

CutLog®

Module: Sawlog sorting optimization

User guide

http://www.cutlog.com

Tekl STUDIO s.r.o.

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CutLog® - Module Sawlog sorting optimization *User guide*

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1. Introduction

Sawlog sorting optimization (SSO) is additional module to CutLog[™]. For details about CutLog's functionality please refer to CutLog user guide.

2. Module – Sawlog sorting optimization

This module is available as standalone additional functionality of CutLog software. For working with SSO is necessary to have CutLog already installed.

In case, that you already have bought CutLog, it is necessary to have new software license key. License for SSO is not transferrable from one CutLog license to other.

3. Precalculation

Before SSO itself, is necessary to prepare appropriate data. Input data for SSO are prepared in optimization function *FlexiCut2*.

In first step is necessary to set parameters in FlexiCut2 (the same way, you are working every day). For example:

| FlexiCut2 | | - • × |
|--|---|-------|
| Results Show Tools Configuration | | |
| SOI Save Porezy SQL | 2D Debug List Yield Segments Sprecher Price simulation PilaMSK Profit | |
| | | |
| Criteria Calculate Yield of timber | | |
| | | |
| Species PIN - Pine | | |
| Group Default Pine | | |
| Middleboard * | | |
| SED 208.00 | | |
| Taper 10.00 🗼 mm/m Length 2.45 🗼 m | | |
| Prism timber 2 | | |
| Species PIN - Pine Group Default Pine Middleboard SED 208.00 Taper 10.00 mm/m Length 2.45 mm/m Prism timber 2 Settings Batch Other Price Middle boards | | |
| Other Price Middle boards | | |
| Correction I. pass II. Pass Other | | |
| Curvature 0.000 / % | | |
| O Decrease of small end 0.000 🕀 mm diameter (SED) by | | |
| diameter (3LD) by | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | Yield | |
| | Yield (Invoice sizes) Log volume m3 | |
| Timber | Timber volume total Central timber volume 99% | |
| Size QTY Volume Price | Price of timber 99% | |
| | Chips volume Sawdust volume | |
| | Chips price Sawdust price | |
| | | |

| FlexiCut II - Batch | × |
|--|--|
| Settings Sorting Optimization | |
| Preset middle board ("*") All middle boards | |
| Curvature | Decrease of small end diameter (SED) by |
| 0.000 -> 0.000 x step 0.000 x | 0 |
| Diameter | |
| | Diameter 0 |
| Taper Taper 10.000 ★ mm/m -> 10.000 ★ mm/m step 0.000 ★ Side segments | |
| Delivery Input file e:\data.csv | Quit |
| Output file e:\data xlsx | <u>Calculate</u> |
| | |

Then select menu "Tools/Batch" we start function for batch optimization:

We have set optimization for diameters 200mm to 250mm with step of 1mm.

Here we can choose the way, how middle boards will be selected into results: *"Preset middle board"* – optimization will be run only on board selected in main FlexiCut2 screen. So it can be either "*" for the best middle board or selected.

"All middle boards" into batch process will be added all middle boards also. It means, that optimization will be made for each middle board separately for combination diameter-curvature-taper. This choice is reccomended.

Preparing of data for sorting optimization you can find on tab "Sorting optimization":

| FlexiCut II - Batch | alon you can find on tab "corting optin | × |
|---------------------------------------|---|-----------|
| Settings Sorting Optimization | | |
| | | |
| | | |
| | | |
| e:\sortOpt txt | Precalculate | |
| | | |
| | | |
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| | | |
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| | | |
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| | | |
| | | |
| | | |
| | | |
| | | |
| Delivery | | Quit |
| Input file e:\data.csv | | |
| Output file e:\data xlsx | | Calculate |
| · · · · · · · · · · · · · · · · · · · | | |
| | | |

On the second tab we just set output filename and press "Precalculate button". Resulted file is input file into sorting optimization function.

4. Sawlog sorting optimization

This module can be found in menu "Tools / Sorting optimization".

