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Research Article

FEATURES OF CALCULATING THE CONSUMPTION OF RAW MATERIALS IN THE PRODUCTION OF TERRY FABRICS ON RAPIER LOOMS

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ABSTRACT

The above calculation system allows you to determine all yarn costs by positions and types of raw materials, and also makes it possible to determine separately the total mass of yarn spent on the cut false edge. This calculation system makes it possible to systematize expenses and specifically deal with their reduction by positions and types, knowing their conditions of occurrence. Naturally, reducing yarn costs to a minimum leads to a reduction in the cost of production and an increase in the competitiveness of the product.

KEYWORDS

ITEMA, competition, cost, fabric, raw materials, towel, false edge, raw material fumes, processing, shrinkage, loom.

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INTRODUCTION

At present, the economic activity of all enterprises, regardless of the form of ownership, is characterized mainly by the sale of products and profits, which are reflected in the competitiveness of products. The transition to a market economy mechanism requires new approaches to solving this problem.

The achievement of manufacturers of global goals depends on the definition of the needs and demands of target markets and on satisfying the consumer more effectively than competitors. This requires, first of all, the introduction of advanced technology into production, as well as regulatory documents that meet the requirements of international standards, the organization of the production of competitive export-oriented products, the creation of waste-free technology, as well as the implementation of quality control of products, based on the requirements of the external and internal markets.

MATERIALS AND METHODS

Product requirements may be set by consumers or manufacturers based on anticipated consumer needs or regulatory requirements. Requirements for products, and in some cases for associated processes, may be contained, for example, in technical specifications, product standards, process standards, contract agreements and regulations [1].

The consumer always wants to receive his product on time in accordance with the quality and of course at an affordable price. In modern conditions of fierce competition for the consumer, the key factor in the successful functioning of companies is the effective management of production resources, which includes three postulates: faster, better and cheaper [2].

The manufacturer always strives to get more profit, but for this, it is necessary to calculate the cost of production, which also ensures the competitiveness of products. Therefore, manufacturers are required to more effectively manage costs and production losses. To effectively manage costs and production losses, it is necessary to systematize the accounting of costs and losses. And for systematization, it is necessary to specifically study each process, where costs and losses occur, with all cost elements.

The cost of products (works, services) is a valuation of natural resources, raw materials, materials, fuel, energy, fixed assets, labour resources used in the production process, as well as other costs for its production and sale.[3].In the weaving industry, one of the main cost items in the production of fabric is the raw material used to make the fabric.

The peculiarity and complexity of calculating the consumption of raw materials in the production of terry fabrics on looms with a rapier weft laying method is that several systems of warp threads are involved in the production of terry fabrics and the presence of a false edge of the fabric,

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depending on the design of the machine. And also in most cases, piece products (towels, napkins) are produced on these machines, forming gaps in the reed teeth and gaps, forming strips between the sheets, which are used later to separate piece products. These features will need to be taken into account when calculating the consumption of raw materials.

For clarity, let's consider the production of a facial towel on a wide rapier loom "ITEMA R9500". The machine produces six pieces of terry facial towel products, the width of the dressing along the reed of each towel is 61.5 cm. Refuelling data are given in table 1.

Table 1. Refueling data for a terry facial towel.

No.	*Name of parameters*	*unit of measurement*	*Indicators*
one	Linear density of yarn root warp background	*tex*	25x2
2	Yarn count of edge threads	*tex*	25x2
3	The linear density of the warp yarn of the false edge	*tex*	25x2
four	Linear density of terry warp yarn	*tex*	37
5	Linear density of weft yarn	*tex*	37
	Total number of warp threads:	*PCS*	8100
	including root threads background	*PCS*	3648
6	edge threads	*PCS*	768
	false edge	*PCS*	36
	terry threads	*PCS*	3648
7	Bird number	*tooth/dm*	55x2
eight	The width of the warp threads on the reed of one product	*cm*	61.5
	including edge threads	*cm*	5.8
9	The density of the fabric on the warp	*thread/dm*	240±10
ten	Weft density	*thread/dm*	178±10
eleven	Threading by root warp	*%*	ten
12	Working out threads on a terry basis	*%*	86.8
13	Weft shrinkage	*%*	5.1
fourteen	The waste yield on root basis (excluding false edge)	*%*	0.7
fifteen	Exit waste on a terry base	*%*	0.8
16	Weft waste yield (excluding false edge)	*%*	0.3

