3 MACHINE PARAMETERS

The button (*Panel Saw*) on the specific job toolbar (third from the left), gives access to the numerous machine parameters that OptiPlanning makes available. The machine parameters describe the panel saw being used and in this way, allow OptiPlanning to calculate exact machining times when processing solutions. Once the *Panel Saw* button has been selected, it is possible to open a series of sections that divide the different machine parameters into a host of logical groups. What follows is a detailed description of all of these sections.

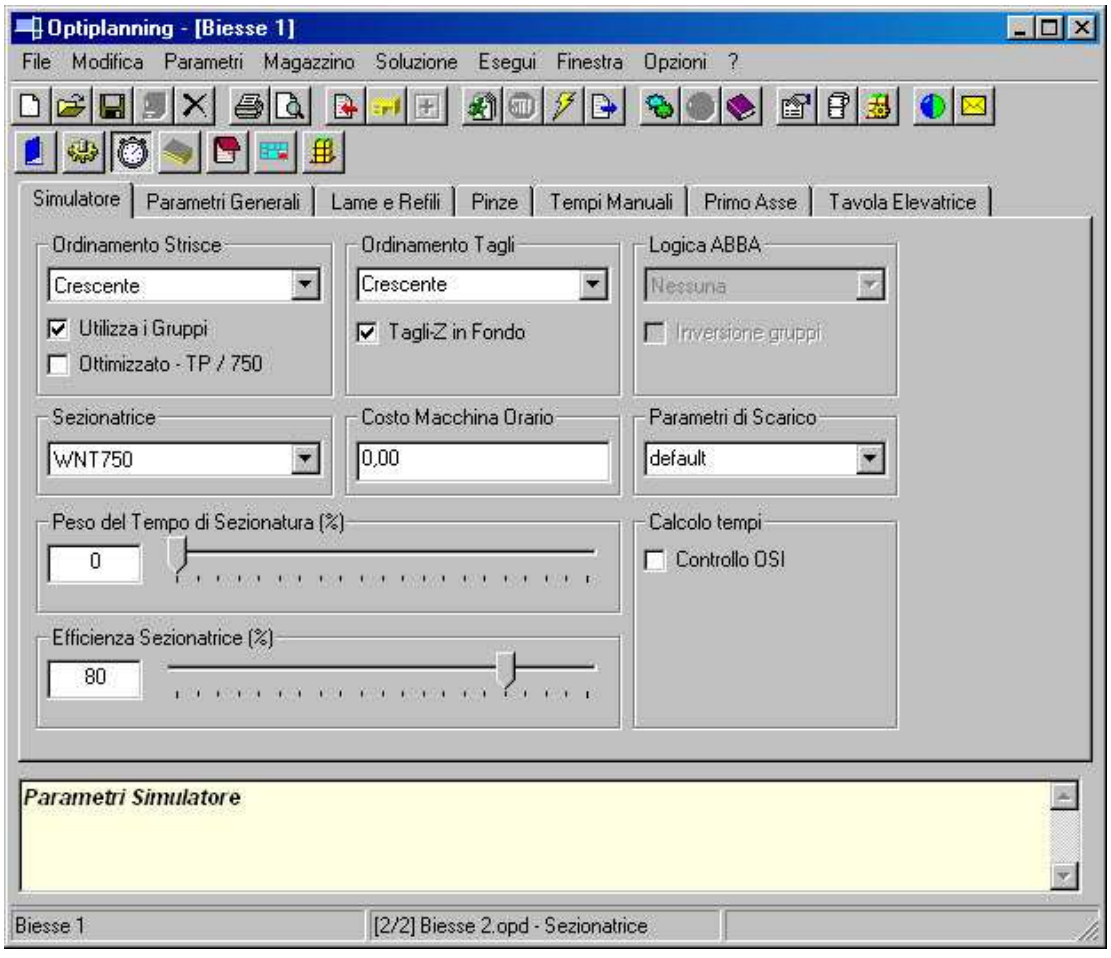


Figure 7.12

1. Time Simulator

The *Time Simulator* page is the most important. Using this page it is possible to set the panel saw model and the percentage importance of panel saw machining time in the calculation of the solution.

- *Panel Saw*
  Enter the model of the panel saw that will be used for machining.
- *Machine Cost per Hour*
  Enter the hourly cost of panel sizing. This cost is the hourly cost of machining and takes into account the cost of the panel saw and of its operators, the management and maintenance costs for the machine (use the same currency unit used for the panel magazine when determining the cost of material).
- *Stacking Parameters*
  Allows you to select the list of stacking parameters to use. This list is generated by the Smart Stacking program.
- *Percentage of Panel Saw Time (%)*
  This parameter, linked to the previous one, is used to set the importance of panel machining time in the calculation of the solution. The higher the value of this parameter, the higher the importance of machining times will be in the calculation of solutions. Generally, as this parameter increases, the complexity of patterns will decrease leading to a reduction in machining times and an increase in the material used. Set this parameter to zero if, when processing the solution, only the cost of the material is to be taken into account. Typical values to use are 0, 1, 10.
- *Panel Saw Efficiency (%)*
  The calculation of machining times is displayed using two values: a time given by the sum of mechanical and operator movements (time with 100% efficiency) and a second, increased time. This increased time takes into account the periods in which the panel saw is kept idle by the operator during a job. Reasons for these downtimes are varied and unpredictable, and they can be considered as a percentage of the first time described. The percentage of this time increase is specified in this parameter.
  Enter the model of the panel saw that will be used for machining.
- *Strips Order*
  This is used to give cutting pattern strips an increasing or decreasing order or no order at all. Increasing order is recommended to speed up machining.
- *Sort by Groups*
  When ordering strips it is possible to use the size of each single strip or a group of strips with the same cross cuts.
- *Optimised TP / 750*
  The position of the strips and pieces that make up a cutting pattern is determined in order to speed up pattern machining on machines with a double pushing device, or 750 models.
- *Cuts Order*
  This is used to order pieces produced with subsequent cross cuts within each single strip in increasing or decreasing order or with no order at all.
- *Z-cuts in Background*
  When ordering cuts it is possible to include or exclude pieces that require further Z-cuts. Usually pieces with Z-cuts are kept to the bottom of the strip because they require further rotation and in

this way it is possible to rotate the piece immediately without moving it from the cutting area. For this reason, it is advisable to leave this parameter enabled.

- *ABBA Logic*
  In angular WNASL machines, the machining operation logic known as "ABBA" can be enabled. The cutting patterns are optimised so as to process the strips of a machine cycle with those of the next cycle, thereby increasing machine productivity. It is possible to select various machining logics: *None, Standard, Partial, Complete*. For a description of the possible machining logics, refer to the machine control manual.

- *Group Inversion*
  If enabled, the simultaneous machining of strips deriving from different cycles is not limited to just the strips themselves, but the groups of strips that form the logics. The selection of a Complete logic with group inversion is the most complex machining operation for the solution obtained.

- *Times Calculation – OSI Control*
  If enabled, this allows you to carry out the times calculation using the machine control simulator, in order to obtain more accurate machining times. The use of this simulator may require longer processing times.

2. General Parameters

The *General Parameters* page contains the general characteristics of the panel saw.

- *Rip Cut Station Dimension*
  Enter the dimension of the cutting line used to make rip cuts.

- *Cross Cut Station Dimension*
  Enter the dimension of the cutting line used to make cross cuts.

- *Head Cut Station Dimension*
  Enter the dimension of the cutting line used to make head cuts.

- *Maximum Thickness*
  This is the maximum height of a stack of panels that can be machined in a cycle (see the parameters in the numerical control of the panel saw). This value is also used by the panel saw to determine the number of panels that can be sized in a single machine cycle.

- *Maximum Number of Panels per Cycle*
  Used to limit the maximum number of panels that can be processed in each machine cycle, regardless of the material thickness.

- *Minimum Material Dimension for Last Cut*
  This allows you to take into consideration the physical characteristics of the machine, and consequently create workable patterns, when the production cycle envisages the cutting of pieces of particularly limited dimensions (e.g. 50mm).

- *Maximum Workable Material Dimension*
  If it is necessary to machine panels larger than the maximum pushing device stroke, and you have a panel saw with "OSI" control, you can create head cut patterns that can be applied via a special logic.

- *Minimum Height to Consider Stack*
  This parameter is linked to the parameter *Stack Cutting Speed Reduction Coefficient (%)*, found in both the *First and Second Axis* groups. It is used as follows: if the stack sized in the current

cycle is larger than the value *Minimum Height to Consider Stack*, there is a percentage reduction in the cutting speed equal to the value entered in *Stack Cutting Speed Reduction Coefficient (%)*.

- *Maximum Board Thickness for Thin Loading*
  This parameter is linked to the parameter *Number of Boards for Thin Loading* (following parameter). The function of these parameters is as follows: if the panels are manually loaded (machine without lifting table) and the panel thickness is lower than the *Maximum Board Thickness for Thin Loading*, it can be assumed that a number of panels equal to that of the *Number of Boards for Thin Loading* will be loaded together. In this way manual loading times for panels are reduced.
- *Number of Boards for Thin Loading*
  See previous parameter.
- *Overlap Strips at Cross Cut Station*
  When this parameter is set to *Yes*, it can be assumed that, during cross cuts, identical strips (with the same cross cuts) will be overlapped for machining at the cross cut station.
- *Cutting Speed Reducer (%)*
  This parameter is used to make percentage reductions in the cutting speed set for the groups *First* and *Second Axis*.

3. Blades and Trims

The *Blades and Trims* page contains the data regarding blade thickness and trim cut parameters. It is most important to ensure that the values for these groups match the values set for the panel saw. For a detailed description of trim cut parameters, see the User's Manual for the numerical control of the panel saw.

- *Blade Thickness for Sectioning*
  This is the blade thickness used for sectioning the material.
- *Blade Thickness for Grooves*
  This is the blade thickness used to create grooves.

The size of rear and front trim cuts varies according to the size of the rip and cross cut offcuts. Trim cut management is the same for both rip and cross cuts: in both cases there are three parameters that divide the offcut from the pattern, as shown here below.

OFFCUT	FRONT TRIM CUT	REAR TRIM CUT
Min. Trim Size to be Split < Offcut < Max. Trim Size to be Split	*½ Offcut*	*½ Offcut*
Min. Trim Size to be Split < Offcut < Max. Trim Size to be Split	*Offcut - Optimum Trim*	*Optimum Trim*
Offcut < Min. Trim Size to be Split	*Offcut*	*0*

The trim cut parameters are:

- *Panel Saw Min. Rip Trim Size to be Split*
  This is used to manage rip cut trims.
- *Panel Saw Max. Rip Trim Size to be Split*
  This is used to manage rip cut trims.
- *Optimum Rip Trim*
  This is used to manage rip cut trims.

- *Min. Cross Trim Size to be Split*
  This is used to manage cross cut trims.
- *Max. Cross Trim Size to be Split*
  This is used to manage cross cut trims.
- *Optimum Cross Trim*
  This is used to manage cross cut trims.
- *Min. Head Cut Trim*
  This is the size of the front trim on the head cut portion. The front trim on the head cut portion is carried out each time that total cross cut offcuts are equal to or greater than the value of this parameter.
- *Head Cut Trim*
  Not Used.

4. Grippers

The *Grippers* page contains data regarding the position of the grippers used for cross cuts. This group contains data only for the grippers used for cross cuts.

- *Gripper Time*
  This is the gripper opening/clamping time.
- *Number of Grippers*
  This indicates the number of grippers used for cross cuts.
- *Number of Raisable Grippers*
  Indicates the number of grippers that can be excluded.
- *Number of Independent Grippers*
  Indicates the number of grippers that can be individually excluded.
- *Number of Secondary Grippers*
  Indicates the number of grippers of the auxiliary pushing device, if the selected panel saw is a TP model.
- *Gripper Dimension*
  This is the working dimension (width) of the gripper.
- *Gripper Tolerance*
  This is the tolerance of the gripper working dimension.
- *Gripper 1 Central Position*
  This is the distance between the centre of the first gripper and the square fence of the panel saw.
- *Gripper 2 Central Position*
  This is the distance between the centre of the second gripper and the square fence of the panel saw.
- *Gripper 3 Central Position*
  This is the distance between the centre of the third gripper and the square fence of the panel saw.

  And so on for the remaining grippers.

5. Manual Times

The *Manual Times* page contains data regarding the manual times of the operator.

- *Hidden Manual Times*
  When this parameter is set to *Yes*, not all the times of the manual operations that may be carried out during panel saw machining are counted.
- *Head Cut Manual Rotation Time*
  This is the time foreseen for the head cut rotation required to carry out cross cuts on the head cut portion.
- *Main Part Rotation Time*
  This is the time foreseen for the rotation of the main part in a pattern with head cuts. This rotation is required to carry out rip cuts.
- *Strip Rotation Time*
  This is the time foreseen for the rotation of a strip, which is required to make cross cuts.
- *Z-cut Rotation Time*
  This is the time foreseen for the rotation of a piece in order to make Z-cuts.
- *Trim Cut Ejection Time*
  This is the time foreseen for the manual ejection of trim cuts.
- *Drops Ejection Time Increase Coefficient (%)*
  This indicates the percentage increase in remainder ejection times compared to trim cut ejection times.
- *Board Manual Loading Time*
  This is the time required for manual panel loading (used for machines without lifting table).
- *Stack Handling Time Increase Coefficient (%)*
  This indicates the percentage increase required to increase the rotation time for strips/pieces when the sized stack is greater than the parameter *Minimum Height to Consider Stack* in the *General Parameters* group.

6. First Axis

The *First Axis* page contains the characteristic technological parameters of the first cutting axis of the panel saw. For single line panel saws the first axis is the only one available, while for angular systems, the first axis is the axis that makes the cross cuts.

- *Saw Carriage Overstroke*
  This indicates the distance travelled by the saw carriage after it has terminated a cut.
- *Saw Carriage Cut Speed*
  This indicates the cutting speed. This datum may be transferred to the numerical control together with the optimised work list.
- *Saw Carriage Return Speed*
  This indicates the speed of the saw carriage when it is not executing a cut.
- *Saw Carriage Ramp Time*
  This indicates the acceleration/deceleration time of the saw carriage.
- *Pusher Speed*
  This indicates the forward feed speed of the pushing device.

- *Pusher Return Speed*
  This indicates the return speed of the pushing device.
- *Pusher Ramp Time*
  This indicates the acceleration/deceleration time of the pushing device.
- *Presser Up/Down Time*
  This indicates the upstroke + downstroke times of the presser and saw carriage.
- *Waiting Time for Last Cut*
  This indicates the additional time required for the last trim cut.
- *Max. Trim Cut Dimension for Speed Reduction*
  This indicates the trim cut size up to which the cutting speed reduction (as defined in the following parameter), must be applied.
- *Trim Cut Speed Reduction Coefficient (%)*
  This indicates the percentage reduction in cutting speed when cutting "narrow" trims (see previous parameter).
- *Stack Cutting Speed Reduction Coefficient (%)*
  This indicates the percentage reduction in cutting speed when cutting stacks (see the parameter *Minimum Height to Consider Stack* in the *General Parameters* group).
- *Front Alignment Distance*
  This indicates the front alignment position for machines with lifting table.
- *Front Alignment Time*
  This indicates the front alignment time for single line machines with lifting table and the front alignment time at the cross cut station for angular systems.
- *Ejectors Interference Position*
  This is the interference position between the trim cuts ejector and the pushing device.
- *Ejection Time*
  This indicates the ejection time for the last trim cut.
- *Minimum Dimensions for Breakdown*
  This parameter only applies to machines with trim cuts waste gate. It indicates the minimum dimension of a front trim cut/remainder to be broken down. On single line machines, this applies to all trim cuts/remainders, while for angular systems, this parameter applies to cross cut station trims/remainders.
- *Side Alignment Time*
  This parameter only applies to angular systems. It indicates the time required for the side alignment of strips transferred to the cross cut station.
- *Rear Position at the Cross Cut Station*
  This parameter only applies to angular systems. It indicates the rear position of the cross cut pushing device.
- *Rear Take-over Position*
  This parameter only applies to angular systems. It indicates the amount that the cross cut pushing device must move back beyond the end of the strips deposited at the cross cut station.

7. Second Axis

The *Second Axis* page contains the characteristic technological parameters of the second cutting axis of the panel saw. These parameters are only available for angular systems and they refer to the axis that executes rip cuts.

- *Saw Carriage Overstroke*
  This indicates the distance travelled by the saw carriage after it has terminated a cut.
- *Cut Speed*
  This indicates the cutting speed. This datum may be transferred to the numerical control together with the optimised work list.
- *Saw Carriage Return Speed*
  This indicates the speed of the saw carriage when it is not executing a cut.
- *Saw Carriage Ramp Time*
  This indicates the acceleration/deceleration time of the saw carriage.
- *Pusher Forward Feed Speed*
  This indicates the forward feed speed of the pushing device.
- *Pusher Return Speed*
  This indicates the return speed of the pushing device.
- *Pusher Ramp Time*
  This indicates the acceleration/deceleration time of the pushing device.
- *Presser Up/Down Time*
  This indicates the upstroke + downstroke times of the presser and saw carriage.
- *Waiting Time for Last Cut*
  This indicates the additional time required for the last trim cut.
- *Max. Trim Cut Dimension for Speed Reduction*
  This indicates the trim cut size up to which the cutting speed reduction (as defined in the following parameter), must be applied.
- *Trim Cut Speed Reduction Coefficient (%)*
  This indicates the percentage reduction in cutting speed when cutting “narrow” trims (see previous parameter).
- *Stack Cutting Speed Reduction Coefficient (%)*
  This indicates the percentage reduction in cutting speed when cutting stacks (see the parameter *Minimum Height to Consider Stack* in the *General Parameters* group).
- *Front Alignment Position*
  This indicates the front alignment position at the rip cut station.
- *Front Alignment Time*
  This indicates the front alignment time at the rip cut station.
- *Ejectors Interference Position*
  This is the interference position between the trim cuts ejector and the pushing device.
- *Ejection Time*
  This indicates the ejection time for the last trim cut.

- *Minimum Dimensions for Breakdown*
  This parameter only applies to machines with trim cuts waste gate. It indicates the minimum dimension of a front rip trim cut/remainder to be broken down.

8. Shuttle

The *Shuttle* page contains the characteristic technological parameters of the shuttle. These parameters are available only for angular systems.

- *Shuttle Width*
  This indicates the width of the shuttle.
- *Shuttle Ramp Time*
  This indicates the acceleration/deceleration time of the shuttle.
- *Shuttle Vertical Movement Time*
  This indicates the shuttle upstroke/downstroke times.
- *Empty Shuttle Speed*
  This indicates the speed of the shuttle without material.
- *Loaded Shuttle Speed*
  This indicates the speed of the shuttle with material.
- *Shuttle Speed for Deposit in the Deposit Area*
  This indicates the shuttle speed during strip deposit in the deposit area when this latter contains material.
- *Shuttle Speed Reduction Coefficient for Stack Handling (%)*
  This indicates the percentage reduction in the shuttle speed when transferring a stack of strips (see following parameter).
- *Minimum Dimension of a Group for Stack Handling*
  This indicates the minimum height of a group of strips transferred by the shuttle at reduced speed as set in the previous parameter.
- *Shuttle Speed Reduction Coefficient for Handling Narrow Strips*
  This indicates the percentage reduction in the shuttle speed when transferring a stack of narrow strips (see following parameter).
- *Maximum Dimension of a Strip for Narrow Strip Handling*
  This indicates the maximum height of a strip transferred by the shuttle at reduced speed as set in the previous parameter.
- *Shuttle Take-over Position*
  This indicates the position of the shuttle at the rip cut station cutting line.
- *Waste Gate Open Position*
  This indicates the position of the shuttle immediately past the rip cut station waste gate.
- *Shuttle Cross Cut Station Position*
  This indicates the position of the shuttle at the cross cut station.
- *Shuttle Deposit Position*
  This indicates the position of the shuttle at the beginning of the deposit area.
- *Deposit Area Dimension*
  This indicates the size of the deposit area.

9. Lift Table

The *Lift Table* page contains the characteristic technological parameters of the lifting table on single line and angular panel saws.

- *Maximum Board Stack Height*
  This indicates the maximum height of the stack of panels on the lifting table.
- *Initial Loading Time*
  This indicates the time it takes to load the stack of panels onto the lifting table.
- *Set Time for Thin Material Loading*
  This indicates the additional time for each stack load of thin material. A panel is considered thin if its thickness is below that in the parameter *Maximum Board Thickness for Thin Loading* in the *General Parameters* group.
- *Take-over Speed from Lift Table*
  This indicates the forward feed speed of the pushing device when taking panels from the lifting table.
- *Take-over Speed for Thin Material from Lift Table*
  This indicates the forward feed speed of the pushing device when taking thin material panels from the lifting table. A panel is considered thin if its thickness is below that in the parameter *Maximum Board Thickness for Thin Loading* in the *General Parameters* group.
- *Take-over Position from Lift Table*
  This indicates the start position of the lifting table.
- *Pushing Point Downstroke Time*
  This indicates the downstroke time of the floating pushing points. This time must be considered for each single load.

10. Vacuum

The *Vacuum* page contains the characteristic technological parameters for vacuum panel feeders.

- *Thick Material First Board Loading Time*
  This indicates the time for vacuum feeder to load the first thick panel in the loading area. A panel is considered thick if its thickness is greater than that in the parameter *Maximum Board Thickness for Thin Loading* in the *General Parameters* group.
- *Thick Material Board Loading Time*
  This indicates the time for the vacuum feeder to load thick panels (after the first thick panel) in the loading area. A panel is considered thick if its thickness is greater than that in the parameter *Maximum Board Thickness for Thin Loading* in the *General Parameters* group.
- *Delta Time for Thick Material Short Loading*
  This indicates the additional time for loading thick panels for patterns with head or short cuts.
- *Thin Material First Board Loading Time*
  This indicates the time for the vacuum feeder to load the first thin panel in the loading area. A panel is considered thin if its thickness is below that in the parameter *Maximum Board Thickness for Thin Loading* in the *General Parameters* group.
- *Thin Material Board Loading Time*
  This indicates the time for the vacuum feeder to load thin panels (after the first thin panel) at the loading station. A panel is considered thin if its thickness is below that in the parameter *Maximum Board Thickness for Thin Loading* in the *General Parameters* group.

- *Delta Time for Thin Material Short Loading*
  This indicates the additional time for loading thin panels for patterns with head or short cuts.
- *Feeder Interference Position*
  This indicates the interference position between the feeder and the pushing device.
- *Stack Take-over Position*
  This indicates the stack position.
- *Vacuum Take-over Speed*
  This indicates the pushing device take-over speed for the stack.

11. Turning Table

The *Turning Table* page contains the characteristic technological parameters of the turning station on single line and angular panel saws.

- *Turning Table Set Time*
  This indicates the additional time for each turn of the turning station. This time does not include rotation time.
- *Rotation Time*
  This indicates the time required for one rotation of the turning station.
- *Machine Length Additional Dimension*
  This indicates the amount by which it is necessary to lengthen the panel saw with turning station as against a panel saw without a turning station.
- *Additional Dimension for Rotation*
  This indicates the extra amount by which the pushing device must move back in order to load a rotated stack. The additional dimension is equal to double the value of the parameter.
- *Front Aligners Distance*
  This indicates the distance between the front aligners in the vicinity of the cutting line and the beginning of the turning station in the event that the machine is equipped with a single group of front aligners only.
- *Double Front Aligner*
  When this parameter is set to *Yes* the machine is considered to have two groups of front aligners: one close to the cutting line and the other close to the turning station. If this is not the case, the only group of front aligners will be positioned close to the cutting line.
- *Front Alignment Position 1*
  This indicates the distance between the front aligner on the turning station and the cutting line.
- *Front Alignment Position 2*
  This indicates the distance between the front aligner close to the cutting line and the cutting line itself.
- *Front Aligners Distance 2*
  This indicates the distance between the front aligners positioned close to the cutting line and the beginning of the turning station when the machine is equipped with two groups of front aligners.

7.4 ERRORS AND WARNINGS

At times, it may occur that one or two parameters in the list that is about to be optimised have values that are inconsistent with each other or with other worklist data. In this case, OptiPlanning

will automatically open a window to view the inconsistency. This occurs when the worklist is being saved. The message already clarifies the reason for the inconsistency but, to help the user to correct the value, OptiPlanning will open the parameters window and position the cursor on the incorrect parameter after a simple double click on the error message.

The example in Fig.7.13 shows an error followed by two warnings. While the error must be corrected in order to be able to optimise the worklist, a solution can also be calculated using one or more of the triggered warnings. Usually a warning message prevents the inclusion of a part in a type of pattern: if it remains, the algorithm will create a solution that only includes that particular part in the patterns allowed.

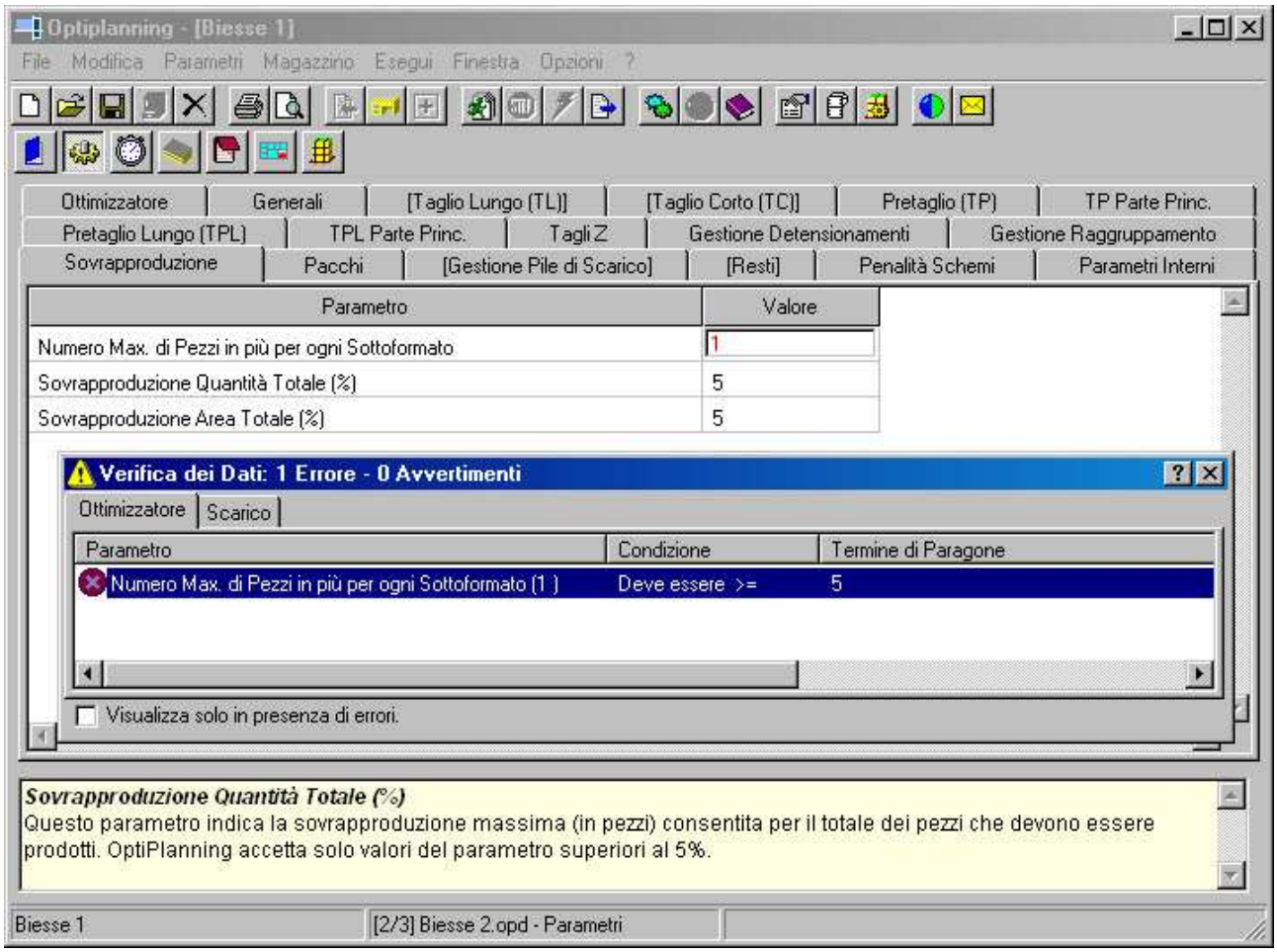


Figure 7.13

Chapter 8

CUTTING PATTERN GRAPHICS EDITOR

8.1 INTRODUCTION

Once the optimisation has been completed, it is possible to edit the solution manually using the cutting pattern graphics editor. This can be used to add and/or remove pieces from one or more cutting patterns, change the number of panels used and delete one or more patterns that are not required. These functions are executed through simple drag&drop operations, without having to enter codes, cuts or cut sizes to be made: a fact which makes them quick and intuitive, even for inexperienced operators.

If the optimisation parameters have been set correctly, the optimised solution will be sent directly to the panel saw. Usually, if a manual intervention takes place, the new solution will not respect the limits set in the optimisation parameters and this is accepted if a simple change is advantageous in terms of product offcuts, material used or reduced machining times.

Manual cutting pattern modifications can be used to:
- complete a pattern, inserting pieces in place of an offcut area
- delete a pattern with a high level of offcuts
- simplify (and speed up) a pattern
- edit a pattern to create a larger reusable offcut.

These manual changes may create solutions that no longer respect the initial limits but which have:
- smaller or larger quantities of pieces than those required
- patterns that are not enabled (Head Cuts, Z-cuts, Patterns with a high number of different strips, etc.)
- a number of engaged piles that is greater than the number of available stacking stations
- a number of used panels that is greater than those available in the panel magazine.

Once the manual edit has been completed, it is therefore necessary to make a careful analysis of the new solution in order to avoid machining a worklist that does not respect the fundamental limits set.

8.2 HOW TO EDIT A CUTTING PATTERN

To edit a cutting pattern in an optimised list, it is necessary to select the *Summary* button in the specific toolbar (to select a list, click once on its name in order to highlight it in blue), right click with the mouse and select *Editable*. This operation will make the list manually editable and to remind the user of this state, the list icon will be changed as shown in the following figure (in place of the blue diamond, a double yellow rule will appear).

At this point, select *Solution*; select the pattern to be edited, right click with the mouse and select *Edit*. In this way, two new windows will open: one will contain the list of parts in the worklist; the other will contain the selected cutting pattern.

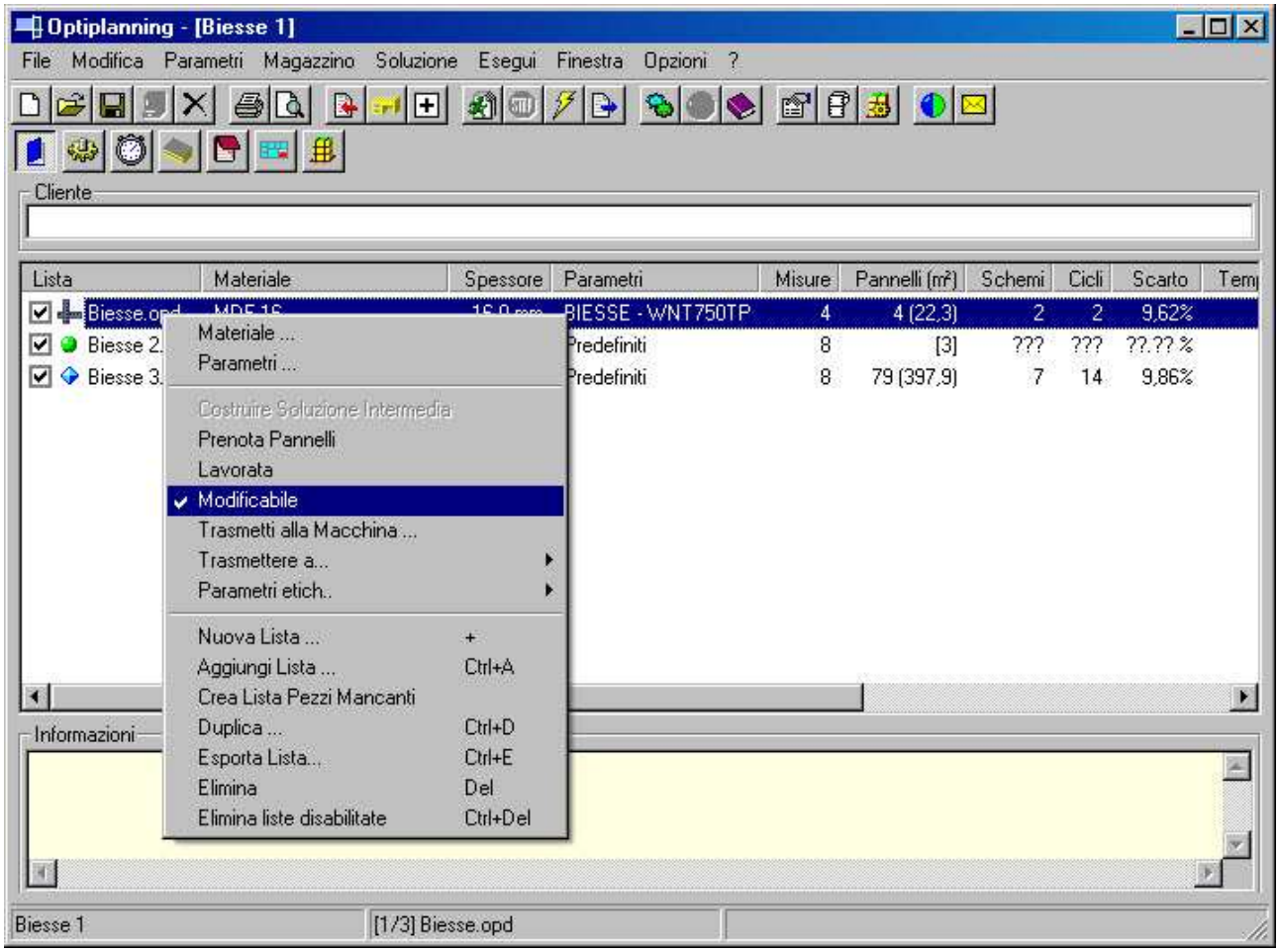


Figure 8.1

The window used to view the cutting pattern contains the salient information about the pattern: pattern type, panel format used and number of sheets to be sized. In the bottom section of the window, as well as the useful percentage area, it is possible to view the measurements of any of the pieces in the pattern or of an offcut area: to do this, it is sufficient to position the mouse on the object for which the dimensions are required. In this way it is possible to identify the parts that can enter into a specific offcut area.

The “Parts List” window provides information regarding the pieces in the list (their dimensions, the quantity produced, and the quantity requested). Further important information for modifying the pattern is highlighted in the image associated with each piece.

Figure 8.2

From left to right, the meaning of the pictures is as follows:
- The piece can only be inserted in the pattern in a non-rotated position;
- The piece can only be inserted in the pattern in a rotated position;

- The piece can be inserted in both a non-rotated and a rotated position, but the non-rotated option has been selected;
- The piece can be inserted in both a non-rotated and a rotated position, but the rotated option has been selected;

The second image can be an arrow or a circle, of various colours. The circle indicates that the piece cannot be inserted in the cutting pattern, while the arrow indicates that the piece can be inserted.

Figure 8.3

The meaning of the colours (according to their importance) is:
- *Red*: the quantity of pieces produced is less than the requested quantity;
- *Blue*: the quantity of pieces produces is equal to the requested quantity;
- *Yellow*: the quantity of pieces produced is more than the requested quantity;
- *Green:* piece added to the list manually, via the editor, but with a quantity of nil;
- *Light blue*: piece added to the list manually, via the editor, and with a quantity specified;
- *Purple*: low priority piece (< 100);
- *Grey*: piece belonging to an assembly;

To add a piece to the pattern, just select - in the cutting pattern - the position where you want to insert the piece, then double click with the mouse on the piece in the parts list window. If you want to insert the piece in a rotated position, you can enable the button in the upper part of the window. Of course, it is only possible to rotate a part if the *Grain* field is set to *No*.

To cancel a piece, click to select it in the pattern, then press the CANC key.

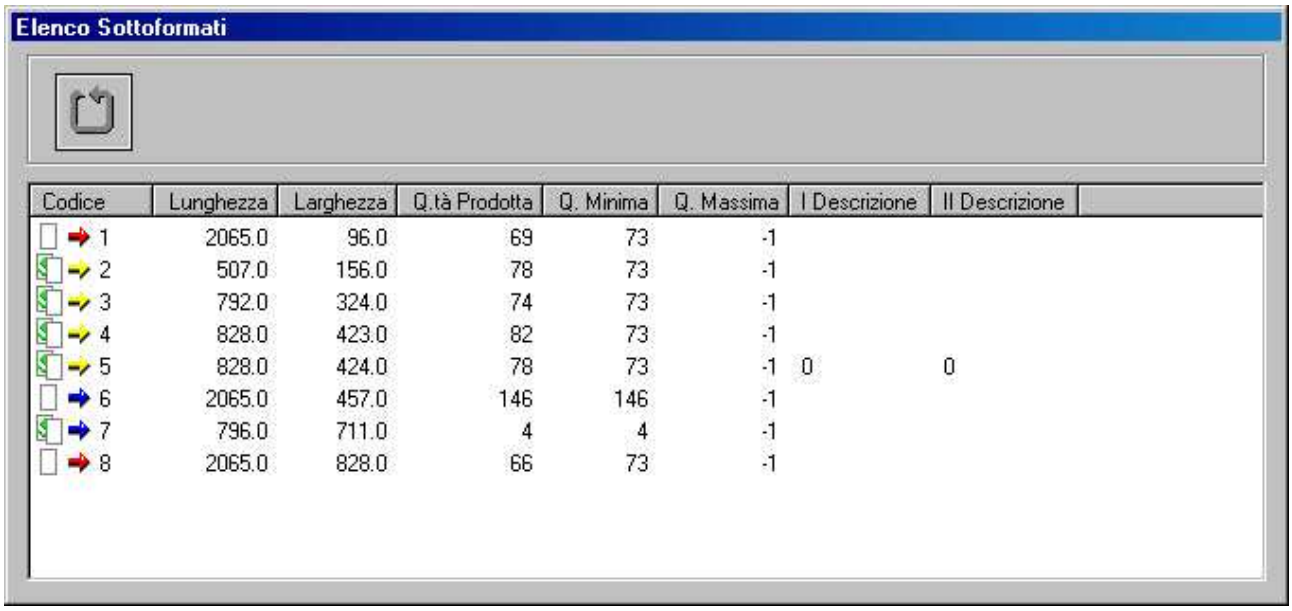


Figure 8.4

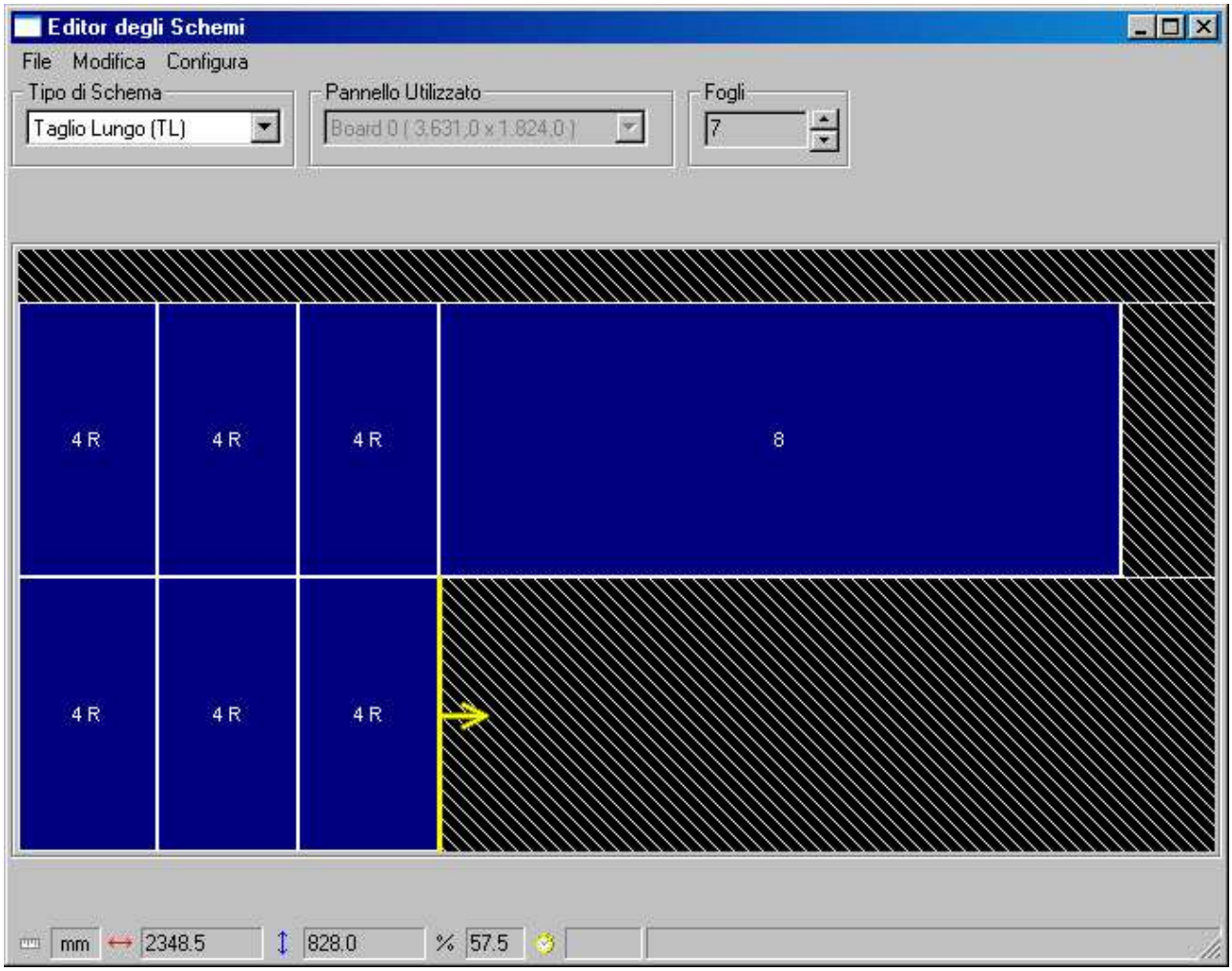


Figure 8.5

Once a piece inside a pattern has been selected, it is possible to copy it by pressing CTRL+C together and to paste it by pressing CTRL+V.

As already mentioned, using the mouse it is possible to select a piece and/or an offcut and this will be highlighted by a yellow arrow in the cutting pattern. This arrow can also be moved using the keyboard. In particular, the direction arrows allow movement among different pieces of the same level (e.g.: inside a strip), the “page up” key moves up one level (e.g.: to pass from a piece to a strip) and the “page down” key moves down one level (e.g.: to pass from a piece obtained using cross cuts to a piece obtained using Z-cuts). In this way it is also possible to select whole strips that can then be copied and pasted or deleted.