Optimisation itself consist from two steps:

- 1. Proposition of sorting boxes
- 2. For each middle board making order of boxes by priority from where is appropriate to take sawlogs for production

| Sorting optimization | and . | | | - | |
|--|--|--|--------------------------|----------|----------|
| Load Save 10 🖈 Nu | umber of diameters with the best yield | | | <u>(</u> | alculate |
| Middleboard 🛛 👻 Weight of the order 🔍 👻 | Number of boxes 10 | ✓ Reduction of th ✓ Reduction of th ✓ Dividing maxim ✓ Dividing minim | e biggiest num values | | |
| SED Score | Yield of timber | Chips volume | Sawdust volume | | |
| | Timber volume total | Yield of chips | Yield of sawdust | | |
| | Price of timber | Border | | | |
| | | | | Box | Border |
| | | | | | |
| Size Yield Score | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| Size Length QTY | | | | | |
| | Timber | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

For the beginning is necessary to load file, which has been precalculated in previous step in FlexiCut2's batch export or file saved from this function/

Important: Button save is intended for saving boxes settings together with input data.

After loading of file, you get this screen:



In the left panel on top there is list where is on each line diameter (SED) and appropriate score (counting of score is described later). Mouse click on column header you can resort lines base on that column.

Below diameter list (in case, that middle board is chosen: "*") is list of timber sizes, which are included in resulted score. There is board size, yield for selected diameter and score. List is sorted base on yield of listed timbers.

Bottom table on left. There are all boards, which you get by sawing of selected diameter and selected middle boards.

For example as result of sawing for diameter 200mm, middle board 25x95 you get listed boards (see Picture above)

On the left side there is list of algorithms for making borders between sorting boxes. There are four possible algorithms:

- 1. Reduction of the smallest
- 2. Reduction of the biggest
- 3. Dividing maximum values
- 4. Dividing minimum values

All will be described later. For each algorithm you can show borders (checkboxes near to each type) or select which of them will be modified by user (which results). In addition double-click on particular color field, you can change color of box borders.

"Number of boxes" field means number of sorting boxes.

Below are the results for selected diameter and middle board (Yield, Timber volume, Chips volume...)

Below results you can find chart. On X axis there is log diameter (SED – small end diameter) and on Y axis is score (described later). Also optimization on selected number of boxes is made and marked on chart

together with numbers, base on selected algorithms. For each optimization method are joined average score values in particular boxes. Each sorting optimization is shown by different color and can be hidden.

Under chart is important table. Base on selected algorithm you can see one row for each middle board.

In one column you can see sorting boxes numbered from 1 to requested value.

So, for particular middle board you have numbered boxes from 1 to 'n' = number of boxes.

It means, that box with number 1 has the best average yield for particular timber. Then box number 2 has the second best yield... In practice this means, that for producing of particular timber is the best to take sawlogs from sorting box with number '1', then from box with number '2' etc...

Button [SAVE] you can use for saving results into file. There is also input data saved into output file. So In saved file is everything: input data and sorting boxes borders. You can load that file later and continue with working on it.

Proposed borders of sorting boxes is possible to change manually:

- 1. By moving mouse cursor in chart, you can see green line below it. With it you can move borders. Split or join boxes.
- 2. You are editing only boxes, which are part of selected optimization algorithm.
- 3. You can move borders between boxes. After changing boxes also bottom table is recalculated.
- 4. You can join two boxes. Just press mouse right click and select Join.
- 5. Existing box is possible to split. Just press mouse right-click inside the box and choose "split". Instead of this you can use "double-click" inside the box.
- 6. You are modifying boxes belonging to selected optimization algorithm.

Second option to change borders:

On the right side of chart is table with box numbers and borders. You can directly change borders there. Of course within borders of previous and next box.

After editing of boxes is automatically recalculated bottom table.

Above of list of diameters, there is field, where you can choose particular middle board score. (star - * - means cumulative score for all middle boards)



Picture shows 10 diameters, which has the best yield for middle board 25x95. There is also percentage yield shown in chart.

There is visible only selected number of diameters. (In this case it is 10)

From the bottom table is clear, that for selected optimization (= reduction smallest) is the most optimal box #1, which has the best score (the best average yield). Then it is box #7 etc.

You can take in account also "importance" of boards by size, by selecting order number. Will be explained latter when score counting will be discussed.

