ESTIMATION OF WOOD WASTE PRODUCED DURING WOOD PROCESSING

Z.S. Sirko Docent of NULES of Ukraine, senior research fellow of UkrNDINanobiotehnolohiy

Was developed the method of calculating the volume of wood waste during wood processing.

Wood, waste, volumes, plywood, sawmill, furniture production.

Wood is currently one of the main versatile materials, it has no equals among the most important types of raw materials in the world. Therefore economical and efficient use, and ongoing maintenance of the national economy of wood raw materials in adequate quantities of high quality is of great importance for the further development of industry of Ukraine.

Thus, given that Ukraine is sparsely wooded country, the wood is very expensive, causing problems of its economical use of gaining great economic importance.

Despite the fact that recently was achieved some success in economical use of wood, still there are serious shortcomings in its processing. During the processing of roundwood to timber formed by seventy percent or more, which are further processed into rough blanks and finishing details.

Depending on the possible future use of wood waste it can be divided into three groups: business, which can be used in other industrial processes; dregs - the waste that can not be used in the national economy, or their use is considered as uneconomical; irreversible, or in other words, the loss - this is the part of the waste that is lost in the production process and the material loses its shape (cut, tolerances and shrinkage etc.).

At the present stage of market relations the great importance is to keep the single procedure of state registration and certification of waste. This order establishes common rules for state registration and certification of waste, which action is extended to enterprises, institutions, organizations of all patterns of

ownership, citizens, businesses whose activity is related to the generation of waste and operations use.

However, as shown by analysis reporting companies which are engaged in wood processing, issues of rational use of wood waste and it has been neglected. In practice the vast majority of businesses do not send in statistical management reports for the appropriate forms.

This was the result of neglaction of the issue of specialization and concentration of production. Various departments and agencies have organized a large number of sawmils-wood proccessing businesses, shops and artisan workshops, mostly of simplified handicraft type that led to the industrial-commercial, not consumer lumbering and wood proccessing.

This developing way of sawmils-wood proccessing and furniture industry has led to the production and formation of imbalance between capacity and actual presence of needs.

Therefore, it is not conducive to the rational use of wood and leads to high consumption rates. The problem of economical and rational use of wood is not new. Practical resolve of it primarily depends on the organizational deficiencies that directly depend on the employees.

The purpose of the study-development of calculation methods of the volume of wood waste generated during the processing of wood.

Methodology of the study- analytical calculation of the amount of waste generated in the production of plywood, timber sawing and furniture manufacturing.

Results of the study- an important reserve of wood saving are streamlining processes handling and processing of wood, development of new improved processes that enable better wood use that goes to recycling. In this regard, it is important to the scientific study of wood costs in all areas, which it is processed, the maximum reduction and reuse of waste.

1. Standards of waste generation in plywood manufacturing

Stages	Amount of material in progress		Waste of wastes and losses		
	$м^3$	% from the initial expenses	wastes and losses	$м^3$	% from the initial expenses
Peeling veneer	21,9	100	pencils	7,51	34,3
Sort veneer	14,39	65,7	production losses	0,14	0,6
Edge-gluing and repairing veneer	13,12	60,0	Pruning veneer	0.46	2,3
Gluing plywood	12,66	57,8	drying and pressing	1,52	7,7
Cutting plywood	11,14	50,1	admissions in cutting	1,14	4,4
Packing plywood	10,0	45,7			
Total	10,0	45,7		11,9	54,3

2. Standards of waste generation in wood manufacturing production are shown in Table. 2.

Type of production	Type of raw material	The rates of wood formation, % on the amount of recyclable material									
		pieces					soft				
		total	flitch	segments	rails	trim panels, plywood pencil	total	shavings	saw dust	pieces of veneer	total waste
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Transport box, sets of coni-ferous timber	Sawn softwood	16,0	-	9,0	7,0	-	10,0	-	10,0	-	26,0
Window and door frames	Sawn timber	22,0	-	22,0	-	-	17,0	10, 0	7	-	39,0
Batten	_»_	5	-	5	-	-	22,0	20,0	2,0	-	27,0
Profiled	_»_	5	-	5	-	-	39,0	36,0	3,0	-	44,0
Baseboard	_»_	5	-	5	-	-	33,0	30,0	3,0	-	38,0

1	2	3	4	5	6	7	8	9	10	11	12
Furniture produ-ction	sawn timber, blanks	30,0	-	25,0	5,0	-	23,5	17,0	6,5	-	34,0
including draft furniture piece	sawn timber softwood	25,0	-	20,0	5,0	-	9,0	-	9,0	-	34,0
including draft furniture piece (ЧМЗ)	sawn timber hardwood	41,0	-	41,0	-	-	7,0	-	7,0	-	48,0
Sliced veneer	Round timber	15,0	15,0	-	-	-	36,0	-	4,0	32,0	51,0
Parquet frieze	sawn timber hardwood	39,0	-	39,0	-	-	7,0	-	7,0	-	46,0
Parquet artificial	sawn timber hardwood	41,0	-	41,0	-	-	21,0	13,0	8,0	-	62,0
Parquet artificial	Parquet frieze	4,0	-	4,0	-	-	26,0	24,0	2,0	-	30,0
Parquet panels	sawn timber hardwood	32,0	-	32,0	-	-	34,7	29,0	5,7	-	66,7
Other production wood-processing and repair and maintenance needs	sawn timber	18,0	-	16,0	2,0	-	15,0	10,0	5,0	-	33,0

Amount of waste as a percentage of the amount on spent raw materials

"O" will be

$$O = 100 - \alpha - \delta,$$

α - useful output from finished products from raw volume , %;

δ - irrecoverable losses (production losses, drying, pressing)

on the amount of spent forest products in a range from 12 to 13,5 %.