It is also possible to insert parts that are not included in the optimised worklist. In this case, it is first necessary to add the part to the existing worklist by right clicking in the parts window and selecting *Add*. At this point, a window will open in which it is possible to enter the part measurements and up to two piece descriptions (see the following figure). To confirm this operation, use the right-hand mouse button; the left-hand button will cancel all changes. At this point, it is possible to proceed as previously described for normal parts. As well as the *Add* option, there is also an *Import* function that can be used to import a list of parts, as explained in the relevant chapter.

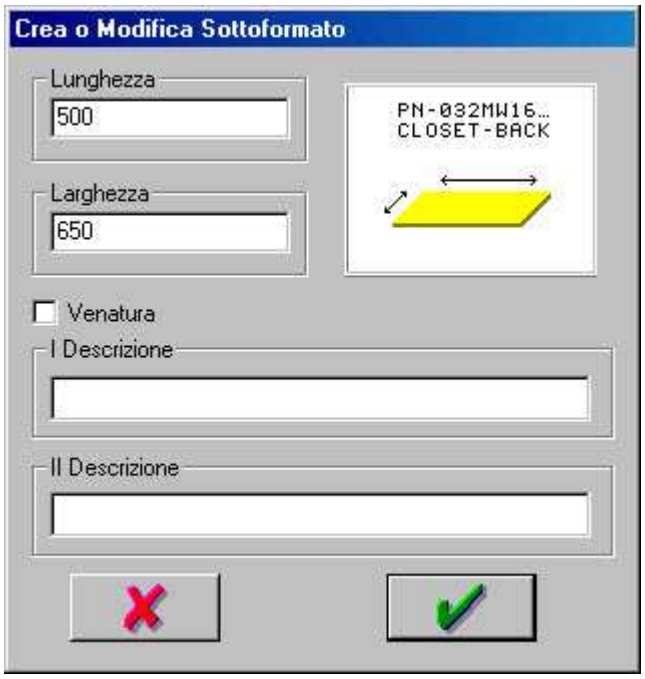


Figure 8.6

It is possible to vary the type of pattern, passing for example, from long to short cuts, in the window used to view the cutting pattern. These operations may allow the dimensions of a reusable remainder to be increased. However, such conversions are not always possible; to avoid conversion errors, the conversion of relatively simple patterns only is recommended. To change the type of pattern, it is sufficient to vary the item in the *Pattern Type* drop-down menu. Using this same window, it is possible to edit the number of panels to be machined with the current pattern; if this value is forced to zero, it means that pattern deletion is required.

In the case of patterns with head cuts, the head cut and main portions are not enabled at the same time (the part that is not enabled is shown in grey). To enable a portion it is sufficient to click on it with the mouse or to press the TAB key.

To save the changes made to the pattern, it is necessary to select *File – Exit (Update Solution); if File – Exit (No Update)* is selected, this will close the function without updating the worklist.

By selecting *Modify* in the window that views the cutting pattern, it is possible to carry out the copy, paste and delete operations described previously. It is also possible to cancel the changes by pressing *Cancel Edit* (the same result can be obtained by pressing CTRL+Z together). The *Configure* menu offers the possibility to vary the unit of measure and the origin used to view the pattern, while the *User* menu is reserved for future use.

Once the pattern editor has been closed and after the changes have been completed, it is possible to check the new worklist results immediately by selecting the various menus in the *Solution* section. Furthermore, it is always possible to retrieve optimised solutions, as shown in the following figure. This operation can serve to make comparisons between solutions or to send the results of the original list to the panel saw.

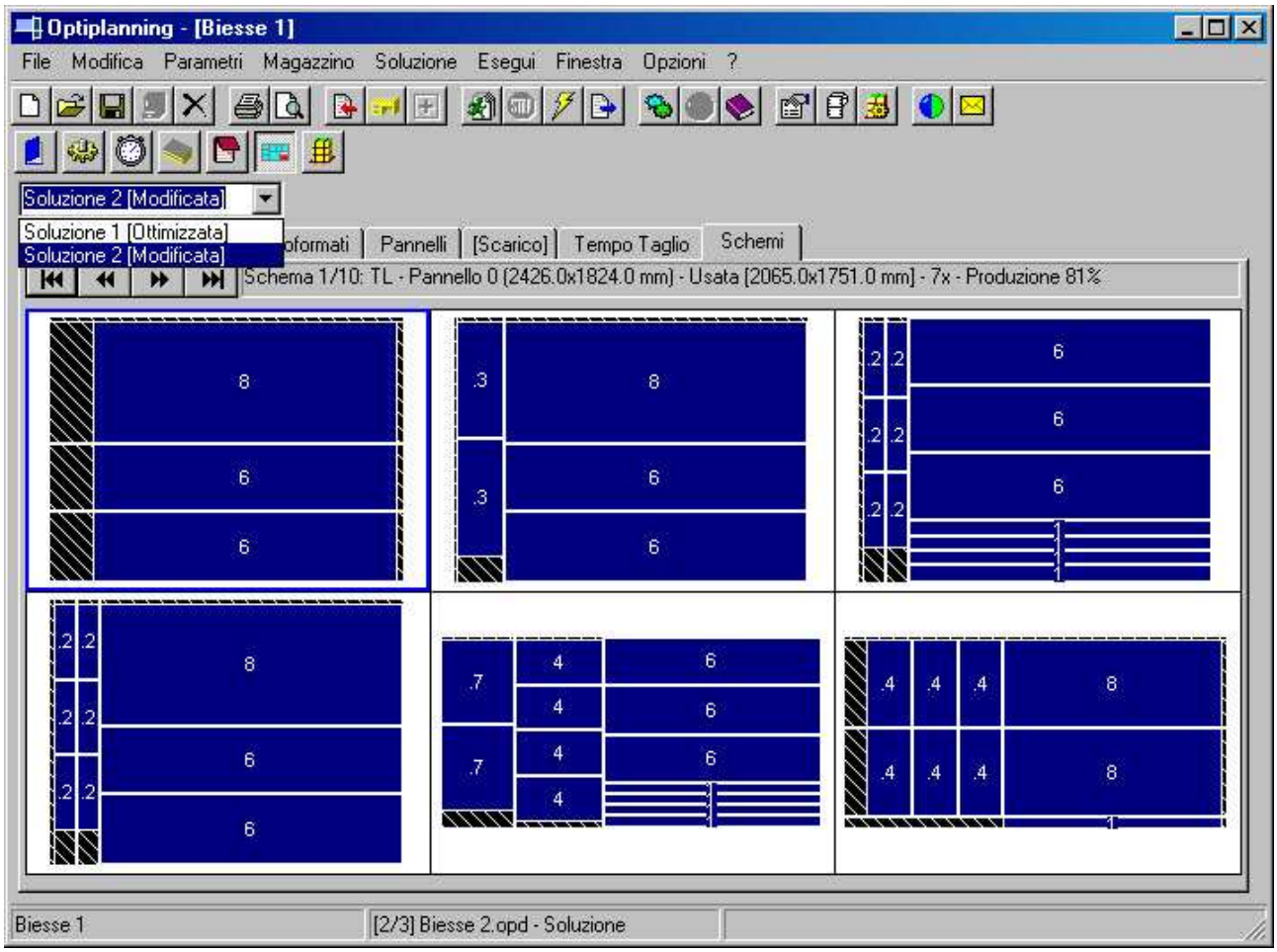


Figure 8.7

8.3 HOW TO EDIT A PATTERN SEQUENCE

As well as editing the pattern layout, it is also possible to edit the sequence of cutting patterns. OptiPlanning automatically creates what is considered to be the optimum pattern sequence, in that it minimises panel type changes at the loading station and piles of pieces at the stacking station. In spite of this, it is possible to vary the calculated sequence if required and to produce, for example, one part datum or offcut before others or even to use a certain panel format before others. To change the pattern sequence it is necessary to make the list modifiable, as described for the pattern editor. Select *Solution*, right click with the mouse and select *Cutting Pattern Sorting*.

This will open a window that contains a list of the patterns produced, together with the type of pattern and the panel format used (see the following figure). To change the sequence, it is possible to drag the patterns with the mouse or to use the two buttons on the right of the window. In this case too, it is possible to exit the function either saving or cancelling the changes made.

Figure 8.8

8.4 ASSEMBLY MANAGEMENT

The parts set management function can be used to create groups of parts with definable layouts, which will be inserted into patterns as predefined blocks. In practice, it is possible to obtain patterns with, for example, two parts alongside one another. This function is useful when two parts form the right and left-hand side doors of a cabinet with grain, or when it is necessary to insert rules concerning the outfeed flow of sized pieces to facilitate stacking operations.

Once the cutting list has been created, by selecting the *Parts* button followed by *Selection*, it is possible to right click the mouse to select *Set Management.* This will open the window that manages the sets. This window will initially be empty; to create a new set, click on *Edit:* the two windows of the graphic pattern editor, as described previously, will open to allow the creation of the layout that will form the first set. The set layout may have any form: it may be comprised of the same part repeated several times or by different parts. Naturally, the complexity of the layout must be reduced in order to allow the algorithm to create a solution that respects the limits imposed. Once the set has been created and saved by clicking on *Exit (Update Solution)* in the *File* menu, the set manager window will look like the one shown Fig.8.6.

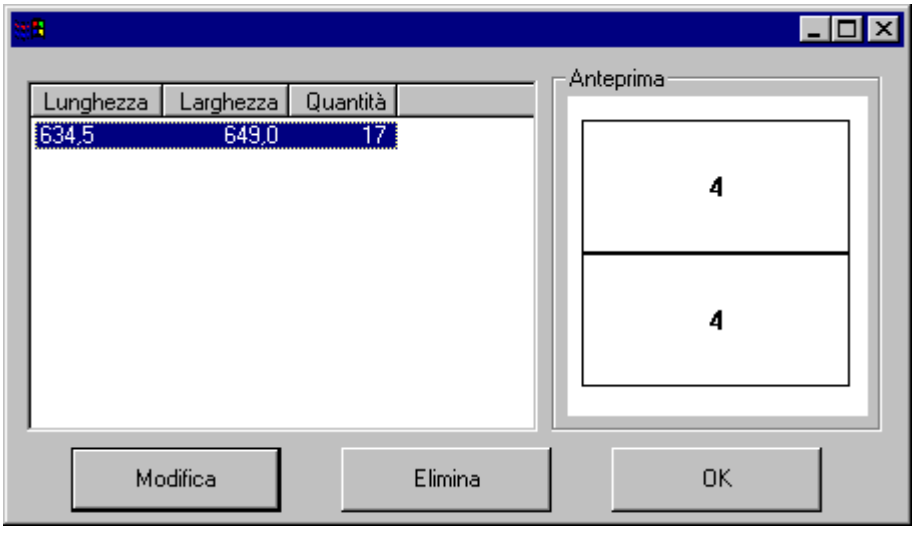


Figure 8.9

Looking at Fig.8.6, it is possible to see that the layout of the only set is formed by piece no. 4 flanked vertically twice; its dimensions can also be seen, including a blade thickness and the number of sets that can be created (17). The window also has a *Delete* button to delete a previously selected set.

Once OK has been selected, the program will return to the list of parts, which now contains part number 4 at the beginning of the list, marked by a red cube, which is the set symbol. This means that the parts order has been changed and the beginning will contain all of parts that form sets; that is, all parts will have a new number and will be preceded by those that derive from sets. Even the minimum quantity may change; in fact this is automatically recalculated and will have values that are compatible with the exact production of the maximum number of possible sets. In other words, if the minimum quantity of part number 4 was odd, it will be reduced by 1 since an even number of these parts (two) is to be used. If the set is formed by two different parts (even if only by piece description) and they have different minimum quantities, the minimum quantities of the two parts will be the same after the set has been created and will equal the lower of the two initial minimum quantities.

Fig.8.7 shows the optimisation results for a single set with the layout of Fig.8.6. It is possible to note that piece no. 1 (originally part no.4) never appears alone but always in pairs and it is never rotated.

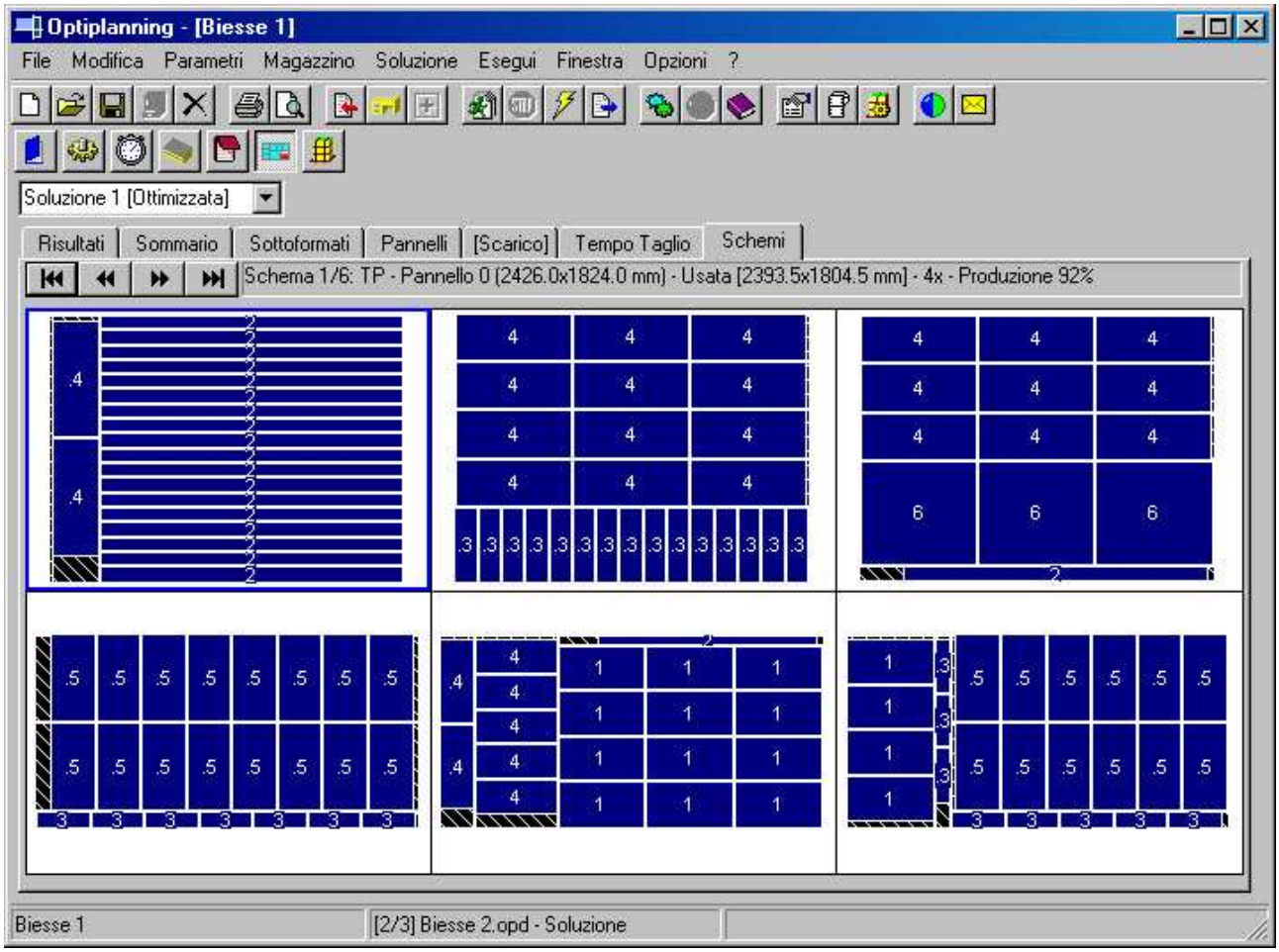


Figure 8.10

Chapter 9

ADVANCED JOB ENTRY

9.1 INTRODUCTION

In the previous chapters we have seen how OptiPlanning manages data in *Jobs* and *Worklists*. As well as the optimisation parameters, each cutting list contains data concerning the parts to be produced and concerning specific material. A job is a set of worklists that can refer to different materials, which have something in common (for example, a single customer, order or machining date).

It is possible to enter or edit the data regarding the parts to be produced in an advanced manner, grouping them together even if they use different materials. In this way it is possible to create parts lists that include all of the pieces required to produce a cabinet. Once the "cabinets stock" has been created, it is possible to carry out a new job, selecting which cabinet pieces to use and if necessary, specifying the number of cabinets to be produced.

In other words, in the event that is necessary to manage a specific number of "products" to be made, this management function allows the parts list to be inserted once only and to proceed to edit the parts according to the order to be completed.

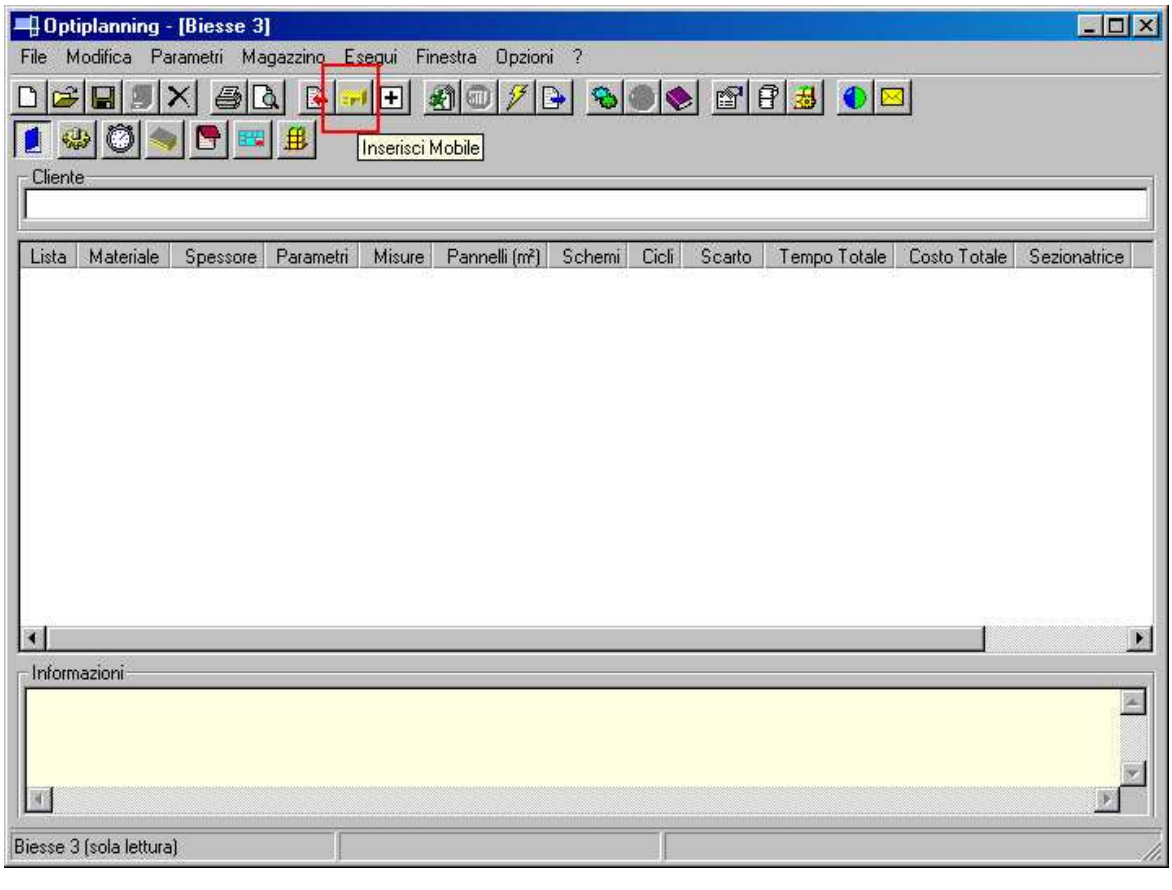


Figure 9.1

9.2 HOW TO CREATE A "CABINET" LIST

To create a "cabinet" list, it is necessary to open an existing list or even to create a new and empty list. It should be remembered that to create an empty job, it is necessary, after specifying the new name, to select *Cancel* in the *New List* window.

Clicking on the *Insert Cabinet* button (see Fig.9.1) will open the cabinet list management window. To create a new list, click on the *New* button; this will open a grid of parts that is similar to the standard OptiPlanning grid. The only difference is the presence of a drop-down menu that has a material code as its first field. This is used to specify the material to be used for each part.

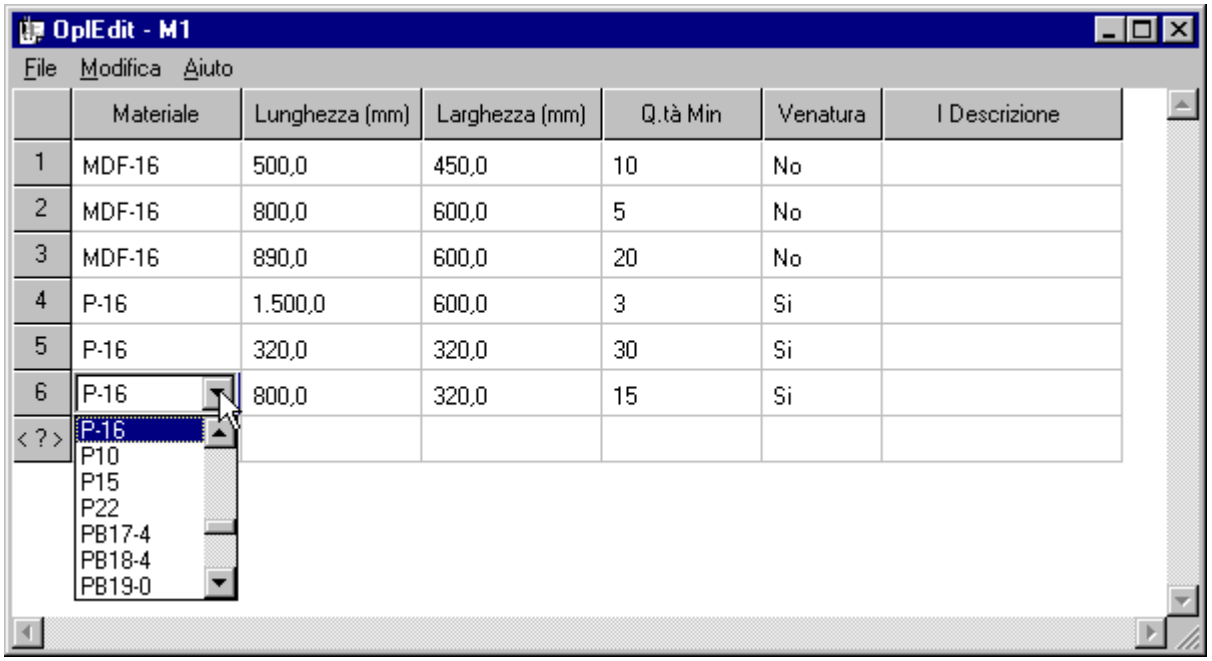


Figure 9.2

Once the relevant data has been entered, select *File – Save* in the main menu and type in the name to be given to the list. The *File* menu also contains the options *Open* and *Save As*, which can be used to open or rename a list of parts. The *Modify* menu is next to the *File* menu and contains the items *Delete* (to delete a part) and *Add* to create a new row for the insertion of parts. To close the window, select *File – Exit*.

At this point the left-hand section of the cabinet list management window will view the name of the newly created list. By proceeding in the same way, it is possible create a file for each of the items to be managed. This same window also contains a *Modify* button to open a previously created and selected list and *Delete* to delete a list.

9.3 HOW TO MANAGE CREATED "CABINET" LISTS

If the order to be issued includes the production of two previously created cabinets, it is sufficient to select them and then drag them into the right-hand section of the window, as shown in Figure 9.3 (or double-click on the list name).

Looking closely at the right-hand section of the cabinet list window, it is possible to note, as well as the names of the selected worklists, the *Quantity* column. By double clicking on one of the quantity fields, it is possible to change its value. The cabinet quantity defines the amount by which to multiply the minimum number of parts (in the corresponding list). This makes it possible to create new jobs that are formed by one or more cabinet lists and if necessary, multiplied by the

number of cabinets of each type to be produced. The remaining columns show the variation in the cabinet dimensions compared with the standard values. These columns can be accessed via the *Measure* button, but only if the *Remeasure Cabinet* option has been selected.

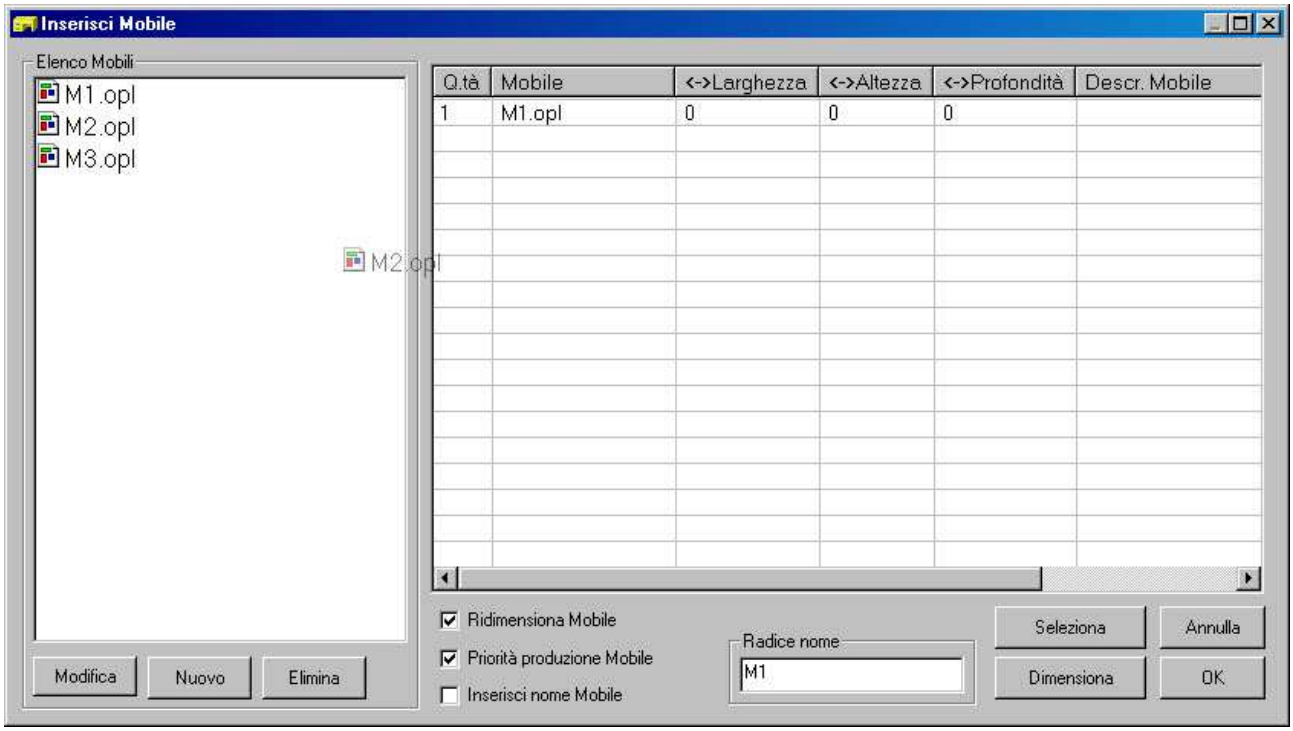


Figure 9.3

Clicking on the OK button will close the window and automatically create the data for the new job. In particular, a worklist will be created for each material code present for the selected cabinets: each one will contain all of the parts that refer to the specific material. In other words, the various cabinet worklists will be divided if they are linked to different materials and combined when associated to the same material (as well as multiplied by the "*Quantity*" factor). The new worklists created will all have the same name, as specified in the *Root Name* field, followed by a progressive number.

If the *Insert Cabinet Name* check is selected, then the name of the membership cabinet list will be inserted in the *Cabinet Code* field of every part in the lists created.

The *Select* button allows you to select the folder where the files relating to the cabinet lists have been saved (or where you want to save them).

With regards this procedure, it is recommended that the use of the cabinet management function for the creation of new worklists always starts from an empty job (without worklist); if not, the newly created parts lists will be added to existing worklists, if these use the same material.

Lastly, the *Cancel* button is of course used to close the cabinet window without creating any new worklist.

9.4 CREATING WORKLISTS WITH CABINET REMEASUREMENT

The creation of the cabinet worklists described in the previous chapters only allows you to define cabinets of a fixed size. If you need to create cabinets with dimensions that vary according to customers' requirements, it is possible to create a standard cabinet worklist and use the "Remeasure Cabinet" option.

To manage the remeasurement of a cabinet, OptiPlanning needs to know how the dimensions of the individual pieces that make up the cabinet vary in relation to the dimensions of the cabinet itself. To specify this information, the window containing the data of a cabinet worklist gives four additional columns (see Figure 9.4) compared with the grid shown in Figure 9.2.

Length increase %: indicates the percentage of variation in the length of the piece that makes up the cabinet, compared with the variation in the cabinet dimension.
Length dependence: used to specify which cabinet dimension the length increase percentage refers to.
Width increase %: indicates the percentage of variation in the length of the piece that makes up the cabinet, compared with the variation in the cabinet dimension.
Width dependence: used to specify which cabinet dimension the length increase percentage refers to.

Let's take the creation of the following cabinet as an example.

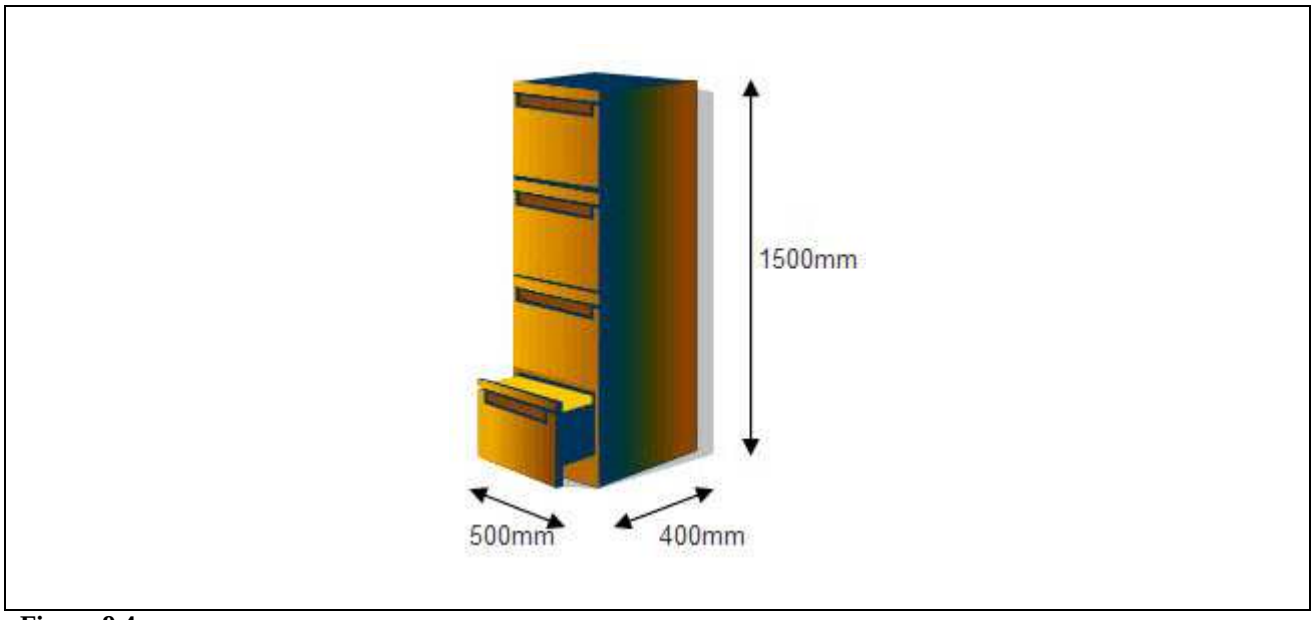


Figure 9.4

The pieces to be inserted in the cabinet editor are:

	Material	Length	Width	Quantity	Description
1	Cherry	1500	400	2	Left and right sides
2	Cherry	500	400	2	Upper and lower bases
3	Cherry	500	375	4	Drawers
4	MDF	1500	500	1	Back panel

For reasons of simplicity, the thickness of the material is not considered when inserting the dimensions of the individual pieces; in this way, the attention focuses on managing the remeasuring of the cabinet.
Once the pieces that make up the cabinet (and their measurements) have been defined, it is necessary to fix the link with the dimensions of the cabinet itself.
- The right and left sides are linked to the height of the cabinet, and its depth.
- The upper and lower bases are linked to the width of the cabinet, and its depth.
- The drawers are linked to the width of the cabinet, and its height.
- The back panel is linked to the width of the cabinet, and its height.

	Description	Length increase %	Length dependence	Width increase %	Width dependence
1	Left and right sides	100	Height	100	Depth
2	Upper and lower bases	100	Width	100	Depth
3	Drawers	100	Width	25	Height
4	Back panel	100	Width	100	Height

The table shows that the dimensions of pieces relating to the side panels, basis and back panel are directly linked to the dimensions of the cabinet, with a value of 100%. If, for instance, I want to produce the same cabinet but 1700mm high (with a variation of 200mm), then also the side panels will be 200mm longer.
The situation is different for the drawers. Given that I need four drawers to make up the height, the height variation of the cabinet must be divided by the number of drawers, so the resulting percentage is 25%. Taking the above example (where I want to produce the same cabinet but 1700mm high, with a variation of 200mm), the width of the drawers will increase by 50mm.

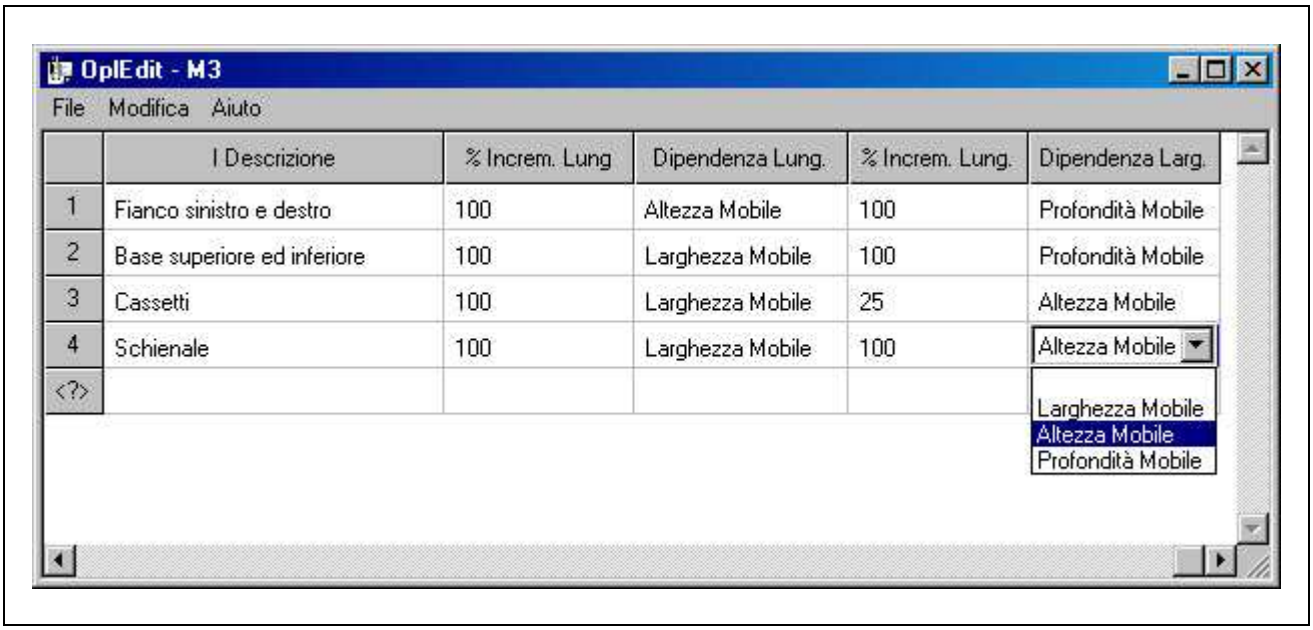


Figure 9.5

After creating the file for the cabinet, the next step is to move it to the right-hand table that lists the cabinets to be produced. If you want to create a cabinet with non-standard dimensions, just select the cabinet to be remeasured and press the “Measure” button, as shown in the figure below.

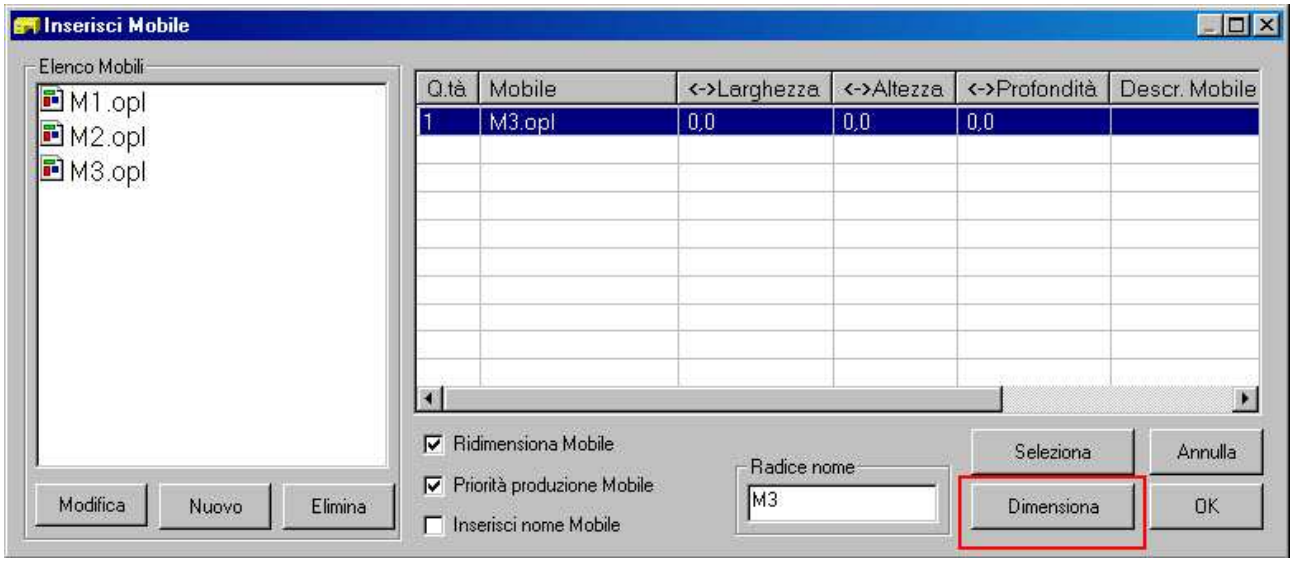


Figure 9.6

In terms of data, the window relating to cabinet remeasuring requires the variations in the dimensions of the end cabinet compared with the standard cabinet. If we want to create a cabinet 1700mm high, 600mm wide and 300mm deep, the data to be entered are:
- *Width variation (X)*: 600 - 500 = 100
- *Height variation (Z)*: 1700 - 1500 = 200
- *Depth variation (Y)*: 300 - 400 = -100

Figure 9.7

The window allows you to specify further information to be associated with the selected cabinet:
- *Cabinet material*: to modify the material to be used for the cabinet. This field can be used when all the pieces that make up the standard cabinet are of the same material, with the same thickness.

- *Cabinet description*: to specify a description for all the pieces that make up the cabinet (for instance the name of the customer for whom the cabinet is being produced), so as to identify the pieces after sectioning.
- *Cabinet priority*: if you have the "Stacking Pile Management" option, then by suitably setting the optimisation parameters you can assign a production priority to the pieces that make up the cabinet.

9.5 CREATING WORKLISTS FROM THE PARTS ENVIRONMENT

Apart from the cabinet management explanation, there are also other ways of creating a list of parts to vary the data in the list of pieces to be produced. These functions can be used to reduce data entry times by quickly editing a list that has already been created. All of these operations are carried out by opening a worklist and selecting the *Parts* button followed by *Select* on the relevant toolbar. This section contains the list of parts that can be edited with a simple click of the mouse. The different possibilities are shown here below.

1. Part Exclusion

Parts are excluded by double clicking on the relevant part; at this point, a red cross will appear in front of the part data. Another double-click will turn this cross back into the green circle that indicates that a part is used normally. An excluded part will not be considered during solution optimisation.

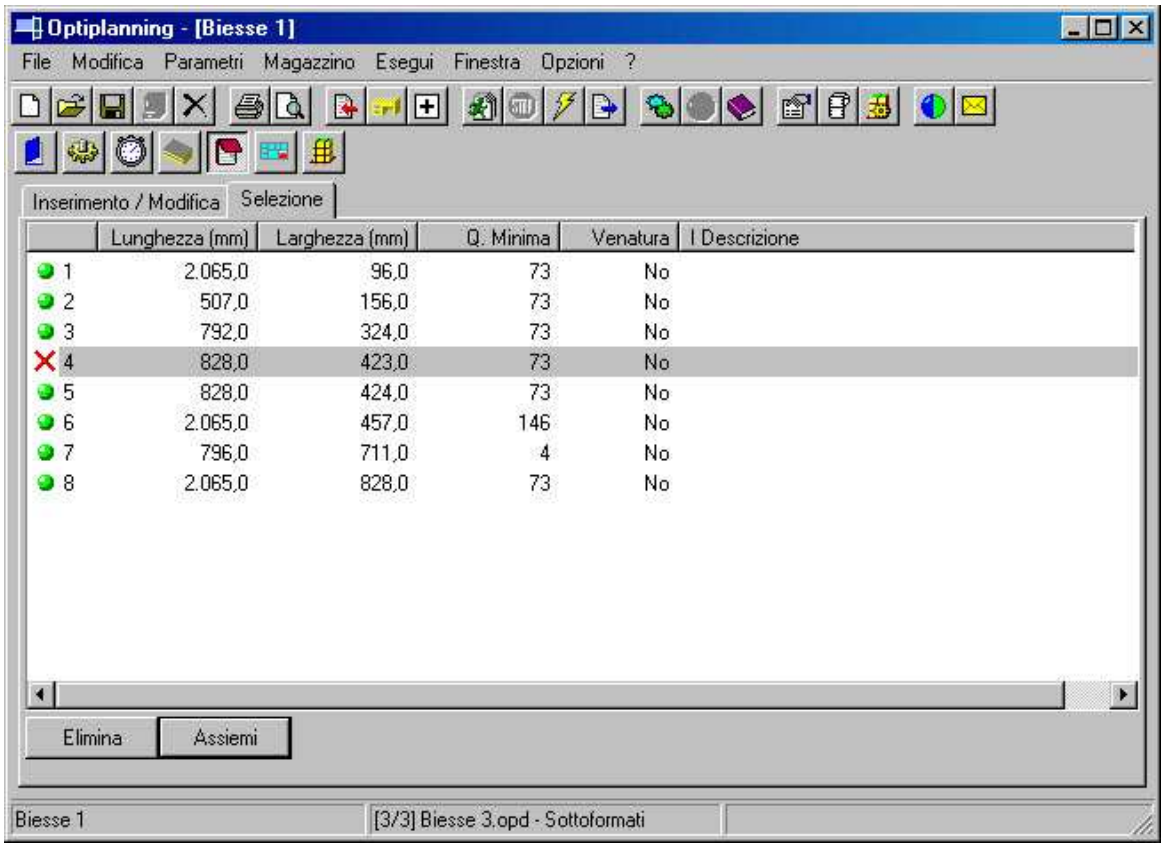


Figure 9.8

2. Part Sequence Editing

This is possible by selecting a part and using the mouse to drag it into a new position (the left-hand button of the mouse must be held down).