4.1. Score

All optimizations works base on score counted from input data. Score for any diameter is counted this way:

For selected middle board are all diameters sorted by yield of timber from the best yield to lowest values. Then are scored assigned to each diameter from the biggiest value to zero. Biggiest value is the value entered into field "*Number of diameters with the best yield*". For example, for value '5' in mentioned fields. (here can enter in account "importance" or weight of board. Each score can be multiplied by importance factor, see next chapter)

| Middle board | Small end diameter (SED) | Timber yield | score |
|--------------|-----------------------------|-----------------|-------|
| 12x30 | 201 | 38,9 | 5 |
| 12x30 | 200 | 38,7 | 4 |
| 12x30 | 202 | 38,5 | 3 |
| 12x30 | 203 | 38,2 | 2 |
| 12x30 | 204 | 37,9 | 1 |
| 12x30 | 206 | 37,7 | 0 |
| 12x30 | 212 | 37,6 | 0 |
| 12x30 | 205 | 37,5 | 0 |
| 12x30 | 211 | 37,5 | 0 |
| 12x30 | 207 | 37,4 | 0 |
| 12x30 | 213 | 37,3 | 0 |
| 12x30 | 208 | 37,1 | 0 |
| 12x30 | 214 | 37 | 0 |
| 12x30 | 209 | 36,7 | 0 |
| 12x30 | 215 | 36,7 | 0 |
| 12x30 | 217 | 36,5 | 0 |
| 12x30 | 210 | 36,4 | 0 |
| 12x30 | 216 | 36,4 | 0 |
| 12x30 | 218 | 36,2 | 0 |
| 12x30 | 224 | 36,1 | 0 |

This way is calculated score for all middle boards. For particular diameters are score values *cumulated*.

In case, that for some diameters is yield the same, then biggiest score is assigned to lower diameter. It means, that table above is sorted by yield (from the biggiest to lowest) and by diameter (from lower to bigger).

Greater score means, that it is more universal diameter for different sizes of timber.

4.2. Influence of "weight" or importance of boards on score

In default sort optimization counting has each board the same importance. For example board size produced once a year has influence on board produced every day, in meaning of sorting optimization. This is not always good. For this you have possibility to take this importance/weight into an account. So score counter in previous page can be multiplied by appropriate "factor of occurence", How it is counted?

For example, your daily board production: $10x20...\ 20m^3$ $10x25...\ 30m^3$

Then board factor for 10x20 is = 20/(20+30) = 20/50 = 0,4And for 10x25 je = 30/(20+30) = 30/50 = 0,6

So appropriate score in table for board 10x20 is multiplied by 0,4 and for board 10,25 is multiplied by 0,6

After this are score tables counted together base on diameter and further optimizations are made.

This quantities are entered into CutLog as orders.

However, if you want to use orders for sorting optimization as factor modification, then order must meet some requirements:

- 1. Wood species of order has to be the same as wood species used in precalculation whithin FlexiCut2 function
- 2. Board sizes counted from batch function in FlexiCut2 must be all presented in order and must have non zero quantity

Only when these conditions are met then particular order can be choosen.

4.3. Interpretation

| Possible interpretation for | vr boord 24v4E for o | ntimization "raduation | of omolloot" |
|-----------------------------|----------------------|------------------------|---------------|
| Possible interpretation to | 0 00210 24843 101 0 | DOMINIZATION TEOUCIION | or smallest |
| | | | or ormanoot . |

| | | | | | | | | | | - | | × |
|---|----------------------------------|---|------------------------------|---|----------------------------|--|------------------------|----------------------------|------------------------------|------------------------------|-------------------|------------|
| Load Save 5 🚖 Number of diameters with the best yield | | | | | | | | | | | | |
| Middle board 24x45 SED Score 5 | Number of I | ooxes 10 | A V | | |] Reduction] Reduction] Dividing (] Dividing (| n of the bi maximum | iggiest i values | | | | |
| 222 5 223 4 224 3 225 2 226 1 | Timber volume | nber 59.73 total 0.063 nber 4.52 | 3 m3 | | olume 0.0 chips 27 | 0231 m3 | | Sawdust vo Yield of sav | | | | |
| Size Yield v Score | | 205 206 207 | 208 209 210 | 211 220 221 56-7 56-7 10 | 59.2 58.7 58.7 | 225 58.2 226 57.7 228 | 229 230 230 | 231 232 233 | 01 235 236 | 240 241 242 | 243 245 245 | 249 250 |
| 24x45 2.45 14.00 45x100 2.45 2.00 | 12x30 24x45 24x60 24x80 | 1 2 1 2 8 9 7 3 11 12 10 11 | 3 3 10 4 6 12 | 4 5 4 5 11 12 5 2 8 9 9 7 | 6 6 1 6 5 3 | 2 9 7 | 8 9 3 4 | 5 0 11 4 1 | 11 11 6 8 2 1 | 12 12 7 1 3 2 | | A III |

For production of board "24x45" is the best to use sawlogs with diameters 222, 223, 224, 225 and 226mm. (five diameters with the best yield).

