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E. A. Mukhurova, PhD student (BSTU);**S. V. Shet'ko**, PhD (Engineering), assistant professor, head of department (BSTU)**DEVELOPING A REASONABLE PLAN FOR CUTTING LOGS FOR ROUGH STOCK OF FURNITURE FOR INTENDED PURPOSE**

The technique, which allows you to quickly and efficiently plan the cutting of hardwood in the rough blanks for glued board. The studies program is obtained, which is the optimum scheme of sawing logs destined for a particular specification timber. Schemes of cutting logs obtained by the developed program allows for three rotation log to carry it on the cutting contour band equipment. In addition, the program is such that the second surface of the cut open, the size is a multiple of the rough piece inscribed in the timber. This feature allows you to create a rational plan for cutting timber upon receipt of rough pieces of furniture purpose.

Introduction. At the present moment there is stable demand for furniture board at the market of the Republic of Belarus and foreign markets. This material has a number of advantages: stability of shape, durability, ecological compatibility, high aesthetic qualities. Furniture board is made of both conifer and hardwood. However there has been intensive growth in demand for board panel made of hardwood which has more attractive appearance of surface. In this connection there is a need for development of valuable hardwood processing technology for producing rough stock for board panel.

For harmonious exploitation of raw materials the development of methods for drawing an optimal plan of cutting for obtainment of furniture rough stock is required.

Main part. For implementation rational pattern cutting it is necessary to study technological process of processing of raw materials of given production. When studying existing technology it is necessary to carry out researches on determination of accuracy of the capital processing equipment for the purpose of optimization of allowances on repeated machining.

Practical measurement of party of the cut boards and statistical processing of the received data [1, 2] is carried out. Statistical processing includes:

- check of implementation of the normal law of distribution (Gauss's distribution);
- definition of an error of operation of the machine;
- allowance definition on processing.

Researches were carried out at the enterprise which makes a furniture board, a pasted window block, elite furniture from an oak and an ash-tree. On studied production as the capital swingblade equipment the band machine of Wood-mizer firm and the rotary saw machine for sawing up of a bar of "SCM Vio Emilia 77-47037 Rimini" is used.

For determination of accuracy of the swingblade machine the party of boards in number of 227 pieces was measured. Measurements were carried out according to STB EN/PR/1309-1 [1].

As a result of statistical processing the error of operation of the machine equals ± 2.44 by mm [3] is calculated. An error of operation of the swingblade machine we accept 3 mm. By the corresponding technique the party of the carving wood received on rotary saw machine was checked. The error of operation of the rotary saw machine made ± 0.42 mm, therefore, the allowance on accuracy of processing is equal 0.5 mm.

Further taking into account technological process and the initial order the amount of draft preparations [4, 5, 6] pays off. In Table 1 the sequence of operations at this enterprise is presented.

At determination of the draft amount of preparations for receiving a pasted board it is necessary to have basic data: final thickness of a board, width lamely, and also information about preparations for a board. The draft amount of preparations taking into account allowances on processing and accuracy of the capital equipment further pays off.

Table 1

Technological process of manufacturing of a board

№	Operation
1	Sawing up of logs
2	Bar sawing up
3	Drying of saw-timbers
4	Cutting of raw-timbers
5	Optimisation
6	Calibration
7	Merging on length
8	Calibration
9	Pasting in a board
10	Grinding

The following stage is specification drawing up. Preparation of the maximum width which will be entered in a layer of a cut bar gets out of draft preparations, and the set of thickness of this preparation will form thickness of a bar.

At calculation of thickness of a bar are considered: width and quantity of cuts; jointing existence (formation of a base surface); frequency rate to thickness of preparation taking into account an allowance on shrinkage; error of operation of machines.

The sizes of lateral boards are made of draft preparations of other sizes. The thickness of cut boards is formed by thickness of draft preparation, and width – width of preparation.

The width of lateral boards considers: width and quantity cuts; jointing existence (formation of a base surface); frequency rate to width of preparation taking into account an allowance on shrinkage; error of operation of machines.

The thickness of lateral boards considers shrinkage, accuracy of the swingblade machine.

For drawing up of schemes cutting logs on preparations for the set specification the program was created. Feature of this program is that a layer of a bar which opens at a sawing, is multiple to the amount of draft preparation. It allows to use the cut bar rationally. The made schemes allow to carry out open logs on rotary saw machines for 3 turns of a log.

Let's describe in more detail the developed program. The basic data necessary for carrying out calculations: diameter of a log; length of a log; specification of a carving wood; the minimum width of preparation cut from a bar layer.

Target parameters: sawing up of a log; distance from the log center in millimeters to the first cut which opens a bar layer, multiple to the amount of preparation; balance of wood.

The program window is given in drawing after the executed calculations. The program reflects basic data: diameter and length, and also the log

volume, a volume exit of sawn goods, balance of wood and the scheme of cutting logs. Besides, the program counts distance from the log center to cuts, opening a surface which size is multiple to thickness of a cut bar.

According to the allowances accepted at this enterprise, we find the amount of draft preparations: 47×52 and 30×50 mm.

The specification made taking into account that preparations are cut from a carving wood of the multiple sizes, is presented in Table 2.

Table 2

The specification taking into account frequency rate to the sizes of preparations

Thickness, mm	Width, mm			
	56	108	111	167
55	×	×		
35	×		×	×

The specification is resulted, on which preparations are cut from saw-timbers of the standard sizes [3, 5].