3. Selecting Several Parts

This is possible using the normal Windows functions; that is, with a left click of the mouse to select the part. To select more than one part, click the mouse while holding down SHIFT or CTRL. If the right button of the mouse is clicked, this will open the window that displays all of the functions that are available for this environment. The first (*Select All*) and the second (*Unselect All*) are used to select/deselect the entire parts list. The selection of one or more parts is used to indicate to which elements the next functions are to be applied.

4. Copy/Paste/Cut

These allow the normal Windows functions for copying and pasting parts from one worklist to another, or to duplicate a part (*Copy* + *Paste* in the same list) or even to move a part from one worklist to another (*Cut* + *Paste*). When passing from one worklist to another, after having edited the first, the program will always ask to save the changes made; if this is not confirmed (YES), the changes will be lost.

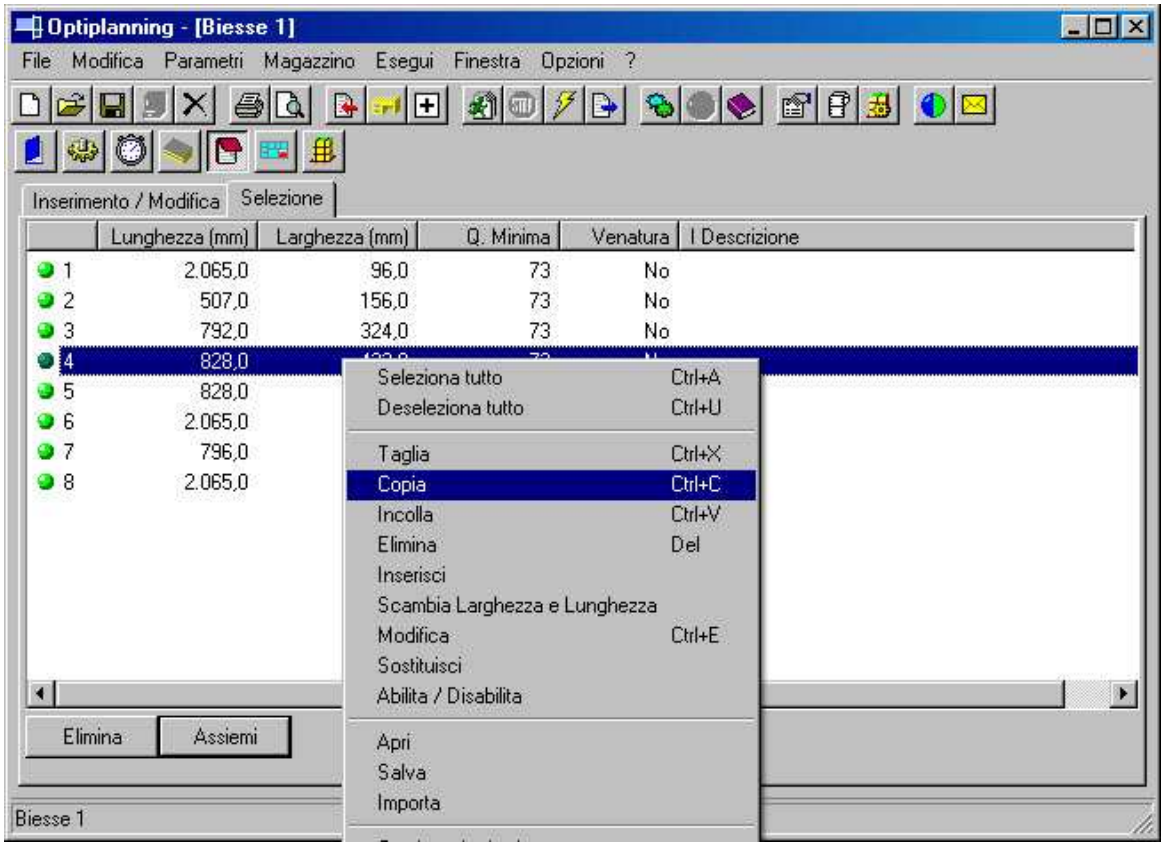


Figure 9.9

5. Deleting Parts

Parts can be deleted by selecting *Delete* from the functions list or by pressing the button in the bottom left of the window.

6. Part Length and Width Inversion

It is possible to invert the values in the part length and width fields by selecting *Exchange Width and Length* from the list of functions.

7. Selection Edit

It is possible to edit selections by choosing *Edit* from the functions list, which will open a window that can be used to change part fields using simple calculations or to fix them using constant values. In particular, for example, if *Length* is selected as *Data*, clicking on the **+** operation and setting the value 10, which must then be confirmed by pressing *OK*, the length of the selected parts will be increased by 10 mm (when the unit of measurement is metric). In the same way, it is possible to reduce a measurement (**-** operation), or to multiply or divide minimum parts quantities (**x** and **/** operations). The **=** operation can be used to fix a constant value in a field; in particular, setting *Grain* = 0 means that pieces can be rotated (*Grain* = 1 means that a piece cannot be rotated). That which has been explained for some part fields can be applied to all data fields as far as regards the +, -, *x,/* operations and also to all assignment text fields (=).

Figure 9.10

8. Parts List File Management

The list of functions also contains *Open*, *Save* and *Import*, which can be used to add lists of parts that are available on file. In particular, *Save* is used to save selected parts in a file with the extension ".lis"; *Open* is used to open one of these files and to paste the associated parts into an open worklist file. *Import* manages, in the same way as the import functions described in a previous chapter, the import of parts lists from ASCII files. In this case too, it is necessary to select a file of import rules and an ASCII file with data to be imported.

The final available function is described in the *Parts Set Management* section.

9.6 EDITING LISTS FROM THE SUMMARY ENVIRONMENT

To complete advanced cutting list management, it is necessary to analyse the functions that are available in the *Summary* window. These are used to quickly change some data in existing worklists in order to adapt them to any new requirements. All of these operations are carried out by opening a job. At this point, OptiPlanning will automatically pass to the *Summary* environment (this environment can, in any case, be selected from the specific toolbar by clicking on the first button on the left). Right clicking from the *Summary* environment will access the following functions (see Fig.8.1).

1. Material Editor

This function is used to change the type of material (and therefore, the thickness) in the selected worklist. It is enabled by selecting *Material* after first selecting a worklist and right clicking with the mouse. At this point, the window shown in the following figure will open. This is used to change the material to be associated to the worklist by means of the drop-down menu and then clicking on *Change*. For each type of material selected, as well as the material code (*Name* field) all of the other properties are also displayed (these properties may only be modified, however from the panel magazine).

In order to avoid errors, it is necessary to remember that editing the materials in a worklist does not vary the panels that are already inserted, only the general characteristics of the material. To vary the panels, it is necessary to refer to the chapter that describes how to add/remove a panel from a worklist.

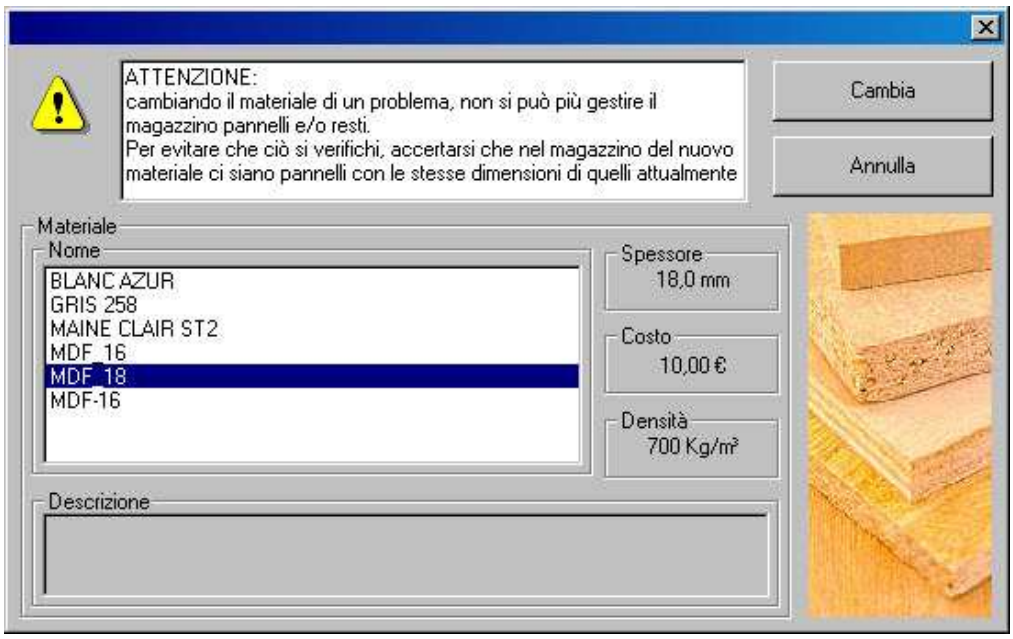


Figure 9.11

2. Parameters Editor

This function is used to edit the set of parameters in a selected worklist. It is enabled by selecting *Parameters* after first selecting the list and right clicking with the mouse.

At this point, the window shown in the following figure will open. This is used to change the set of optimisation parameters to be associated to the worklist, using the drop-down menu and confirming the operation by clicking on *OK*.

The same window also contains a *Compare* button, which is used to make comparisons between the parameters currently used in the worklist and the set of parameters selected in the drop-down menu. In fact, at times, after creating a worklist, several optimisation tests are made by varying some parameters compared to the base set that is initially loaded with the list. Now it is possible to view the parameters that have been varied compared to the base set (which appears in bold type at the top of the window) by selecting the base set from the drop-down menu and then clicking on *Compare*.

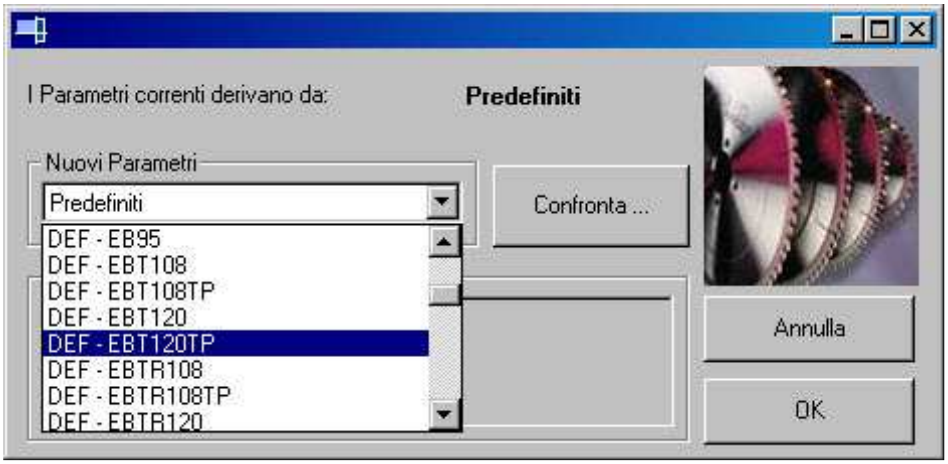


Figure 9.12

After *Compare* has been clicked on, the window shown in Fig.9.11 will open. To start the comparison, it is sufficient to click on the lens button. At the end of the search, only the values of the changed parameters will be displayed. It is possible to select the groups of parameters to be searched in the top part of the window.

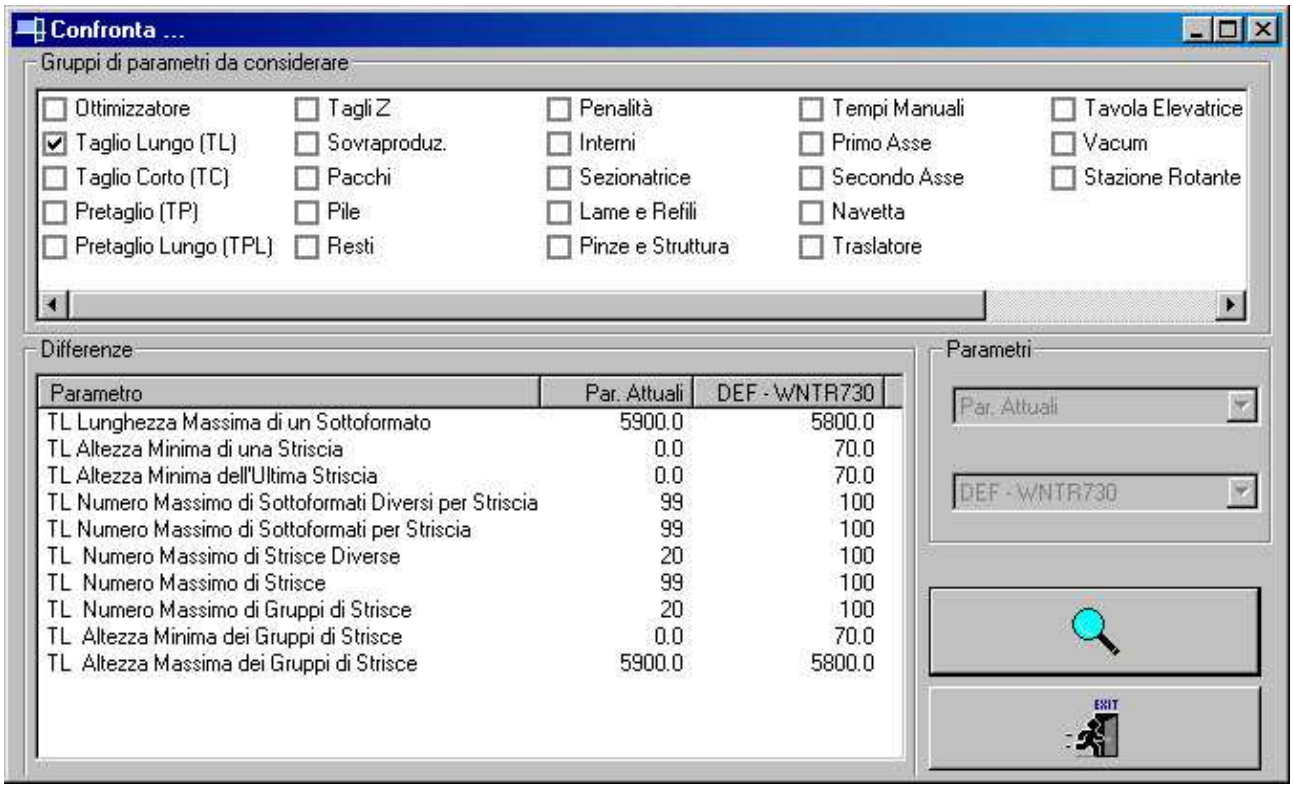


Figure 9.13

3. Creating Intermediate Solutions

This function is used if a worklist processing operation is interrupted by clicking on the stop button. If the worklist manages stacking piles and is interrupted at a time when the algorithm has already been able to create an intermediate solution, it is possible to view the results obtained, even if these will not respect the limit with regard to the maximum number of open piles. This is possible by selecting the *Intermediate Solution Creation* function, after right clicking with the mouse.

4. Stock Updates

This function is used to update the panel magazine after a list has been optimised. It is enabled by selecting *Processed* after first selecting the list and right clicking with the mouse. This operation can be used to automatically reduce the number of panels available in the magazine by a quantity that is equal to the number of panels used in the worklist, as well as to enter the new remainders produced. These changes will of course be made to the material used for the current worklist. The reduction of panels in the magazine will occur only if the quantity of panels is not unlimited and can be extended to recovered remainders (i.e. to remainders present in the magazine, and used in the current list). Once *Processed* has been selected, the symbol in front of the list will change to remind the user that the magazine has been updated.

If *Processed* is selected twice for the same worklist, the magazine data will return to the previous settings.

By selecting *Stock – Automatic Update* from the OptiPlanning menu, it is possible to update the panel magazine automatically at the end of worklist optimisation.

5. Transmission to Machine

This function is used to send the data of the enabled list to the numerical control of the machine, as described in a previous chapter. This is possible by selecting *Transmit to Machine* after first right clicking with the mouse. The same function is enabled by the *Transmit* button on the main toolbar.

6. Adding a New Worklist

This function is used to start the creation of a new list to be added to the job, as already described in a previous chapter. This is possible by selecting *New List* after first right clicking with the mouse. The same function is enabled by the *New List* button on the main toolbar.

7. Adding an Existing Worklist

This function is used to add a worklist that already exists in another job (or which, in any case, is saved in an ".opd" file) to the enabled job. This is possible by selecting *Add List* after first right clicking with the mouse. This will open a window that can be used to explore the folders that are accessible from the PC in order to find the required job (the directory with two points can be used to pass to the directory above). It is also possible to select several lists to be added at the same time. It should be remembered that for each job, OptiPlanning creates a new folder with the name of the job. The job lists will be saved inside this folder in files that have the name of the list and the extension ".opd".

8. Duplicating an Existing Worklist

This function is used to make a copy of the current worklist. It is enabled by selecting *Duplicate*, after first right clicking with the mouse. This will open a window that is used to name the copy to be created. The name of the original worklist plus a progressive number is proposed as default.

Duplicating a worklist can be advantageous when optimisation tests are to be carried out; in this case, it is possible to maintain the best solution obtained while making tests on the copy.

9. Deleting a Worklist

This function is used to delete the current worklist. This is possible by selecting *Delete* after first right clicking with the mouse.

9.7 MANAGING OPTIONAL PIECES

Via the menu item "*Execute - Add optional pieces*", it is possible to enable the editor of a magazine of standard pieces. These pieces are automatically entered in the cutting lists so as not to create remainders.
The piece editor can be viewed via the menu item "*Stock - Optional pieces*". The data entry window is similar to the one for cabinet management.

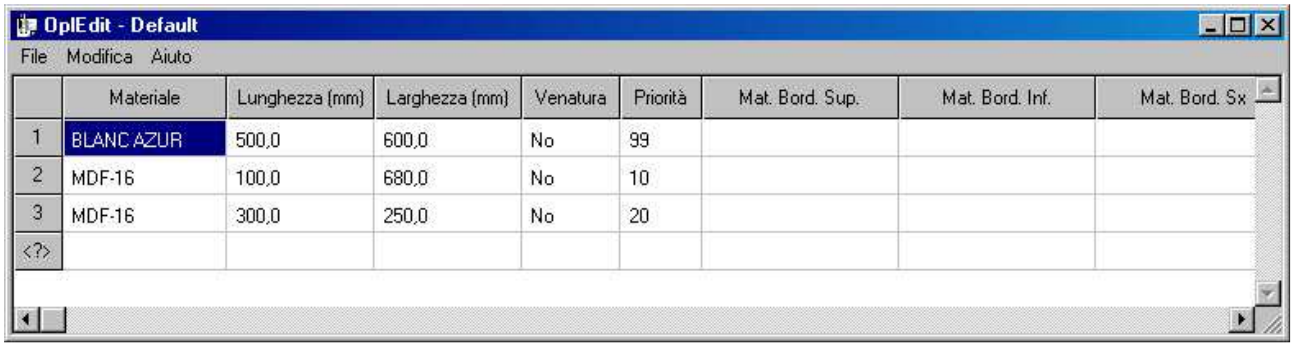


Figure 9.14

Chapter 10

"OPTIONS" MENU PROPERTIES

10.1 INTRODUCTION

The Options menu of OptiPlanning can be used to set a host of general functions that are used for all of the jobs to be managed. Usually these functions are only modified during the installation/configuration of the program to then be maintained for each working session.

10.2 INTERNATIONAL CONFIGURATIONS

This is the first function of the menu and it is used to enter the settings that are usually linked to the country of use. To make these settings operative, it is necessary to restart OptiPlanning. If selected, this function will open the window shown in Fig.10.1, which is used to set the following:

Figure 10.1

- *Measure unit*
  This can be set in millimetres or inches (decimal or fractional).
- *Language*
  This is used to select one of the available interface languages.
- *Display fields*
  This is used to select the order with which to view and print reports concerning the measurements and quantities of parts and panels.

10.3 CONFIGURATION

This is the second function of the menu and it is used to set the folders to be used for saving OptiPlanning data. The default setting, which is enabled after program installation, is usually the setting to be maintained unless it is necessary to share data with other users and/or to store data on a network server. To change any of the set paths, it is sufficient to select it and to click on change (or double click on the path); this will open a window that is used to explore the folders that can be accessed by the PC and to select a new path, which – as already mentioned – may also be a network path.

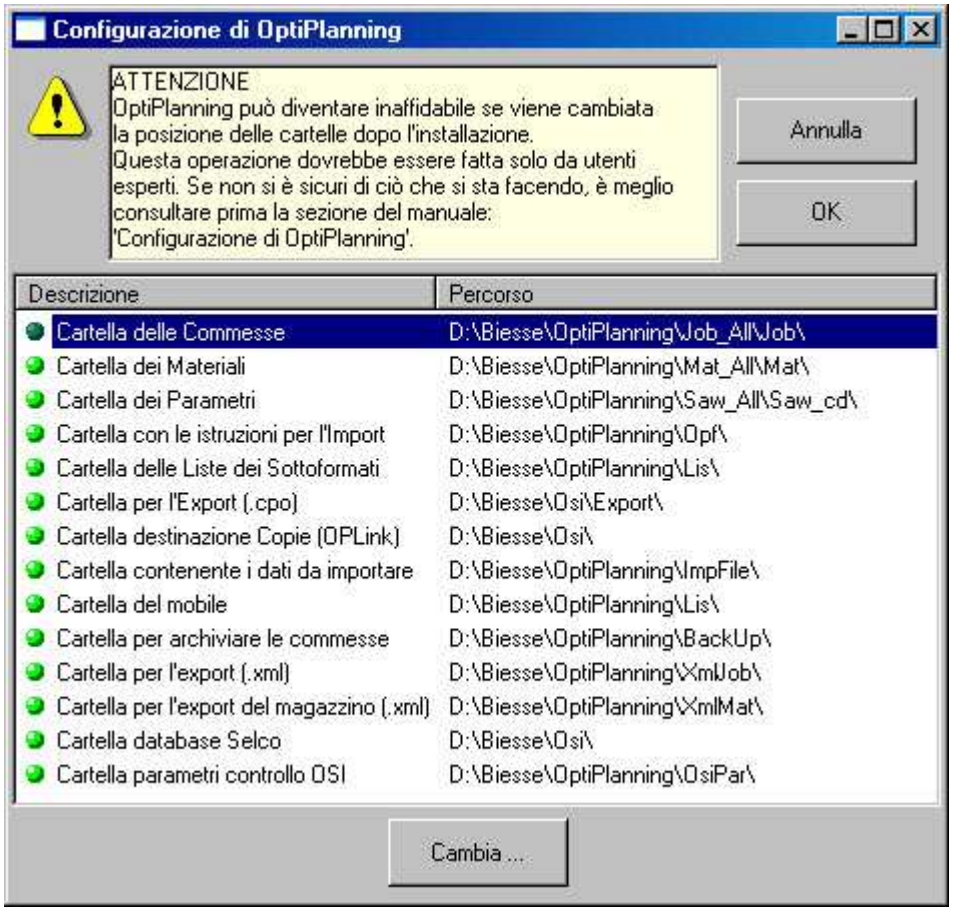


Figure 10.2

The meanings of the different options are as follows:

- *Batch folder*
  This is used to save jobs and all of the lists that they include. If this is set as a network folder, it may slow down OptiPlanning.

- *Materials folder*
  This is used to save the panel magazine. It is one of the folders that are usually shared by different users.

- *Parameters folder*

This is used to save the optimisation parameters lists. It is one of the folders that are usually shared by different users.

- *Import rules folder*
  This is used to save files containing data import rules.

- *Parts list folder*
  This is used to save files containing the parts lists than can be added to existing worklists.

- *Export folder (.cpo)*
  This is used to save the export ASCII file required for downloading data to 480/481 numerical controls, to the worklist import function of the three-dimensional simulation program or for customised processing of optimisation results.

- *Copy path folder (OPLink)*
  This is used to save files destined for NC500 numerical controls and is normally set as the floppy disk drive (for downloading via disk), or as a network path, to the folder "\Selco\NC500\" where the panel saw control program is installed. It can also be set from the "*Options – Data Download – Downloading Options*". For more details, refer to the chapter that describes data downloading.

- *Import data folder*
  This is used to save the ASCII file containing the data of the worklists to be imported.

- *Cabinet folder*
  This is used to save cabinet files. It is one of the folders that are usually shared by different users.

- *Order backup folder*
  This is used to save compressed data backup files (see relevant chapter).

- *Export folder (.xml)*
  This is used to save the ASCII XML files for customised processing of optimisation results. For further information, see the appendix of this manual.

- *Stock export folder (.xml)*
  Used to save the contents of the magazine in an ASCII XML file.

- *Selco database folder*
  Allows OptiPlanning to share the materials magazine with the machine control, in order to manage material consumption and the production of new remainders in the best way.

- *OSI control parameters folder*
  This is necessary for the pattern ordering options for twin pusher and 750 model machines, and to perform the time calculation via the machine control simulator.

10.4 REPORTS

This function is used to set printouts of optimisation results. For more details, see the relevant chapter.

10.5 DATA TRANSFER

This function is used to set the parameters for downloading data to the machine. For more details, see the relevant chapter.

10.6 LABELLING

This function is used to set the parameters for label printing. For more details, see the relevant chapter.

10.7 BAR CODE SCANNER

This function allows OptiPlanning to receive information via a bar code scanner, to simplify file import operations.

10.8 SPECIAL MACHINING OPERATIONS

This menu item visualises a window where you can select a series of special machining operations that can be applied to the cutting lists.

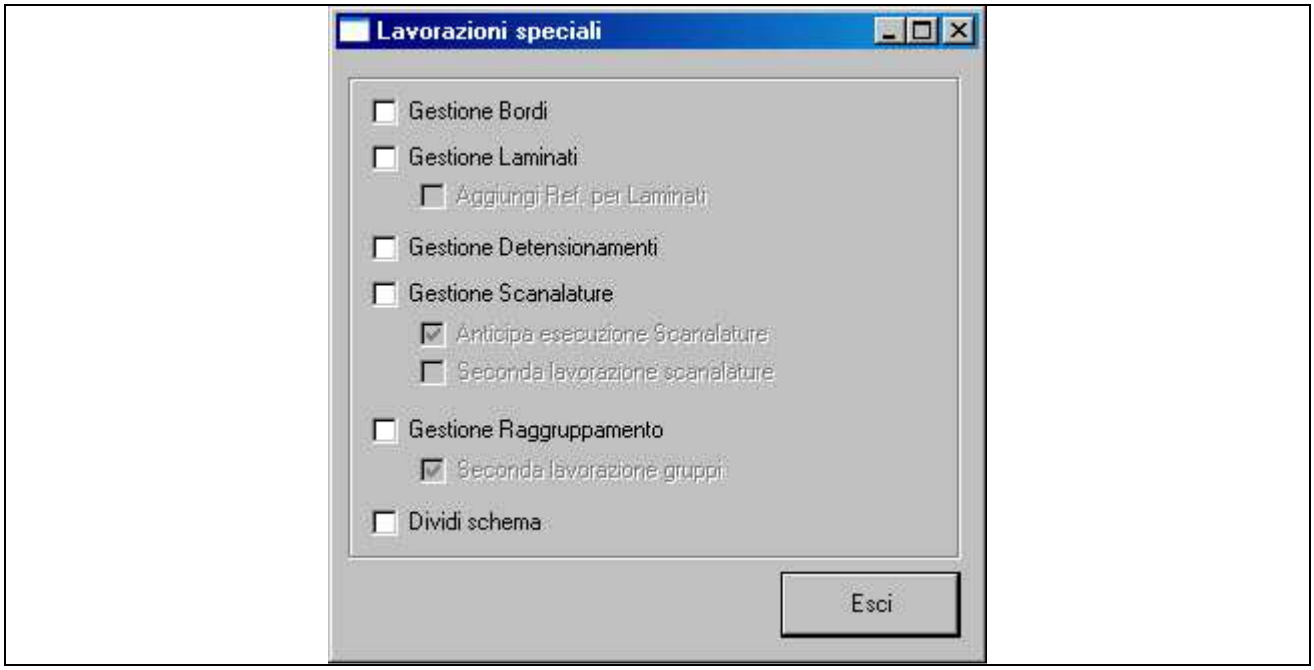


Figure 10.3

The various options are described in the following chapters.

10.9 EDGES MANAGEMENT

This function enables the *Edges Management* (a second click will disable it once more). This type of management includes the use of an edge magazine that can be opened by selecting the menu *Stock – Edges*. In practice, it is possible to enter data concerning the edges to be applied to the parts. This information can be used to evaluate the quantity (length) of edges to be applied to the different pieces. It can also be used to edit the measurements to be sized (used to create patterns) compared to the finished measurements of the parts.

Once the edges magazine has been opened, a further window will open for the entry of the following information (see Fig.10.4):

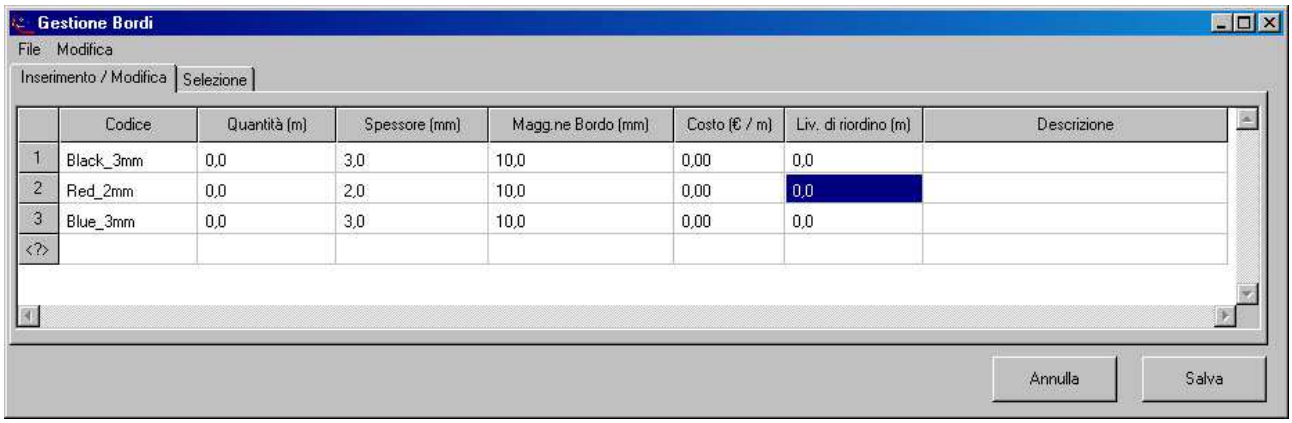


Figure 10.4

1. *Code*

This contains the material code for the edge and is used to identify the edge type.

2. *Quantity*

Shows the quantity available in the magazine. Every time you optimise a list containing edges, or select the processed option, OptiPlanning will reduce the available quantity.

3. *Thickness*

This contains the thickness of the edge. This datum is used to calculate the sized measurement once the finished measurement is known. In practice, each sized part dimension is obtained by subtracting up to two edge thicknesses from the finished measurement; the number of thicknesses to be subtracted depends upon the number of part sides to be edged.

4. *Edge increase*

This contains the excess edge that is present on each side to be edged. In practice, when an edge is applied to the side of a sized piece, the length of the edge is the same as the length of the side, plus the value of this field. This datum is used to calculate the total edge metres used.

5. *Cost*

This contains the cost per metre of the edge.

6. *Reorder level*

This contains the minimum edgebanding quantity, beneath which it must be reordered.

7. *Description*

This can contain a description of the edge.

The parts fields that are destined to contain information concerning the type of edge that is or is not present on the side of a part are:
- *Upper Edge Material* (for the upper side of the part).
- *Lower Edge Material* (for the lower side of the part).
- *Left-hand Edge Material* (for the left side of the part).
- *Right-hand Edge Material* (for the right side of the part).

When the edges management is enabled, these fields have a drop-down menu that can be used to select just one of the edge codes available in the magazine.

Via the menu item "*File-Print*", it is possible to print a report of the edgebanding in the magazine. In addition, if the available quantity and reorder level are specified, the report will highlight depleted edgebanding.

If a new list with new edgebanding is created in OptiPlanning, these will be automatically loaded in the edgebanding stock if the file import option is used.

10.10 LAMINATES MANAGEMENT

This function enables *Laminate Management* (a second click disables it again). This type of management includes the use of a laminates magazine that can be opened by selecting the menu *Stock – Laminates*. In short, it is possible to enter the data for the laminates to be applied to the sectioned parts.

Once the laminates magazine has been opened, a further window will open for the entry of the following information (see Fig.10.5):

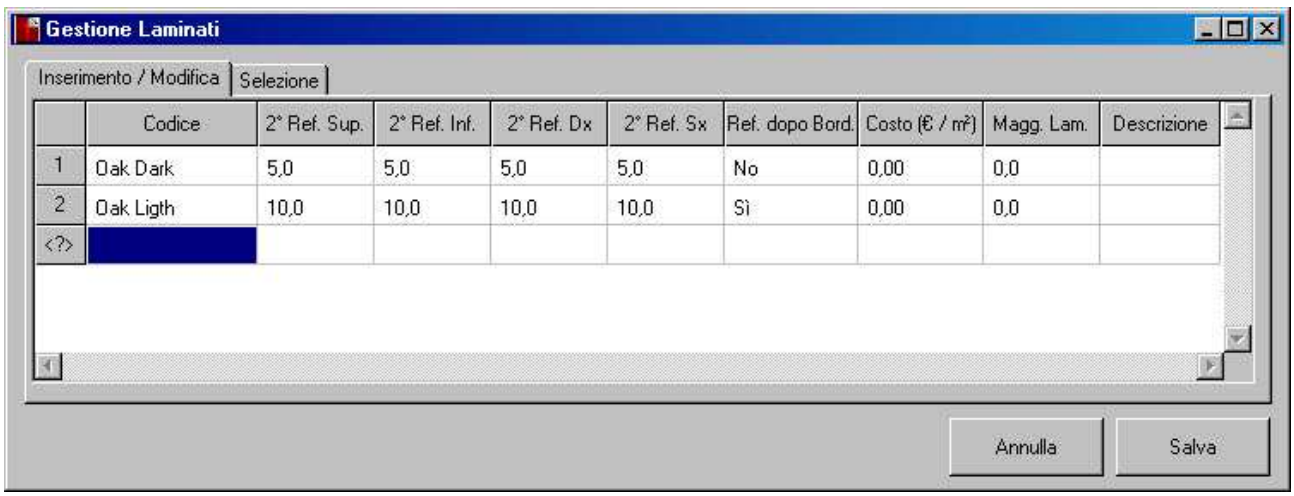


Figure 10.5

This window can be used to enter the following information:

1. *Code*
This contains the material code for the laminate used.

2. *2° Up. Trim*
This contains the size of the second trim cut to be made on the upper side of the part.

3. *2° Lo. Trim*
This contains the size of the second trim cut to be made on the lower side of the part.

4. *2° Le. Trim*
This contains the size of the second trim cut to be made on the left side of the part.

5. *2° Rh. Trim*
This contains the size of the second trim cut to be made on the right side of the part.

6. *Trim after Edge*
This indicates when to make the second trim cut: before or after edging. More specifically, NO means "Trim after Edging" (see first example), while YES means "Trim before Edging " (see second example).

8. *Cost*
This contains the cost per square metre of the laminate.

7. *Lam. Inc.*
Contains the laminate increase that is destined for future use.

8. *Description*
This can contain a description of the edge.

This function is used to introduce a new machining process for sized pieces, which can be summed up as follows:

1. OptiPlanning creates a first worklist to size "rough" pieces and print a "rough pieces label"
2. The "rough" pieces produced are then veneered
3. The veneered pieces return to the panel saw to be trimmed on all four sides. The worklist and programs to be executed for this second machining process will have already been downloaded by OptiPlanning and are recalled using a barcode reader. In other words, the "rough pieces label" contains a barcode which indicates the program to be recalled for execution of the second machining process.
4. The "final" label, if necessary, is printed during the second trim cut of the pieces
5. The pieces are edged.

OptiPlanning Data Entry:

- The finished measurements of the pieces (the measurements after final edging) are entered into the parts grid.

- OptiPlanning has a laminates magazine in which to save the names (material codes) of the laminates, together with the indication for the size of the second trim cut to be made on veneered pieces. This magazine will be described in greater detail later.
- The data for the edge types and part sides are managed as described in the "Edges Management" section.
- It is not necessary to enter any data obtained from "manual calculations".

OptiPlanning processing operations:
Once the data have been entered, the optimiser will calculate and transmit the following to the panel saw:

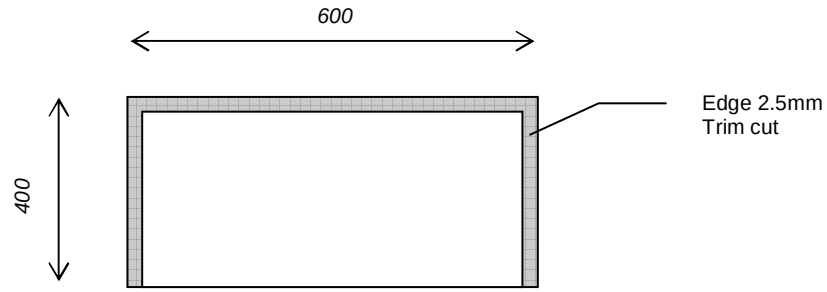
- The worklist to be sized to obtain the "first sizing".
- The worklist to be executed to produce the "second trim cut".
- The data to be printed in the labels for the two worklists.

Variations:

- It is possible to edge rough pieces before the second trim cut

To clarify the processes described here, there is an example for each of the two possible controlled machining processes.

Example 1 – Standard machining process
Data:
Measurement of the finished piece: 600 x 400mm
Trim cuts: right 2mm, left 2mm, upper 2mm, lower 2mm
Edge thickness: right 2.5mm, left 2.5mm, upper 2.5mm, lower 0mm



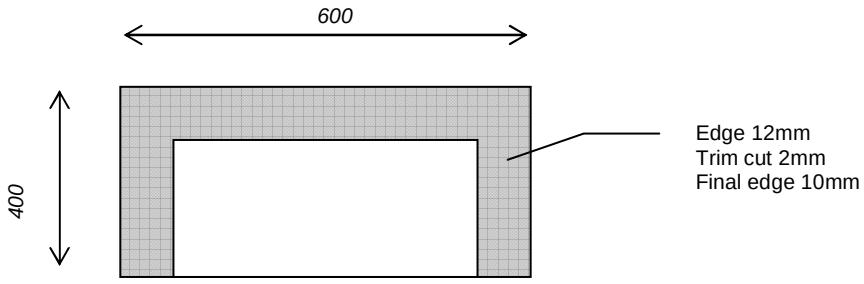
Calculations made by OptiPlanning:

Stage 1 Measurement of the rough piece after the first sizing operation = Finished measurement + trim cuts – edges
600 + 2 + 2 – 2.5 – 2.5 = 599mm
400 + 2 + 2 – 2.5 – 0 = 401.5mm

Stage 2 Measurement of the panel for the second sizing operation = Stage 1 measurement (599 x 401.5)
Measurement of the panel after the second sizing operation = Measurement of the rough piece – trim cuts
599 – 2 –2 = 595mm (with two 2.5mm edges, is 600mm)
401.5 – 2 - 2 = 397.5mm (with one 2.5mm edge, is 500mm)

Example 2 – Edging before the Second Trim Cut
The rough piece is edged, sanded and veneered. At this point the second trim cut must be made.

Data:
Measurement of the finished piece: 600 x 400mm
Trim cuts: right 2mm, left 2mm, upper 2mm, lower 2mm
Edge thickness: 12mm, left 12mm, upper 12mm, lower 0mm
The final edge is given by the thickness of the edging less the thickness of the trim cut (in our example 12-2=10mm)



Step 1 Measurement of the rough piece after the first sizing operation = Finished measurement + trim cuts – edges
600 + 2 + 2 – 12 – 12 = 580mm
400 + 2 + 2 – 12 – 0 = 392mm

Step 2 Measurement of the panel for the second sizing operation = Step 1 measurements (580x392) + edges
580 + 12 + 12 = 604mm
392 + 12 + 0 = 404mm
Measurement after the second sizing operation = Measurement of the rough piece + edges – trim cuts
604 – 2 –2 = 600mm
404 – 2 - 2 = 400mm

The part field that will contain the information concerning the type of laminate used is: *Available Laminate*. When laminate management is enabled, this field has a drop-down menu that can be used to select just one of the codes in the magazine.

To manage this machining operation, it is necessary to send the panel saw two files for each worklist optimised. In the case of the NC500 control, the two worklists will have the same name as the original one, with the addition of a final letter: "i" for the initial worklist (cutting of unprocessed pieces), and "f" for the final worklist (second trim cut). In the case of the OSI control, when transmitting xml files, or transmitting directly to the database, a new name is assigned to the second list to be used for trim cutting the pieces. The name of the second list is created from the name of the first list, adding the characters "-lam".

The creation of the second list must be enabled via the "*Add Trim After Laminate*" option in the "*Special Machining Operations*" window.

10.11 UNSTRAIN MANAGEMENT

This function allows you to work strained materials, i.e. those that lose their shape after the first cut. This special cycle creates cutting patterns that contain areas allowing the controlled deformation of the material. This deformation will be eliminated during the sectioning of the pieces.

The task of OptiPlanning is to envisage the areas of deformation on the basis of the user's needs, so the enabling of this option visualises a new parameters page.