According to these data, the waste generated in the production of plywood, on the amount of raw materials will be:

$$O = 100 – 46 – 13 = 41\%$$

Amount of waste generated in the production of furniture on the amount of timber used «O» (%) can be determined by the same formula

$$O = 100 - \alpha - \delta ,$$

α - useful output of finished products from the volume of timber,

δ - irrecoverable losses on the amount of spent forest products (1 – 2 %).

The composition of waste in the production of furniture, as we know - is sawdust, shavings, slats, side ruffled details. They can and should be efficiently utilized.

To determine the volume of wood waste generated in the wood-machining industries (window and door frames, parquet) use a data table. 3.

3. Normal consumption of raw materials in the manufacture of windows and doors, parquet

Types of products	Raw used	Volume of production	Normal consumption of raw t per m^3 per unit	Raw material need
1	2	3	4	5
Manufacturing of windows and doors, thousand on m2	-	-	-	
Production of window units, thousand on m2	Lumber		0,113	x 0,113
Manufacture of door units, thousand on m2	Lumber		0,0569	x 0,0569
Parquet artificial	Lumber		0,0547	x 0,0547

Using the data table. 3 , for example, during the production of parquet in the volume of 100.0 thousand m2 the loss of raw material is 100,0x0,0547=54,7 м^3, according to Table. 2 waste will be 54,7x62 % = 33,9 м^3.

Including: lump waste 13,9 м^3 (33,9x41,0 %); soft waste 7,13 м^3 (33,9x21,0 %); including: shaving 4,4 м^3 (33,9x13,0 %); sawdust 2,7 м^3 (33,9x8,0 %).

The volume of waste, formed in the saw-mill during the manufacture of lumber, depends on the diameter of the logs and accepted method of cutting: cutting lumber for boards.

Quantity of waste generated as a percentage of the volume at different ways during sawing (for logs with a diameter of 20-22 cm length of 5.5-6 m) are shown in Table. 4.

4. Volume of generated waste, generated during different ways of round timber sawing

Name of waste	Board sawing		Sawing girder on boards	
	uncut	cut	with 50% girder	with 100% girder
flitch	6	6	8-8,5	10-11
rails	-	17-19	13-14,5	9-10
cutting and wood end	-	2	3	4
Sawdust	8-9	10-11	10,5-11,5	11-12
Total waste	14-15	35-38	34,5-37,5	34-37
Irreversible loss(shrinkage5%, spraying 2%)	6	6	6	6
Total waste and loss	20-21	41-44	40,5-43,5	40-43

The bark is not considered as a waste (4-6 %), which is not included in the volume of raw . Amount of waste as a percentage «O» is calculated by the formula:

$$O = 100 - \alpha - \delta ,$$

α - useful output of raw timber, %;

δ - irrecoverable losses of the volume of raw, %.

Standards for waste production of sawmill cutting capacity are shown in Table. 5.

5. Standards for waste production of sawmill cutting capacity are shown

Sawmill waste	consumption rate for the production of timber , $м^3/м^3$	Standards for waste production, % of sawmill cutting capacity					
		Softwood		softwood specie		hardwood specie	
		piece	sawdust	piece	sawdust	piece	sawdust
Total waste	1,50	14,6	12,3	16,1	9,8	15,9	11
	1,60	18,3	13,3	19,9	10,6	19,5	12
	1,70	21,4	13,8	23,0	11,2	22,8	12,4
	1,80	24,3	14,2	25,9	11,6	25,7	12,8
including	1,50	10,6	-	12,3	-	12,1	-
	1,60	13,4	-	15,2	-	14,6	-
	1,70	15,6	-	17,6	-	17,4	-
	1,80	17,7	-	19,6	-	19,6	-
rails	1,50	3,3	-	3,2	-	3,2	-
	1,60	4,0	-	3,9	-	3,9	-
	1,70	4,6	-	4,4	-	4,4	-
	1,80	5,1	-	4,8	-	4,8	-
segments	1,50	0,7	-	0,6	-	0,6	-
	1,60	0,9	-	0,8	-	0,8	-
	1,70	1,2	-	1,0	-	1,0	-
	1,80	1,5	-	1,3	-	1,3	-

Conclusions:

1. These data will enable enterprises of different ownership forms, depending on the production program to calculate the volume of wood waste during its processing and subsequent use.

2. The proposed method of calculating the volume of wood waste will increase the production efficiency.

References

1. Sirko Z.S. The current state of forest resources of Ukraine – renewable energy of the future: International scientific and practical conference.[«Alternative and renewable energy as alternative primary energy sources in the region»], (Lviv, 10-11 april 2013).- Lviv: Lviv Regional Administration, 2013.- 232p.

2. Sirko Z.S. Problems of using and processing wood waste remains unsolved/Z.S. Sirko, I.R. Holodivs'kyy// World of Furniture and Wood.- 2005.- № 2.- 29-31p.