But, after sorting into 10 boxes. You should use for producing boards 24x45 box #6 then box #7, then box #8 etc. see picture above.

This prioriting of boxes for particular board is counted base on average yield for particular middle board within sorting box. For all diameters in box available for particular middle board, not only first five diameters. Then are all boxes sorted by counted average yield in box. Box with the biggiest average yield has the biggiest priority (= number 1), box with second biggiest average yield will be number #2 etc...

In the picture above there are only first five diameters, because those was important for optimization. But for counting of box priority for particular middle board are taken all data from precalculation.

4.4. Optimization

There are four different methods of optimization. It is up to user, which optimization method he will choose. All results can be modified base on user needs. User can also save the results for later use.

Reduction of the smallest



Assumption: Diameters with greater score, should be sorting separately and diameters with the lower scores can be merged into one sorting box.

Method:

Let's take chart similar to previous picture. On the beginning of optimization there is number of boxes equal to number of available diameters for which we have input data (created from FlexiCut2 optimization). Our task is reduce number of boxes to requested value.

In each iteration we split two boxes into one. (remove one box). Iterations are repeated until number of boxes are not on requested value.

<u>STEP 1</u>

| Box (diameter) | Score | Contains diameters |
|-------------------|-------|--------------------|
| 205 | 9 | 205 |
| 206 | 3 | 206 |
| 207 | 4 | 207 |
| 213 | 2 | 213 |
| 214 | 1 | 214 |
| 218 | 5 | 218 |

- 1. We find box with the lowest score. In our case it is 214
- 2. For particular box (214) we found neighbor box, which has lowe score. In our example it is box (= diameter) 213
- 3. New sorting box will contain sawlog diameters 213 and 214 and new average score will be 1.5
- 4. (steps 1 3) are repeated until number of boxes is not equal the value we need

(further steps are for illustration, how optimization works)

<u>STEP 2</u>

| Box (diameter) | Score | Contains diameters |
|-------------------|-------|--------------------|
| 205 | 9 | 205 |
| 206 | 3 | 206 |
| 207 | 4 | 207 |
| 213 | 1,5 | 213,214 |
| 218 | 5 | 218 |

- 5. We found box (=diameter) with the lowest score, in our case it is 213
- 6. For this box (213) we found neighbor box, which has lower score, it is box 207 (score = 4)
- 7. New box, will contain diameter (=boxes) 213, 214 a 207, new scóre will be average = 2,333 (average of score 213,214 a 207)

<u>STEP 3</u>

| Box (diameter) | Score | Contains diameters |
|-------------------|-------|--------------------|
| 205 | 9 | 205 |
| 206 | 3 | 206 |
| 207 | 2,333 | 207,213,214 |
| 218 | 5 | 218 |

Results ar 4 sorting boxes:

| Box number | Diameter from |
|------------|---------------|
| 1 | 205 |
| 2 | 206 |
| 3 | 207 |
| 4 | 218 |