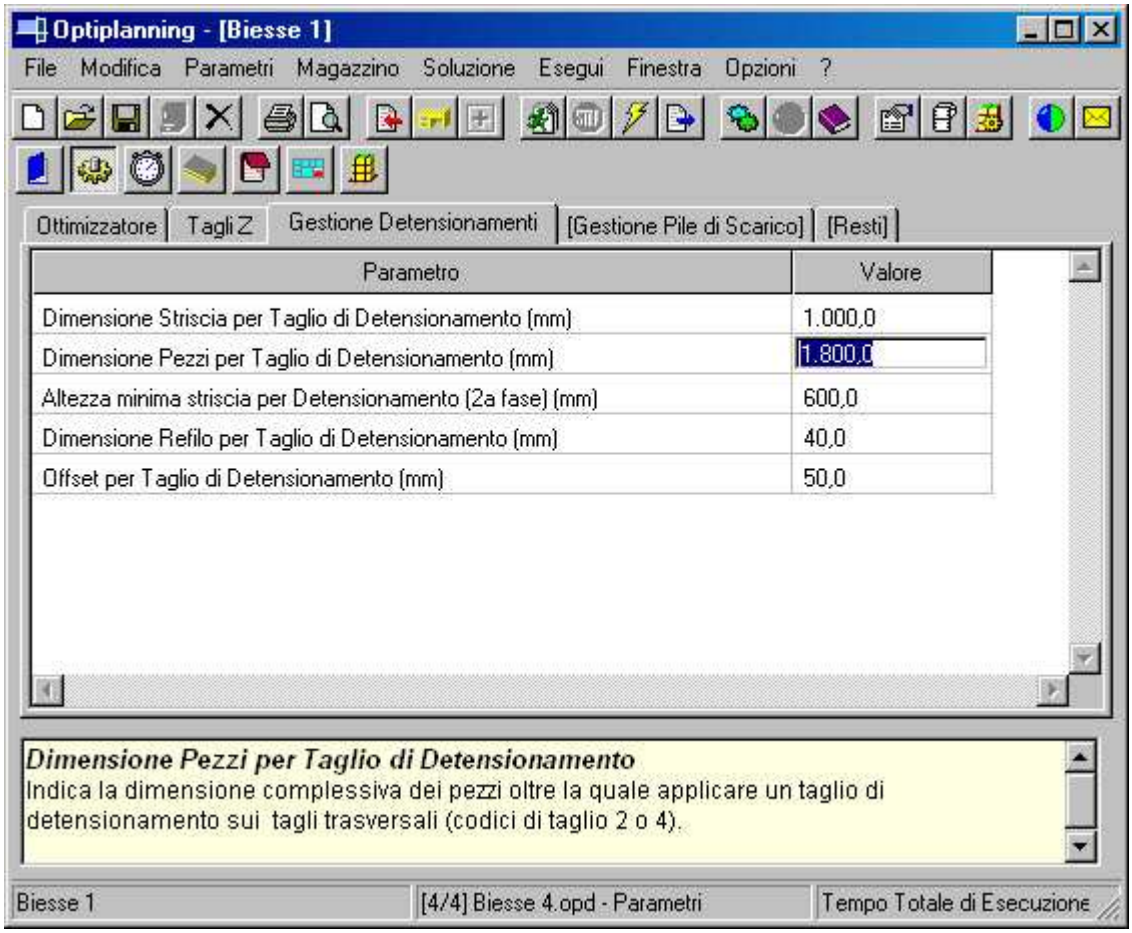


Figure 10.6

- *Dimension of Strip for an Unstrain Cut.*

This allows you to define the maximum dimension of a group of strips included between two unstrain cuts. If the group consists of several strips, the unstrain cut will be made before the parameter is exceeded. If the parameter is set at zero, no unstrain cuts are generated. Figure 10.7 dimension A.

- *Dimension of Pieces for an Unstrain Cut.*

This allows you to define the maximum dimension of a group of pieces included between two unstrain cuts. If the group consists of several pieces, the unstrain cut will be made before the parameter is exceeded. If the parameter is set at zero, no unstrain cuts are generated between the pieces. Figure 10.7 dimension C.

- *Minimum Strip Height for an Unstrain Cut.*

This allows you to define the minimum dimension of a strip in order to make an unstrain cut between the various pieces. Given that the unstrain cut involves making a blind bore inside the

programmed trim cut, the minimum workable dimension depends on the diameter of the blade used. Generally speaking, the minimum recommended dimension is 600mm. Figure 10.7 dimension B.

- *Dimension of Trim Cut for an Unstrain Cut.*
This allows you to define the dimension of the trim cut to be applied to the unstrain cut, in order to eliminate the material deformation. Figure 10.7 dimension D.

- *Unstrain cut offset.*
This allows you to define the start and end margin of the blind cut, in order to allow the controlled deformation of the material. Figure 10.7 dimension E.

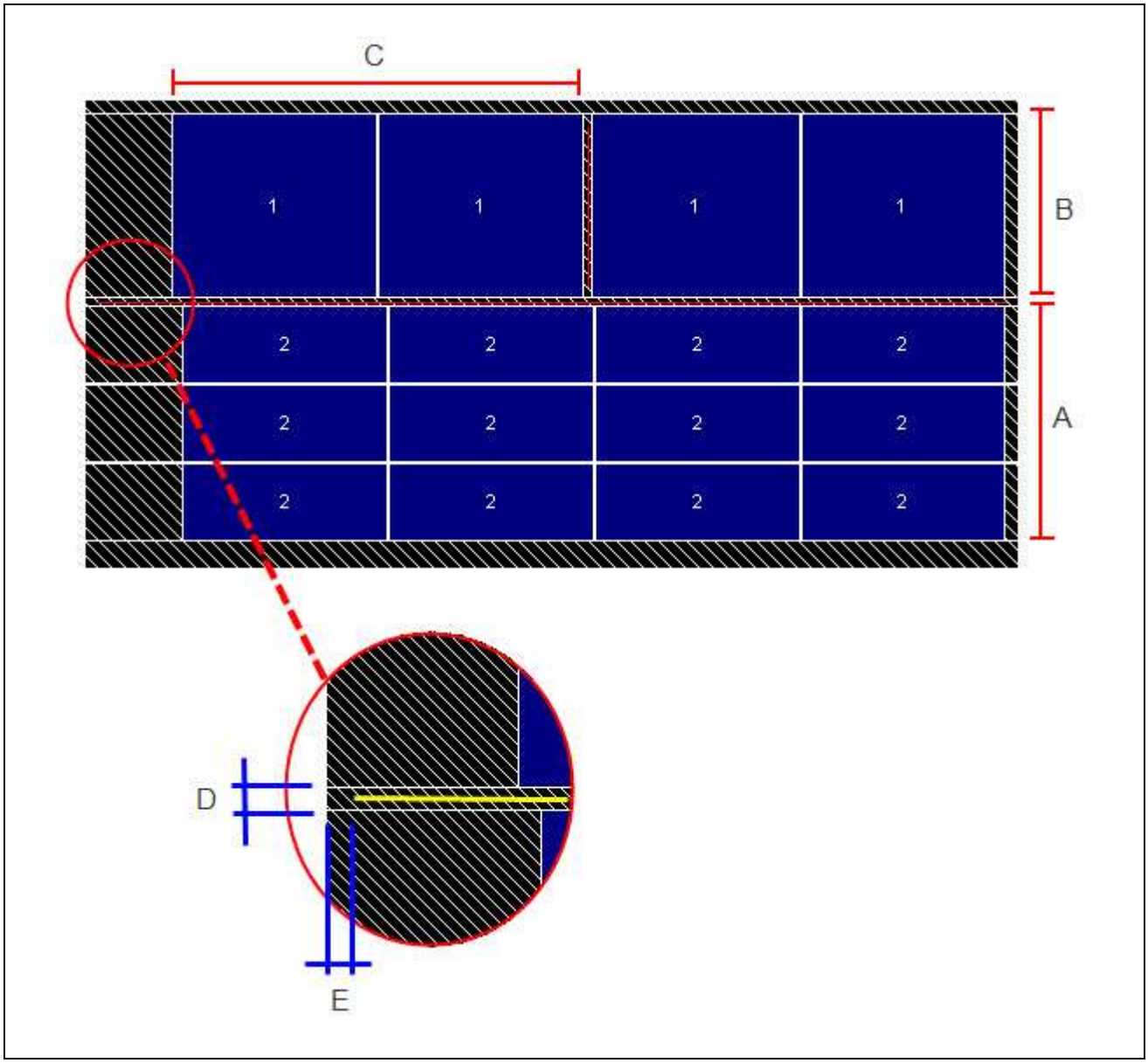


Figure 10.7

If the pattern envisages a recoverable remainder (generating an unstrain cut between the remainder itself and the first strip or piece of the pattern), the unstrain cut will be made simply with a second double edge trimming, without making the blind cut.
For a detailed description of the machining cycle for patterns with unstrain cuts, refer to the machine control manual.

10.12 GROOVE MANAGEMENT

This function allows you to set the creation of grooves directly in the optimiser, in order to automatically generate the cutting codes required to produce them. Apart from enabling the option, you must select - in the parts editor - a new description field called "*Groove Info.*".

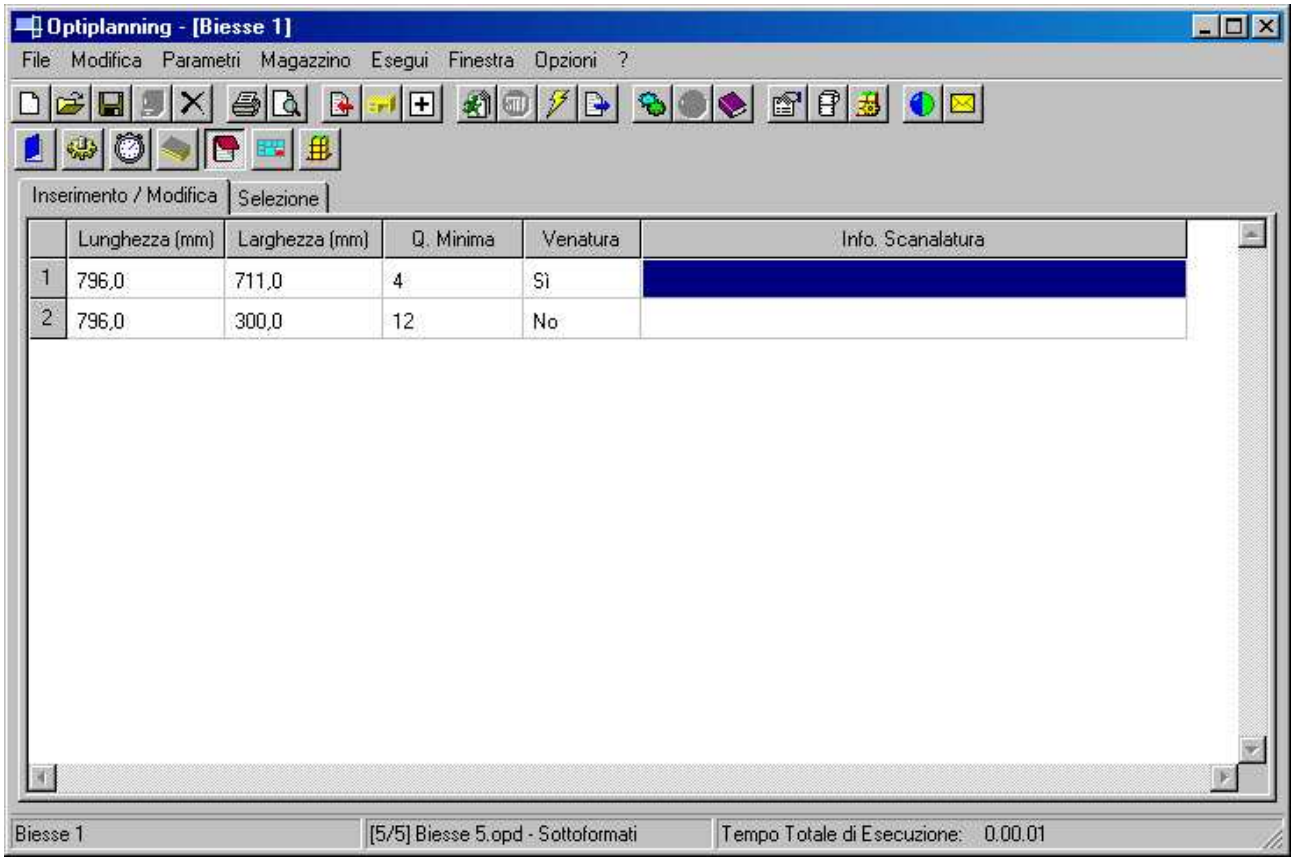


Figure 10.8

The information relating to the grooves associated with a part is memorised by OptiPlanning via a suitable formatted string. The creation of this string is facilitated by a special editor that is visualised while parts data is being entered, by pressing the "ENTER" key or double clicking the mouse in the "*Groove Info.*" field. The parts editor maintains its own characteristics even when grooves are entered, so when the data for a new row are being entered, the editor proposes the grooves entered on the previous row. To eliminate the grooves proposed, you can use the "*Cancel all rows*" button or quit the editor using the "ESC" key.

In the lower area, the editor provides a graphic representation of the piece, with the grooves inserted. Further information concerns the maximum groove depth (equal to the material thickness and the minimum width to be produced), corresponding to the OptiPlanning parameter "*Blade Thickness for Grooves*".

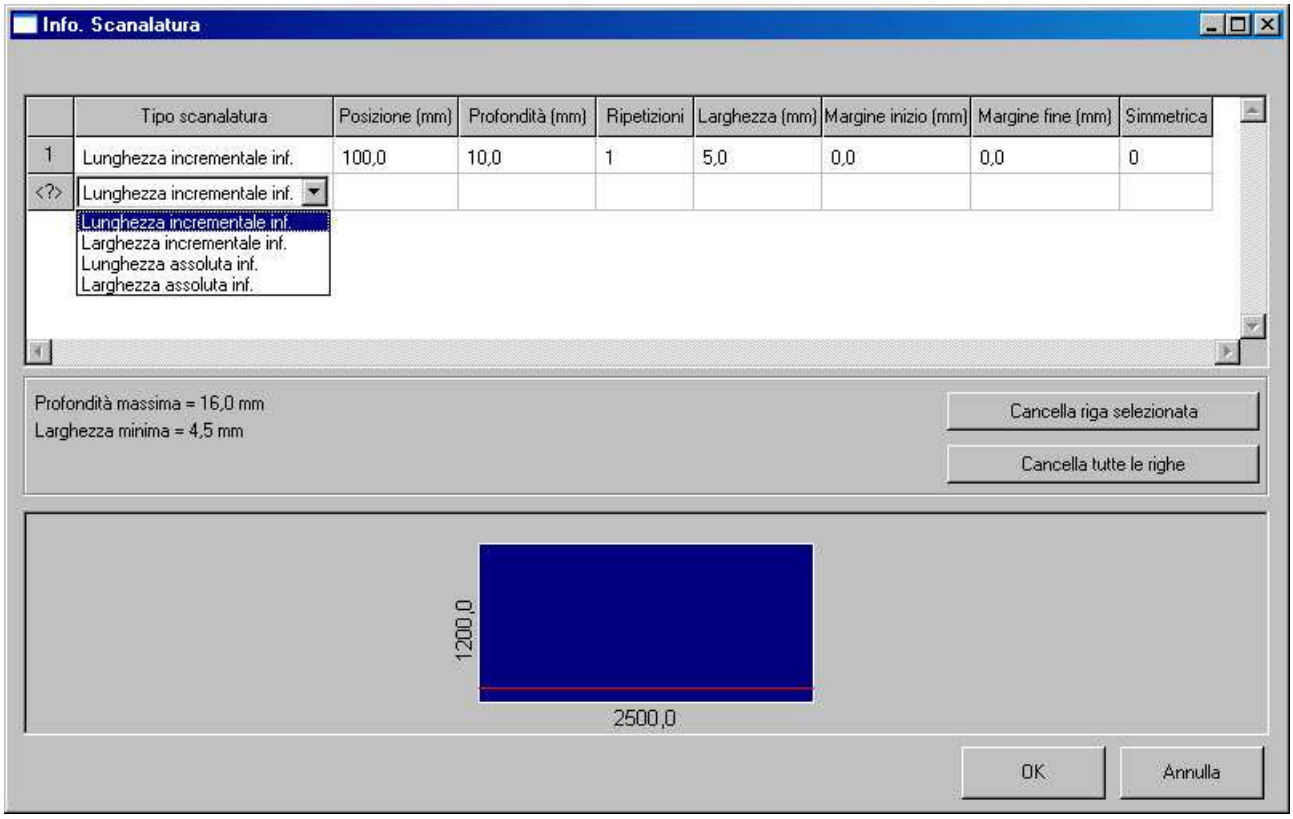


Figure 10.9

- *Type of Groove.*

In a drop-down menu it is possible to specify the direction of the groove, and its positioning. In the string created on the parts page, a number is assigned for every type of groove that can be produced.

1) *Lower incremental length.*
2) *Lower incremental width.*
3) *Lower absolute length.*
4) *Lower absolute width.*

Length-wise, the grooves are parallel to the length of the piece. Width-wise, they are parallel to its width. In the case of an absolute reference, the position of the groove is determined starting from the panel edge. In the case of a relative reference, the position is determined as an increment from the final side of the previous groove.

The four types of groove refer to the lower face of the piece, as a possible development is envisaged on the creation of grooves on the upper face.

- *Position.*

This indicates the position of the groove, in relation to the panel edge for absolute grooves, or in relation to the previous groove in the case of incremental grooves.

- *Depth.*

This indicates the depth of the groove to be created. The material thickness is specified in the window, but there are no checks on the groove depth, thereby leaving the possibility to create blind cuts or window cuts.

- *Repetitions.*
This indicates the number of groove repetitions if it is of the incremental type. For absolute grooves, the allowed value is 1.

- *Width.*
This indicates the width of the groove. Its minimum value is the thickness of the blade used to create the grooves. If a value of zero or '*' is entered, the width will be taken as the blade thickness specified in the OptiPlanning parameters.

- *Start margin / End margin*
This indicates the margins to be maintained in relation to the edge of the material, when you do not want to create a through groove.

- *Symmetrical*
If enabled, this allows you to create mirror grooves without having to manage the piece dimensions. Ensure the grooves created on the clamped side of the piece are compatible with the technical characteristics of the panel saw.

The grooves can also be entered in the cabinet worklists, following the same procedure described above.

Given that the grooves are entered via the parts editor, any modification to them after optimisation will lead to the loss of the solution found. To avoid this problem, there is the possibility to modify or enter the grooves in the patterns editor too, without losing the solution found.

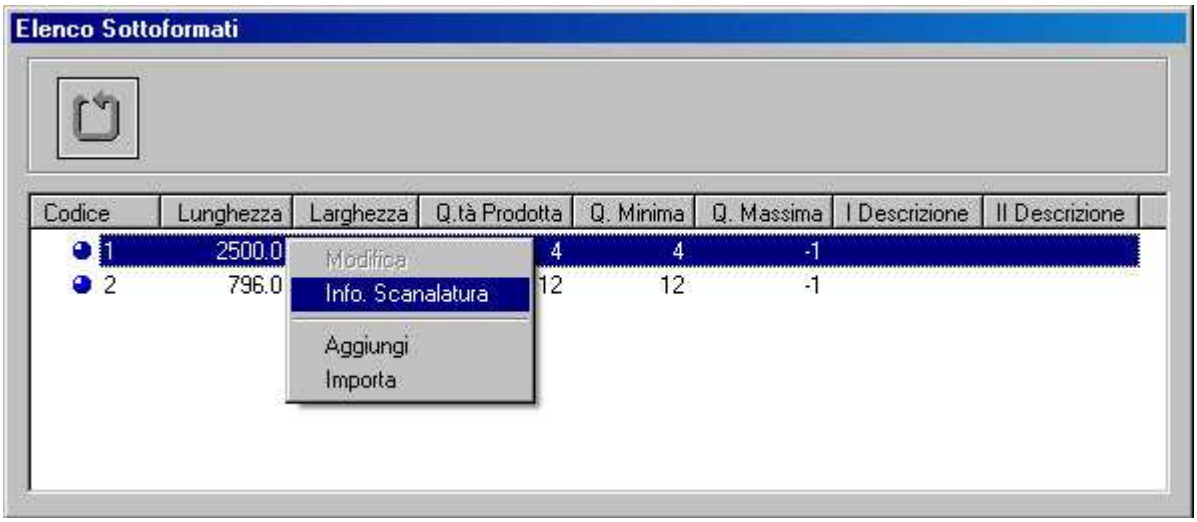


Figure 10.10

The machining of the grooves in the machine control envisages three types of processing, which can be selected via the options in the "*Special Machinings*" window.

- *Anticipate groove machining.*

If no option is specified, the grooves are created during the cutting pattern, immediately prior to the production of the single piece. If piece rotation is required in order to create the groove,the cutting pattern generated will execute code Z1 or Z2, maintaining the piece dimensions unaltered. If selected, the option allows you to reduce the pattern machining time, creating several grooves simultaneously. During the data transmission phase in fact, the pieces that make up the cutting pattern are processed. If all the pieces that form a strip have the same grooves, then a single groove is generated for all the pieces, and is created before the strip is cut. This optimisation is not performed if the strip contains recoverable remainders.

- *Second groove machining.*

This involves generating a second worklist for creating grooves on single pieces. This management function is necessary when you need to use a different blade from the sectioning one, or when you need to perform intermediate machinings between the sectioning and the groove creation. To facilitate the second machining, during the transmission phase the name of the program that makes the grooves is entered in every part. In this way, it is possible - during piece sectioning - to print a label showing the bar code of the name of the second machining, in order to run that machining automatically via the scanner.

The name of the second worklist is generated from the name of the original list, adding the letters "-*grv*". The name of the second machining is entered in the "*II Description*" field of pieces that make up the original worklist.

10.13 GROUPING MANAGEMENT

This function is linked to the edgebanding of the pieces. It is used when pieces smaller than the minimum workable dimension need to be produced. Enabling the option, a special page in the Optiplanning parameters is visualised.

The function involves the automatic creation of a group formed of the unworkable piece (with dimensions that overcome the restraint). After the edgebanding, the group is split to create the required piece.

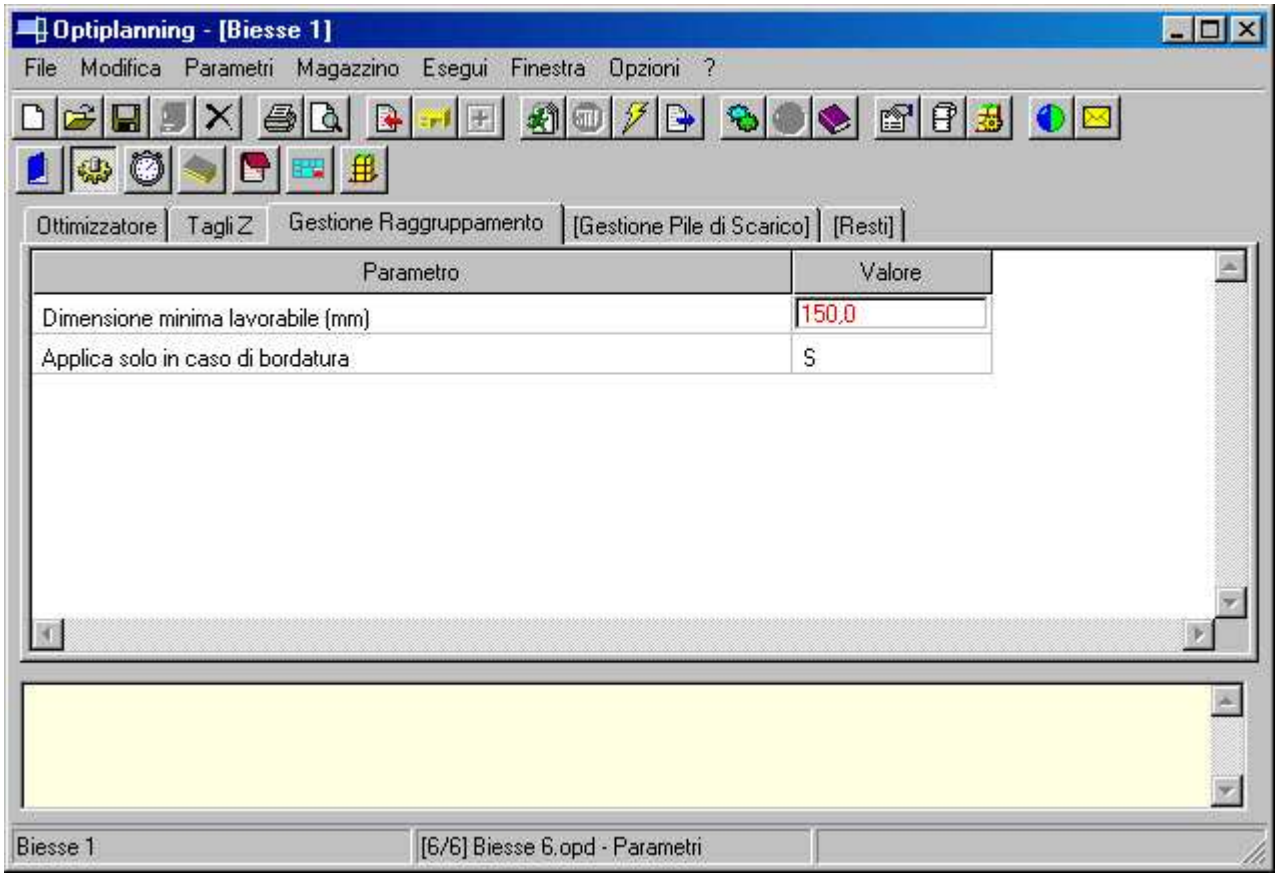


Figure 10.11

- *Minimum Workable Dimension*

This indicates the minimum workable dimension. All the pieces with a dimension less than this parameter will generate groups.

- *Only apply in the case of edgebanding*

If enabled, the option is only applied to pieces for which the type of edgebanding has been specified via the OptiPlanning edge magazine.

As an example, we will create a new cutting list containing a piece smaller than the minimum workable dimension, which must be edged on all four sides (as shown in the image below).

Given that the piece dimension is 75mm and the minimum workable dimension is 150mm, OptiPlanning will automatically create a new piece by joining together two pieces. As the new piece will have to be sectioned again, it is important to take into account the blade thickness.
The dimension of the group will be: 75mm + blade thickness 4.4 + 75mm = 154.4mm

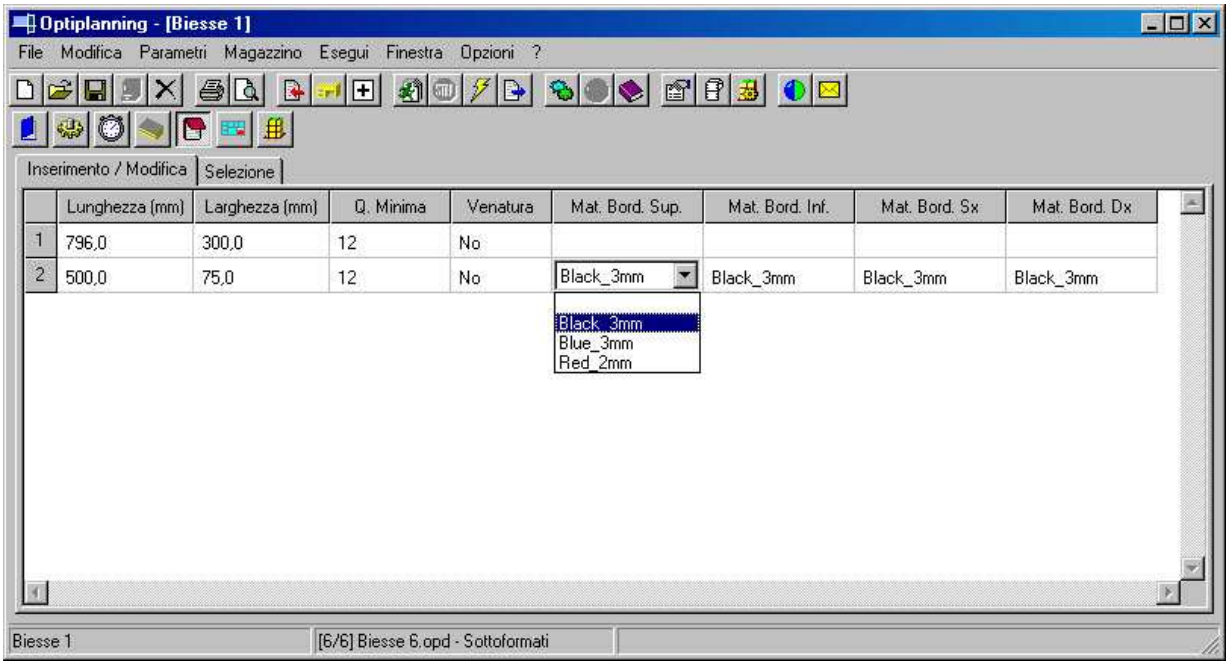


Figure 10.12

Observing the optimisation solution, it is immediately possible to see which aggregates are generated by OptiPlanning (they are shown in grey).

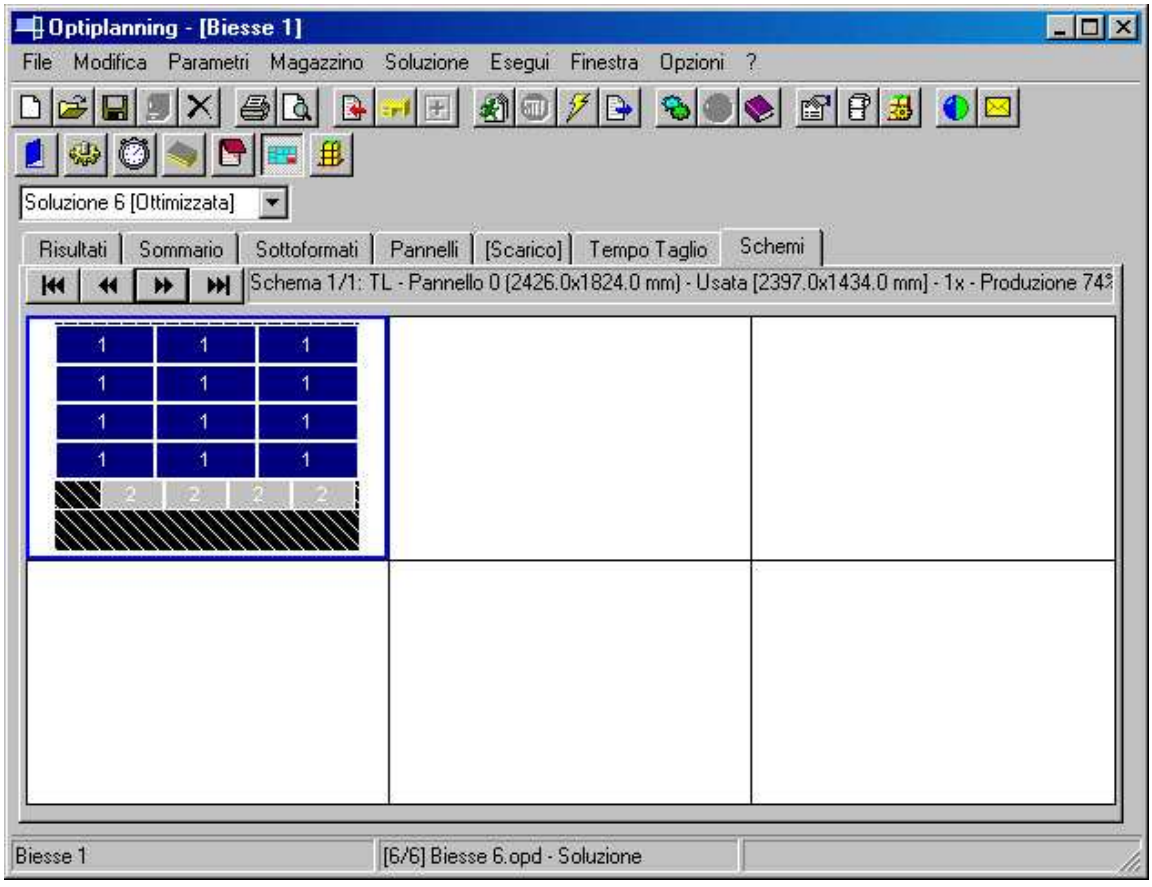


Figure 10.13
The creation of the cutting list to separate the groups can be enabled via the "*Second group machining*" option in the "*Special Machinings*" window.

This involves generating a second worklist to separate the groups after they have been edgebanded. To facilitate the second machining, during the transmission phase the name of the program that performs the separation is entered in each group. In this way, it is possible - during group sectioning - to print a label showing the bar code of the name of the second machining, in order to run that machining automatically via the scanner.

The name of the second worklist is generated from the name of the original list, adding the letters "*-grp*". The name of the second machining is entered in the "*II Description*" field of groups that make up the original worklist.

10.14 PATTERN SPLIT MANAGEMENT

This function allows you to split the machining of one cutting pattern into two separate patterns. In the first pattern, only the rips cuts (RIP) are made, while in the second only the cross cuts (CRS) are made. Generally speaking, this function is used by customers who have a panel saw and a strip cutting machine. The "Pattern Split" option, in fact, enables the simultaneous transmission to machine 1 and machine 2, present in the data transmission options.

During transmission, the worklist is processed to create two new lists. The name of the worklists is generated from the name of the original list, adding the letters "*-rip*" for the rip cuts and "*-crs*" for the cross cuts. The worklist for rip cuts is transmitted to machine 1, while the cross cuts list is transmitted to machine 2.

10.15 INTERFACE DEFINITION

This function is used to customise the OptiPlanning interface. For more details, refer to the chapter about customised settings.

10.16 PATTERNS

This function is used to set pattern displays/printouts. For more details, refer to the chapters about printouts and customised settings.

Chapter 11

CUSTOMISED SETTINGS

11.1 INTRODUCTION

OptiPlanning allows the configuration of a countless series of options that can simplify its use for both expert users and for those using a cutting pattern optimiser for the first time. When OptiPlanning is installed, most of these options are automatically configured to standard settings that are suitable for different practical cases. This chapter is for those who wish to use the potential of this program to the full.

11.2 PARTS GRID

It is possible to define which parts data fields to view and the order in which they appear. To access this option, select *Options – Interface Configuration – Parts* from the main menu. At this point, the window shown in Fig.11.1 will open

The left-hand column (*Existing Fields*) will show all the available part fields. The ones marked with an asterisk are the essential fields that must contain data and that will be visualised in the parts grid; all the others can be omitted. All of the fields in the right-hand column (*Displayed Fields*) will be displayed in the parts grid in the same order as set in this window. To move a field from the left-hand column to the column on the right, it is sufficient to select it and then to click on the button with the right-facing arrows (the other button is used to move the field in the other direction). The same result can be achieved by double clicking on the name of the field.

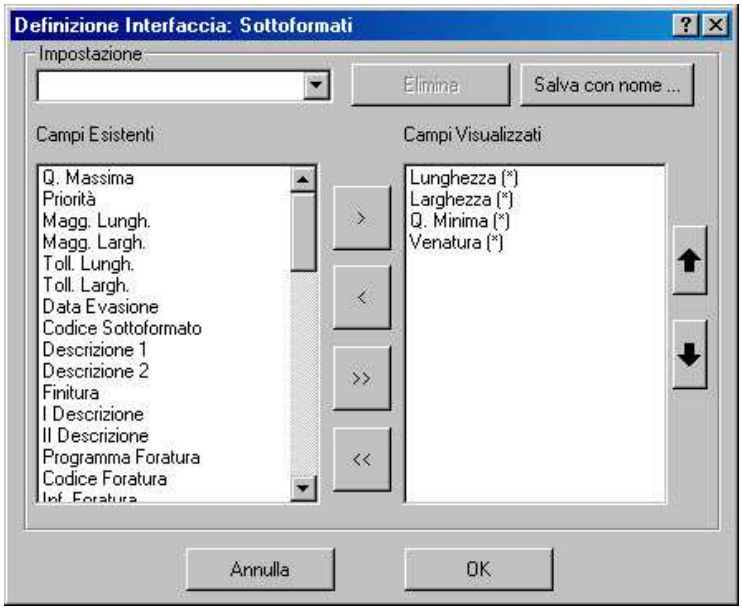


Figure 11.1

Once the fields have been selected, it is possible to save this configuration using the *Save As* button. In this way, it is possible to quickly retrieve the configuration, using the *Setup* drop-down

menu, which allows rapid selection of the part configurations according to the user or the job to be managed. The *Delete* button can be used to delete one or more of these saved sets. To make these changes effective, it is necessary to restart OptiPlanning, after first confirming the new interface definition with the *OK* button.

11.3 PANEL GRID

It is possible to define which panel data fields are to be viewed in the same way as described for the parts grid. To access this option, select *Options – Interface Configuration – Boards* from the main menu. At this point, a window like the one shown in Fig.11.1 will open; this window also contains the same options. To make these changes effective, it is necessary to restart OptiPlanning, after first confirming the new interface definition with the *OK* button.

11.4 FREQUENTLY USED PARAMETERS

It is possible to define which parameters are to be viewed in a new section of optimisation parameters, known as *Frequent Use*. To access this option, select *Options – Interface Configuration – Parameters* from the main menu. At this point, the window shown in Fig.11.2 will open. The functions of this window are the same as those described previously for the parts grid. The arrows in the bottom right of the window can be used to vary the sequence of selected parameters.

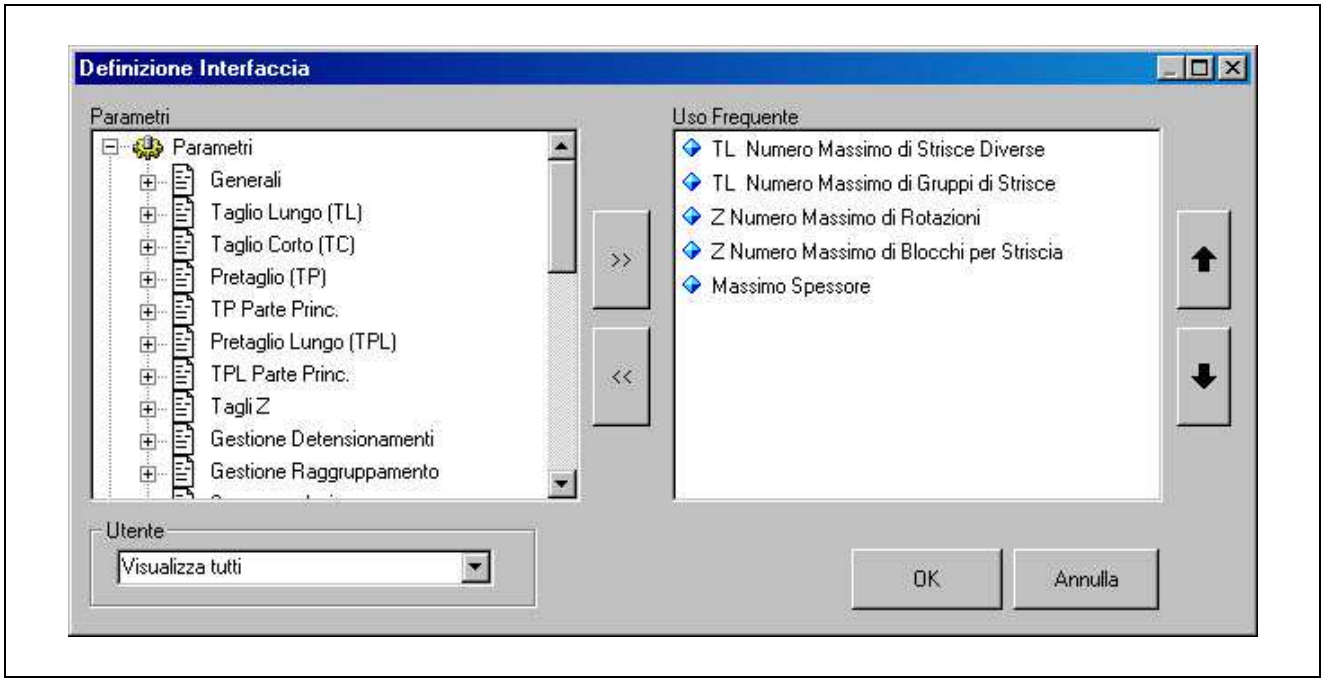


Figure 11.2

If the settings shown in Fig.11.2 are confirmed, after restarting OptiPlanning, the new section, as shown in Fig.11.3, will be obtained. This type of management is useful for moving all of the parameters that are commonly varied during different optimisation processes into a single, immediately accessible section.

The "*User*" field allows you to specify the level of knowledge of the program, in order to reduce the number of parameters visualised and not normally used.

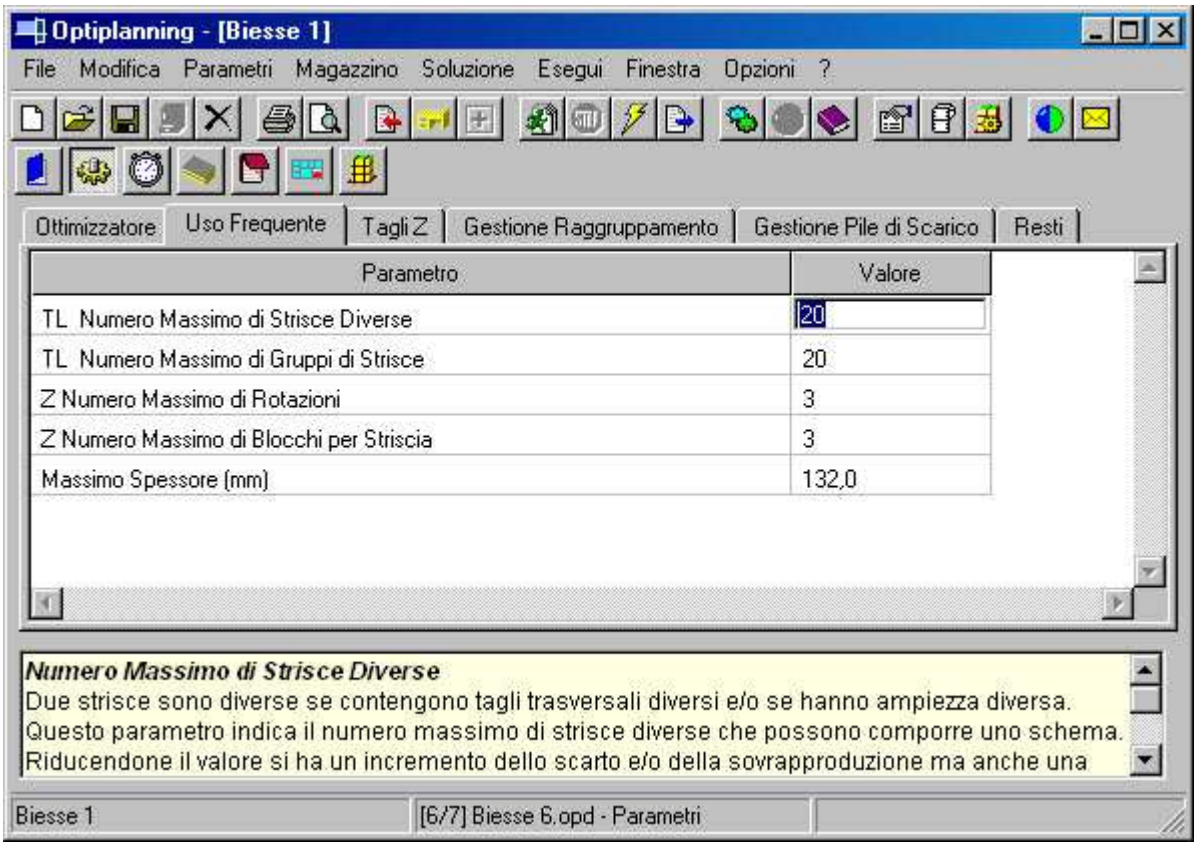


Figure 11.3

11.5 RENAMING PARTS GRIDS

It is possible to change the name of the description fields in the parts grid. This operation, together with the customisation of the number and position of part fields, is useful when data is entered manually and it is necessary to add part descriptions with a different meaning to that in the OptiPlanning default settings. In other words, if for example, the field named *Drilling Program* were to be used to contain a type of part packing to be used, it may be useful to rename this field *Packing Type*.

