

SOFTWARE SOLUTIONS CONSULTING

Cutting Optimизiser Users Guide

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Background

What this optimizer is about.

Optimization is the process of making “something” as “best” as possible. In this case, the “something” is the selection and layout of the cutting of rectangle (or linear) pieces of metal (or other material) from larger rectangle (or linear) pieces. This program deals with machines that cut all the way through the source material in a straight line such as saw or shears and not stop or curved cuts such as a plasma burner can produce. This program defines “best” as using the least amount of material and making the remaining material (restocks) as large as possible. Using this program, the utilization of the material can be greatly increased resulting in significant cost savings.

Using the program

The basic functions of the cut optimizer

The basic operations of the cut optimizer is collecting the quantity and sizes needed parts, the quantity and sizes of the available stock, optimizing the cuts, and printing the diagram.

Figure 2-1 show the entry screen for the cut optimizer. The left half of the screen contains the needed parts under the “REQUIRED” label. The right half of the screen contains the available stock under the “AVAILABLE” label as well as the thickness, saw kerf, and tolerance. Entry of the parts and available stock is done in the same way. The entries are made in the top part of the screen and parts / stock that are part of the optimization are shown in the bottom.

To add parts / stock

Enter the number of pieces needed / available

Enter the width and length in inches of the pieces needed / available (Note other units can be used so long the same units are used for the parts and the stock, i.e. no conversion is done.)

For parts only you can optionally specify

Price – the price per piece. Used in the calculations.

Keep grain - A check box found below the price field. If this box is checked, the part will maintain its orientation relative to the stock, i.e. the width of the part will be in the same direction as the width of the stock.

Once the information has been added, click on the “Add” button to include this part / stock in the optimization.

The system will clear the entry boxes and add the part / stock to the part / stock list.

Entering the information in the boxes will not include the part / stock in the optimization. Only parts /stock in the lists below will be used during the optimization.

To delete parts / stock

Click on the part / stock in the list at the bottom of the screen.

Click on the “Delete” button on the Required or Available side

The system will remove the part / stock from the lists at the bottom

To change a part / stock

Click on the part / stock in the list at the bottom of the screen

The program will fill in the entry boxes with the information specified.

Change the pieces, width, length, etc.

Click on the “Replace” button on the Required or Available side

The program will erase the entry boxes and update the part / stock lists

Kerf

The kerf is the amount of material removed during the cutting process and corresponds to the thickness of the cutting blade. This number must be greater than or equal to zero. Zero thickness is often used in shearing operations.

Thickness / Tolerance

These fields are used for reference only and do not affect the calculations

Cross Cut / Rip Cut

These check boxes affect the optimization process. None or one of these boxes can be checked. If the “Cross Cut” box is checked, the optimization favors cut that go with the width of material. If the “Rip Cut” box is checked, the optimization favors cuts that go with the length of the material. These are not hard restrictions but “push” the optimization in one direction or the other.

Optimize

Once the parts and stock have been added, click on the “Optimize” button. If parts and stock are not specified or there is not enough stock to create the needed parts, an error message will be display. If there is not an error, the figure window will be displayed. Figure 2-2 shows a sample, optimized figure. The part list, the required stock, and the expected restocks are listed on the figure. A picture showing the layout of the parts and restocks are shown. The parts are colored red and the restocks are colored blue. The cut lines / scrap is shown in white. The parts and restocks are labeled to correspond to the list. One picture is displayed per cut layout. The title of the picture shows the number of pieces to cut this way, the size of the stock, and the utilization of the stock (yield).

Printing the figure

To print this figure, click on the printer icon in the toolbar or select the menu item File -> Print. A dialog box will be displayed asking whether you wish to print the figure or the calculations. Make your selection and click “OK” to continue printing or “Cancel” to abort the print. If you click “Cancel”, you will be returned to the program. If you click “OK”, a standard windows print dialog box will be displayed. Select printer, copies, etc and click “OK” or “Cancel”.