Reduction of the biggiest

| Here I Sorting optimization | | _ | | | _ | | | - | | _ 🗆 🗙 |
|---|-----------------------------|---------------------------------|-----------------|--------------|---|--|--|-----------------------------|--|---------------------------------|
| Load Save 5 A | umber of diameters w | ith the best yie | ld | | | | | : | <u>C</u> alculate | |
| Middle board • <t< th=""><th>Yield of t</th><th>boxes 15</th><th></th><th>Chips volur</th><th> Redu Divic Divic Divic 0.0207 n </th><th>uction of the s uction of the l ding maximum ding minimum n3</th><th>biggiest m values n values Sawdust volu</th><th>7.555 555 1.000 1.000</th><th>3</th><th></th></t<> | Yield of t | boxes 15 | | Chips volur | Redu Divic Divic Divic 0.0207 n | uction of the s uction of the l ding maximum ding minimum n3 | biggiest m values n values Sawdust volu | 7.555 555 1.000 1.000 | 3 | |
| 203 6 | Timber volume Price of t | etotal 0.05 m. imber 0.9 EUI | | Yield of chi | ps 29.3% | | Yield of sawd | lust 13% | | |
| 204 2 | | | | | | | | 5 6 7 8 | | |
| Size Length QTY | 201 202 203 203 | 205 206 205 | 210 209 211 209 | | 576 576 576 | 228 229 230 | 231 232 233 234 234 | 235 236 240 241 | 242 243 244 245 245 245 | 247 248 249 249 250 |
| 26x30 2.45 12.00 45x100 2.45 2.00 | Timber | 1 2 | 3 4 | 5 | 6 7 | 8 | 9 10 | 11 12 | 13 14 | 15 🔺 |
| 40×100 2.40 2.00 | 12x30 | 1 2 | 3 4 | 5 | 6 7 | | 9 10 | 11 12 | 13 14 | 15 |
| | 24x45 24x60 | 12 1 1 13 | 2 5 15 3 | 8 | 10 13 4 6 | | 15 3 8 9 | 4 6 11 10 | 7 9 12 14 | 5 |
| | 24x80 24x80 | 15 12 | 10 3 | 8 | 4 0 | | 3 4 | 5 6 | 7 9 | 11 |
| | 24x180 | 12 15 | 8 3 | 2 | 4 10 | 13 | 14 5 | 6 7 | 9 11 | 1 |
| | 26x30 | 1 2 | 3 4 | 5 | 6 7 | 8 | 9 10 | 11 12 | 13 14 | 15 🗸 |

Assumption: Diameters with greater score can be cumulated. This way is preserved greater average yield.

Method:

Let's take chart similar to previous picture. On the beginning of optimization there is number of boxes equal to number of available diameters for which we have input data (created from FlexiCut2 optimization). Our task is reduce number of boxes to requested value.

In each iteration we split two boxes into one. (remove one box). Iterations are repeated until number of boxes are not on requested value.

<u>STEP 1</u>

| Box (diameter) | Score | Contains diameters |
|-------------------|-------|--------------------|
| 205 | 9 | 205 |
| 206 | 3 | 206 |
| 207 | 4 | 207 |
| 213 | 2 | 213 |
| 214 | 1 | 214 |
| 218 | 5 | 218 |

1. We find box (diameter) with the greatest score. In our case it is 205

- 2. For this box (205) we find neighbor box, whith greater score. It is box 206.
- 3. New box will contain diameters 205 and 206 and new score will be 6 (it is average value from score 9 and 3).
- 4. (steps 1 3) are repeated until number of boxes is not equal the value we need

(further steps are for illustration, how optimization works)

<u>STEP 2</u>

| Box (diameter) | Score | Contains diameters |
|-------------------|-------|--------------------|
| 205 | 6 | 205, 206 |
| 207 | 4 | 207 |
| 213 | 2 | 213 |
| 214 | 1 | 214 |
| 218 | 5 | 218 |

- 5. We found box with the greatest score. It is 205.
- 6. For this box we found neighbor box with greater score. It is box 207 (score = 4)
- 7. New box will contain diameter (205, 206, 207) and new score will be average = 5.33

<u>STEP 3</u>

| Box (diameter) | Score | Contains diameters |
|-------------------|-------|--------------------|
| 205 | 5,333 | 205, 206, 207 |
| 213 | 2 | 213 |
| 214 | 1 | 214 |
| 218 | 5 | 218 |

Results are 4 boxy:

| Box number | Diameter from |
|------------|---------------|
| 1 | 205 |
| 2 | 213 |
| 3 | 214 |
| 4 | 218 |