To access this function, it is necessary to run the *OpSet* program via the button on the OptiPlanning toolbar.

Figure 11.4

Once OpSet.exe has been started, it will open a window like the one shown in Fig.11.5. In this window, it is possible to see all the description fields that can be renamed by double clicking with the mouse. After the fields have been renamed, the *Modify* button is used to save the changes.

The files with the original texts remain available in ".bak" format, should retrieval become necessary (the program makes a backup copy). In practice, by deleting the files "<language name>.lbl", "OPLEdit.<language code>" and "Import.<language code>" and giving the corresponding ".bak" files the same names as the deleted files, it is possible to return to the original situation. It should be remembered that all language files are to be found in "\OptiPlanning\Cfg\". In the case of Italian, for example, the files in question are: "Italiano.lbl", "OPLEdit.ita" and "Import.ita".

It can be seen that the OpSet window shows not only the name of the fields but also the maximum length of each one. In the OptiPlanning program and the OSI machine control, this can facilitate the choice of the field to be renamed.

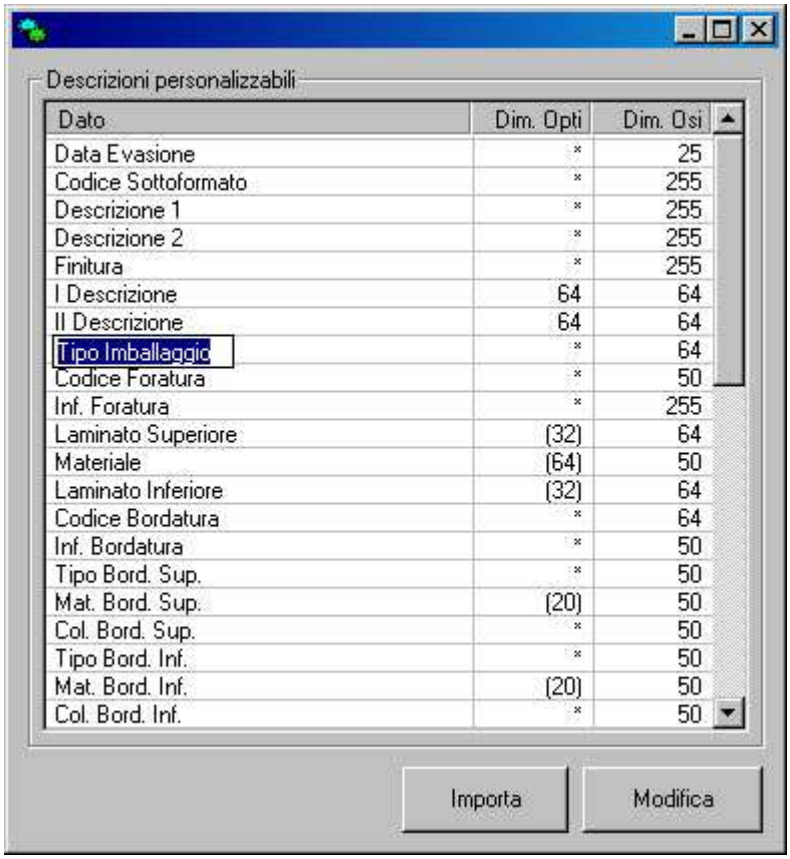


Figure 11.5

The dimensions in brackets indicate the limitations when using special functions such as edgebanding or lamination.

When updating OptiPlanning, it is possible that the customised configuration of the descriptions may be lost. You can reload your own settings by pressing the "Import" button and selecting the OpSet.txt file.

11.6 VIEWING THE PATTERNS

It is possible to define the number of patterns to be viewed at the same time in the section *Solution – Patterns* (for more details, see the relevant chapter). To access this option, select *Options – Patterns* from the main menu. At this point, it is possible to set the number of patterns per page in the fields *Rows* and *Column*. If, for example, *Rows* = 2 and *Column* = 3 are set, 6 patterns will be viewed at the same time. Lastly, the same window contains a drop-down menu, *Origin*, which can be used to define the point of origin used to view the patterns (see Fig.11.6).

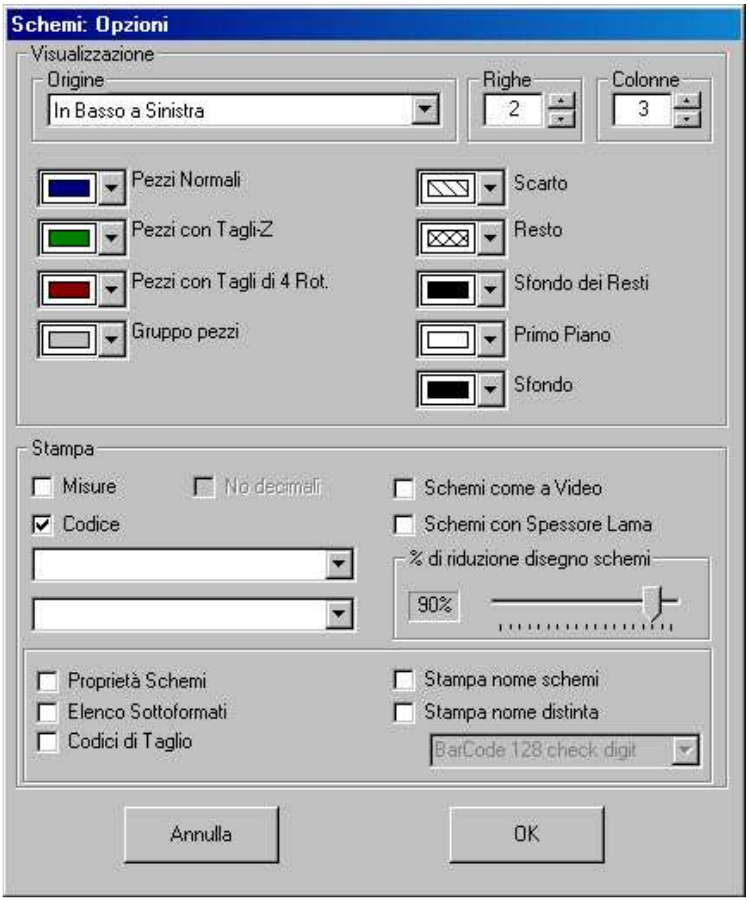


Figure 11.6

11.7 MULTI-TASK WINDOW

It is possible to view the same window twice, and to view the two in tile or cascade form. This operation is used to make immediate comparisons between different worklists. The main application of this function is applied when making copies of the same list in order to edit optimisation parameters; if more than one solution is maintained, it is possible to view and compare them at the same time.

To use this function, it is sufficient to open the same job twice, selecting the option *Load Copy*, during the second "opening". To view both jobs at the same time, it is necessary to select *Window – Tile* or *Window – Cascade* from the main menu. The end result is that shown in Fig.11.7.

It should be remembered that any changes to the job may only be made in the original window, and not in the copy.

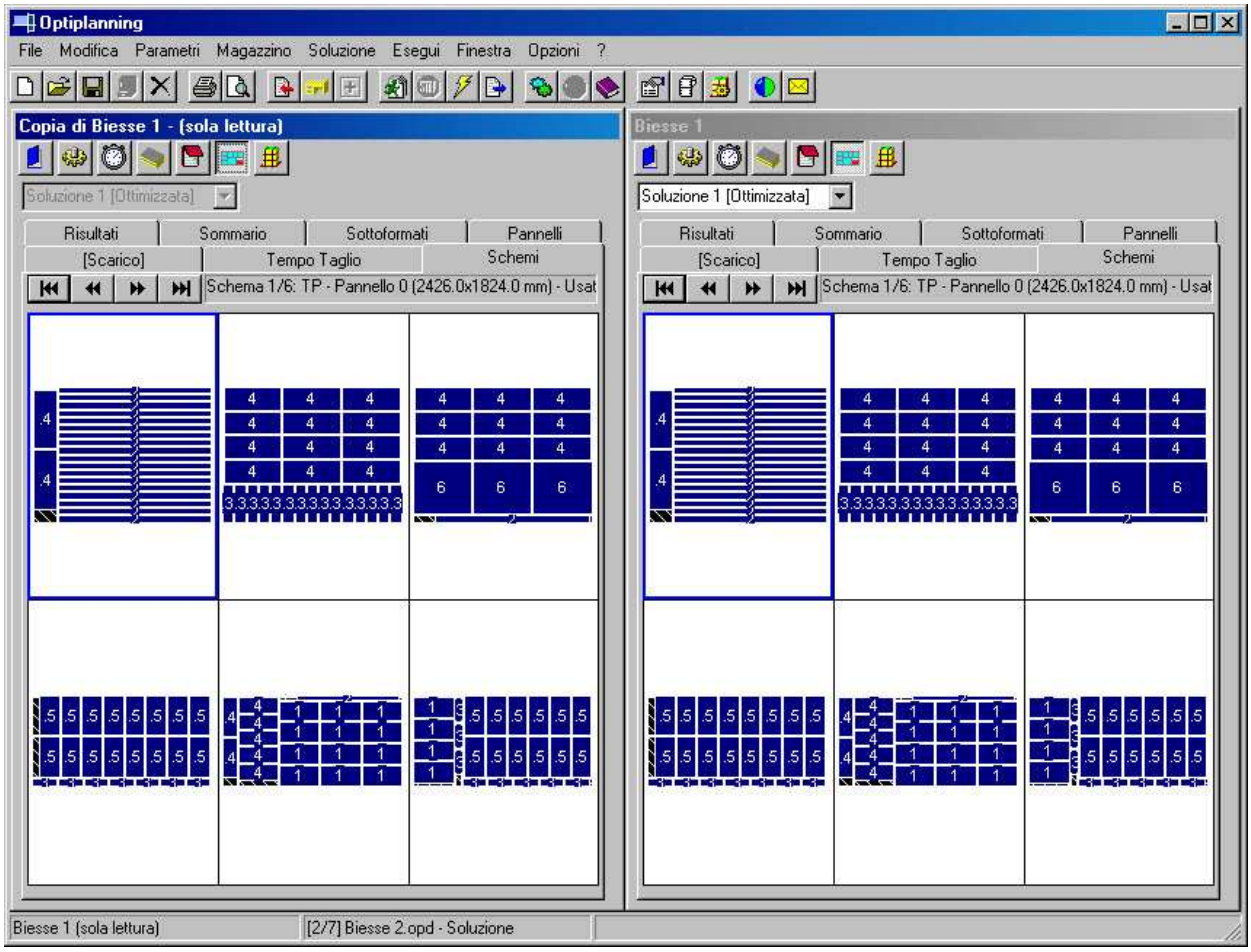

Optiplanning
File Modifica Parametri Magazzino Soluzione Esegui Finestra Opzioni ?
Copia di Biesse 1 - (sola lettura)
Soluzione 1 [Ottimizzata]
Risultati Sommario Sottoformati Pannelli
[Scarico] Tempo Taglio Schemi
Schema 1/6: TP - Pannello 0 (2426.0x1824.0 mm) - Usat
Biesse 1
Soluzione 1 [Ottimizzata]
Risultati Sommario Sottoformati Pannelli
[Scarico] Tempo Taglio Schemi
Schema 1/6: TP - Pannello 0 (2426.0x1824.0 mm) - Usat
Biesse 1 (sola lettura)
[2/7] Biesse 2.opd - Soluzione

Figure 11.7

Chapter 12

DATA ARCHIVE

12.1 INTRODUCTION

For complete data management, OptiPlanning allows previously created files to be stored and retrieved. In particular, it is possible to compress one or more jobs for saving in a predefined folder (or even to floppy disk or network server). At this point, OptiPlanning can delete stored data, which will remain available in compressed form for retrieval if required. This type of management allows a limited number of files to be kept inside OptiPlanning; these facilitate daily data processing and at the same time store files in "safe", always accessible storage devices.

12.2 BACKUP/RESTORE ORDERS

To open the window that manages the function described above, start OptiPlanning and click on the *Backup* button or select the menu *File – Backup* (see Fig.12.1).

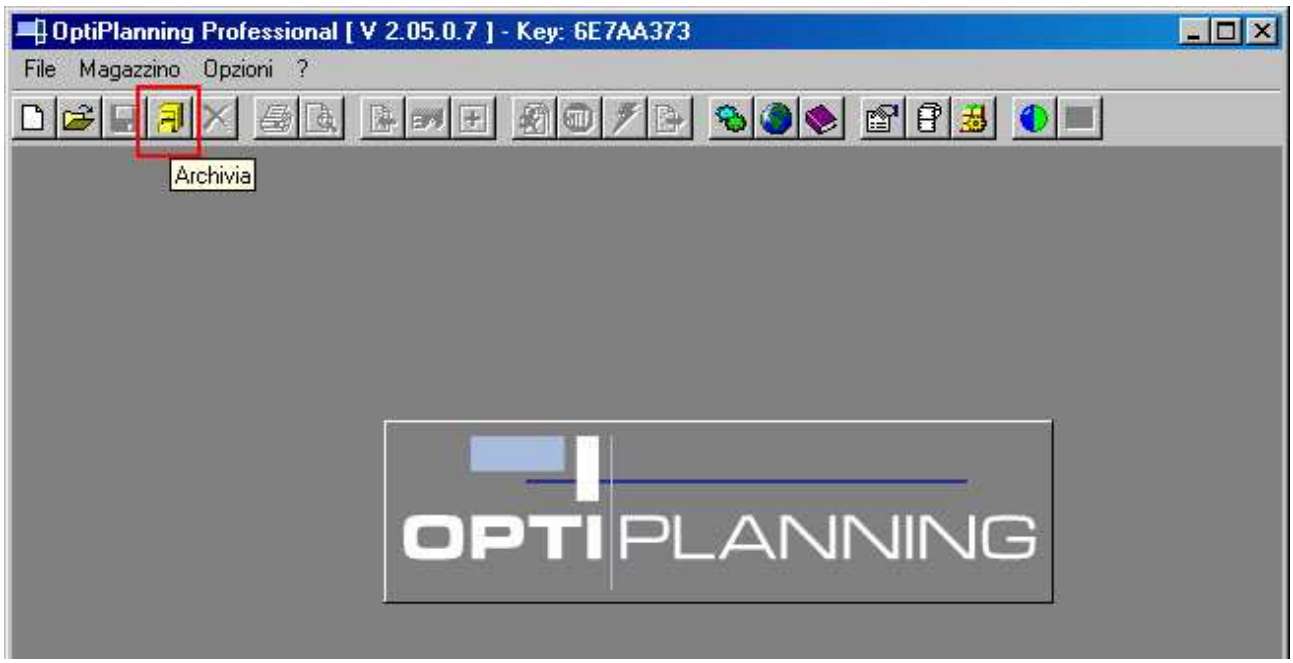


Figure 12.1

At this point, a new window displaying all of the existing jobs will open. To make a backup copy of a job, it s sufficient to select it in the *File Available* field and drag it to the *Backup Files* window below (see Fig.12.2). This can also be done by double clicking on the job to be backed up. The *Backup Files* window will now contain the job in compressed format (.zip). It is important to note that the same job is still available in the *File Available* field; in fact, the operation described here has created a compressed copy of the files linked to the job, without deleting any data.

More precisely, it should be noted that, for each job, a file with ".opj" extension (containing the general data for the job) is saved, as is one ".opd" file for each of the worklists in the job (each of these files contains the data of a stored worklist).

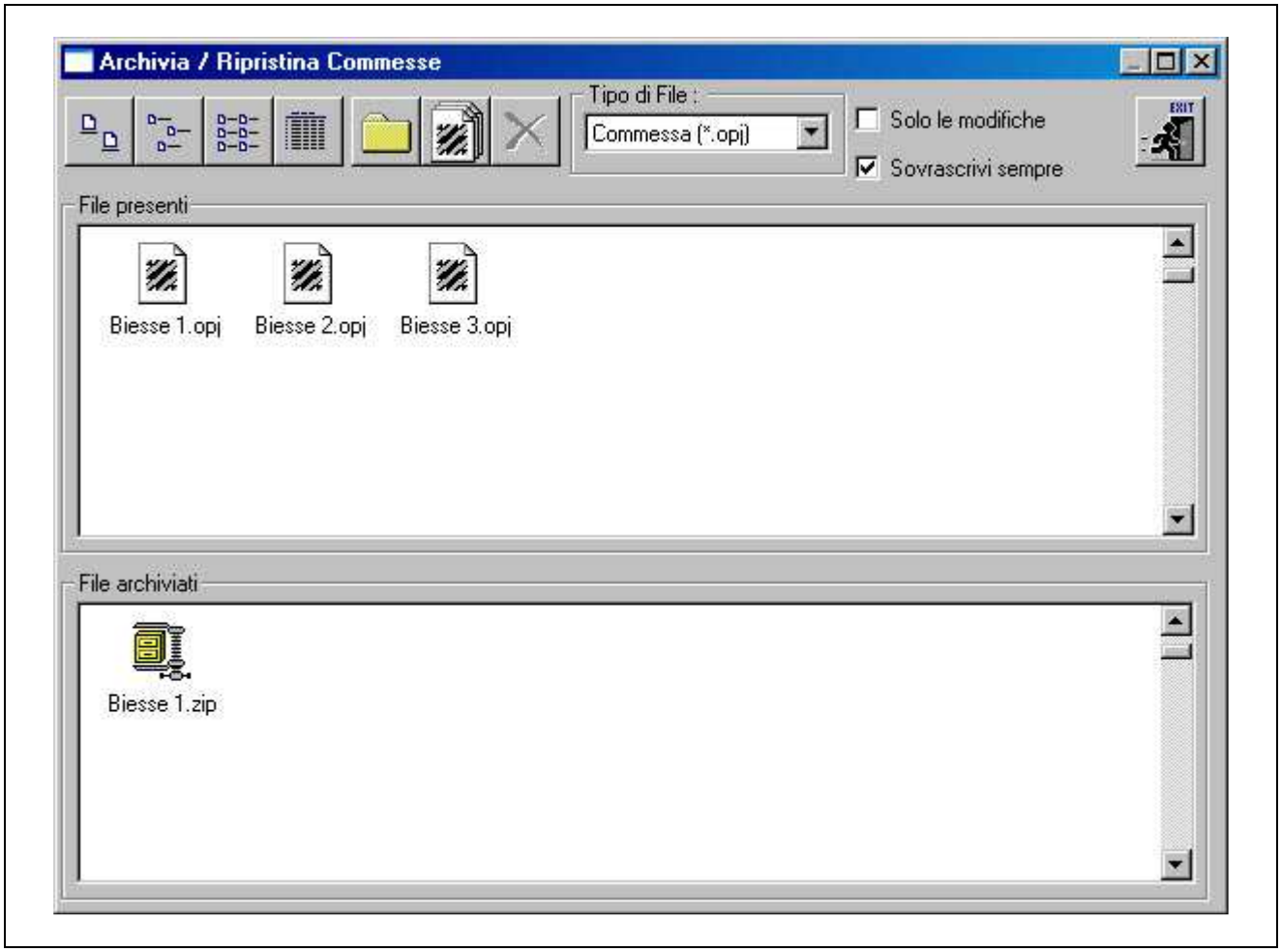


Figure 12.2

To restore a backup of a job, it is sufficient to carry out the operation in reverse; that is, to drag the ".zip" file into the *File Available* window (or double-click on the backup file to be restored).

To select several files at the same time, hold down the SHIFT or CTRL key while left clicking with the mouse. The *Select All* button (sixth from left) can be used to select all of the existing jobs. This function is useful when a complete backup of all data is required.

The *Backup Folder* button (fifth from left) is used to define the folder in which to save the compressed files. This folder may be local to the PC, on the network server, or the drive of a floppy disk. The same setting is also available in the *Configuration* window described in a previous chapter.

If job backup or restore operations are carried out twice, it is possible to define when to overwrite the resulting files. If the option *Modified Only* is enabled, a new file will be created (and will therefore overwrite the old file) only if the job contains updates of one or more lists compared to the previous backup version. If the *Always Overwrite* option is enabled, the files will always be updated.

12.3 BACKUP/RESTORE PARTS LISTS AND PANEL MAGAZINE

It is possible to backup and restore parts lists created with the "*Cabinet*" option (see relevant chapter) and panel magazine, in the same way as described above for jobs. To access these data, use

the *File Type* drop-down menu to select the type of file required. The data will be saved, always in compressed form, in the predefined folder and with the following format:
- ".opz" for parts lists. In this case, the file name will be the same as the list name.
- "OPStore.opm" for the panel magazine. In this case, the entire magazine is saved in a single file.

12.4 VIEWING FILES

To assist the operator in the choice of files to backup and/or restore, OptiPlanning allows them to be viewed in four formats that can be selected using the first four buttons in the window. These formats are:
- large icons;
- small icons organised into columns;
- small icons organised into rows;
- small icons with details concerning the date that the files were created or changed. In this mode, it is possible to order files by name or date by clicking at the top of the column.

12.5 DELETING FILES

The data backup function also allows fast deletion of whole jobs, parts list files, and panel magazine.

To delete one or more of these data, it is sufficient to select it/them as previously described, and to press the *Delete* button.

Chapter 13

SMART STACKING

13.1 INTRODUCTION

Smart Stacking is a program incorporated in Optiplanning, and it provides all the tools needed to manage the stacking of the pieces produced. In particular it is possible to view and modify the sequence of pieces to be stacked, so as to adapt the stacking solution to your specific needs.

13.2 STARTING SMART STACKING

The Smart Stacking program can easily be visualised via the button in Optiplanning.

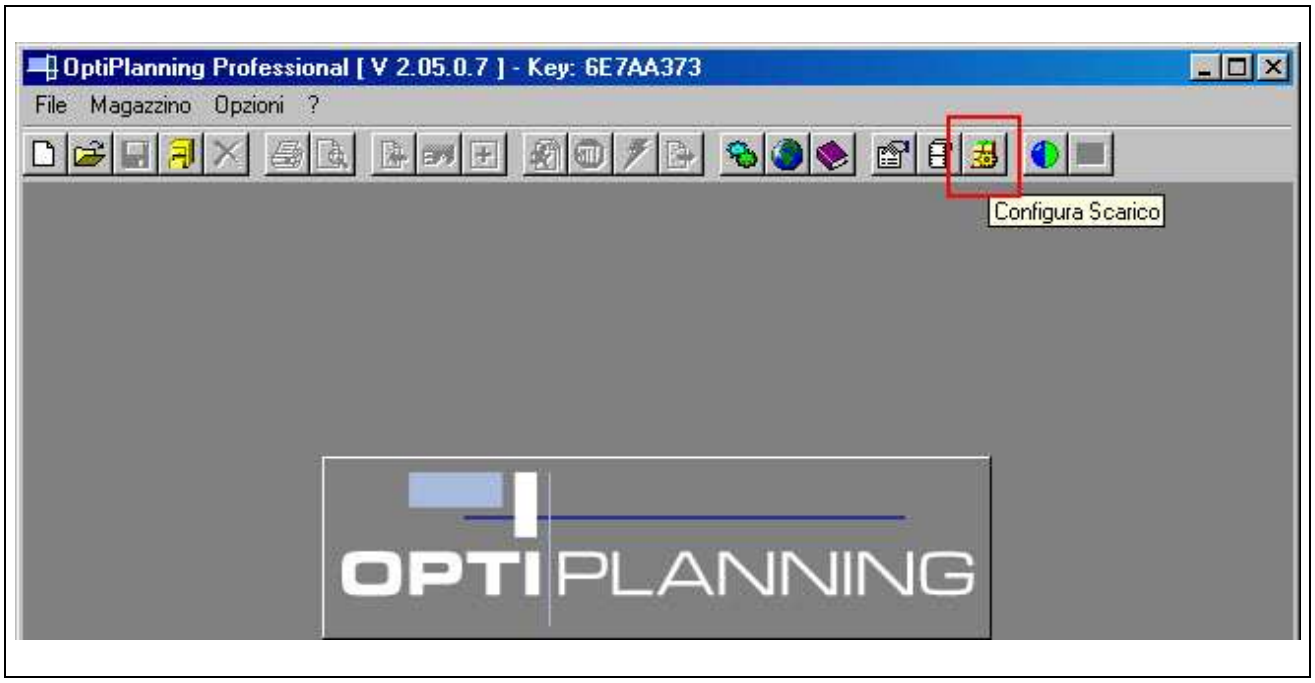


Figure 13.1

When it is opened, Smart Stacking shows all the stacking information for the selected cutting list if it has been optimised by enabling the stacking management option with Smart Stacking. The information available concerns the use of the stacking stations, the number and composition of the stacking piles generated, and a simulation of the stacking operations to be carried out. This information is generated by simulating the machining of the worklist.

If a list is not optimised, or there are no lists open in Optiplanning, Smart Stacking visualises a window that allows you to configure the piece stacking composition.

13.3 CREATING A CUSTOMISED STACKING COMPOSITION

"Stacking composition" means the arrangement of the pieces in a stacking station. Smart Stacking allows notable flexibility in the creation of the piles, thanks to a simple, versatile interface.

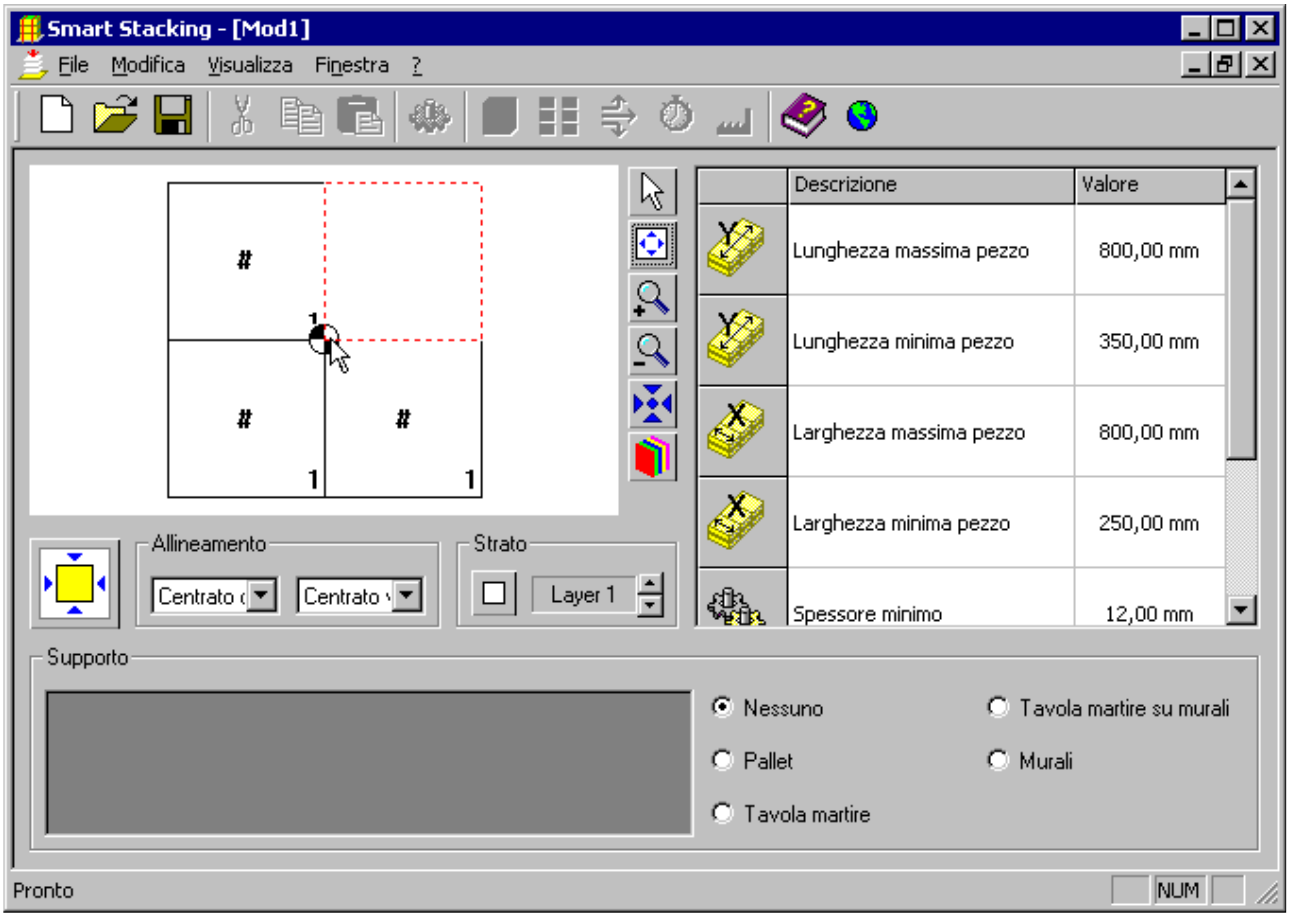


Figure 13.2

The initial data for creating a stacking composition concern the maximum and minimum dimensions of a panel so that it can be stacked in accordance with that composition. These values can be viewed and modified in the right-hand table.

The first element to be inserted in the composition is the type of support on which you want to stack the pieces. If a pallet-type support, support table, or wall support table is selected, the lower right table will show the available measurements. The user can easily modify the data in the table, or add new measurements and cancel existing ones. To insert a support, just select the required row of the table and press the left key of the mouse in the graphic composition area.

The insertion of the pieces in the composition is carried out directly in the graphics area. By moving the mouse, you will see the point in which a new piece can be inserted; a red dotted rectangle indicates the dimensions. The composition can be modified by adding pieces from the top or right side. Other functions useful for creating the required composition can be viewed by clicking the right key of the mouse; the menu shown in Figure 13.3 will be visualised.

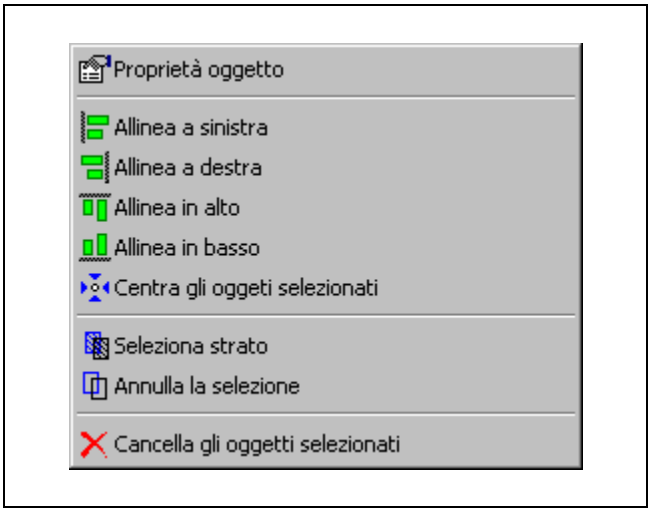
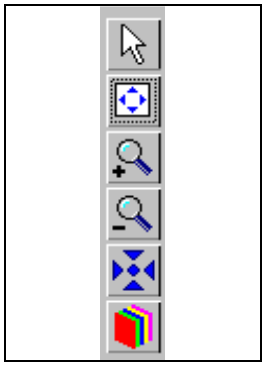


Figure 13.3

The items available allow you to visualise the properties of the selected object, align or centre the selected objects, select or deselect a layer, cancel the selected objects. The objects can be selected by keeping the “Ctrl” key pressed and then pressing the right mouse key on the required object.



The buttons visible in the middle of the window allow you to manage the properties of the graphics area. By means of the mouse, they allow you to modify (in order from top to bottom) the position of the composition inside the window, and the zoom.
The last button allows you to visualise the layers created in the form of a list, in order to choose which ones to visualise.

Figure 13.4

The controls located beneath the graphics area allow you to manage the horizontal and vertical alignment of the various layers. With the button on the far left, you can visualise the composition created considering the minimum or maximum panel dimensions.

Figure 13.5

To associate a layout with a specific piece, just enter the name of the layout in the parts list, in the *Stacking Layout* field of all the parts corresponding to that piece.

13.4 VIEWING THE STACKING STATIONS

The first window presented by Smart Stacking - after optimising a cutting list - contains all the stacking information according to the time.

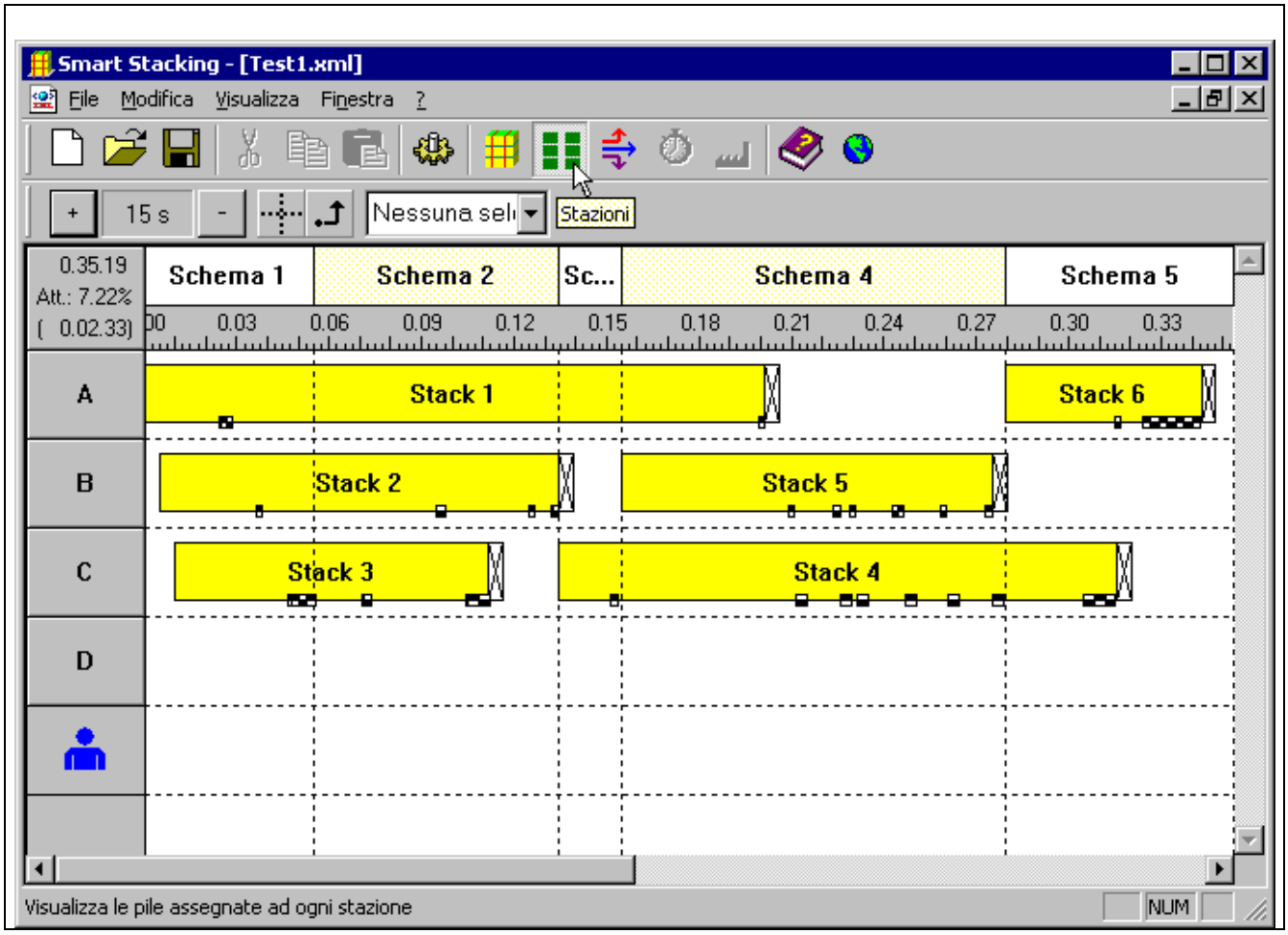


Figure 13.6

The window is subdivided vertically according to the patterns being used, and horizontally according to the stacking stations available.

Apart from the stacking stations, the last row is an additional horizontal band indicating the operator's intervention.

In the top part of the window, there is a scale indicating the simulated time in which the single stacking operations are performed. The orange colour highlights the time intervals during which the panel saw waits for the completion of a stacking cycle. In the top left corner, there is a summary of the machine's stacking times. The first row shows the total stacking time of the current list. The other two rows show the total waiting time of the panel saw (as both a percentage and in seconds).

The stacked piles are shown with a yellow band. For each pile, it is possible to determine the time in which it is opened, the time in which it is evacuated, and the station used. In the lower part of each band, there are symbols indicating the precise moment in which one or more stacking operations are performed on the pile itself. The time interval that elapses between the completion of a pile and its evacuation is highlighted by a white rectangle.

By pressing the left mouse key twice on a pile, a window appears, giving detailed information about that pile (see Figure 13.7) and allowing you to modify the stacking solution according to your specific needs. You can select another available station for stacking the indicated piece, or modify the final time in order to evacuate the pile earlier.

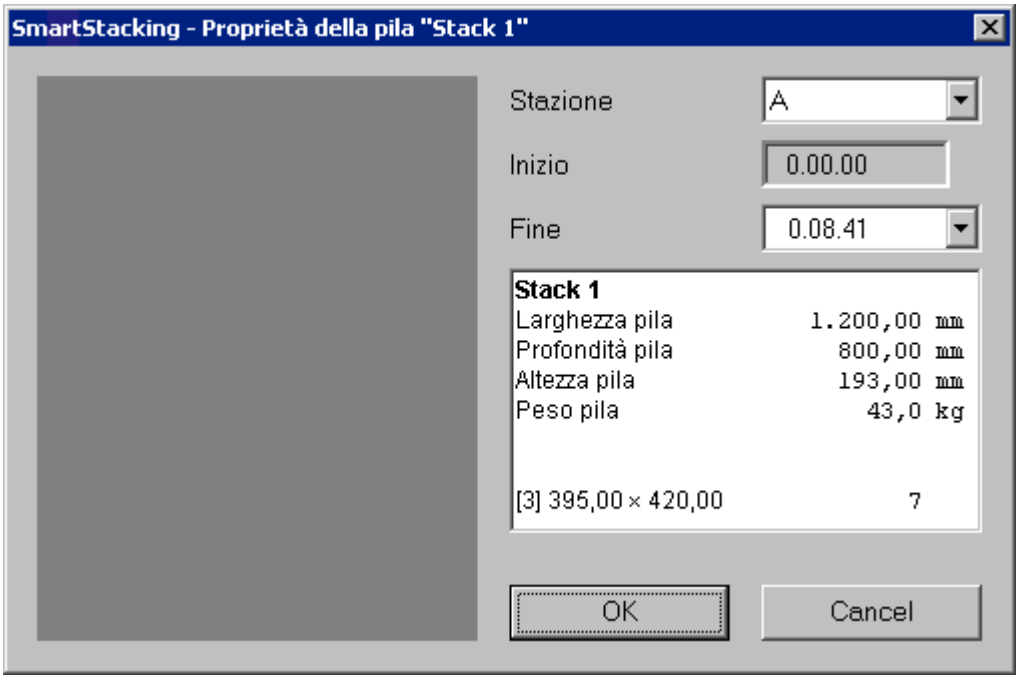


Figure 13.7

Using the buttons on the toolbar, it is possible to visualise the specific stacking solution in detail.

Figure 13.8

The first two buttons allow you to increase or decrease the time scale, in order to visualise the single piles in detail. The remaining controls are used to highlight the piles containing a specific piece.

13.5 VIEWING THE STACKING OPERATIONS

Smart Stacking has a powerful simulator that allows you to view the individual stacking operations. To access this function, just select the menu item:
- *View\Stacking Program*
or press the appropriate button on the toolbar.

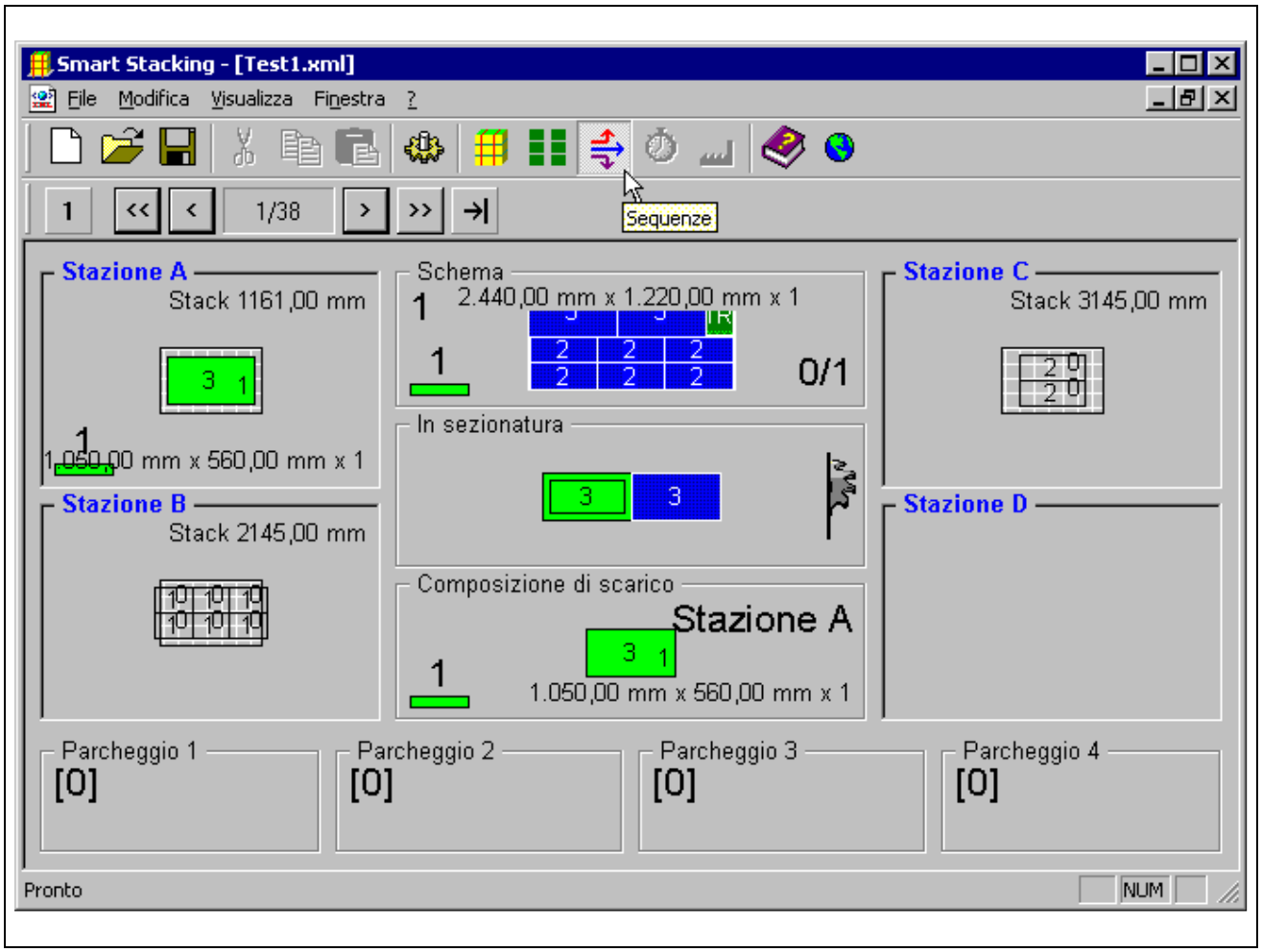


Figure 13.9

The visualised elements can be configured according to your own specific needs. Two graphic configurations are available, and can easily be selected. Each configuration may represent:
- the current cutting pattern;
- the pieces evacuated from the panel saw;
- the stacking composition;
- the stacking stations;
- the parking areas.