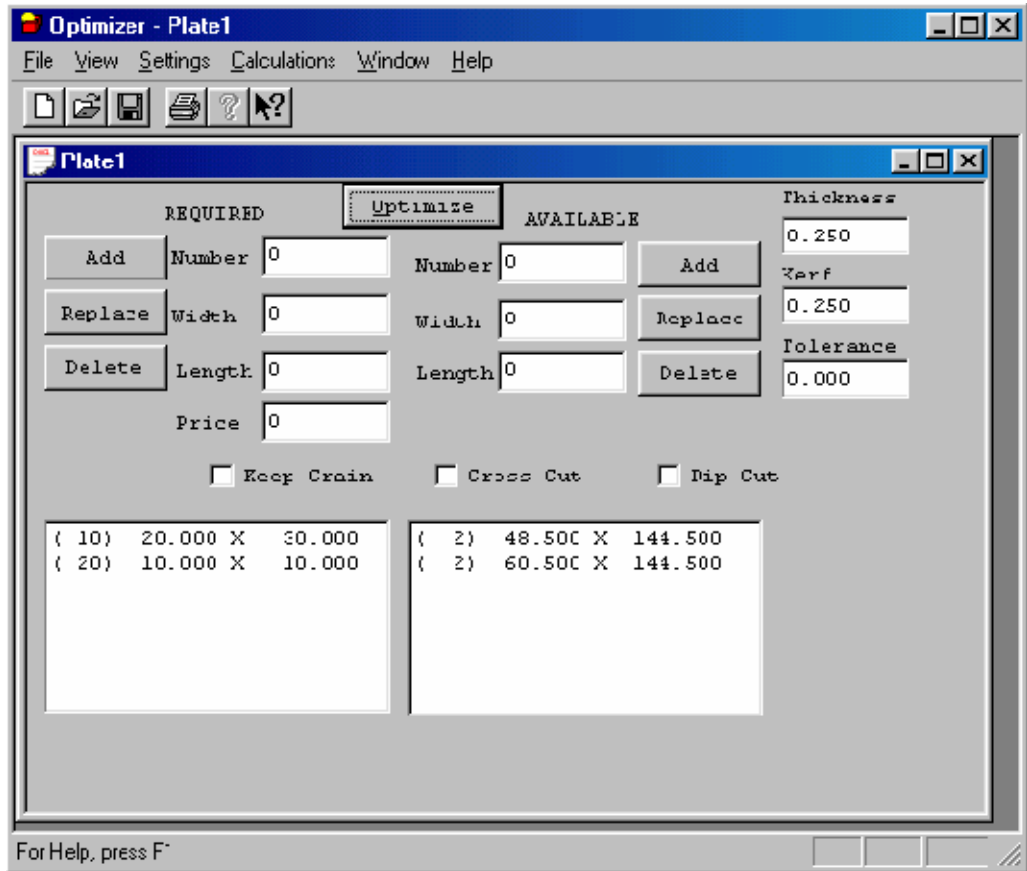


Figure 2-1: Sample cut optimizer screen

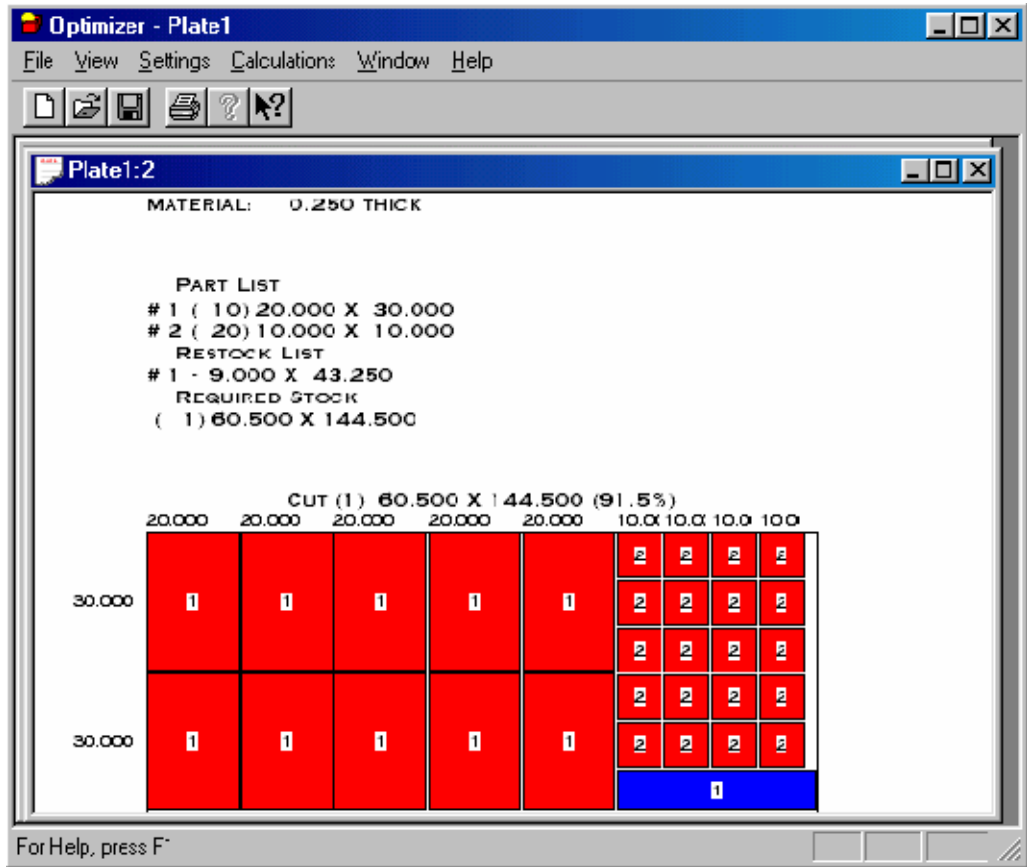


Figure 2-2: Sample Figure

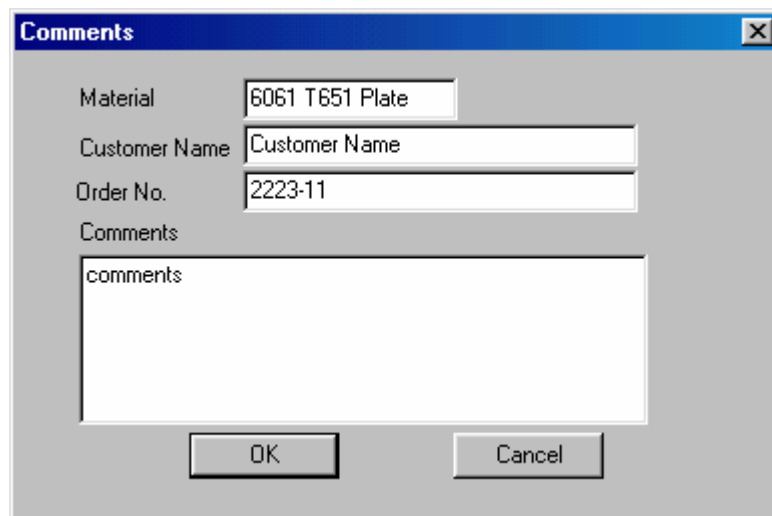
Advanced Use

This section describes some of the advanced features of the cut optimizer

The cut optimizer contains several advanced features that make the program more flexible and useful.

Adding info to the figure

By selecting the menu item Setting -> Comments, additional info can be added to the figure. Figure 3-1 shows the dialog box that will be displayed. Info in the material box will appear after the material thickness on the figure. The customer name, order number, and comments will appear below this.



The image shows a Windows-style dialog box titled "Comments". It has a blue title bar with a close button (X) on the right. The dialog contains four input fields stacked vertically: "Material" with the text "6061 T651 Plate", "Customer Name" with the text "Customer Name", "Order No." with the text "2223-11", and a "Comments" text area with the text "comments". At the bottom of the dialog are two buttons: "OK" and "Cancel".

Figure 3-1: Comments dialog box

Expert Setting

Selecting the menu item Settings -> Expert will display the dialog box shown in Figure 3-2. These settings affect the optimization process and the display. The iteration 1 and 2 boxes set how many combinations the optimization process attempts. Increasing this value for complicated optimizations may yield better results but the calculation time may increase significantly. The Max / page field indicates how many pictures will be drawn on one figure page. When more than the specified number of pictures need to be drawn, additional pages are used. The default values are shown.

The IFS location is used only in the Transtar version and is described in chapter 4.