Dividing maximum values

| i⇔i Sortir Load | ng optimizatio | n ave 5 | Number of diameters | vith the be | st yield | | | | | | Cal | | × |
|------------------------|---|-----------------|---|-------------|-------------------|------|------------|------------------|--|--|--|---|-----|
| SED 200 201 | Middle board Score 10 15 | • | Number of Yield of | fboxes [| | Chir | 0 | Reducti Dividing | on of the s on of the b g maximum g minimum | n values n values | me 0.0112 m3 | | |
| 202 | 10 | | Timber volun | | | | d of chips | | | Yield of sawd | | | |
| 203 204 | 6 | | Price of | timber 0 | 9 EUR | | | | | | | | |
| Size 26x30 12x30 | Yield 57.7 53.1 | Score 5 5 | | 2 | 3 4 | 5 | 6 | | | 8 | | | |
| Size | Length | QTY | 201 200 200 201 201 201 201 201 201 201 | 205 206 206 | 209 209 210 | 2112 | | 225 226 | 229 | 231 232 233 234 234 235 | 235 236 240 241 242 242 | 243 244 245 245 247 248 248 248 248 | 250 |
| 26x30 | 2.45 | 12.00 | Timber | 1 | 2 3 | 4 | 5 6 | 7 | 8 | 9 10 | | | * |
| 45x100 | 2.45 | 2.00 | 12x30 | 1 | 2 3 | 4 | 56 | 7 | 8 | 9 10 | | | |
| | | | 24x45 | | 8 9 | | 5 1 | 2 | | 6 4 | | | - |
| | | | 24x60 | | 1 3 | - | 6 8 | 10 | - | 9 7 | | | |
| | | | 24x80 24x180 | | 89 97 | - | 4 7 1 5 | 6 8 | - | 1 2 6 3 | | | |
| | | | 24x180 | | 2 3 | - | 7 5 | 6 | | o 3 9 10 | | | |

This optimization makes border between boxes on local maximum score (peak).

For example, in case of box *i* is it's score greater than score of box*i-1* and greater than score of box *i+1*, Special case is, that score of box *i+1* (*i+2*...*i+n*) is the same as score of box *i* but greater than *i+n+1*. Then border of box is set on first diameter – box *i*.

It means, that maximum number of boxes is equal to number of those 'peaks'.

Let's take number of peaks = m. While is number of boxes lower (x), then previous box number i belongs to new box with number f (from interval 1 - x), where f = i * (x / m).

It means, that in first step we found all peaks, where are borders of sorting boxes. Then base on needs are boxes merged.

Dividing minimum values

| | ng optimizatio | | | | | | | | | | | - | ſ | | • | | | | x |
|------------|----------------|--------|-------------------------------|------------|-------------------|-------------------|-----------|-------------------|--------|------------|---------------------|------------|----------|----------|---------------|------------|------------|------------|-----|
| Load | | Save 5 | Number of diameters v | vith the b | est yield | | | | | | | | | <u> </u> | <u>C</u> alcu | late | | X | |
| | Middle board | • | Number of | fboxes | 15 🌲 | | | | | | smalles biggiest | | | | | | | | |
| | - | | | | | - | | | | | um value | | | | | | | | |
| SED 200 | ▲ Score 10 | | | | | | | | - | | m values | | | | | | | | |
| 200 | 15 | | | | | | | | | | | | | | | | | | |
| 201 | 10 | | | timber 5 | | | hips volu | | | | | | ime 0.0 | | | | | | |
| 202 | 6 | | Timber volum | | | Yi | eld of ch | ips 29.3 | 3% | | Yield | ofsawo | lust 13° | 6 | | | | | |
| 203 | 2 | | Price of | timber (| J.5 EUR | | | | | | | | | | | | | | |
| Size | Yield | Score | | | | Le. | | | 17 | | la. | | 10 | | | 10 | | la a | |
| 26x30 | 57.7 | 5 | | | 3 4 | 5 | 6 | | 1 | | 8 | | 9 | | | 10 | | 11 | |
| 12x30 | 53.1 | 5 | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| Size | Length | QTY | 23 23 29 | 202 Ja | 207 208 209 | 210 211 220 | 221 | 223 224 224 | 226 | 229 230 | 231 232 | 234 234 | 235 | 241 | 243 | 245 245 | 246 247 | 248 249 | 250 |
| 26x30 | 2.45 | 12.00 | | | | | | - | - | - | - | | | | | | | | |
| 45x100 | 2.45 | 2.00 | Timber | 1 | 2 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | | | | | | |
| | | | 12x30 24x45 | | 2 3 9 10 | 4 | 5 8 | 6 1 | 7 2 | 8 3 | 9 6 | 10 4 | 11 5 | | | | | | Ξ |
| | | | 24x45 24x60 | | 3 2 | 1 | 4 | 8 | 2 | 3 7 | 9 | 4 | 6 | | | | | | |
| | | | 24x80 | - | 7 10 | 9 | 5 | 6 | 8 | 4 | 1 | 2 | 3 | | | | | | |
| | | | 24x180 | | 9 10 | 3 | 2 | 4 | 8 | 5 | | 6 | 1 | | | | | | |
| | | | 26x30 | | 2 3 | 4 | 6 | 5 | 7 | 8 | 9 | 10 | 11 | | | | | | |