It is possible to visualise the entire stacking sequence - observing each single operation performed on the pieces produced - by using the buttons on the toolbar. In addition, Smart Stacking can manage two stacking layouts simultaneously, and these can be viewed at any time by using the first button in Figure 13.10.

Figure 13.10

1. Cutting pattern

The information shown concerns the cutting pattern in sectioning. The data at the top indicate the number of the pattern and the dimensions of the panel. In the lower part there is the number of sheets to be sectioned (on the left) and the number of sheets cut in relation to the quantity to be cut (on the right). In the middle, a graphic representation of the pattern.

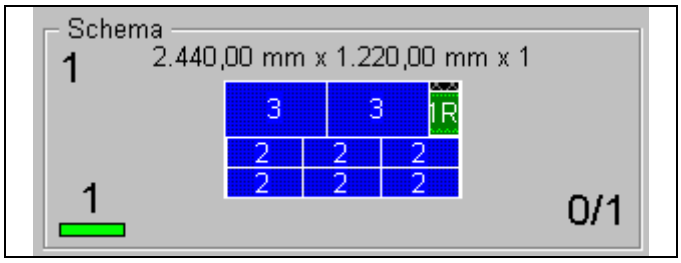


Figure 13.11

2. Pieces evacuated

A graphic representation of the pieces evacuated from the panel saw is visualised. The pieces that must be moved during the current stacking operation are shown in green, while the pieces to be stacked are shown in blue.

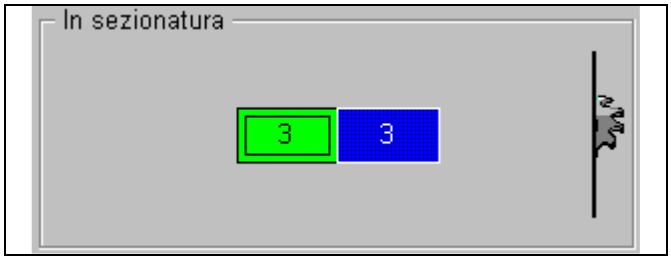


Figure 13.12

3. Stacking composition

Showing a graphic representation of the stacking composition that will be deposited. In the upper part there is the name of the station where the composition will be deposited, while the lower part shows the dimension of the composition and the number of overlapping panels.

Figure 13.13

4. Stacking stations

It is possible to configure up to sixteen different stacking stations within the graphic stacking representation. The frame shows the name of the station visualised. The upper part shows the pile height, while the lower part shows the dimension and number of panels (in height) deposited in the station of the current stacking operation. In the middle you can see the pile composition. Green is used to highlight the position of the pieces stacked during the current stacking operation. Brown indicates the pieces already stacked. A piece is shown as being transparent if its quantity is zero.

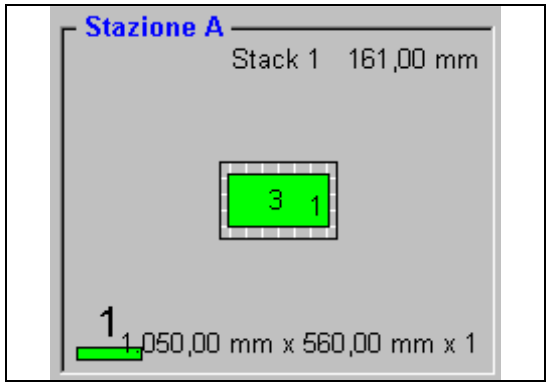


Figure 13.14

5. Parking areas

The parking areas are used to temporarily deposit the pieces while they are waiting to be stacked. It is possible to configure up to sixteen parking areas. The information visualised concerns the piece to be parked. The data in the upper part indicate the quantity of parked pieces and the number of pieces to be deposited (blue down arrow) or picked up (red up arrow). The lower part shows the piece dimension.

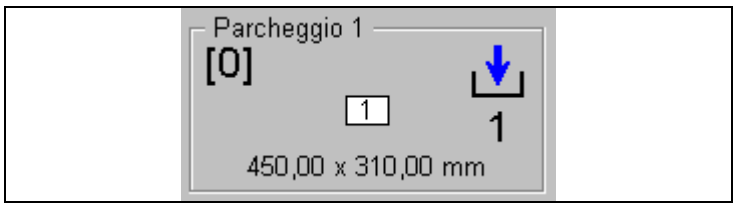


Figure 13.15

13.6 VIEWING THE STACKING PILES

Smart Stacking provides a detailed summary of the simulation carried out; this is visualised on the page showing the piles produced. This window gives a list of all the piles generated by the simulator for piece stacking, as well as the information associated with them.

To visualise the information for a specific pile, just select it from the list in the top right corner. For every pile, there is detailed information about its physical dimensions and the support used.

On the left there is a graphic representation of the composition of the pieces that form the pile. The grid at the bottom left provides information about the pieces produced by the cutting list. The pieces stacked in the current pile are highlighted in blue. By selecting a row of the grid, the list above highlights the piles containing that piece.

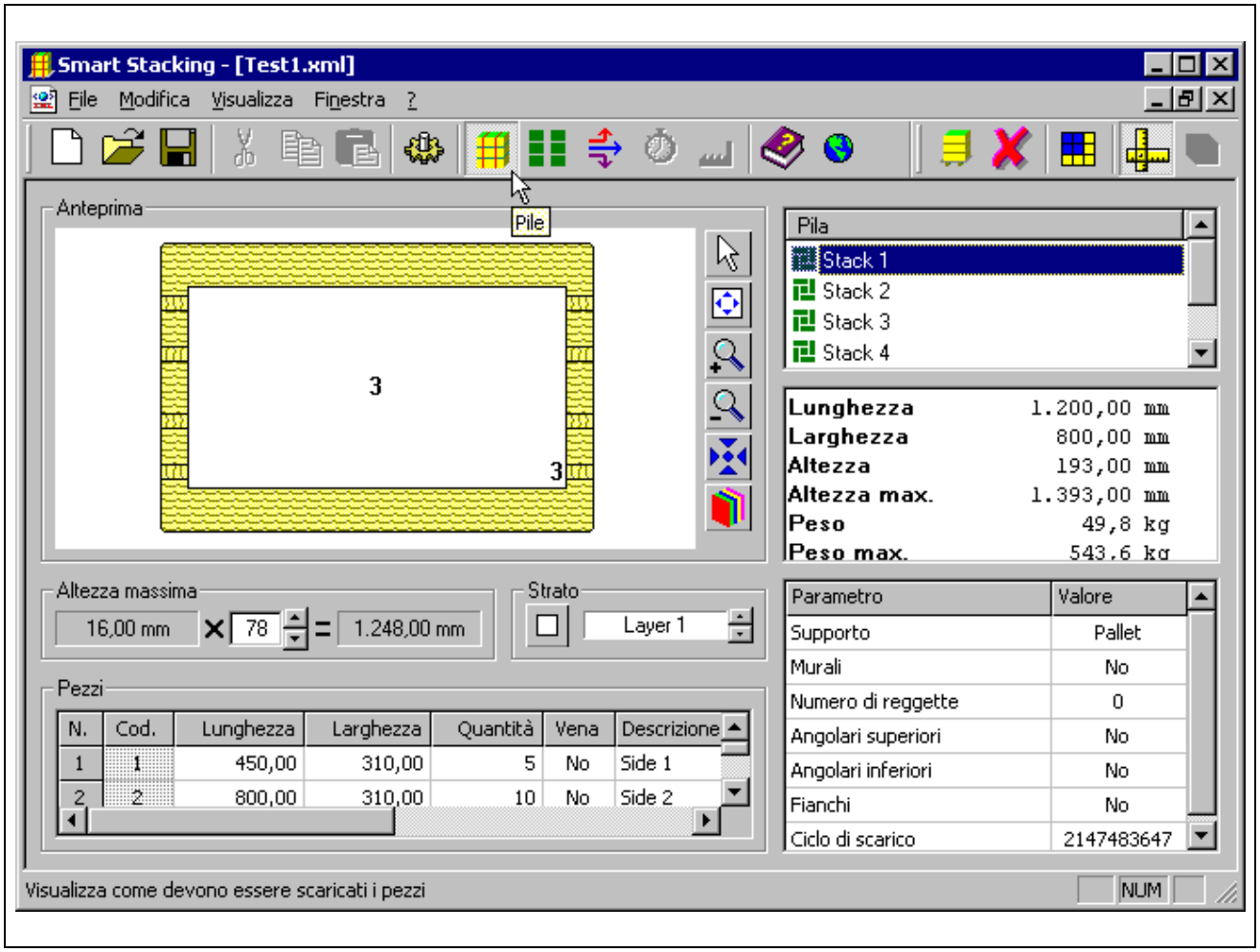


Figure 13.16

This window allows you to modify the stacking solution by modifying the composition of the pieces in each single pile. It is also possible to add new piles or eliminate existing piles, or to regenerate the stacking solution via the buttons on the toolbar.

The various operations are performed in the same way as for the stacking compositions (see chapter 13.3).

13.7 CONFIGURATION PARAMETERS

The advantage of Smart Stacking lies in the 100% flexibility of the stacking solution, that can be customised by modifying the program parameters. To access the stacking parameters, just press the button on the toolbar (as shown in the figure below).

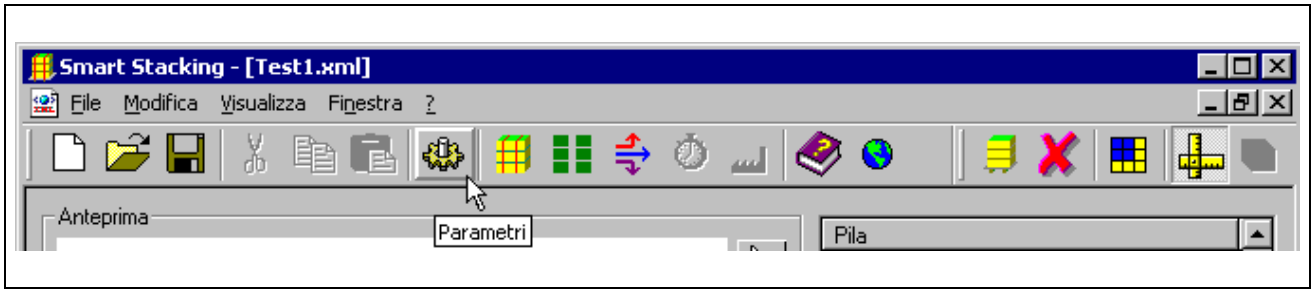


Figure 13.17

To create several configuration files, it is possible to use the menu item *File/Save parameters as…;* by default the program saves the parameters in the file *default.p00*.

In OptiPlanning, it is possible to define which stacking parameters file to use for a specific list. To do this, you must go to "*Panel Saw*", "*Simulator*", "*Stacking Parameters*" and select the list of parameters to be used.

The parameters window is made up of several pages that can be selected via the mouse. In the lower part of certain pages there is a detailed description of the parameters visualised.

1. General

On the following page you can specify the type of configuration to be used for stacking the pieces. The possible compositions are:

- single row
- double row
- customised (not available)
- interlocking (not available)

The composition can be selected by means of the mouse.
It is also possible to select the type of support to be used as a base for the piles.

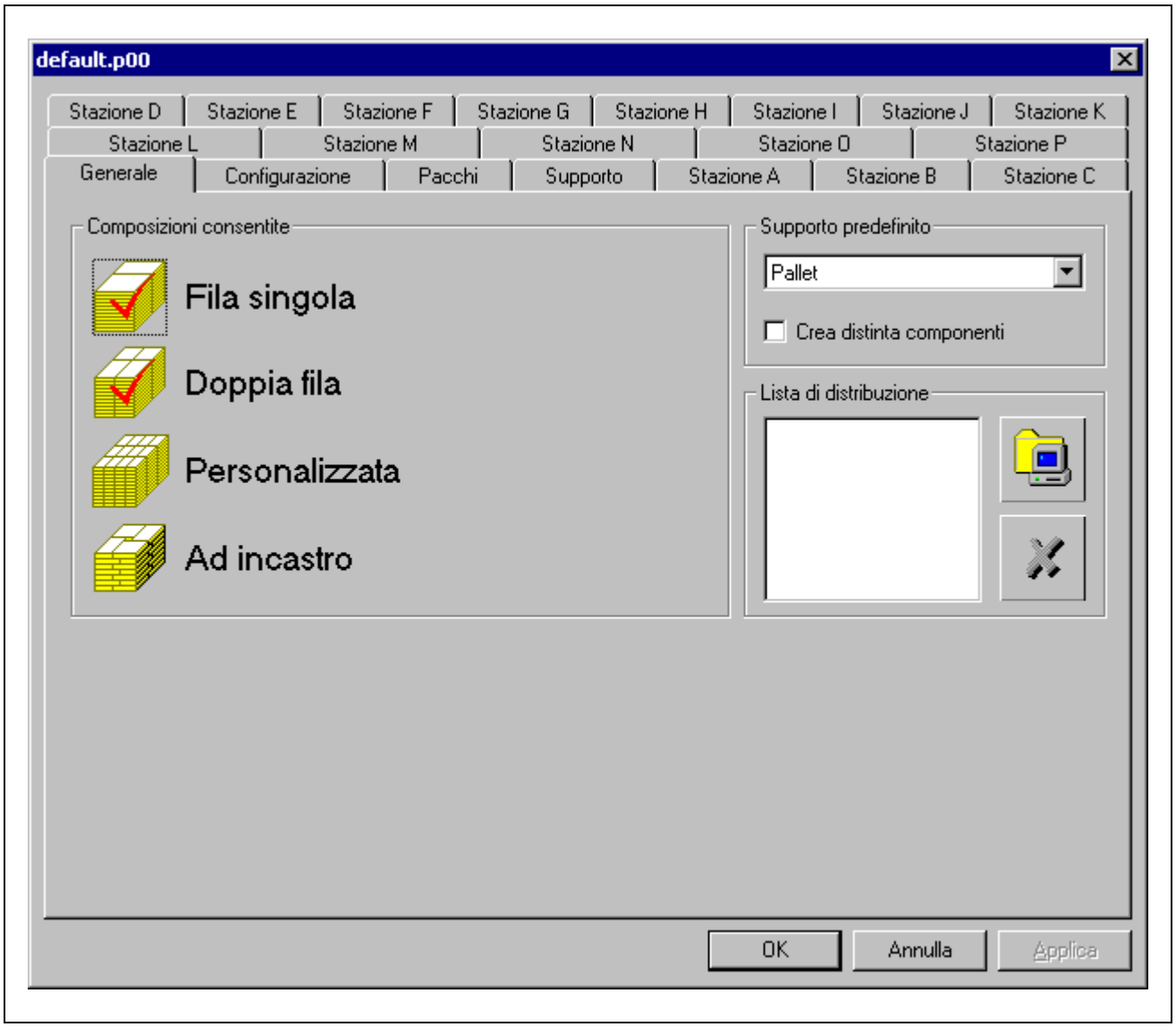


Figure 13.18

The stacking parameters are used in both the office version and the machine version of Smart Stacking. If you have a network connection between the various computers, it is possible to keep

the files containing the stacking parameters aligned, and establish a distribution list. Using the buttons on the page, you can specify the folders containing the parameter files.

2. Configuration

On the following page you can set the parameters linked to the physical characteristics of the current stacking method. These parameters have a considerable effect on the stacking solution.

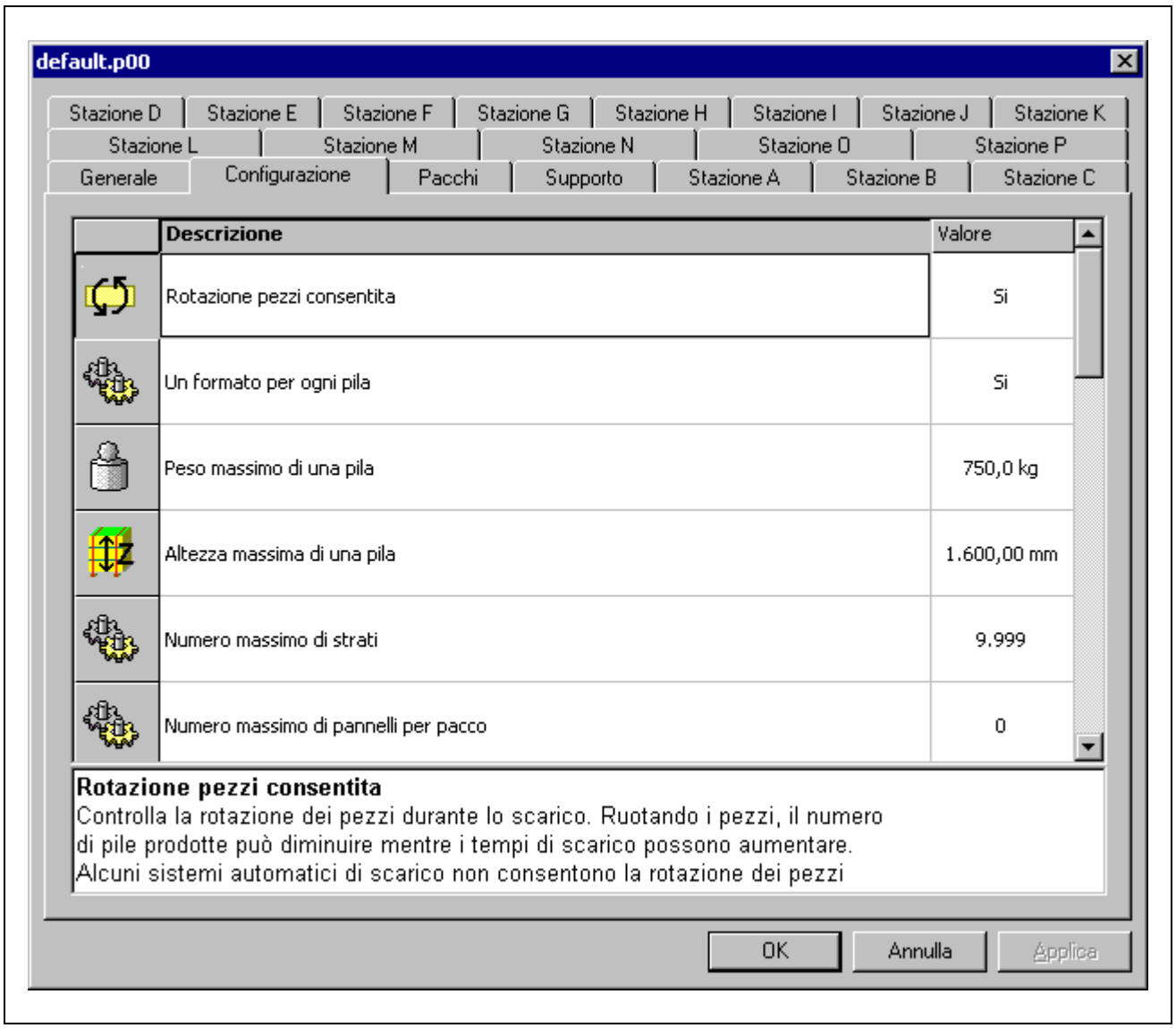


Figure 13.19

The parameters displayed are:

Piece rotation allowed
Controls the rotation of the pieces during stacking. By rotating the pieces, the number of piles produced may diminish while the stacking times may increase. Certain automatic stacking systems do not allow piece rotation.

A format for every pile
Controls the pile composition. By deactivating this parameter, the piles could contain different types of pieces.

Maximum pile weight

The maximum weight (base + pieces) of a pile.

Maximum pile height

The maximum height (base + pieces) of a pile.

Maximum number of layers

The maximum number of layers that make up a pile.

Maximum number of boards per stack

The maximum number of panels that make up a stack. By inserting 0, the system will use the maximum value allowed by the material and panel saw.

Maximum stack height

The maximum height of a stack evacuated from the panel saw.

Number of stacking stations available

The number of stations available for stacking. This value cannot be greater than 16.

Pile evacuation time

The time needed to move a pile away from a station.

Stack rotation time

The time needed to perform a rotation cycle.

Additional strip handling time

The time to be added to a cycle in order to simultaneously stack an extra strip.

Additional block handling time

The time to be added to a cycle in order to simultaneously stack an extra block.

Maximum number of strips per handling cycle

The maximum number of strips that can be simultaneously stacked.

Manual stacking time

The duration of a manual stacking cycle.

Use the previously assigned stations

If enabled, it ensures that when a pile of pieces (whose production has not yet been completed) is evacuated, the stacking solution matches a station with a pile that has an identical structure to the previous one. Disabling this option, it is possible to reduce the times if other stations are free.

Piece stacking according to size

The material evacuated from the panel saw is generally stacked for strips. By enabling this option, the material produced by a cut (a strip in the X direction) is stacked first.

Intermediate buffer

This indicates whether it is possible to park the pieces before stacking them. The possibility to park the pieces is useful when the stacking solution can only deposit complete layers.

Deposit only complete layers

This indicates whether each stacking cycle must deposit a complete layer, i.e. the pile must not have "steps". This parameter is not compatible with the interlocking stacking style, and must be enabled for most automatic stacking solutions.

Maximum number of cuts per handling cycle

When the material is stacked by cuts, this parameter limits the maximum number of cuts (strips in the X direction) that can be handled for each cycle.

Stack parking time

The time required to deposit a stack in the parking area.

Time for removing a stack from the parking area

The time required to remove a stack from the parking area.

Stack adjustment time

The time required to modify the position of a stack in the stacking composition.

3. Board Stacks

On this page you can set the parameters relating to the pieces which can be moved during a stacking operation.

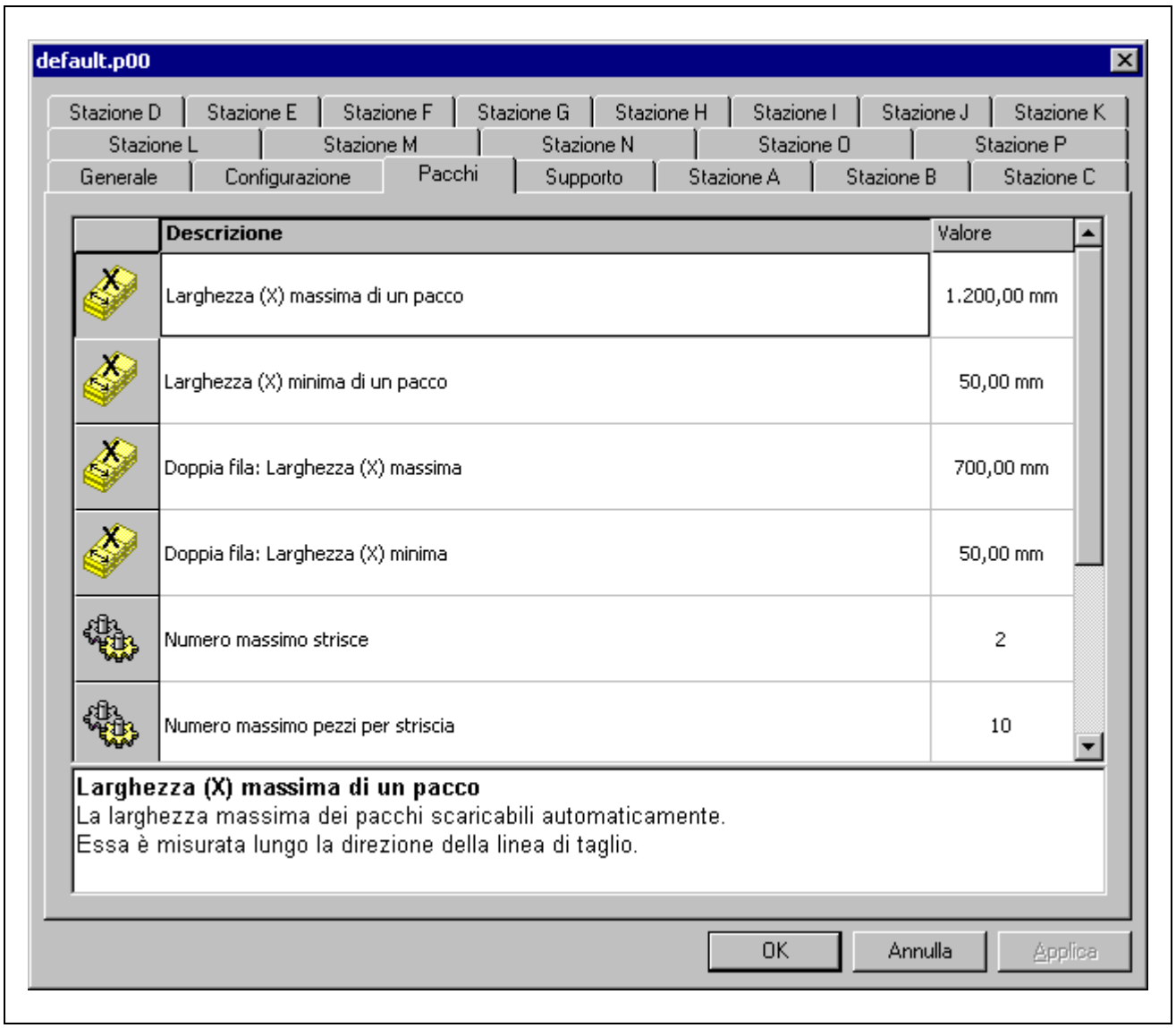


Figure 13.20

The parameters displayed are:

Maximum width (X) of a stack
The maximum width of stacks that can be automatically stacked. It is measured along the direction of the cutting line.
Minimum width (X) of a stack
The minimum width of stacks that can be automatically stacked. It is measured along the direction of the cutting line.
Double row: maximum width (X)
The maximum (overall) width of two strips that can be stacked in a double row. It is measured along the direction of the cutting line. Certain stacking systems do not allow double row stacking.
Double row: minimum width (X)
The minimum (overall) width of two strips that can be stacked in a double row. It is measured along the direction of the cutting line. Certain stacking systems do not allow double row stacking.

Maximum number of strips
The maximum number of strips that make up a pile.
Maximum number of pieces per strip
The maximum number of pieces in a strip of a pile.
Maximum stack length
The maximum length of a stack that can be automatically stacked. It is measured along the direction of the square fence (Y).
Minimum stack length
The minimum length of a stack that can be automatically stacked. It is measured along the direction of the square fence (Y).
Maximum stack weight
The maximum weight of a stack that can be automatically stacked.

4. Support

On the following page you can set the parameters relating to the position of the pieces in relation to the support and the time needed to load a base.

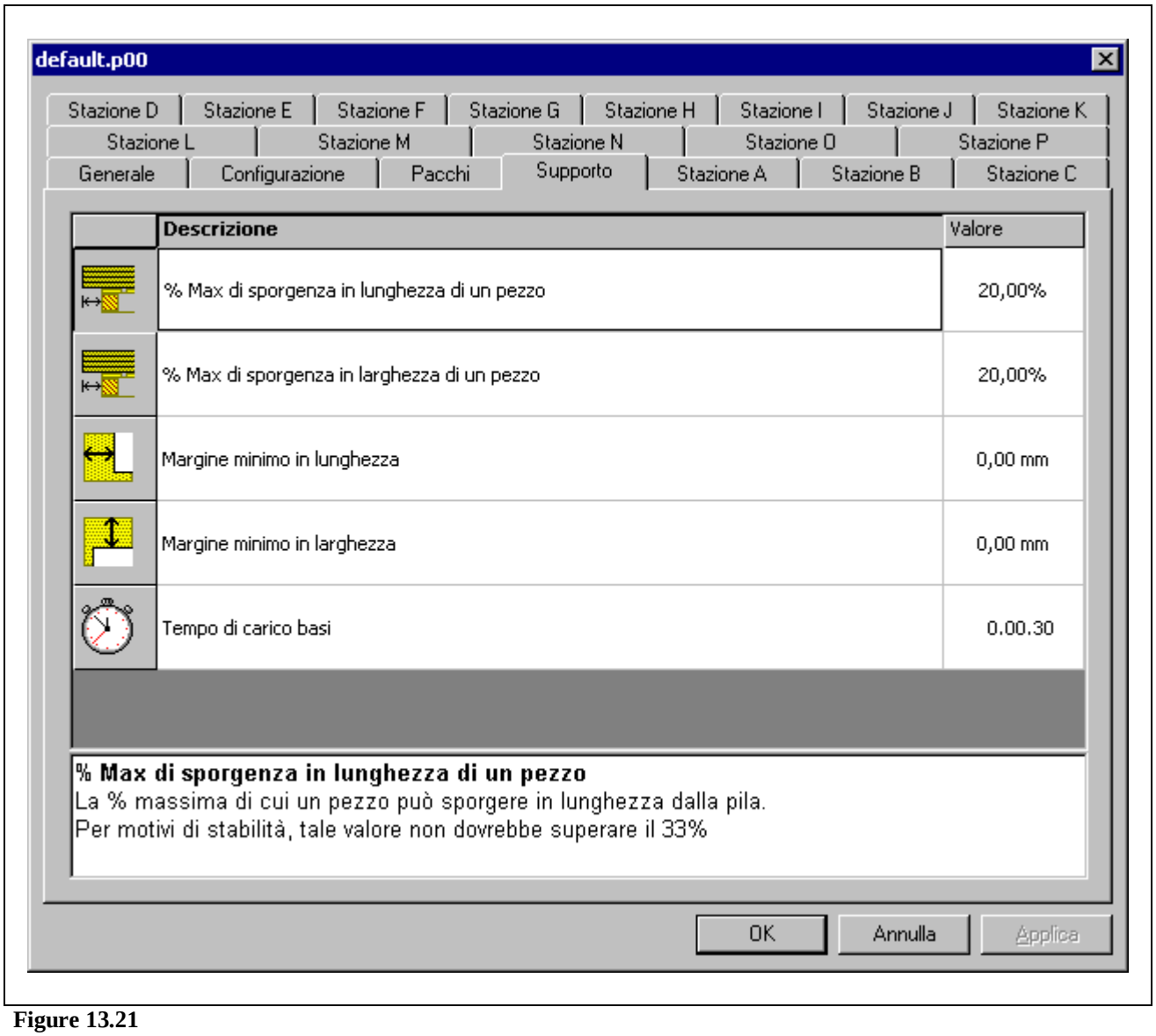


Figure 13.21
The parameters displayed are:

Max. protrusion % of a piece lengthwise
The maximum % by which the length of a piece may protrude from the pile. For reasons of stability, this value cannot exceed 33%.
Max. protrusion % of a piece widthwise
The maximum % by which the width of a piece may protrude from the pile. For reasons of stability, this value cannot exceed 33%.
Minimum margin lengthwise
The minimum distance of the pieces from the edges of the pile. This value is measured along the length of the pile.
Minimum margin widthwise
The minimum distance of the pieces from the edges of the pile. This value is measured along the width of the pile.
Base loading time
The time needed to load the base of a pile.

5. Station

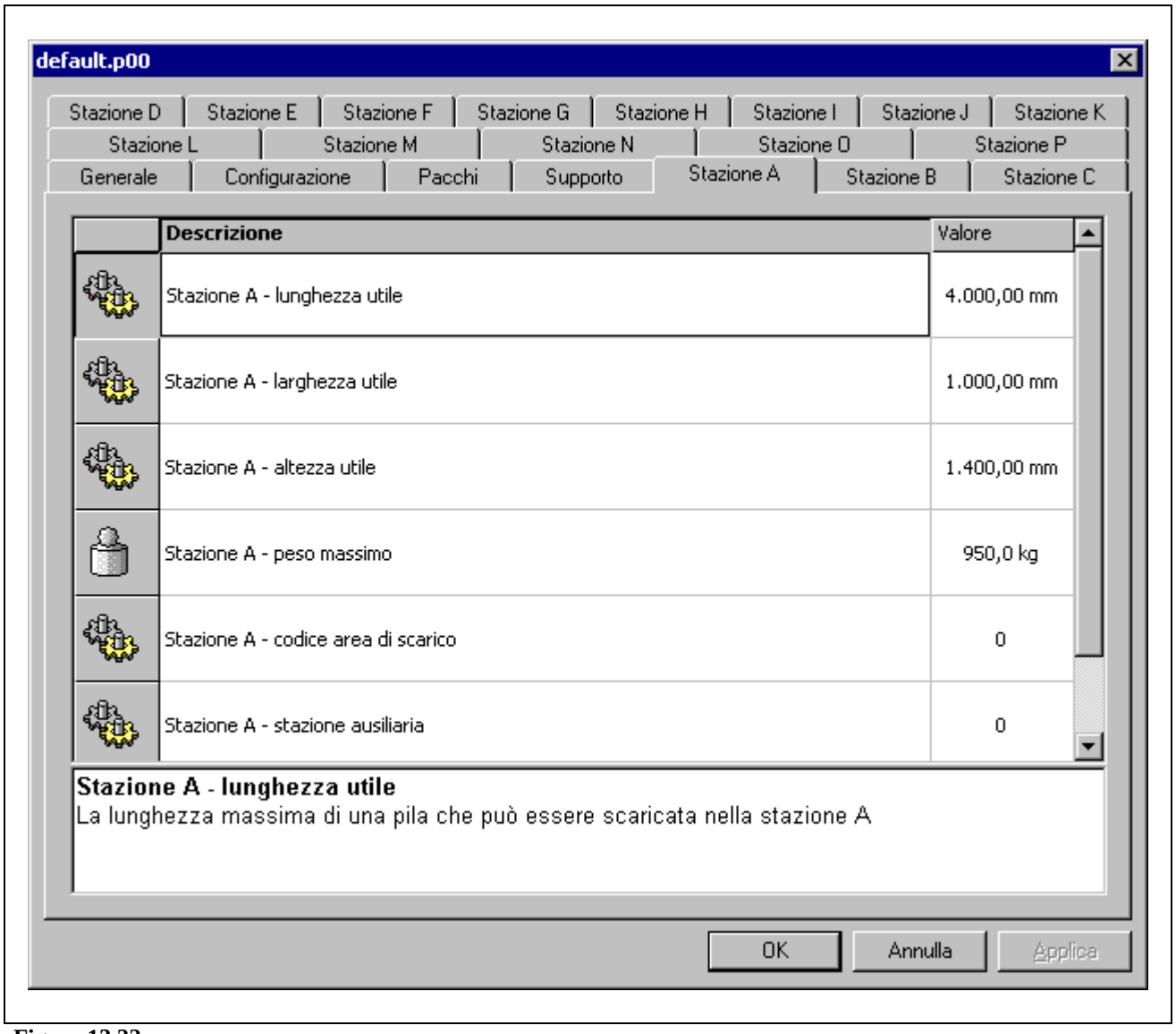


Figure 13.22

The configuration parameters window contains sixteen pages relating to the sixteen configurable stations; these are identified with a letter of the alphabet.

Each page contains the parameters needed to configure each available stacking station. The parameters relating to the stations affect the composition of the pieces in the piles generated.

The parameters displayed for station A are:

Station A - effective length
The maximum length of a pile that can be stacked in station A.
Station A - effective width
The maximum width of a pile that can be stacked in station A.
Station A - effective height
The maximum height of a pile that can be stacked in station A.
Station A - maximum weight
The maximum weight of a pile that can be stacked in station A.
Station A - stacking area code
The stacking area to which the station belongs.
Station A - auxiliary station
Which station can be used to extend the capacity of station A.
Station A - stacking time
The duration of a stacking cycle that terminates in station A.

Similar parameters are available for the other stacking stations (Station B – Station K).

13.8 OPTIMISATION WITH STACKING MANAGEMENT USING SMART STACKING

To optimise a worklist using the full potential of the SmartStacking program, after editing a list, just go to the "*Parameters*", "*Optimiser*", "*Stacking Pile Management*" page and select the option *SmartStacking*.

To adapt the stacking solution to your own needs, it is possible to associate the required stacking layout with each part, using the item "*Stacking Layout*" in the parts list. It is also possible to associate a specific set of stacking parameters with the worklist, using the item "Panel Saw", "Simulator", "*Stacking Parameters*".

If no stacking layout is specified for a part, the calculation will be automatic and will maximise the are used on the stacking station.

The pile composition rules (shape and height) and the list of stacking parameters are set in the SmartStacking program.

If the stacking layout is shown in square brackets, and the general parameter "*Create Assemblies*" is selected, then an assembly will be created with the current part, coinciding with the stacking layout (so the pieces will leave the panel saw in the same way that they will be stacked).

The general parameter "*Consider Stations for Large Pieces*" allows you to manage cutting lists with several "large" pieces that can only be stacked in a limited number of stations (e.g 2 out of 6).

When saving the list, OptiPlanning visualises any inconsistencies between the stacking parameters and the stacking layouts required.

Once the list entry is complete, it is possible to launch the optimisation. OptiPlanning creates not only the optimised list, but also the stacking solution in the case of maximum stack machining on all the cycles of a pattern except the last one.

At this point, it is possible to view the results of the optimisation and stacking solution. On the page showing machining times, there is a new column indicating (pattern by pattern) any time in which the panel saw is waiting for stacking completion (see "Waiting Time for Stacking").

The "Stacking" button on the OptiPlanning toolbar allows you to visualise this solution in two

formats: as a list of the piles of panels produced (see Figure 13.23) and as a sequence of piece stacking on the piles according to the pattern used (see Figure 13.24).

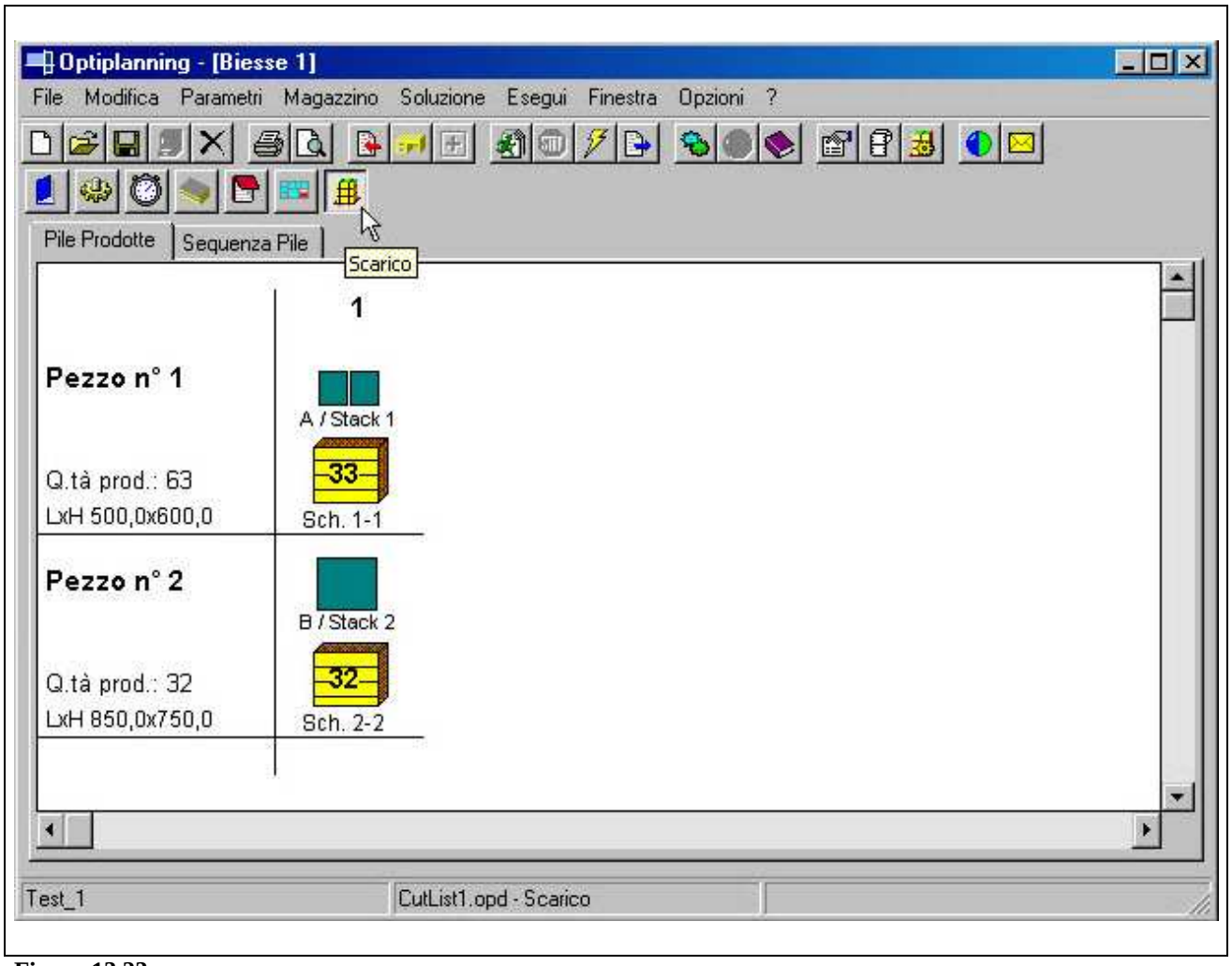


Figure 13.23

For every piece produced, the "*Piles Produced*" page provides the information about the piles in which it has been stacked. The first column shows all the pieces produced in the list, with the relative information concerning the quantity produced and the dimensions. For every piece, the piles produced are graphically represented on the horizontal line. In the example, piece 1 is stacked in a single pile in station A, according to a 1x2 composition. It is called "*Stack 1*" and is opened and evacuated in pattern 1 (Pattern 1-1). The maximum pile height is 33 pieces. The name of each pile also indicates the opening order.