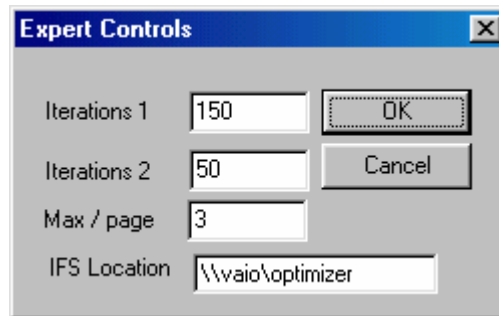


Figure 3-2: Expert Controls dialog box

Calculations

The cut optimization program can be used to estimate profits. This begins with setting the cost of the stock and the value of the restocks and the scrap. The menu item Calculations -> Material Usage displays the dialog box shown in figure 3-3. The weights shown are estimates based on aluminum as the source materials and the thickness specified.

Selecting the menu item Calculations -> Profit will display the dialog box shown in figure 3-4. The material cost is calculated by using the values supplied in the Material Usage dialog box. The items in the list are the parts that you are creating. You can specify the price per pound, price per piece, or total price for each part. The cutting and transportation boxes are additional costs that can be applied. The "Sales" field is the total of the total price and the random and scrap field is the value of the restocks and scrap. The profit and percent profit are displayed.



Figure 3-3: Material Usage dialog box

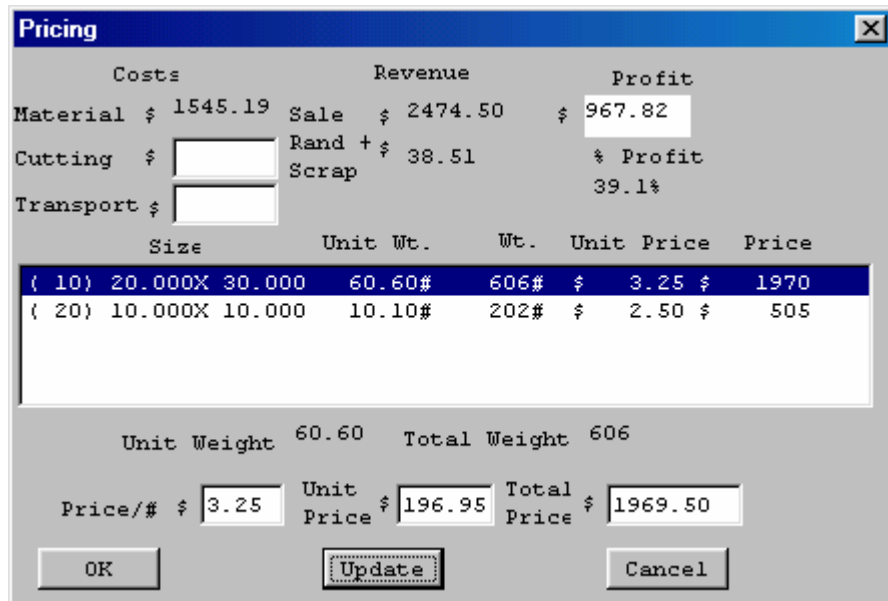


Figure 3-4: Profit dialog box

Registration

To protect against unauthorized use, the cut optimizer uses a software key system. After the program is installed, it will function properly for 30 days without installing the key. If the key is not install after 30 days, the program will no longer optimize jobs.

To install the software key, go to the menu item Help->About/Registration. The dialog box shown in figure 3-5 will be displayed. Contact Software Solutions via e-mail or telephone and provide the Software code display on the screen. Software Solutions will provide the Liberation code. Enter the liberation code and click "Register". The box below the "OK" button will say "Registered." as shown in the figure. This needs to be done only once per computer.

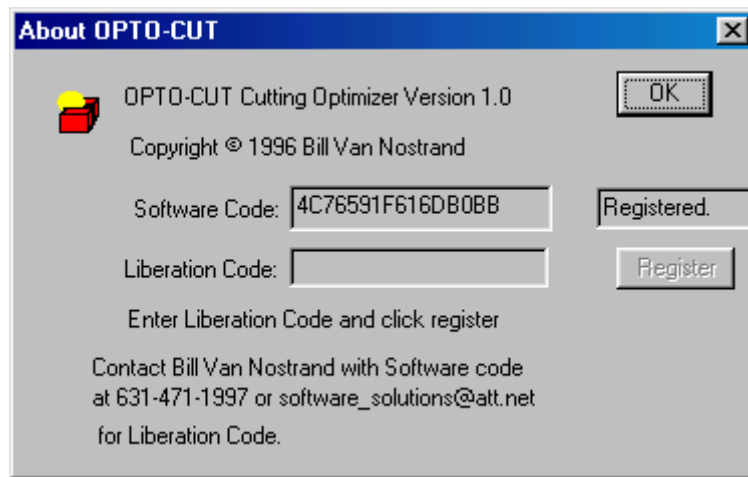


Figure 3-5: Registration dialog box

Specific Info

This section details the interface to the Transtar DSP system

The cut optimizer has been modified to work with DPS systems. The program can be used as described in the previous chapters or can be slaved to the DPS system. In the “slave” mode, no changes can be made to the parts / stock. Other functions can be used as described in chapters 2 and 3.

