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WANE CUTTING INFLUENCE ON LUMBER VOLUME

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ABSTRACT

When cutting lumber in the sawmill, if there is more left wane, the more voluminous output blanks. Efforts in the sawmill increase, but the increase in volume output blanks pays for effort and makes a profit.

This increase in the volumetric output of lumber due to the cutting board in width in two stages – in the sawmill and woodworking shop after drying lumber. At the same time, the costs related to that part of the drying lumber, which will be removed in a woodworking shop, will be repaid by increasing the volumetric output of billets produced lumber.

Thus, the timber with a predetermined quantity wane after leaving the drying room may be used in such a form as pieces for a wooden house.

Key words: timber, raw sawn lumber, wane, blanks, voluminous, profit.

1. INTRODUCTION

In order to reduce the waste in cutting lumber on the blanks they may be cut to other schemes.

So birch lumber unlike softwood lumber has greater curvature. Recycling uncut birch lumber in cutting department is not always advisable as automation of the process of laying a dried packages and further cutting requires additional costs.

One solution to this problem can be the modified circuit trim in lumber materials in the sawmill with leaving the top of the board blunt wane, that exceed parameters the requirements of the standards (Fig.1).

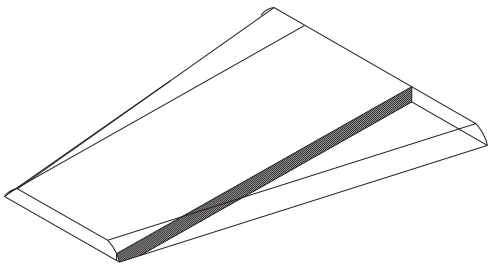

Figure 1: Cutting edging lumber, in order to increase the useful output of billets

Analytical calculation was made to put on edged lumber and blunt wane lumber.

Analyticalcal culation was performed by software Excel (Figure 2).

The data obtained from the study will be used to develop new methods for assessing the quality of lumber.

The experiment was conducted on the basis of data obtained in Schelkovskogo training and experimental forestry.

For the experiment is used the birch sawn timber wood break up method: diameter 18 to 26 cm, the volume of 31m3, 6 m long.

Among them, with a possible deviation of± 5 %: I grade -40 %, II grade -40 %, III grade -20% in accordance with is made by GOST9462-88 "Round timber hardwood. Specifications."

Then information about the sawn edging materials is put in a skid passport boards.

It is assumed that the quality wood lumber has same quality wood blanks.

Conducted is an analytical calculation of the volumetric output of sawn in two schemes of edging trim lumber.

The first scheme edged lumber production through-and-through sawing to give a

different widths boards and the tapering region are sowing on a sawmill (Figure 2). Calculated volumetric data output edged lumber are shown in Table 1

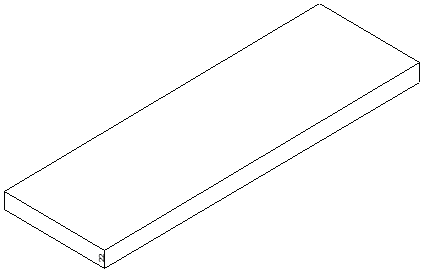

Figure 2: Cutting scheme 1

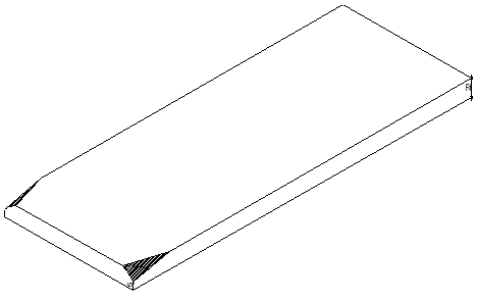

**Figure 3: Cutting scheme 2.
First stage – cutting in the sawmill**

Table 1: Calculation of the volumetric output edged lumber thickness of 22 mm birch logs with a diameter of 18 cm and a length of 6 m.

Number of boards	Boards thickness, mm	Boards width, mm	Boards length, m	Volumetric output edged lumber,%
2	22	175	6	23.34
2	22	150	6	20.0
2	22	75	5.25	8.75
2	22	75	2.25	3.75
The total volumetric output of lumber				**55.84**

The second production scheme was sawing logs to obtain uncut of different widths, which then must be cut off on a blunt wane lumber at sawmill. Its width increases, if compared this scheme to the first scheme. For make blunt wane lumber enough to create edge thickness of 5mm base for stacking bags in a drying and further processing (Figure 3). Calculated volumetric data you-stroke edged lumber blunt wane presented in Table 2.

Table 2: Calculation of the volumetric output of blunt wane lumber, thickness is 22 mm, birch logs with a diameter of 18 cm and a length of 6 m.