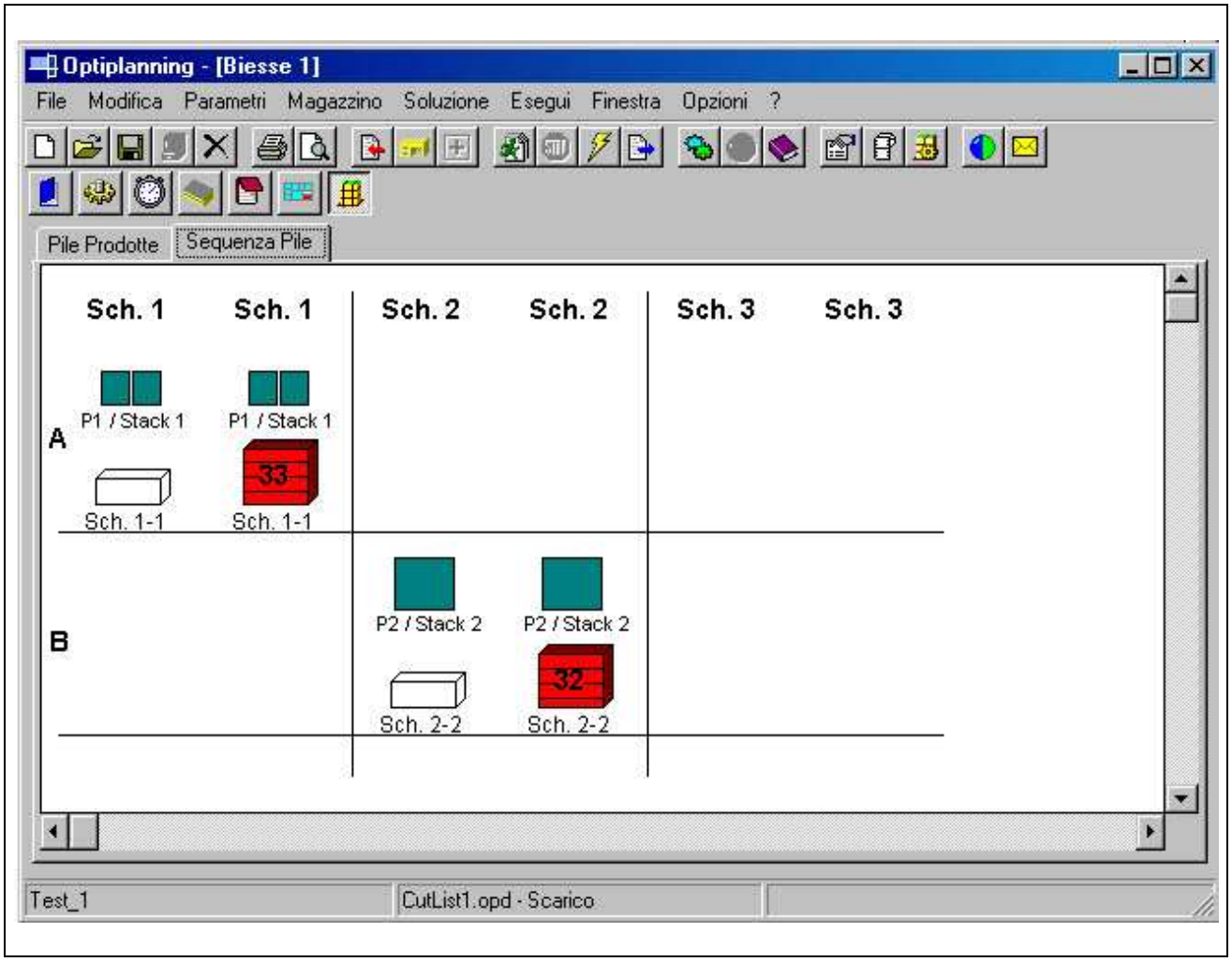


Figure 13.24

For each station, the "*Pile Sequence*" page provides the information about the pieces stacked in relation to the pattern. The first column shows the stations available, while the first row shows the cutting list patterns. In the example, station A is occupied during the machining of pattern 1. The pile composition is 1x2 and consists of piece P1, while the name of the pile is "Stack 1"; the name of each pile indicates its opening order. The two images show the opening of the pile in white, and the relative closure in red; these operations are performed in pattern 1 (Pattern 1-1). In addition, the second image shows the maximum pile height, which is 33 pieces.

With SmartStacking, it is possible to visualise the stacking solution (as described in the previous chapters) and customise it by modifying the stacking parameters. In the latter case, when the modifications are saved the solution is also updated in OptiPlanning.

The result of the optimisation with regards the piles produced can be printed by enabling the "*Piles Produced*" option in the print report.

Below there is a block diagram showing how to use SmartStacking. It outlines the operations described in this chapter.

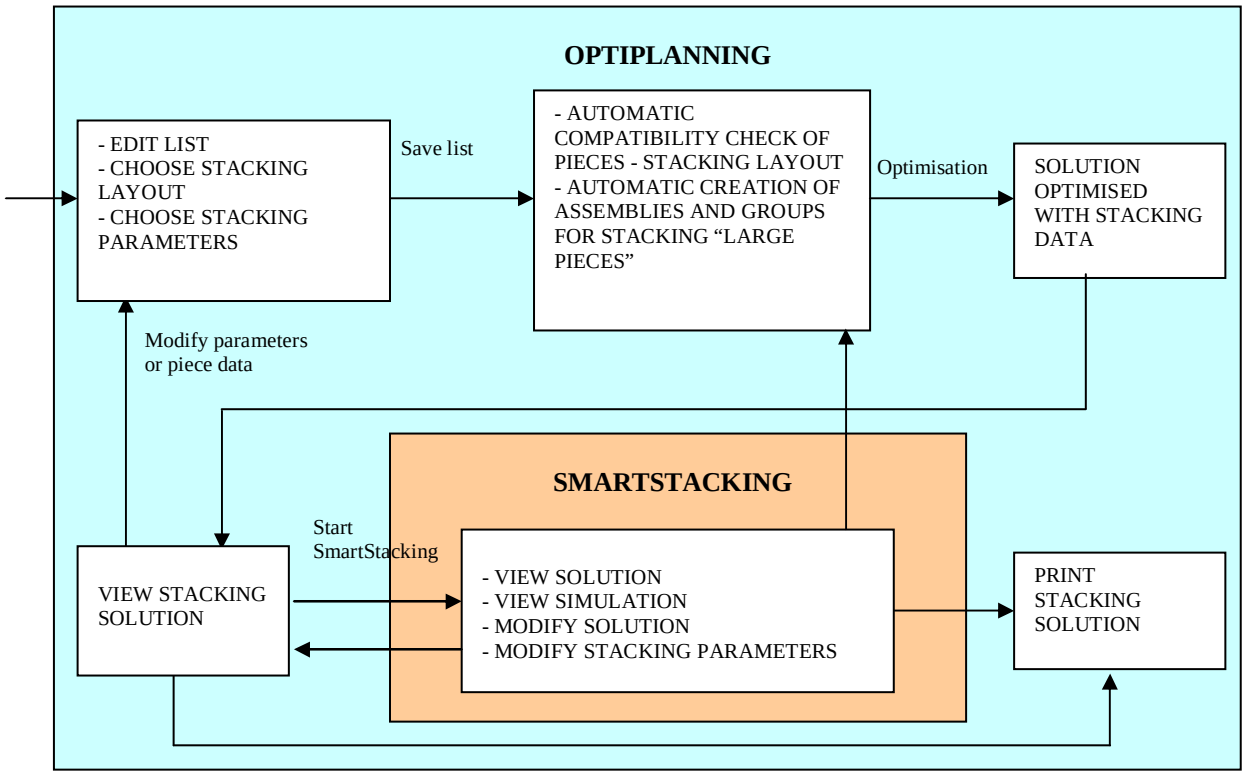

OPTIPLANNING
- EDIT LIST
- CHOOSE STACKING LAYOUT
- CHOOSE STACKING PARAMETERS
Save list
- AUTOMATIC COMPATIBILITY CHECK OF PIECES - STACKING LAYOUT
- AUTOMATIC CREATION OF ASSEMBLIES AND GROUPS FOR STACKING "LARGE PIECES"
Optimisation
SOLUTION OPTIMISED WITH STACKING DATA
Modify parameters or piece data
SMARTSTACKING
Start SmartStacking
VIEW STACKING SOLUTION
- VIEW SOLUTION
- VIEW SIMULATION
- MODIFY SOLUTION
- MODIFY STACKING PARAMETERS
PRINT STACKING SOLUTION

Figure 13.25

Appendix A

XML FILE FORMAT DESCRIPTION

A.1 INTRODUCTION

For each saved job OptiPlanning can produce an export file for customised elaboration of the optimised report. The files produced are in XML format which is a text file format that can be opened with any text editor. To produce XML files click on the *Export* button as shown in Figure A.1.

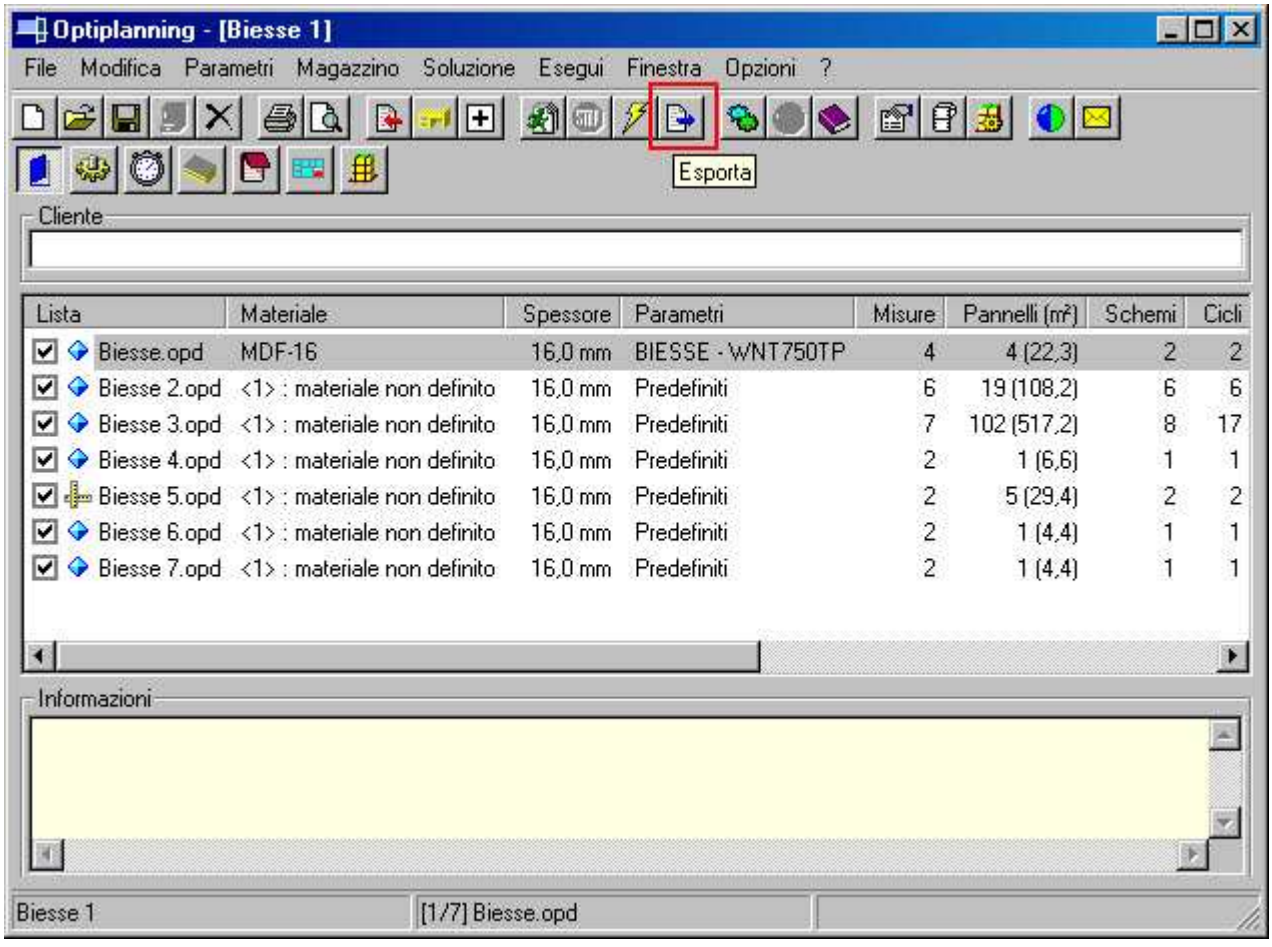


Figure A.1

In this way for each job stored in the current order OptiPlanning creates one file. The file name is the job name without limitations (the file extension is .xml). The following pages will exactly describe the file format; for additional information see www.w3.org and www.xml.org .

A.2 XML EXPORT FILE DESCRIPTION

1. General description

Each row of this file is called *Element* and starts with an < . The end of an element is done with />. The first word after the element start is the *Element Name*. To store each information we use an *Attribute* which ends with = , then we have the value stored between quotation marks.
An element can contain one or more attributes; two attributes are separated with a blank character.

In other words a row of an XML file has the following structure:
<ElementName Attribute='Value' Attribute='Value' …/>

A second way to end an element is showed in the following example:
<ElementName Attribute='Value' Attribute='Value' …>
</ElementName>

The number of elements and attributes saved in each file can change with the job/worklist depending on its characteristic (i.e. remainders produced).
At the beginning of each file we have the file codification to specify the type of character used (first row) and a comment with the creation date (second row). The date format is always the same.
All the measures are in metric unit, particularly the part/panel sizes are in millimetres.

2. Description of the elements

To exactly describe all XML file elements/attributes, each of the following sections will start with the element name in the exact sequence stored in the file and will end with an example.

Cutlist Indicates a general job description.
next= Indicates the following job in the current order. This attribute is not present in the last job.
NParts= Indicates the total number of parts inserted in different rows.
NBoards= Indicates the total number of different panels inserted.
Example:

```
<CutList next='Job2.xml' NParts='8' NBoards='3'>
```

Tx Indicates the downloading data.
Date= Indicates the NC downloading date in a fixed format. A question mark is present if the job isn't downloaded yet.
Example:

```
<Tx Date='Tue Oct 16 14:09:50 2001'/>
```

Part Indicates the part data (for each inserted part one element).
id= Indicates the part identifier (part no.1 = P1, part no.2 = P2, etc.).
L= Indicates the part length.
W= Indicates the part width.
qMin= Indicates the minimum part quantity.
Prio= Indicates the part priority. This attribute is present if the priority is lower than 100. The minimum value permitted is 1.
Grain= Indicates the part grain. This attribute is only present if the grain is set to 1 (= yes), in this case the part cannot be rotated.
Code= Indicates the part code (numerical value).
MatNo= Indicates the material type reference (numerical code).

IncL= Indicates the part length increase. This value, which might also be negative, will be added to the part length to get the cutting size.
This attribute is only present if the value is different from zero.
IncW= Indicates the part width increase. This value, which might also be negative, will be added to the part width to get the cutting size.
This attribute is only present if the value is different from zero.
TolL= Indicates the part length tolerance used to combine parts with similar sizes. This value might also be negative. This attribute is only present if the value is different from zero.
TolW= Indicates the part width tolerance used to combine parts with similar sizes. This value might also be negative. This attribute is only present if the value is different from zero.
Stackable= Indicates if the part wont be considered in the stacking pile management. This attribute is only present if the part is not stacked, in this case its value is 0.
SizeNo= Indicates the number of the corresponding Piece element.

The following attributes are part description fields used to store additional information which do not influence the optimisation results. These attributes are only present if the corresponding fields contain data. The complete list is shown with the maximum characters allowed for each field.

IDesc
IIDesc
EvDate
PartNo
Desc1
Desc2
Finish
DrillCode
DrillBarCode
DrillInfo
OutLam
Material
InsLam
EdgingCode
EdgingInfo
TypEdgeUp
MatEdgeUp
ColEdgeUp
TypEdgeLo
MatEdgeLo
ColEdgeLo
TypEdgeL
MatEdgeL
ColEdgeL
TypEdgeR
MatEdgeR
ColEdgeR
CabCode
CabWidth
CabHeight
CabDepth
CabDesc
CabInfo
CabPrio
Draw_1
Draw_2
Draw_3
Draw_4
Draw_5
InfoDraw_1
InfoDraw_2
InfoDraw_3
InfoDraw_4
StackingLayout
StackingArea

Example:

```
<Part id='P1' L='500.00' W='400.00' qMin='2' Grain='1' Code='1'
MatNo='112' IncL='8.00' IncW='8.00' TolL='2.00' TolW='2.00'
IDesc='fff' IIDesc='ggg' EvDate='aaa' PartNo='bbb' Desc1='ccc'
Desc2='ddd' Finish='eee' DrillCode='hhh' DrillBarCode='iii'
DrillInfo='lll' OutLam='mmm' Material='nnn' InsLam='ooo'
EdgingCode='ppp' EdgingInfo='qqq' TypEdgeUp='rrr' MatEdgeUp='sss'
ColEdgeUp='ttt' TypEdgeLo='uuu' MatEdgeLo='sss' ColEdgeLo='zzz'
```

```
TypEdgeL='AAA'   MatEdgeL='BBB'   ColEdgeL='CCC'   TypEdgeR='DDD'
MatEdgeR='EEE'   ColEdgeR='FFF'   CabCode='GGG'   CabWidth='200,5'
CabHeigth='100'   CabDepth='300,06'   CabDesc='HHH'   CabInfo='III'
CabPrio='LLL'  Draw_1='MMM'  Draw_2='NNN'  Draw_3='OOO'  Draw_4='PPP'
Draw_5='QQQ'   InfoDraw_1='RRR'   InfoDraw_2='SSS'   InfoDraw_3='TTT'
InfoDraw_4='UUU'          SizeNo='1'          StackingLayout='VVV'
StackingArea='ZZZ'/>
```

AddedPart Contains the manual added part data (one element for each inserted part).
id= Indicates the part identifier (part no.1 = P1, part no.2 = P2, etc.).
L= Indicates the part length.
W= Indicates the part width.
qMin= Indicates the minimum part quantity.
Prio= Indicates the part priority. This attribute is present if the priority is lower than 100. The minimum value permitted is 1.
Grain= Indicates the part grain. This attribute is only present if the grain is set to 1 (= yes), in this case the part cannot be rotated.
Code= Indicates the part code (numerical value).
MatNo= Indicates the material type reference (numerical code).
SizeNo= Indicates the number of the corresponding Piece element.

The following attributes are descriptive fields of the part, used to contain additional information. These attributes are only present if the corresponding fields contain data.

Desc1
Desc2

Board Contains the panel data (one element for each panel inserted).
id= Indicates the panel identifier (panel no.1 = B1, panel no.2 = B2, etc.).
L= Indicates the panel length.
W= Indicates the panel width.
Type= Indicates whether the panel used comes from the magazine (‘1’), is a previous remainder (‘-1’), or has been manually added (‘0’).
MatNo= Indicates the material type reference (numerical code).
Thickness= Indicates the material thickness.
PercVal= Indicates the panel percentage reduction value. This attribute is only present if the value is lower than 100.
BrdCode= Indicates the panel code. This attribute is only present if the description field indicates data.
BrdInfo= Indicates the panel information. This attribute is only present if the description field indicates data.
ReordLev= Indicates the panel reorder level. This attribute is only present if the data field indicates data.
LotSize= Indicates the panel reorder quantity. This attribute is only present if the data field indicates data.
BalBrd= Indicates the indication of the panel id which has to be balanced with the current panel. This attribute is only present if the current panel is balanced with another board size.
Balance= Indicates the balance ratio. This attribute is only present if the current panel is balanced with another panel size.

Qty= Indicates the panel available quantity. This attribute is only present if the available quantity isn't unlimited.
QtyRes= Indicates the booked quantity of a panel. This attribute is present if the value is greater than zero.
LTrim= Indicates the minimum panel left trim. This attribute is present if the value is greater than zero.
RTrim= Indicates the minimum panel right trim. This attribute is present if the value is greater than zero.
TTrim= Indicates the minimum panel top trim. This attribute is present if the value is greater than zero.
BTrim= Indicates the minimum panel bottom trim. This attribute is present if the value is greater than zero.
Cost= Indicates the cost of 1 panel.
Example:

```
<Board id='B1' L='2440.00' W='1220.00' Type='1' MatNo='112'
Thickness='16.00' PercVal='80' BrdCode='11111' BrdInfo='BBBB'
ReordLev='50' LotSize='5000' BalBrd='Brd2' Balance='2.000000'
Qty='1000' LTrim='5.00' RTrim='5.00' TTrim='5.00' BTrim='5.00'
Cost='10000.000000'/>
```

Material Indicates the material data.
id= Indicates the reference of the material type used (numerical code). The same value is saved in the MatNo attribute in the *Part* and *Board* elements.
Thickness= Indicates the material thickness.
Density= Indicates the material density in Kg/m^3.
Cost= Indicates the material cost per square meter.
Code= Indicates the material code used to identify the material type.
Desc= Indicates the material description. This attribute is only present if the data field indicates data.
Example:

```
<Material id='112' Thickness='18.00' Density='1.0000'
Cost='9500.0000' Code='ChipB18' Desc='First Quality'/>
```

The following elements describes the OptiPlanning parameter list, the list is divided in two main parts (two main elements) which are *Param* for the optimisation parameters and *SimulParam* for the machine parameters.

Param Indicates the optimisation parameters.
The following attributes are optimisation parameters fields which are listed completely. For more details see the relevant chapter in the OptiPlanning instruction manual.
Algo= Indicates the selected algorithm type. The possible values are:
1 = High Volumes
2 = Low Volumes
5 = Both with overproduction
6 = Both without overproduction
9 = Mono-dimensional with High Volumes
10 = Mono-dimensional with Low Volumes
13 = Mono-dimensional with Both with overproduction
14 = Mono-dimensional with Both without overproduction

LR=’1’ Indicates Long Cut patterns enabled. This attribute is only present if this type of pattern is enabled.
SR=’1’ Indicates Short Cut patterns enabled. This attribute is only present if this type of pattern is enabled.
SHC=’1’ Indicates Head Cut patterns enabled. This attribute is only present if this type of pattern is enabled.
LHC=’1’ Indicates Long Head Cut enabled. This attribute is only present if this type of pattern is enabled.
ZC= Indicates the maximum number of rotations for n-phase cuts (n>2). This attribute is only present if a Z-cut is enabled.
DRP='1' Indicates remainders enabled. This attribute is only present if the remainders are enabled.
STK='1' Indicates stacking pile management enabled. This attribute is only present if this management is enabled.

OptiParam Indicates the main optimisation parameters.
Ver= Indicates parameter version.
PatternRed= Indicates whether the pattern reduction function is active.
OverPrRed= Indicates whether the overproduction reduction function is active.
TimeWeight= Indicates the algorithm time weight.
PattRed='1' Indicates the algorithm pattern reduction. This attribute is only present if this management is enabled.
OverRed='1' Indicates the algorithm overproduction reduction. This attribute is only present if this management is enabled.
OverBV='1' Indicates the algorithm overproduction reduction for low volumes. This attribute is only present if this management is enabled.
Compl='1' Indicates the algorithm complete pattern function. This attribute is only present if this management is enabled.
LRPen= Indicates the Long Cut penalty.
SRPen= Indicates the Short Cut penalty.
SHCPen= Indicates the Head Cut penalty.
LHCPen= Indicates the Long Head Cut penalty.
ZCPen= Indicates the Z-cut penalty.
TRound= Indicates an internal algorithm parameter.
RunLevel= Indicates an inner parameter.
TrigLev= Indicates an internal algorithm parameter.
HCTrigLev= Indicates an internal algorithm parameter.
ZCTrigLev= Indicates an internal algorithm parameter.
PreProcSize= Indicates an internal algorithm parameter.
SQTrigger= Indicates an internal algorithm parameter.
PattOrd= Indicates the pattern ordering criterion.
SawEff= Indicates the Saw efficiency.
TimeTrigHV= Indicates an internal algorithm parameter.
TimeTrigLV= Indicates an internal algorithm parameter.
SQPar= Indicates an internal algorithm parameter.
AlgoFlags= Indicates an internal algorithm parameter.

OverParam Indicates the overproduction parameters.
NumConstraints= Indicates an inner parameter.
NumConstrParts= Indicates an inner parameter.
NumConstrBoards= Indicates an inner parameter.
NumConstrBalance= Indicates an inner parameter.

DeltaSol= Indicates an inner parameter.
MaxOverParts= Indicates the maximum parts quantity overproduction (0 means no limit).
MaxOverArea= Indicates the maximum total area overproduction (0 means no limit).
MaxOverPieces= Indicates the maximum total parts quantity overproduction (0 means no limit).

AddParam Contains general optimiser parameters.
NoTensionStrip= Indicates the strip height for an unstrain cut.
NoTensionTrimDim= Indicates the initial dimension of the trim cut for a strain cut.
SawTPar= Indicates the parameters to be used for the panel saw (value 0-20).
DownloadSawNum= Indicates which machine the data should be transmitted to.
ParamLabelingNum= Indicates which labelling parameters to use.
JobTime= Indicates an inner parameter.
JobCost= Indicates an inner parameter.

DropParam Indicates the reusable waste (remainder) parameters.
MinLen= Indicates the minimum remainder length.
MinWid= Indicates the minimum remainder width.
MinArea= Indicates the minimum remainder area.
ExchangeDim= Indicates the possibility to exchange the minimum part sizes.
HCEmpty= Indicates the possibility to produce head cut without parts.
DropValue= Indicates the remainder value.
GreatDimTol= Indicates the tolerance on the measurement test for piece output on the longer side.

StackParam Indicates the stacking pile management parameters.
MaxStack= Indicates the maximum open stacks.
HCNotStacked= Indicates head cuts without stacking management (0 means NO, 1 means YES).
MinDim= Indicates the minimum part dimension to be considered in the stacking management. The parameter is referred to the smaller part size
MaxDim= Indicates the maximum part dimension to be considered in the stacking management. The parameter is referred to the smaller part size (0 means no limits).
MinQty= Indicates the minimum part quantity to be considered in the stacking management.

BundleParam Indicates the saw panel stacks (bundle) management parameters.
MinBundle= Indicates the minimum panel number per cycle.
MaxBundle= Indicates the maximum panel number per cycle (0 means no limit).
NoPattMinWaste= Indicates the minimum waste percentage to eliminate a pattern with the multiple stack management.

ZCutParam Indicates the Z-cuts parameters. A Z-cut is an n-phase cut (n>2).
MaxStages= Indicates the maximum number of rotations for n-phase cuts.
MinCutLen= Indicates the minimum Z-cut length.
MaxCutLen= Indicates the maximum Z-cut length.
MinCutDist= Indicates the minimum distance between 2 Z-cuts.
MaxCutDist= Indicates the maximum distance between 2 Z-cuts.
MinLastCutDist= Indicates the minimum distance of the last Z-cut.
MaxCutsForBlock= Indicates the maximum number of different Z-cuts per block.
MaxTotCutsForBlock= Indicates the maximum number of Z-cuts per block.
MinCutTrim= Indicates the minimum Z-cut trim.
MaxCutTrim= Indicates the maximum Z-cut trim.
MaxStripZCuts= Indicates the maximum number of strips for Z-cuts.

LRParam Indicates the Long Cut pattern parameters.
MinPartLen= Indicates the minimum part length.
MaxPartLen= Indicates the maximum part length.
MinLastPartLen= Indicates the minimum last part length.
MinStripWid= Indicates the minimum strip width.
MaxStripWid= Indicates the maximum strip width.
MinLastStripWid= Indicates the minimum last strip width.
MaxPartsForStrip= Indicates the maximum number of different parts per strip.
MaxTotPartsForStrip= Indicates the maximum parts per strip.
MaxStrips= Indicates the maximum number of different strips.
MaxTotStrips= Indicates the maximum number of strips.
MaxStripGroups= Indicates the maximum number of different strip groups.
MinStripGroupWid= Indicates the minimum strip group width.
MaxStripGroupWid= Indicates the maximum strip group width.
ZCutsAllowed= Indicates Z-cuts enabled for Long Cut pattern (0 means NO, 1 means YES).

SRParam Indicates the Short Cut pattern parameters.
MinPartWid= Indicates the minimum part width.
MaxPartWid= Indicates the maximum part width.
MinLastPartWid= Indicates the minimum last part width.
MinStripLen= Indicates the minimum strip length.
MaxStripLen= Indicates the maximum strip length.
MinLastStripLen= Indicates the minimum last strip length.
MaxPartsForStrip= Indicates the maximum number of different parts per strip.
MaxTotPartsForStrip= Indicates the maximum parts per strip.
MaxStrips= Indicates the maximum number of different strips.
MaxTotStrips= Indicates the maximum number of strips.
MaxStripGroups= Indicates the maximum number of different strip groups.
MinStripGroupLen= Indicates the minimum strip group length.
MaxStripGroupLen= Indicates the maximum strip group length.
ZCutsAllowed= Indicates Z-cuts enabled for Short Cut pattern (0 means NO, 1 means YES).

SHCParam Indicates the head cut pattern parameters.
MaxHCLen= Indicates the maximum head cut size.
MinHCLen= Indicates the minimum head cut size.
MinBodyLen= Indicates the minimum main part size.

ShortHeadCut Indicates the head cut section parameters (in head cut pattern).
MinPartWid= Indicates the minimum part width.
MaxPartWid= Indicates the maximum part width.
MinLastPartWid= Indicates the minimum last part width.
MinStripLen= Indicates the minimum strip length.
MaxStripLen= Indicates the maximum strip length.
MinLastStripLen= Indicates the minimum last strip length.
MaxPartsForStrip= Indicates the maximum number of different parts per strip.
MaxTotPartsForStrip= Indicates the maximum parts per strip.
MaxStrips= Indicates the maximum number of different strips.
MaxTotStrips= Indicates the maximum number of strips.
MaxStripGroups= Indicates the maximum number of different strip groups.
MinStripGroupLen= Indicates the minimum strip group length.
MaxStripGroupLen= Indicates the maximum strip group length.

ZCutsAllowed= Indicates Z-cuts enabled for head cut section (0 means NO, 1 means YES).

ShortMainBody Indicates the main part section parameters (in head cut pattern).
MinPartLen= Indicates the minimum part length.
MaxPartLen= Indicates the maximum part length.
MinLastPartLen= Indicates the minimum last part length.
MinStripWid= Indicates the minimum strip width.
MaxStripWid= Indicates the maximum strip width.
MinLastStripWid= Indicates the minimum last strip width.
MaxPartsForStrip= Indicates the maximum number of different parts per strip.
MaxTotPartsForStrip= Indicates the maximum parts per strip.
MaxStrips= Indicates the maximum number of different strips.
MaxTotStrips= Indicates the maximum number of strips.
MaxStripGroups= Indicates the maximum number of different strip groups.
MinStripGroupWid= Indicates the minimum strip group width.
MaxStripGroupWid= Indicates the maximum strip group width.
ZCutsAllowed= Indicates Z-cuts enabled for main part section (0 means NO, 1 means YES).

LHCParam Indicates the long head cut patterns parameters.
MaxHCWid= Indicates the maximum head cut size.
MinHCWid= Indicates the minimum head cut size.
MinBodyWid= Indicates the minimum main part size.

LongHeadCut Indicates the head cut section parameters (in long head cut pattern).
MinPartLen= Indicates the minimum part length.
MaxPartLen= Indicates the maximum part length.
MinLastPartLen= Indicates the minimum last part length.
MinStripWid= Indicates the minimum strip width.
MaxStripWid= Indicates the maximum strip width.
MinLastStripWid= Indicates the minimum last strip width.
MaxPartsForStrip= Indicates the maximum number of different parts per strip.
MaxTotPartsForStrip= Indicates the maximum parts per strip.
MaxStrips= Indicates the maximum number of different strips.
MaxTotStrips= Indicates the maximum number of strips.
MaxStripGroups= Indicates the maximum number of different strip groups.
MinStripGroupWid= Indicates the minimum strip group width.
MaxStripGroupWid= Indicates the maximum strip group width.
ZCutsAllowed= Indicates Z-cuts enabled for head cut section (0 means NO, 1 means YES).

LongMainBody Indicates the main part section parameters (in long head cut pattern).
MinPartWid= Indicates the minimum part width.
MaxPartWid= Indicates the maximum part width.
MinLastPartWid= Indicates the minimum last part width.
MinStripLen= Indicates the minimum strip length.
MaxStripLen= Indicates the maximum strip length.
MinLastStripLen= Indicates the minimum last strip length.
MaxPartsForStrip= Indicates the maximum number of different parts per strip.
MaxTotPartsForStrip= Indicates the maximum parts per strip.
MaxStrips= Indicates the maximum number of different strips.
MaxTotStrips= Indicates the maximum number of strips.

MaxStripGroups= Indicates the maximum number of different strip groups.
MinStripGroupLen= Indicates the minimum strip group length.
MaxStripGroupLen= Indicates the maximum strip group length.
ZCutsAllowed= Indicates Z-cuts enabled for main part section (0 means NO, 1 means YES).

Example:

```
<Param Algo='1' LR='1' SHC='1' ZC='99'>
          <OptiParam ver='6' PatternRed='0' OverPrRed='0'
          TimeWeight='1' LRPen='0' SRPen='10' SHCPen='50'
          LHCPen='0' ZCPen='100' TRound='20' RunLevel='0'
          TrigLev='50' HCTrigLev='30' ZCTrigLev='30'
          PreProcSize='30' SQTrigger='20' PattOrd='102' SawEff='80'
          TimeTrigHV='0' TimeTrigLV='0' SQPar='0' AlgoFlags='8'/>
          <OverParam NumConstaints='2' NumConstrParts='1'
          NumConstrBoards='1' NumConstrBalance='0'
          DeltaSol='10000000' MaxOverParts='10' MaxOverArea='10'
          MaxOverPieces='10'/>
          <AddParam NoTensionStripH='0.00' NoTensionTrimDim='0.00'
          SawTPar='0' DownloadSawNum='0' ParamLabelingNum='0'
          SfridoPerc='950.25' JobTime='1408'
          JobCost='3993.112413'/>
          <DropParam MinLen='300.00' MinWid='300.00' MinArea='0'
          ExchangeDim='1' HCEmpty='1' DropValue='5'
          GratDimTol='0'/>
          <StackParam MaxStack='6' HCNotStacked='0' MinArea='0'
          MaxArea='0' MinQty='0'/>
          <BundleParam MinBundle='1' MaxBundle='0'
          NoPattMinWaste='0'/>
          <ZCutParam MaxStages='99' MinCutLen='0.00'
          MaxCutLen='2500.00' MinCutDist='0.00'
          MaxCutDist='2500.00' MinLastCutDist='0.00'
          MaxCutsForBlock='99' MaxTotCutsForBlock='99'
          MinCutTrim='0.00' MaxCutTrim='2500.00'
          MaxStripZCuts='0.20'/>
          <LRParam MinPartLen='0.00' MaxPartLen='5000.00'
          MinLastPartLen='0.00' MinStripWid='0.00'
          MaxStripWid='2500.00' MinLastStripWid='40.00'
          MaxPartsForStrip='30' MaxTotPartsForStrip='99'
          MaxStrips='3' MaxTotStrips='99' MaxStripGroups='3'
          MinStripGroupWid='0.00' MaxStripGroupWid='5000.00'
          ZCutsAllowed='0'/>
          <SRParam MinPartWid='0.00' MaxPartWid='5000.00'
          MinLastPartWid='0.00' MinStripLen='0.00'
          MaxStripLen='2500.00' MinLastStripLen='0.00'
          MaxPartsForStrip='9999' MaxTotPartsForStrip='9999'
          MaxStrips='9999' MaxTotStrips='9999'
          MaxStripGroups='9999' MinStripGroupLen='0.00'
          MaxStripGroupLen='5000.00' ZCutsAllowed='0'/>
          <SHCParam MaxHCLen='2000.00' MinHCLen='300.00'
          MinBodyLen='0.00'>
               <ShortHeadCut MinPartWid='0.00' MaxPartWid='5000.00'
               MinLastPartWid='0.00' MinStripLen='0.00'
```

```
                MaxStripLen='2500.00' MinLastStripLen='70.00'
                MaxPartsForStrip='10' MaxTotPartsForStrip='99'
                MaxStrips='1' MaxTotStrips='99' MaxStripGroups='1'
                MinStripGroupLen='0.00' MaxStripGroupLen='5000.00'
                ZCutsAllowed='1'/>
                <ShortMainBody MinPartLen='0.00'
                MaxPartLen='5000.00' MinLastPartLen='0.00'
                MinStripWid='0.00' MaxStripWid='2500.00'
                MinLastStripWid='70.00' MaxPartsForStrip='30'
                MaxTotPartsForStrip='99' MaxStrips='3'
                MaxTotStrips='99' MaxStripGroups='3'
                MinStripGroupWid='0.00' MaxStripGroupWid='5000.00'
                ZCutsAllowed='0'/>
           </SHCParam>
           <LHCParam MaxHCWid='1250.00' MinHCWid='0.00'
           MinBodyWid='0.00'>
                <LongHeadCut MinPartLen='0.00' MaxPartLen='5000.00'
                MinLastPartLen='0.00' MinStripWid='0.00'
                MaxStripWid='2500.00' MinLastStripWid='0.00'
                MaxPartsForStrip='9999' MaxTotPartsForStrip='9999'
                MaxStrips='9999' MaxTotStrips='9999'
                MaxStripGroups='9999' MinStripGroupWid='0.00'
                MaxStripGroupWid='5000.00' ZCutsAllowed='0'/>
                <LongMainBody MinPartWid='0.00' MaxPartWid='5000.00'
                MinLastPartWid='0.00' MinStripLen='0.00'
                MaxStripLen='2500.00' MinLastStripLen='0.00'
                MaxPartsForStrip='9999' MaxTotPartsForStrip='9999'
                MaxStrips='9999' MaxTotStrips='9999'
                MaxStripGroups='9999' MinStripGroupLen='0.00'
                MaxStripGroupLen='5000.00' ZCutsAllowed='0'/>
           </LHCParam>
</Param>
```

SimulParam Indicates saw parameters.
Model= Indicates the saw model. The possible values are:
0=WN600
1=WNT600
2=WNTR600
3=WNV600
4=WNA600SS
5=WNAR600SS
6=WNAV600SS
7=WNARV600SS
8=WNA600SL
9=WNAR600SL
10=EB108
11=EBT108
12=EBTR108
13=EB120
14=EBT120
15=EBTR120

16=EB108TP
17=EBT108TP
18=EBTR108TP
19=EB120TP
20=EBT120TP
21=EBTR120TP
22=EB70
23=EB80
24=EB100
25=EB75
26=EB95
27=WN750
28=WNT750
28=WNTR750
30=SEKTOR400
31=WN750TP
32=WNT750TP
33=WNTR750TP
34=WN730
35=WNT730
36=WNTR730
37=WN730TP
38=WNT730TP
39=WNTR730TP
40=WN710
41=WNT710
42=WNTR710
43=WN710TP
44=WNT710TP
45=WNTR710TP
TimeCost= Indicates the saw cutting cost per hour.
SawSetup= Indicates an inner parameter.
RipSize= Indicates the saw rip cut size.
CrossSize= Indicates the saw cross cut size.
HCSize= Indicates the saw head cut size.
MaxBook= Indicates the maximum saw stack height.
BookThreshold= Indicates the stack threshold.
ThickThreshold= Indicates the thin material threshold.
ThickLoad= Indicates the max number of thin material panels per stack.
StripSuperposition= Indicates strips overlapping enabled (0 means NO, 1 means YES).
SpeedReduction= Indicates the speed reduction percentage

Blades Indicates the saw blades parameters.
Rip= Indicates the rip cut blades thickness.
Cross= Indicates the cross cut blades thickness.
HC= Indicates the head cut blades thickness.
ZC= Indicates the Z-cut blades thickness.

Trims Indicates the trims parameters.
MinDivRip= Indicates the minimum rip trim size to be split.

MaxDivRip= Indicates the maximum rip trim size to be split.
OptRip= Indicates the optimum rip trim.
MinDivCross= Indicates the minimum cross trim size to be split.
MaxDivCross= Indicates the maximum cross trim size to be split.
OptCross= Indicates the optimum cross trim.
HCTrim= Indicates the head cut trim.
HCTrimMin= Indicates the minimum head cut trim.

Clamps Indicates the cross cut saw grippers parameters.
Nr= Indicates the number of grippers in the cross cut section.
Dim= Indicates the size of the cross cut section grippers.
Tol= Indicates the size tolerance of the cross cut section grippers.
ClampsTime= Indicates the cross cut section grippers closing/opening time (in sec).

Clamp Indicates the cross cut saw grippers position.
pos= Indicates the cross cut section central grippers position referred to the square fence (for each gripper, one element and one attribute).

Tman Indicates the manual operation time parameters.
mask= Indicates masked manual time (0 means NO, 1 means YES).
HCRot= Indicates manual head cut rotation time.
MBRot= Indicates manual main part rotation time.
StripRot= Indicates manual strip rotation time.
ZCRot= Indicates Z-cut rotation time.
TrimEvac= Indicates manual trim evacuation time.
DropEvacCoeff= Indicates increase coefficient for manual remainder evacuation time.
PanelLoad= Indicates manual panel load time.
BookCoeff= Indicates increase coefficient for manual stack handling.