This optimization makes border between boxes on local minimum of score.

For example, in case of box *i* is it's score lower than score of box*i-1* and lower than score of box *i+1*, Special case is, that score of box *i+1* (*i+2*...*i+n*) is the same as score of box *i* but lower than *i+n+1*. Then border of box is set on first diameter – box *i*.

It means, that maximum of boxes is equal to number of those 'lows'

Let's take number of minims = m. While is number of boxes lower (x), then previous box number i belongs to new box with number f (from interval 1 - x), where f = i * (x / m).

It means, that in first step we found all minims, where are borders of sorting boxes. Then base on needs are boxes merged.

Cummulative results

| | | | | | | | | - | | x |
|--|--|--|--|---|--|----------------------------|--|--|---|---|
| Load Save 5 N | umber of diameters with the | best yield | | | | | <u></u> | <u>Calculate</u> | | X |
| Middle board SED Score N CO 10 CO 15 CO | Number of boxes | | Chins ve | Reduce Dividi | ction of the sm ction of the big ing maximum v ing minimum v | igiest values values | ume 0.0112 n | | | |
| 202 10 203 6 204 2 | Timber volume total Price of timber | 0.05 m3 | | hips 29.3% | | Yield of sawc | | | | |
| Size Yield Score 26x30 57.7 5 12x30 53.1 5 | 1 2 3 4 5 2 000 000 000 000 000 000 000 0 | 3 3 6 4 7 4 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 | 6 | 223 224 225 226 | 7 2 300 627 827 828 | 48 | 235 236 241 241 241 241 8 241 | | 120 13 14 15 376 577 578 578 578 578 578 578 578 | |
| 26x30 2.45 12.00 45x100 2.45 2.00 | Timber 1 12x30 1 24x45 9 24x60 10 24x80 14 24x180 13 26x30 1 | 2 3 2 3 10 11 4 5 15 7 14 15 2 3 | 4 5 4 5 1 1 14 7 2 10 12 10 12 4 5 | 6 7 6 7 15 12 3 6 13 5 5 4 6 10 | 8 9 8 9 1 2 9 12 6 8 3 6 7 8 | 10 3 | 11 12 11 12 4 5 15 8 11 4 11 9 11 12 | 13 1 13 1 6 7 13 1 13 1 13 1 13 1 13 1 13 1 13 1 13 1 13 1 13 1 13 1 | 8 1 1 3 2 | |

In case, that all results are shown, then we have in one chart all optimizations shown in different colors. Double-click on color field you can change color for particular optimization. Modifying of boxes and lower table is bind to optimization, which is selected....

5. Export results

Results of optimization can be exported into MS Excel:



After press button [X] you are prompted for output file name.