Optimizer Listener

The Optimizer Listener (or starter) is a separate program installed into the startup group that works with DPS and starts the optimizer in slave mode. Figure 4-1 show the main window for this program. The program also puts an icon in the system tray. Job name is the value passed from DPS to the optimizer. It represents the folder name used for the data transfer. The program location is the location of the cut optimizer in the file system. Port 3000 is the default TCP/IP port the Listener and DPS communicate on. Clicking on “Hide” will hide the listener program. This program will continue to function. Right click on the icon in the system tray to unhide or exit the listener program. Click “Stop” to change the settings, “Save Settings” makes the changes permanent, and “Listen” to restart the program.

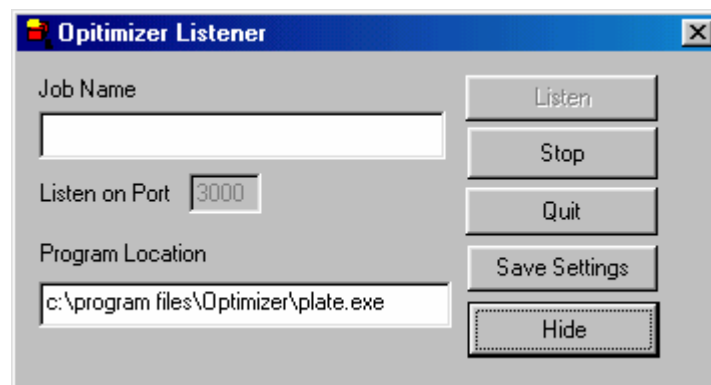


Figure 4-1: Optimizer Listener Main Window

Cut Optimizer and DPS

The export data function in the DPS system creates the needed files to transfer the information to the PC, sets up the files for the information going back to the DPS system, and sends a message to the PC via TCP/IP on 3000 will the folder name where the information is stored. The import data function in the DPS system reads the information from the PC about what stock the parts are to be cut from and the restocks.

Upon receiving the message from DPS, the listener program starts the cut optimizer. The cut optimizer then loads the information from the folder specified. No changes are allowed to the parts or stock in this slave mode. The cut is optimized, the program writes the results to the specified folder so that DPS can read the information.

The data files are to be located on the AS400 IFS. There will be a main optimization folder with subfolders for ToPc and FromPc. A folder is created in both ToPc and FromPc folders for a given optimization job. These folders both contain two comma separated files, cuthdr.csv and cutdtl.csv. DPS puts information in the ToPC files, which is read by the cut optimizer. The cut optimizer puts information in the FromPC files, which is read by DPS. The details of these files are contained in the appendix. The location of the main optimization folder needs to be specified using the menu item Settings->Expert. The location can be specified in terms of a mapped drive or a window standard naming convention (i.e. [\\machine\share\folder](#)).

Appendix

File formats

Header (cuthdr.csv)

WHWKO#	7	CUT#
WHLLIN	4 0	LAST LINE of CUT
WHOPT#	20	Assigned Optimize number (user-job#)
WHYELD	6 3	YIELD
WHTOLR	6 3	TOLERANCE
WHKERF	6 3	KERF
WHGRAN	1	(L)ength/(T)urn
WHCROS	1	WHCROS
WHLSTS	60	Comments/Notes

Cut to (cutto.csv)

WIWKO#	7	CUT#
WICLIN	4 0	CUT LINE#
WITOFRM	10	From/To designation
WIGITM	17	ITEM
WIQTYO	7 0	QTY
WILBQY	9 2	PND
WIPLN	6 3	LENGTH
WIWTH#	6 3	width
WIORD#	7	ORDER NO
WILINE	3	order LINE