The following elements describe the technological machine data. For more details see the relevant OptiPlanning instruction manual chapter and the saw numeric control instruction manual.
FirstAxis Indicates the axis parameters for a single line machine and the cross axis parameters for an angular system.
SawCarriageOverstroke
SawCarriageSpeed
SawCarriageReturnSpeed
SawCarriageRamp
PusherSpeed
PusherReturnSpeed
PusherRamp
PressureBeam
LastCutWait
SpeedDecThresholdForTrim
SpeedDecCoeffForTrim
SpeedDecCoeffForBook
FrontAlignPos
FrontAlignTime
ExpulInterfPos
ExpulsionTime
SplitUpThreshold
SideAlignTime

BackPos
WithdrawalPos

SecondAxis Indicates the rip axis parameters for an angular system.
SawCarriageOverstroke
SawCarriageSpeed
SawCarriageReturnSpeed
SawCarriageRamp
PusherSpeed
PusherReturnSpeed
PusherRamp
PressureBeam
LastCutWait
SpeedDecThresholdForTrim
SpeedDecCoeffForTrim
SpeedDecCoeffForBook
FrontAlignPos
FrontAlignTime
ExpulInterfPos
ExpulsionTime
SplitUpThreshold

Shuttle Indicates the shuttle parameters for an angular system.
Width
RampTime
LiftTime
EmptySpeed
LoadedSpeed
StoringSpeed
SpeedDecCoeffForBook
GroupMinWidthForBookMov
SpeedDecCoeffForNarrowStrips
NarrowStripWidthMax
WithdrawalPos
TrapdoorOpenPos
CrossPos
WaitingStationPos
WaitingStationSize

LiftTable Indicates the panel lift table parameters.
MaxLoadingHeight
SetupTime
ThinMatLoadTime
WithdrawalSpeed
ThinMatWithdrawalSpeed
WithdrawalPos
PushingPointsTime

Vacuum Indicates the panel vacuum parameters.
LoadingTimeForFirstThickPanel

ThickPanelLoadingTime
ThickPanelDeltaTime
LoadingTimeForFirstThinPanel
ThinPanelLoadingTime
ThinPanelDeltaTime
VacuumInterferencePos
BookWithdrawalPos
WithdrawalSpeed

TurningTable Indicates the head cut turning table parameters.
FixedTime
RotationTime
SawLengthIncrease
IncreaseForRotation
FrontAlignerPos
DoubleAligner
FirstAlignerPos
SecondAlignerPos
AlignersDistance
Example:

```
<SimulParam Model='5' TimeCost='200000' SawSetup='4'
RipSize='5700.00' CrossSize='2500.00' HCSize='2500.00'
MaxBook='120.00' BookThreshold='60.00' ThickThreshold='8.00'
ThickLoad='30' StripSuperposition='0' SpeedReduction='100'>
          <Blades Rip='4.50' Cross='4.50' HC='4.50' ZC='4.50'/>
          <Trims MinDivRip='20.00' MaxDivRip='80.00' OptRip='30.00'
          MinDivCross='20.00' MaxDivCross='80.00' OptCross='30.00'
          HCTrim='10.00' HCTrimMin='10.00'/>
          <Clamps Nr='9' Dim='50.00' Tol='2.00' ClampsTime='1'>
               <Clamp pos='270.00'/>
               <Clamp pos='470.00'/>
               <Clamp pos='670.00'/>
               <Clamp pos='870.00'/>
               <Clamp pos='1070.00'/>
               <Clamp pos='1270.00'/>
               <Clamp pos='1470.00'/>
               <Clamp pos='1670.00'/>
               <Clamp pos='2000.00'/>
          </Clamps>
          <TMan mask='0' HCRot='12' MBRot='20' StripRot='10'
          ZCRot='8' TrimEvac='2' DropEvacCoeff='0' PanelLoad='20'
          BookCoeff='0'/>
          <FirstAxis SawCarriageOverstroke='1000.00'
          SawCarriageSpeed='40' SawCarriageReturnSpeed='150'
          SawCarriageRamp='1' PusherSpeed='40'
          PusherReturnSpeed='60' PusherRamp='1' PressureBeam='7'
          LastCutWait='5' SpeedDecThresholdForTrim='20.00'
          SpeedDecCoeffForTrim='100' SpeedDecCoeffForBook='100'
          FrontAlignPos='1230.00' FrontAlignTime='8'
          ExpulInterfPos='850.00' ExpulsionTime='4'
          SplitUpThreshold='160.00' SideAlignTime='5'
          BackPos='0.00' WithdrawalPos='0.00'/>
```

```
            <SecondAxis SawCarriageOverstroke='1000.00'
            SawCarriageSpeed='40' SawCarriageReturnSpeed='150'
            SawCarriageRamp='1' PusherSpeed='40'
            PusherReturnSpeed='60' PusherRamp='1' PressureBeam='8'
            LastCutWait='5' SpeedDecThresholdForTrim='20.00'
            SpeedDecCoeffForTrim='100' SpeedDecCoeffForBook='100'
            FrontAlignPos='900.00' FrontAlignTime='4'
            ExpulInterfPos='850.00' ExpulsionTime='4'
            SplitUpThreshold='200.00'/>
            <Shuttle Width='2222.00' RampTime='1' LiftTime='1'
            EmptySpeed='70' LoadedSpeed='40' StoringSpeed='30'
            SpeedDecCoeffForBook='100'
            GroupMinWidthForBookMov='80.00'
            SpeedDecCoeffForNarrowStrips='100'
            NarrowStripWidthMax='80.00' WithdrawalPos='20.00'
            TrapdoorOpenPos='510.00' CrossPos='2365.00'
            WaitingStationPos='5165.00'
            WaitingStationSize='1650.00'/>
            <LiftTable MaxLoadingHeight='500.00' SetupTime='5'
            ThinMatLoadTime='5' WithdrawalSpeed='30'
            ThinMatWithdrawalSpeed='15' WithdrawalPos='3350.00'
            PushingPointsTime='2'/>
            <Vacuum LoadingTimeForFirstThickPanel='10'
            ThickPanelLoadingTime='8' ThickPanelDeltaTime='2'
            LoadingTimeForFirstThinPanel='8' ThinPanelLoadingTime='6'
            ThinPanelDeltaTime='1' VacuumInterferencePos='1800.00'
            BookWithdrawalPos='6400.00' WithdrawalSpeed='30'/>
            <TurningTable FixedTime='30' RotationTime='20'
            SawLengthIncrease='2150.00' IncreaseForRotation='700.00'
            FrontAlignerPos='2920.00' DoubleAligner='0'
            FirstAlignerPos='3600.00' SecondAlignerPos='550.00'
            AlignersDistance='0.00'/>
</SimulParam>
```

Size Contains the piece data relating to stacking (one piece, one element). Each piece has a different size, one or more parts can get one piece. More parts refer to the same piece if they have the same size, in this case the parts are combined.
N= Indicates the piece identifier. The same number is used in the pattern description string.
L= Indicates the piece length. This is the exact sectioned value.
W= Indicates the piece width. This is the exact sectioned value.
Q= Indicates the produced quantity.

Stk *id=* Contains the reference to the corresponding part (one element for each part).

HandStack *Qty=Indicates the quantity of pieces that will be manually stacked.*

SendOptions Contains the options for data transmission towards the panel saw.
P1= Change panel pile.
C1= Front loading (for WNA only).
C2= Accumulated loading (for WNA only).
B0= Disable turning table (for WNTR and WNAR).
A0= Disable accumulation (for WNA only).

R0= Disable piece recirculation from accumulation (for WNA only).
S1= Offcut in accumulation (for WNA only).
L1= Cross machining (for single-line models only).
E1= Stack evacuation (for WNT and EBT).
KMat= Material attribute coefficient (for WNA only).
DropL= Maximum length for worklist options.
DropH= Maximum width for worklist options.
SPartCut= Produce a cutting measurement:
0: never;
1: always;
2: according to the piece stacking logic.
TxTim= Trim cut transmission.
CpoList= Link the list to the next one.
CutSpeed= Transmit cutting speeds.

Labeling Contains the data to print labels. If there is no information, the print program will use the internal data.
PrintPattern= Indicates whether to print the labels associated with the patterns (= 1), or those associated with the pieces produced (= 0).
PrintDrop= Indicates whether to print the labels relating to the remainders produced (= 1).
LabelLayout= Indicates the name of the file (without any extension) to be used as a module for the labels. If there is no name, the default module is used.

LabelingParam Contains the data needed to print the labels associated with the pieces produced.
StackLabeling= Indicates whether to print a label for every stack (= 1) or for every piece (= 0) produced.
StepStack= Indicates how to distribute the labels associated with the stacks (in the case of several different parts).
StepLabel= Indicates how to distribute the labels associated with the pieces (in the case of several different parts).
NPartsPerLab= Indicates for how many pieces N a label should be printed.
FirstLab= Indicates whether to print the first label after N pieces.
LastLab= Indicates whether to print the last label after N pieces.
StepOverprod= Indicates how to assign the overproduction to the various parts.
MinQtyFirst= Indicates whether to complete first the labels in relation to the minimum quantity requested.
ReqQtyFinalLab= Indicates whether to print the label for the piece corresponding to the quantity requested.
ProdQtyFinalLab= Indicates whether to print the label for the piece corresponding to the quantity produced.

Example:

```
<Labeling PrintPattern='0' PrintDrop='1' LabelLayout='' >
     <LabelingParam StackLabeling='0' StepStack='0' StepLabel='0'
     NPartsPerLab='0' FirstLab='1' LastLab='1' StepOverprod='0'
     MinQtyFirst='1' ReqQtyFinalLab='1' ProdQtyFinalLab='1'/>
</Labeling>
```

Solution Indicates the report of the optimised job.
NPatterns= Indicates the number of different patterns produced.
NPieces= Indicates the total number of different parts (with different sizes).

PercLost= Indicates the total material lost in percentage.
TCut= Indicates the total cutting time. This attribute is only present if the optimiser is enabled for time calculation. The value is stored in seconds.
TLongMB= Indicates the total cutting time for long and short cut patterns done in the rip section of the saw. This attribute is only present if the optimiser is enabled for time calculation. The value is stored in seconds.
TCrossMB= Indicates the total cutting time for long and short cut patterns done in the cross section of the saw. This attribute is only present if the optimiser is enabled for time calculation. The value is stored in seconds.
TLongHC= Indicates the total cutting time for head cut patterns done in the rip section of the saw. This attribute is only present if the optimiser is enabled for time calculation. The value is stored in seconds.
TCrossHC= Indicates the total cutting time for head cut patterns done in the cross section of the saw. This attribute is only present if the optimiser is enabled for time calculation. The value is stored in seconds.
TMan= Indicates the total manual operation time. This attribute is only present if the optimiser is enabled for time calculation. The value is stored in seconds.
CutLen1= Indicates the total cut length for a single line saw and the total cut length in the 1st axis (rip axis) for an angular system. The value is stored in decimal millimetres.
CutLen2= Indicates the total distance cut in the 2nd axis (cross axis). The value is stored in decimal millimetres.
NCycl= Indicates the total number of machine cycles.
Prod= Indicates the total produced part area. The value is stored in squared millimetres.
HProd= Indicates the total area of the high priority parts produced (with priority 100). The value is stored in squared millimetres.
Drop= Indicates the total area of reusable waste (remainders). The value is stored in squared millimetres.
Lost= Indicates the total area lost. The value is stored in squared millimetres.
Kerf= Indicates the area removed by the blades as dust. The value is stored in squared millimetres.
Trim= Indicates the area removed as minimum trims. The value is stored in squared millimetres.
Scrap= Indicates area of waste pieces. The value stored in squared millimetres is calculated as follow: Lost – Kerf – Trim.
NStackQueue= Indicates the number of stacking piles generated.
TotTime= Indicates the time taken to optimise the list (expressed in seconds).
Worked= Indicates whether the list has been processed.

Example:

```
<Solution NPatterns='4' NstackQueu='1' TotTime='8' Worked='0'
NPieces='7' PercLost='12.965%' TCut='1571' TLongMB='420'
TCrossMB='903' TLongHC='70' TCrossHC='178' TMan='328'
CutLen1='600881' NCycl='4' Prod='10745596' HProd='10745596'
Lost='1600804' Kerf='273686' Trim='109500' Scrap='1217618'>
```

Pattern Indicates the pattern data (for each pattern one element).
id= Indicates the pattern identifier (pattern no.1 = S1, pattern no.2 = S2, etc.).
BrdNo= Indicates the reference to the used panel number (B1 = panel with identifier 1).
Rep= Indicates the number of panels to be cut.
Cyc= Indicates the number of cycles to be executed.
UL= Indicates the maximum panel length used. The value is stored in millimetres.
UW= Indicates the maximum panel width used. The value is stored in millimetres.

TCyc= Indicates the cycle time (calculated with full stack). This attribute is only present if the optimiser is enabled for time calculation and the pattern is a head cut pattern. The value is stored in seconds.
TStart= Indicates the pattern start instant. This attribute is only present if the optimiser is enabled for time calculation and the pattern is a head cut pattern. The value is stored in seconds.
TStop= Indicates the pattern end instant. This attribute is only present if the optimiser is enabled for time calculation and the pattern is a head cut pattern. The value is stored in seconds.
TMan= Indicates the pattern manual operation time. This attribute is only present if the optimiser is enabled for time calculation and the pattern is a head cut pattern. The value is stored in seconds.
TLongMB= Indicates the pattern cutting time for long or short cut patterns done in the rip section of the saw. This attribute is only present if the optimiser is enabled for time calculation and the pattern is a head cut pattern. The value is stored in seconds.
TCrossMB= Indicates the pattern cutting time for long or short cut patterns done in the cross section of the saw. This attribute is only present if the optimiser is enabled for time calculation and the pattern is a head cut pattern. The value is stored in seconds.
TLongHC= Indicates the pattern cutting time for head cut patterns done in the rip section of the saw. This attribute is only present if the optimiser is enabled for time calculation and the pattern is a head cut pattern. The value is stored in seconds.
TCrossHC= Indicates the pattern cutting time for head cut patterns done in the cross section of the saw. This attribute is only present if the optimiser is enabled for time calculation and the pattern is a head cut pattern. The value is stored in seconds.
CutLen1= Indicates the total cut length for a single line saw and the total cut length in the 1st axis (rip axis) for an angular system. The value is stored in decimal millimetres.
CutLen2= Indicates the total cut length in the 2nd axis (cross axis). The value is stored in decimal millimetres.
Prod= Indicates the produced part area. The value is stored in squared millimetres.
HProd= Indicates the area of the high priority parts produced (with priority 100). The value is stored in squared millimetres.
Drop= Indicates the area of reusable waste (remainders). The value is stored in squared millimetres.
Lost= Indicates the area lost. The value is stored in squared millimetres.
Kerf= Indicates the area removed by the blades as dust. The value is stored in squared millimetres.
Trim= Indicates the area removed as minimum trims. The value is stored in squared millimetres.
Scrap= Indicates area of waste pieces. The value stored in squared millimetres is calculated as follow: Lost – Kerf – Trim.
Str= Indicates the pattern layout description. For more details see the following section.
Example:

```
<Pattern id='S1' BrdNo='B1' Rep='1' Cyc='1' UL='2417.00'
UW='1209.00' TCyc='477' TStart='0' TStop='351' TMan='87'
TLongMB='104' TCrossMB='110' TLongHC='35' TCrossHC='102'
CutLen1='126885' Prod='2845360' HProd='2845360' Lost='131440'
Kerf='57098' Trim='36500' Scrap='37842'
Str='H(X,[(X,(Y,@1,@1,(X,@7)))],(Y,(X,2,5),(X,2,5),(X,2,5)))'>
```

Piece Indicates the piece data (one element for each piece). Each piece has a different size, one or more parts can get one piece. More parts refer to the same piece if they have the same size, in this case the parts are combined.
N= Indicates the piece identifier. The same number is used in the pattern description string.
L= Indicates the piece length. This is the exact value cut (the corresponding part length can be different)
W= Indicates the piece width. This is the exact value cut (the corresponding part width can be different)

Q= Indicates the produced quantity.
G= Indicates the piece grain. This attribute is only present if the grain is set to 1 (= yes), in this case the part cannot be rotated.

Pid *id*= Indicates the reference to the corresponding combined parts (one element for each combined part).
Aid *id*= Contains the reference to the corresponding part manually added to the cutting solution (one element for each part).

Sid
id= Contains the reference to the patterns where the current piece is produced (one element for each pattern).
qPx= Indicates how many parts Px(= *Pid id*) are produced in the *Sid id* pattern, considering a progressive assignment of the quantities.

MatCost Currency= Indicates the material cost of the total current pieces
CutCost Currency= Indicates the cutting cost of the total current pieces
UCost Currency= Indicates the current piece unit cost
Example:

```
<Piece N='1' L='508.00' W='408.00' Q='3'>
     <Pid id='P1'/>
     <Pid id='P2'/>
     <Aid id='P2'/>
     <Sid id='S1' qP1=’1’ qP2=’1’/>
     <Sid id='S3' qP2=’1’/>
     <MatCost><Currency>7518.309932</Currency></MatCost>
     <CutCost><Currency>0.000000</Currency></CutCost>
     <UCost><Currency>2506.103311</Currency></UCost>
</Piece>
```

Drop Indicates the reusable waste data (remainder) - one element for each remainder produced.
L= Indicates the remainder length.
W= Indicates the remainder width.
Q= Indicates the produced quantity for the current remainder.
Example:

```
<Drop L='2005.50' W='1220.00' Q='1'/>
```

BrdInfo Indicates the panel used report (one element for each different panel size).
BrdId= Indicates the panel identifier (panel no.1 = B1, panel no.2 = B2, etc.).
QUsed= Indicates the number of current panels used.
Prod= Indicates the used current panel area. The value is stored in squared millimetres.
Drop= Indicates the remainder area produced with the current panel. The value is stored in squared millimetres.
Lost= Indicates the lost area produced with the current panel. The value is stored in squared millimetres.
Example:

```
<BrdInfo BrdId='B1' QUsed='4' Prod='7771280' Drop='3608988'
Lost='526932'/>
```

StackingSolution Contains the data relating to the stacking solution.
nStacks = Number of piles generated.

nStations= Number of stations used.

Stack Contains the stacking information of a single pile.
Stop= Indicates the number of the pattern in which the pile is terminated.
Start= Indicates the number of the pattern in which the pile is opened.
TBegin= Indicates the machining time (in seconds) in which the pile is opened.
StackID= Indicates the reference pile.
Station= Indicates the station used.
TFinish= Indicates the machining time (in seconds) in which the pile is closed.

Example:

```
<StackingSolution nStacks='1' nStations='1'>
     <Stack Stop='2' Start='1' TBegin='690' StackID='1' Station='1'
     TFinish='966'/>
</StackingSolution>
```

PiecesStack Contains the information of a single pile.
Id= Indicates the pile id.
Code= Indicates the pile name.
L= Indicates the pile length.
W= Indicates the pile width.
H= Indicates the pile height.
Weight= Indicates the pile weight.
NLayers= Indicates the number of layers in the pile.
Base= Indicates the id of the base used.

Layer Contains the information relating to a single layer of a pile.
N= Progressive layer number.
Code= Layer name.
L= Indicates the layer length.
W= Indicates the layer width.
H= Indicates the layer height.
NH= Indicates the layer height.
MaxNH= Indicates the maximum layer height.
TotQty= Indicates the current quantity of objects that make up the layer.
HObj= Indicates the height of an object that makes up the layer.
NObj= Indicates the number of objects that make up a layer.
Str= Indicates the structure of the layer.

Obj Contains the information for each single object that makes up a layer. The term "object" refers to a sectioned piece.
X= Indicates the x position of the object in relation to the base.
Y= Indicates the y position of the object in relation to the base.
L= Indicates the object length.
W= Indicates the object width.
Q= Indicates the number of objects in the layer.
Weight= Indicates the object weight.
Data= Indicates a descriptive field of 11 characters.

Example:

```
<PiecesStack   id='1'   Code='Stack   1'   L='1200.00'   W='800.00'
H='161.00' Weight='31.120' NLayers='2' Base='1'>
     <Layer  N='0'  Code='Pallet'  L='1200.00'  W='800.00'  H='145.00'
     NH='1' MaxNH='1' TotQty='1' HObj='145.00' NObj='1'>
          <Obj   X='0.00'   Y='0.00'   L='1200.00'   W='800.00'   Q='1'
          Weight='30.000' Data='^2'/>
     </Layer>
</PiecesStack>
```

PCode Contains a section that describes the cutting pattern, using the codes in the machine control.

Cut Contains the data to execute a cutting code, relating to a *PCode* section.
id= progressive cutting code number
Code= Type of cutting code (1, 2, 4, 5, Z1, Z2, etc.)
L= Cut dimension
Rep= Code repetitions

Example:

```
<PCode>
  <Cut id='1'  Code='4' L='1000.00' Rep='1'/>
  <Cut id='2'  Code='5' L='500.00'  Rep='1'/>
  <Cut id='3'  Code='5' L='500.00'  Rep='1'/>
  <Cut id='4'  Code='5' L='500.00'  Rep='1'/>
  <Cut id='5'  Code='5' L='500.00'  Rep='1'/>
  <Cut id='6'  Code='5' L='500.00'  Rep='1'/>
  <Cut id='7'  Code='4' L='1000.00' Rep='1'/>
  <Cut id='8'  Code='5' L='500.00'  Rep='1'/>
  <Cut id='9'  Code='5' L='500.00'  Rep='1'/>
  <Cut id='10' Code='5' L='500.00'  Rep='1'/>
</PCode>
```

3. Pattern layout description

The pattern layout is stored in the XML file in the *Pattern* element – *Str* attribute in a description string with the following meaning.
The first character is used to identify the pattern type:
L = Long Cut Patterns.
Long Cut patterns are formed of rip cut strips (lengthways along the panel) and for these patterns the first cut is made along the panel length.

S = Short Cut Patterns.
Short Cut patterns are formed by cross cut strips (along the width of the panel) and for these patterns the first cut is made across the panel width.

H = Head Cut Patterns.
Patterns with head cuts are formed by two parts: the first (*Head Cut*) has cross cut strips that are machined in the same way as the strips which form a short cut; the second *(Main Part*) has rip cut strips that are machined in the same way as the strips which form a long cut.

The objects that are cut at the same level (i.e. belong to the same strip) are surrounded by brackets and separated by commas. X and Y are used to specify the direction

according to the object laid (X = horizontal, Y = vertical).

The head cut section is surrounded by squared brackets. The numbers within the string refer to the corresponding *Piece id* used. The @ char indicates rotated piece (the length of the piece is parallel with the width of the panel).

Example:
`Str='L(Y,(X,3,1,1,1),(X,3,1,1,1),(X,3,1,1,1),(X,3,1,1,1))'`
It corresponds to a long cut pattern with 4 identical strips, each strip indicates piece # 3 (one time) and piece # 1 (three times).

Example:
`Str='H(X,[(X,(Y,7,7,7,7,7))],(Y,(X,@6,@6,@6,@6,@6,@6),(X,1,4,(Y,@6),(Y,3)),(X,6,6,6,6,6,6,6,(Y,7,7))))'`
It corresponds to a head cut pattern. The head cut section has one strip with piece # 7. The main part section has 3 different strips: the first with piece # 6 rotated, the second with pieces # 1, 4, 6, 3 particularly pieces number 6 and 3 are produced with two 3rd phase cuts placed side by side, the third with pieces 6 and 7 (two pieces # 7 are produced with two following 3rd phase cuts).

Example:
`Str='S(X,(Y,2,2,2,(X,3,3,3,3,3,3,3,(Y,4))),(Y,2,2,2,2))'`
It corresponds to a short cut pattern with two strips. The first strip indicates piece # 2 (three times), piece # 3 (7 times) produced with 7 following 3rd phase cuts and piece # 4 produced with a 4th phase cut. The second strip has piece # 2 four times.

A.3 EXAMPLE OF AN XLM FILE

This chapter is aimed at those who need to generate an XML file, in order to transmit the solutions created by other optimisers to the OSI control.
As an example, let's consider a very simple cutting list so we can describe in detail the links inside the xml file. The file generated will be characterised by the fact it only contains the data needed for transmitting the cutting patterns.

The xml file must be written in accordance with version 1.0, using the encoding UTF-8. All the descriptive fields in the file must be converted to the encoding indicated if they are currently expressed in Unicode.

The file heading is:
```
<?xml version="1.0" encoding="UTF-8" ?>
```

As an example, we'll consider the production of 3 parts. With 2 panel measurements available, the first file key will be:
```
<CutList NParts="3" NBoards="2">
```

The parts to be produced are:

	Length	Width	Quantity	Grain	Description
1	950.00	550.00	3	Yes	Right
2	950.00	550.00	3	Yes	Left
3	750.00	550.00	5	No	

In the xml file, for every part it will be necessary to describe a *Part* field.

```
<Part id="P1" L="950.00" W="550.00" qMin="3" Grain="1" IDesc="Right" />
<Part id="P2" L="950.00" W="550.00" qMin="3" Grain="1" IDesc="Left" />
<Part id="P3" L="750.00" W="550.00" qMin="5" />
```

The *id* is a progressive field that must begin from 1. It gives the part a unique, unmistakable identification.
If the part is not grained, it is possible to omit the *Grain* field, or set it at zero. Likewise, the descriptions that are not present can also be omitted.
In the example, only one description has been inserted for each part, using the *IDesc* field, but there is nothing to prevent you using any other descriptive field indicated in the *Part* section of the last chapter.

The available panels are:

	Length	Width	Quantity	Thickness	Description
1	3800.00	2070.00	*	16	
2	1050.00	755.00	1	16	Rack 4

The first row refers to a panel in stock in unlimited quantity, while the second refers to a recovered remainder (only 1 available).

In the xml file, for every panel it will be necessary to describe a *Board* field.

```
<Board id="B1" L="3800.00" W="2070.00" Thickness="16.00" />
<Board id="B2" L="1050.00" W="755.00" Thickness="16.00" Qty="1" BrdInfo="Rack 4"/>
```

The *id* is a progressive field that must begin from 1. It gives the panel a unique, unmistakable identification.
Given that there is an unlimited quantity of the first panel, the relative *Qty* field has been omitted.
The *Board* field has only two descriptive fields; the example uses *BrdInfo*.

The material used is:

Code	Thickness
MDF_16	16

The material must have an unequivocal code that identifies it in terms of both thickness and colour.
In the xml file, this will be:

```
<Material id="1" Thickness="16.00" Code="MDF_16" />
```

The *id* field always has a value of one, because every xml file must show the data for one type of material only. If the *Material* field is omitted, the OSI control will generate a new material with a default code to assign to the worklist.

We will now describe how the panels should be processed in order to create the required parts. In practice, the solution is generated by a hypothetical optimiser using the OptiPlanning criteria.

When showing the solution, OptiPlanning does not use the parts table described above; it generates a new table in which the parts are grouped according to size and indicated as *Pieces*.

	Length	Width	Quantity	Grain	
1	950.00	550.00	8	Yes	
2	750.00	550.00	5	No	

Piece 1 represents the combination of parts 1 and 2.

```
<Piece N="1" L="950.00" W="550.00" Q="8" G="1">
        <Pid id="P1" />
        <Pid id="P2" />
        <Sid id="S1" />
        <Sid id="S2" />
</Piece>
```

Piece 2 represents part 3.

```
<Piece N="2" L="750.00" W="550.00" Q="5">
        <Pid id="P3" />
        <Sid id="S1" />
</Piece>
```

Field *N* is used to identify the piece in an unequivocal manner, and will be used in the cutting pattern description.

It is important to note that the quantity shown for each piece is not the sum of the quantities of parts grouped together, but the total quantity actually produced. If the quantity is greater than the required amount, we speak of "overproduction"; if it is less, "underproduction". The assignment of the quantities to the relative parts is usually managed by the label printing program.

The list of *Pid* fields show which parts have been grouped together in the *Piece* field.
The list of *Sid* fields show which cutting patterns contain the piece.

In the xml file, the *Piece* fields are inserted in the *Solution* section of the file, after the description of the cutting patterns.

```
<Solution NPatterns="2" NPieces="2">
```

The section shows as attributes the number of cutting patterns and the number of pieces obtained from the grouping of the parts (described above).
The list used as an example produces two cutting patterns:

```
<Pattern id="S1" BrdNo="B1" Rep="1"
Str="L(Y,(X,1,1,1),(X,1,1,1),(X,@2,@2,@2,@2,@2,(Y,1)))" />

<Pattern id="S2" BrdNo="B2" Rep="1" Str="L(Y,(X,1))" />
```

The *id* field is a progressive number beginning from 1 and, as in the previous sections, it allows the unique, unmistakable identification of the cutting pattern.

The *BrdNo* field allows you to determine which panel format should be used to process the cutting pattern, while the *Rep* field indicates how often the pattern must be repeated, and therefore how many panels must be used.
The *Str* field provides a structural description of the cutting pattern.

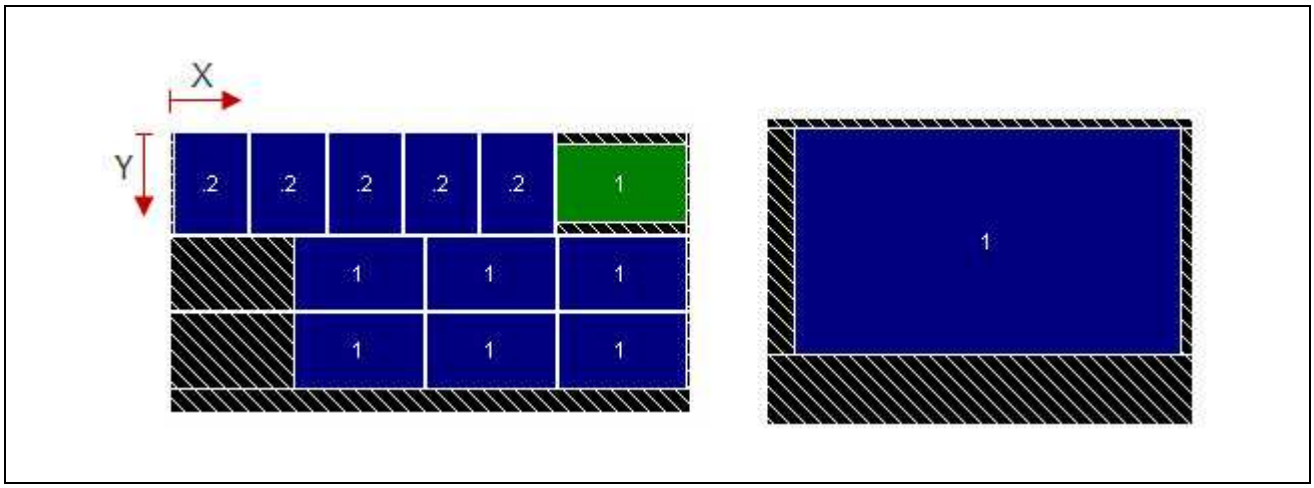


Figure A.2

The solution envisages the creation of two long cut patterns. A long cut pattern is characterised by the fact that the first cut is always parallel to the panel length.
The '.' character shown in the image indicates that piece ".2" has been positioned after being rotated by 90° compared with the edited data in the parts table.

All the long cut patterns begin with the text L (Y, etc.).
A cutting pattern consists of strips, which are indicated in round brackets. A strip may contain pieces, or sub-strips.
In the example, the first pattern consists of three strips, so there will be three groups of brackets: *L(Y,(…),(…),(…))*.

Given that each group of strips develops in the Y direction, the pieces that form them will develop in the X direction. Therefore:
(X,1,1,1)
(X,1,1,1)
(X,@2,@2,@2,@2,@2, (…))

The structure of the pattern indicates not only the piece id but also its orientation. In the case of piece 2, the character '@' indicates that the piece is rotated, so the edited length is parallel to the panel width, and the edited width is parallel to the panel length.
If nothing is specified, the length and width of the piece are parallel to the length and width of the panel.

In the third strip there is a Z-cut, i.e. a group of pieces (in this case, only one) that form a sub-strip. In this case, the orientation is Y, therefore opposite the orientation of the strip that contains it.
(Y,1)

Recomposing the various parts, we obtain: *L(Y,(X,1,1,1),(X,1,1,1),(X,@2,@2,@2,@2,@2,(Y,1)))*

The xml file will therefore be:

```
<?xml version="1.0" encoding="UTF-8" ?>
```

```
<CutList NParts="3" NBoards="2">
        <Part id="P1" L="950.00" W="550.00" qMin="3" Grain="1" IDesc="Right" />
        <Part id="P2" L="950.00" W="550.00" qMin="3" Grain="1" IDesc="Left" />
        <Part id="P3" L="750.00" W="550.00" qMin="5" />
        <Board id="B1" L="3800.00" W="2070.00" Thickness="16.00" />
        <Board id="B2" L="1050.00" W="755.00" Thickness="16.00" Qty="1" BrdInfo="Rack 4" />
        <Material id="1" Thickness="16.00" Code="MDF_16" />
        <Solution NPatterns="2" NPieces="2">
                <Pattern id="S1" BrdNo="B1" Rep="1"
                        Str="L(Y,(X,1,1,1),(X,1,1,1),(X,@2,@2,@2,@2,(Y,1)))" />
                <Pattern id="S2" BrdNo="B2" Rep="1" Cyc="1" Str="L(Y,(X,1))" />
                <Piece N="1" L="950.00" W="550.00" Q="8" G="1">
                        <Pid id="P1" />
                        <Pid id="P2" />
                        <Sid id="S1" />
                        <Sid id="S2" />
                </Piece>
                <Piece N="2" L="750.00" W="550.00" Q="5">
                        <Pid id="P3" />
                        <Sid id="S1" />
                </Piece>
        </Solution>
</CutList>
```

The description of the cutting pattern can also be expressed via the cutting codes of the machine control.
The list of cutting codes must be contained in a *PCode* section, and inserted in the *Pattern* section of the pattern it describes.

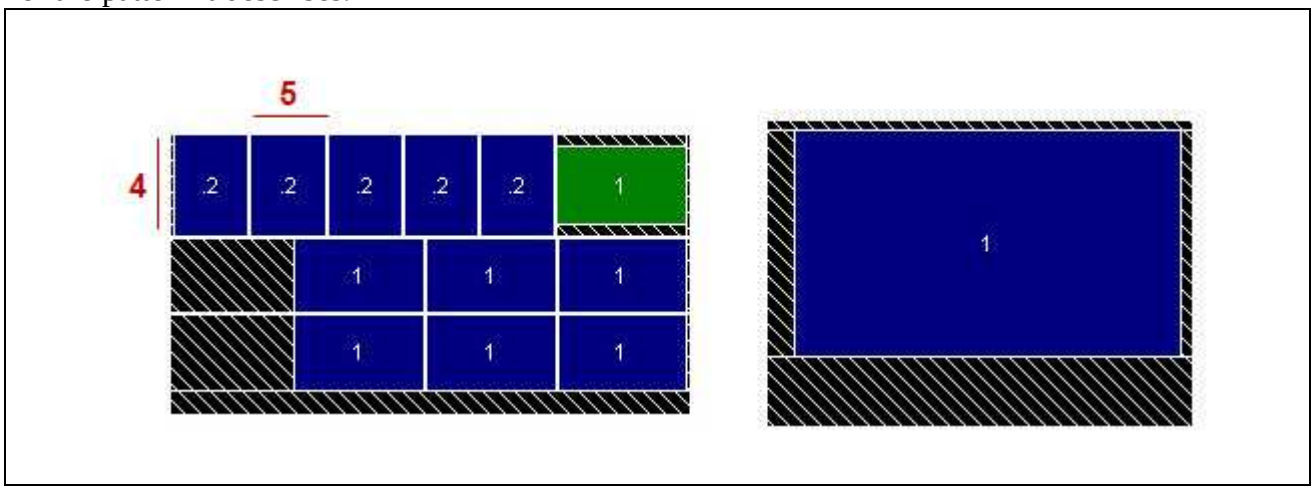


Figure A.3

A long cut pattern is described via the cutting codes 4 and 5. For each code, it is necessary to indicate the dimension and repetitions.

The first strip produces piece 1, with dimensions 950.00 x 550.00 and quantity three. The first cutting code is code 4, which produces a strip 550mm high. Given that the first two strips are identical, it is possible to make the list of cutting codes more compact by inserting 2 as the number of repetitions. The next code is code 5, which produces three pieces 950mm long.

```
<Cut id="1" Code="4" L="550.00" Rep="2" />
<Cut id="2" Code="5" L="950.00" Rep="3" />
```

In the same way, the third strip produces piece 2, with rotated dimensions 550.00 x 750.00 and quantity five. The cutting code 4 will therefore have a dimension of 750mm and repetition 1.
The next code is 5, with dimension 550mm and repetition 5.

```
<Cut id="3" Code="4" L="750.00" Rep="1" />
<Cut id="4" Code="5" L="550.00" Rep="5" />
<Cut id="5" Code="5" L="950.00" Rep="1" />
<Cut id="6" Code="Z1" L="550.00" Rep="1" />
```

The piece indicated in green represents a Z-cut. It is shown as another code 5 with dimension 950mm, and a subsequent code Z with dimension 550mm.

The xml file will therefore be:

```
<?xml version="1.0" encoding="UTF-8" ?>
<CutList NParts="3" NBoards="2">
	<Part id="P1" L="950.00" W="550.00" qMin="3" Grain="1" IDesc="Rigth" />
	<Part id="P2" L="950.00" W="550.00" qMin="3" Grain="1" IDesc="Left" />
	<Part id="P3" L="750.00" W="550.00" qMin="5" />
	<Board id="B1" L="3800.00" W="2070.00" Thickness="16.00" />
	<Board id="B2" L="1050.00" W="755.00" Thickness="16.00" Qty="1" BrdInfo="Rack 4" />
	<Material id="1" Thickness="16.00" Code="MDF_16" />
	<Solution NPatterns="2" NPieces="2">
		<Pattern id="S1" BrdNo="B1" Rep="1">
			<PCode>
				<Cut id="1" Code="4" L="550.00" Rep="2" />
				<Cut id="2" Code="5" L="950.00" Rep="3" />
				<Cut id="3" Code="4" L="750.00" Rep="1" />
				<Cut id="4" Code="5" L="550.00" Rep="5" />
				<Cut id="5" Code="5" L="950.00" Rep="1" />
				<Cut id="6" Code="Z1" L="550.00" Rep="1" />
			</PCode>
		</Pattern>
		<Pattern id="S2" BrdNo="B2" Rep="1" Cyc="1">
			<PCode>
				<Cut id="1" Code="4" L="550.00" Rep="1" />
				<Cut id="2" Code="5" L="950.00" Rep="1" />
			</PCode>
		</Pattern>
		<Piece N="1" L="950.00" W="550.00" Q="8" G="1">
			<Pid id="P1" />
			<Pid id="P2" />
			<Sid id="S1" />
			<Sid id="S2" />
		</Piece>
		<Piece N="2" L="750.00" W="550.00" Q="5">
			<Pid id="P3" />
			<Sid id="S1" />
		</Piece>
	</Solution>
</CutList>
```

To complete the description of the xml file, this example shows the case of short cut, head cut, and long head cut patterns.

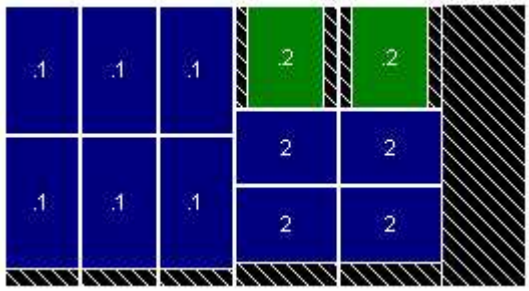


Figure A.4

In the short cut patterns, the string begins with the text S (X, etc.).
In the example given here, there are five strips which are represented by the group (Y, etc.).

(Y,@1, @1)
(Y @1,@1)

(Y,@1,@1)
(Y,2,2,(X,@2))
(Y,2,2,(X,@2))

The resulting string will be:
S(X,(Y,@1,@1),(Y,@1,@1),(Y,@1,@1),(Y,2,2,(X,@2)),(Y,2,2,(X,@2))).

In the case of the head cut, the pattern is divided into two portions - A and B. The front portion represents a short cut pattern, while the rear portion shows a long cut.

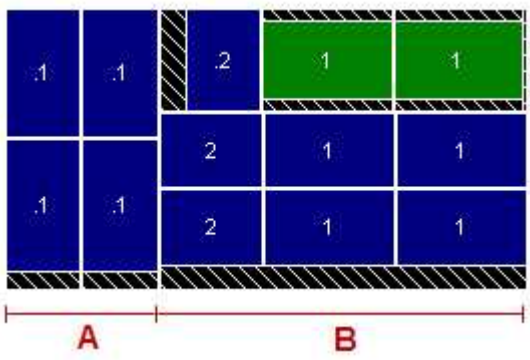


Figure A.5

In head cut patterns, the string has a standard structure of the type: *H (X,[A], B.)*
The square brackets enclose the description of the front portion, while the character X indicates that we're dealing with a short head cut.
The front portion - A - represents a short cut pattern *(X, etc.)*, while the rear portion shows a long cut *(Y, etc.)*.

H(X,[(X, …)], (Y, …)).

The front portion consists of two strips:
(Y,@1,@1)
(Y,@1,@1)

The rear portion consists of three strips, with the third containing two Z-cuts:
(X,2,1,1)
(X,2,1,1)
(X,@2,(Y,1),(Y,1))))

The final string will be:
H(X,[(X,(Y,@1,@1),(Y,@1,@1))],(Y,(X,2,1,1),(X,2,1,1),(X,@2,(Y,1),(Y,1))))

Likewise, in the case of a long head cut, the front portion represents a long cut pattern, while the rear portion shows a short cut pattern.

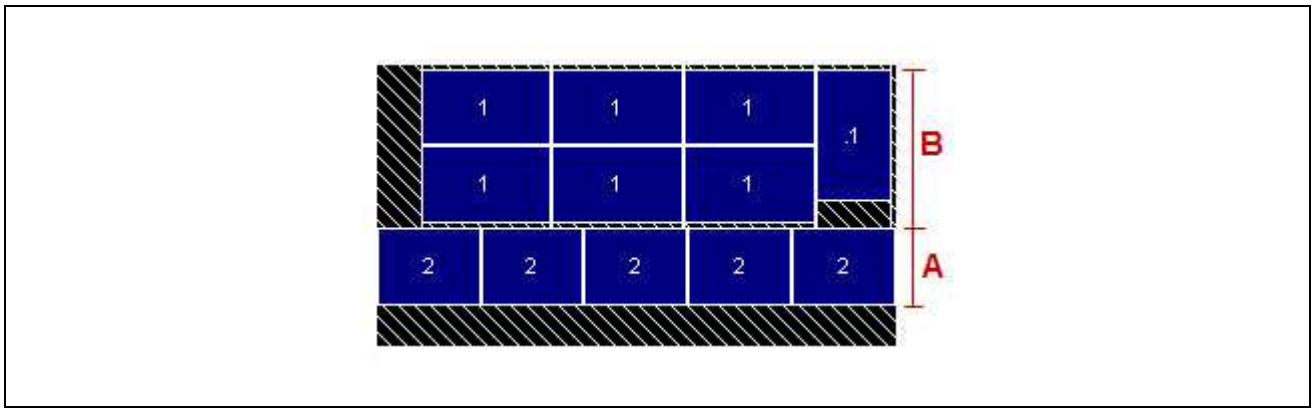


Figure A.6

In long head cut patterns, the string has a standard structure of the type: *H (Y,[A], B.)*
The square brackets enclose the description of the front portion, while the character Y indicates that we're dealing with a long head cut.
The front portion - A - represents a long cut pattern *(Y, etc.)*, while the rear portion shows a short cut *(X, etc.)*.

H(X,[(Y, …)], (X, …)).

The front portion consists of a single strip:
(Y,2,2,2,2,2)

The rear portion consists of four strips:
(X,1,1)
(X,1,1)
(X,1,1)
(X,1,1)
(X,@1)

The final string will be:

H(Y,[(Y,(X,2,2,2,2,2))],(X,(Y,1,1),(Y,1,1),(Y,1,1),(Y,@1)))

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