| A | В | С | D | E | F | G | Н | I. | J | К | L | М | N | 0 | Р | |
|--------|------|---|----|----|---|---|----|----|----|----|----|---|---|---|---|--|
| Box | From | | | | | | | | | | | | | | | |
| 1 | 0 | | | | | | | | | | | | | | | |
| 2 | 204 | | | | | | | | | | | | | | | |
| 3 | 207 | | | | | | | | | | | | | | | |
| 4 | 209 | | | | | | | | | | | | | | | |
| 5 | 211 | | | | | | | | | | | | | | | |
| 6 | 221 | | | | | | | | | | | | | | | |
| 7 | 226 | | | | | | | | | | | | | | | |
| 8 | 231 | | | | | | | | | | | | | | | |
| 9 | 236 | | | | | | | | | | | | | | | |
| 10 | 244 | | | | | | | | | | | | | | | |
| 11 | 248 | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| Timber | 1 | 2 | 3 | | 5 | | 7 | 8 | | | 11 | | | | | |
| 12x30 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | | | | | |
| 24x45 | 7 | 9 | 10 | 11 | 8 | 1 | 2 | 3 | 6 | 4 | 5 | | | | | |
| 24x60 | 5 | 3 | 2 | | 4 | _ | 10 | 7 | 9 | 11 | 6 | | | | | |
| 24x80 | 11 | 7 | 10 | | 5 | | 8 | 4 | 1 | 2 | 3 | | | | | |
| 24x180 | 11 | 9 | 10 | 3 | 2 | | 8 | 5 | 7 | 6 | 1 | | | | | |
| 26x30 | 1 | 2 | 3 | 4 | 6 | | 7 | 8 | 9 | 10 | 11 | | | | | |
| 30x60 | 3 | 4 | 2 | 1 | 5 | 7 | 11 | 10 | 8 | 9 | 6 | | | | | |
| 45x100 | 7 | 9 | 11 | 10 | 8 | 5 | 1 | 2 | 3 | 4 | 6 | | | | | |
| 50x200 | | | | | 7 | 5 | 6 | 2 | 1 | 3 | 4 | | | | | |
| 80x200 | | | | | | 6 | 1 | 2 | 3 | 4 | 5 | | | | | |
| 90x150 | 5 | 6 | 3 | | 7 | 8 | 10 | 9 | 11 | 2 | 1 | | | | | |
| 95x160 | 1 | 2 | 5 | 3 | 4 | 6 | 7 | 8 | 10 | 9 | 11 | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |

Example of resulted MS Excel file:

You can see, that for each optimization method there is separate sheet. Firstly, there is table, where you have sorting boxes. For each sorting box you have started sawlog diameter.

Below is table, where is for each middle board assigned particular box by priority. So for example, base on image above. For timber 24x45 is the best to take sawlogs from box #6, where are sawlogs with diameters 221mm -225mm (or 225.9999, as you wish)

Of course, base on selected optimization you get different results. It is base on your opinion and technology, which one to choose.

6. System requirements

System requirements are the same as requirements for CutLog software.

For running and using of software is necessary to fulfill some base requirements. Systems base on Windows 95 and 98 are not supported, because they are obsolete.

Hardware – minimum requirements:

(base on Windows 2000 professional and .NET Framework 2.0 Redistributable)

| Processor: | Pentium compatible processor 133 MHz or newer |
|------------|--|
| RAM: | minimum 64MB |
| Hard Disk: | 2GB |
| VGA: | 1024x768 a greater resolution. At least 256 colors |

Hardware – recommended:

(base on Windows XP professional system and .NET Framework 2.0 Redistributable)

| Processor: | Pentium compatible processor 1 GHz or newer |
|------------|---|
| RAM: | minimum 128MB |
| Hard Disk: | 2GB |
| VGA: | 1024x768 and greater resolution. At least 32 bit colors |

Operating system:

Windows 2000 and newer

Windows 7 is recommended (32 or 64 bit versions)

CutLog software is compatible with Windows 7 and it can be used on both - 32 and 64 bit versions of system.

Others: For exporting into MS Excel, it is necessary to hav MS Office installed, or at least MS Excel

Links:

.NET framework 2.0 requirements: http://msdn.microsoft.com/netframework/technologyinfo/sysregs/default.aspx

Windows 2000 System requirements:

http://www.microsoft.com/windows2000/professional/evaluation/sysregs/default.asp

Windows XP Professional system requirements:

http://www.microsoft.com/windowsxp/pro/evaluation/sysregs.mspx

Microsoft .NET Framework Version 2.0 Redistributable Package (x86) http://www.microsoft.com/downloads/details.aspx?FamilyID=0856eacb-4362-4b0d-8eddaab15c5e04f5&DisplavLang=en

Microsoft .NET Framework Version 2.0 Redistributable Package (x64) http://www.microsoft.com/downloads/details.aspx?FamilyID=b44a0000-acf8-4fa1-affb-40e78d788b00&DisplayLang=en

Microsoft .NET Framework Version 2.0 Redistributable Package (IA64) http://www.microsoft.com/downloads/details.aspx?FamilyID=53c2548b-bec7-4ab4-8cbe-33e07cfc83a7&DisplayLang=en