Number of boards	Boards thickness , mm	Boards width, mm	Boards length, m	Volumetric output blunt wane lumber,%
2	22	175	6	23.34
2	22	150	6	20.00
2	22	125	6	16.67
2	22	75	4.25	7.08
The total volumetric output of lumber				**67.1**

After drying of lumber with a blunt wane made their further cutting into blank sin a woodworking shop. First of all, the board is cut transversely to the blank which misses blunt wane and the blank with remains blunt wane. Then the blank with remains blunt wane is cut out with a blunt wane in the longitudinal direction, completely cutting off the wane (Figure 4).

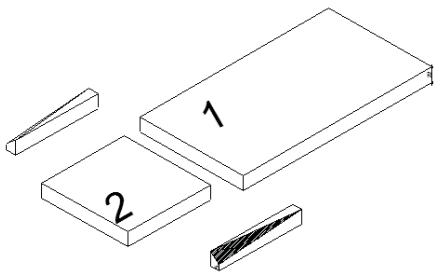

**Figure 4: Schematic of cutting. 2. The second stage – cutting in woodworking shop.
1 – blank without blunt wane. 2 – blank after cutting blunt wane.**

Table 3: Calculation of the volumetric output from blunt wane lumber, thickness is22 mm, birch logs with a diameter of 18 cm.

Number of boards	Blanks thickness, mm	First blanks length, m	Second blanks length, m	First blanks width, m	Second blanks width, m	First blanks Volumetric output,%	Second blanks Volumetric output, %	The total volumetric output of two blanks, %
2	22	6	0	175	0	23.34	0	23.34
2	22	6	0	150	0	20.00	0	20.007
2	22	5.25	0.75	125	100	14.59	1.67	16.257
2	22	2.25	2	75	50	3.76	2.22	5.977
The total volumetric output of lumber			61.68		3.86		**65.57**	

After analyzing the data in Tables1, 2 and 3 shows that the difference between the volumetric output edged lumber blunt wane and fully edged lumber is 11.25 %. Difference between the volumetric output of blanks made from edging boards and blunt wane boards is 9.72 %

In determining the output lumber when cutting logs followed reveal cross-sawn length wise method is recommended to use the following formula:

For edging board:

$$p_i = \sum_{j=1}^{s} \frac{4 l_j m_j b_j N_1}{(D^2 + d^2)\pi L N_2} * \left(1 - \frac{2 n_1 t_1}{\sqrt{D^2 - 4a_j^2} + \sqrt{d_p^2 - 4a_j^2}}\right) * \left(1 - \frac{n_2 t_2}{l_j}\right) * K_y (K_1 + K_2 + K_3) K_4 * 100\%$$

For trimming boards:

$$p_i = \sum_{j=1}^{s} \frac{4 l_j m_j b_j N_1}{(D^2 + d^2)\pi L N_2} * \left(1 - \frac{n_1 t_1}{B_j}\right) * \left(1 - \frac{n_2 t_2}{l_j}\right) * K_y (K_1 + K_2 + K_3) K_4 * 100\%$$

d – diameter of the logs in the apical part, m

D – diameter of the logs in the butt, m

L – length of the log, m

l_j – length j-th edging board, m

m_j – the nominal thickness j-th edging board, m

m_j – the nominal thickness j-th edging board, m

s – is the number of boards output

a_1 – is the distance from the longitudinal axis of the timber to the outer j-th board, m

N_1 –the number of blanks to the width of the board

N_2 – number of pieces on the board length

bj – width j-th blank shrinkage allowance, m

Bj – edged board width

i – the procurement type

t_1 – the kerf when cutting edging boards in width, m

t_2 – the kerf when cutting edging boards in length, m

n_1 – number of cuts across the width of the board, m

n_2 – number of cuts along the length of the board, m

K_1 – the coefficient of volumetric output main blanks

K_2 – coefficient of volumetric output short blanks

K_3 – coefficient of volumetric output glued blanks

K_4 – volume ratio improving upstand and preparations

Ky – coefficient taking into account the width of lumber shrinkage.

Coefficient of volumetric output i-th blank takes into account the waste saw dust when cutting across the width.

$\left(1 - \frac{n_2 t_2}{l_j}\right)$ – Coefficient of volumetric output i-th blank takes into account the waste saw dust when cutting to length.

CONCLUSIONS

The result of using both analytical and practical calculation is becoming, showed an increase of output boards with blunt wane in comparing with the coefficient of output edging board on 9 %.

This increase in the volumetric output of lumber due to the cutting board in width is in two stages – in the sawmill and woodworking shop after drying lumber. At the same time, the costs related to that part of the drying lumber, which will be removed in a woodworking shop, will be repaid by increasing the volumetric output of billets produced lumber.

Thus, the timber with a predetermined quantity wane after leaving the drying room may be used in such a form as pieces for a wooden house.

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