Table 3

The specification of saw-timbers the standard sizes

Thickness, mm	Width, mm				
	55	100	110	125	180
52		×		×	
30	×		×		×

Schemes cutting and exits of saw-timbers and draught preparations are resulted in the form of Table 4.

$$d = 32 \text{ cm}; l = 3 \text{ m}; k = 1.15$$

$$\text{Log volume} = 0.280 \text{ m}^3$$

The first cut on distance of 108.1 mm from the centre

$$55 \times 117 \times 3 - 2 \text{ p.}$$

$$V_{log} = 0.03861 \text{ m}^3$$

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$$55 \times 117 \times 3 - 2 \text{ p.}$$

$$V_{log} = 0.03861 \text{ m}^3$$

$$43 \times 105 \times 3 - 2 \text{ p.}$$

$$V_{log} = 0.02709 \text{ m}^3$$

$$35 \times 56 \times 3 - 2 \text{ p.}$$

$$V_{log} = 0.01176 \text{ m}^3$$

$$27 \times 111 \times 3 - 2 \text{ p.}$$

$$V_{log} = 0.01798 \text{ m}^3$$

$$43 \times 105 \times 2.75 - 1 \text{ p.}$$

$$V_{log} = 0.01242 \text{ m}^3$$

Balance:

Exit of the item of m – 66.06%

Lumpy waste – 24.84

Sawdust – 7.60

Shrinkage – 0.0

Milling loss – 1.5%

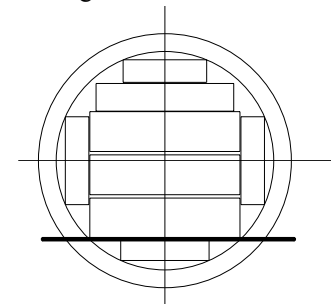
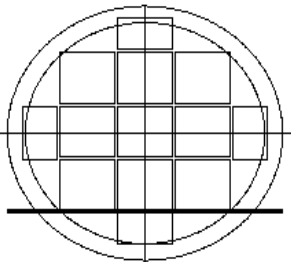
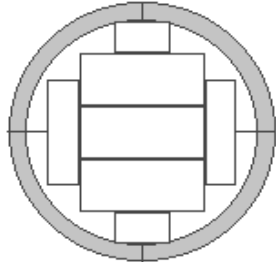
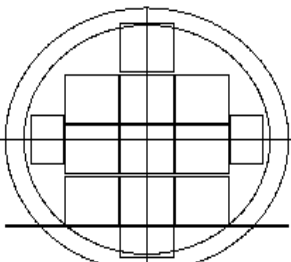
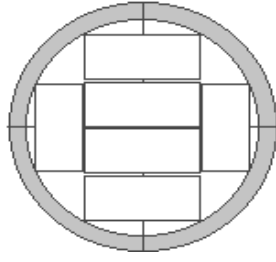
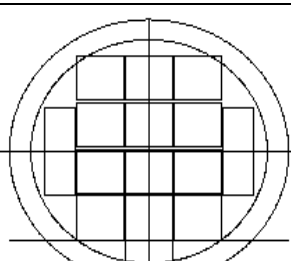
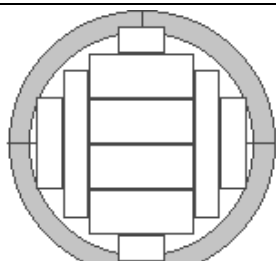
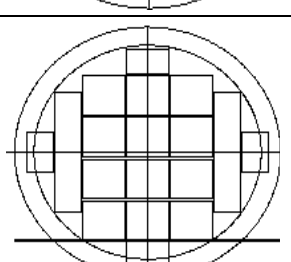
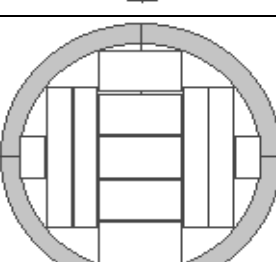


Table 4

Comparative characteristics of schemes cutting

Diameter	The schemes made under the specification taking into account frequency rate to the sizes of preparations			The schemes made under the specification saw-timbers of the standard sizes		
	Sawn goods	Exit of draught preparations	The scheme	Sawn goods	Exit draught preparations	The scheme
24	61.79	48.65		55.9	39.24	
26	58.17	45.92		57.58	38.97	
28	62.28	49.14		61.49	45.55	
30	63.96	50.29		60.09	39.11	

Analyzing Table 4 it is possible to tell about the advantage of developed techniques. The general exit of a sawn goods by drawing up of schemes cutting taking into account frequency rate to preparations for 1–9% is higher than logs, than by drawing up of schemes cutting from a carving wood of the standard sizes. The exit of draft preparations from a log by drawing up of schemes cutting taking into account frequency rate to preparations for 7–22% is higher than raw materials, than by drawing up of schemes cutting raw materials for a carving wood of the standard sizes.

By drawing up of schemes cutting logs taking into account frequency rate to the amount of preparations an exit of draft preparations less general exit to 21% – percent of losses concerning sawn goods exit, by drawing up of schemes cutting logs from a standard carving wood an exit of draft preparations less general exit to 25–35%.

Conclusion. The developed technique allows quickly and to make rationally the cutting plan of deciduous wood on draft preparations for a pasted board.

The made schemes cutting logs by means of the received program give the chance to carry out it for three turns of a log open on the rotary saw equipment. Besides, the program is made in such a manner that at the second cut the surface which size is multiple to the amount of the draft preparation entered in a bar opens. This feature allows to make the rational cutting plan of logs when receiving draft furniture preparations of a designated purpose.

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