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The calculation of the consumption of raw materials is made for each position and type of raw materials separately. We determine the consumption of raw materials based on 100 running meters of grey tissue [4]:

Root warp fabric background

$$M_{коф} = \frac{T_{рк} \cdot n_{коф} \cdot 100}{10^6 (1 - 0{,}01 a_{ок})} = \frac{50{,}8 \cdot 3648 \cdot 100}{10^6 (1 - 0{,}01 \cdot 10)} = 26{,}591 \text{ кг}$$

Taking into account burnout

$$M_{кофу} = \frac{M_{коф}}{1 - 0{,}01 \cdot y_o} = \frac{26{,}591}{1 - 0{,}01 \cdot 0{,}7} = 26{,}778 \text{ кг}$$

Edge threads of fabric

$$M_{кн} = \frac{T_{рк} \cdot n_{кн} \cdot 100}{10^6 (1 - 0{,}01 a_{ок})} = \frac{50{,}8 \cdot 768 \cdot 100}{10^6 (1 - 0{,}01 \cdot 10)} = 4{,}335 \text{ кг}$$

Taking into account burnout

$$M_{кну} = \frac{M_{кн}}{1 - 0{,}01 \cdot y_o} = \frac{4{,}335}{1 - 0{,}01 \cdot 0{,}7} = 4{,}366 \text{ кг}$$

Terry warp threads

$$M_{мо} = \frac{T_{рм} \cdot n_{мо} \cdot 100}{10^6 (1 - 0{,}01 a_{ом})} = \frac{37 \cdot 3648 \cdot 100}{10^6 (1 - 0{,}01 \cdot 86{,}8)} = 102{,}255 \text{ кг}$$

Taking into account burnout

$$M_{моу} = \frac{M_{мо}}{1 - 0{,}01 \cdot y_o} = \frac{102{,}255}{1 - 0{,}01 \cdot 0{,}8} = 103{,}077 \text{ кг}$$

The total mass of the base worked out in 100 running meters. terry cloth will be equal to:

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$$M_o = M_{коф} + M_{кн} + M_{мо} = 26,591 + 4,335 + 102,255 = 133,181 \text{ кг}$$

Taking into account burnouts

$$M_{оу} = M_{кофу} + M_{кну} + M_{моу} = 26,778 + 4,366 + 103,077 = 134,221 \text{ кг}$$

To calculate the consumption of weft thread per 100 p.m. terry cloth, the following formula applies:

$$M_y = \frac{T_{ру} \cdot 10P_y \left(К_п \cdot B_1 + \frac{Z_1(K_п - 2) + Z_2}{0,1N_б}\right) 100}{10^6 \cdot (1 - 0,01a_y)}$$

True - duck settlement tex; Ru - fabric density in weft per dm; Kp - the number of cloths tucked across the width of the machine; B_1 - the width of the probing along the reed of one canvas; Z_1=4 - the number of missing teeth between blades (Fig. 1); Z_2=11 – the number of missing teeth between the blades in the middle of the machine due to the presence of an additional middle rack shaft (Fig. 2) [5-9].

$$M_y = \frac{37 \cdot 10 \cdot 178 \left(6 \cdot 61,5 + \frac{4(6-2)+11}{110 \cdot 0,1}\right)}{10^6 \cdot (1 - 0,01 \cdot 5,1)} = 25,778 \text{ кг}$$

Taking into account burnout

$$M_{yy} = \frac{M_y}{1 - 0,01 \cdot y_y} = \frac{25,778}{1 - 0,01 \cdot 0,3} = 25,856 \text{ кг}$$

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Figure 1. The gap between the canvases

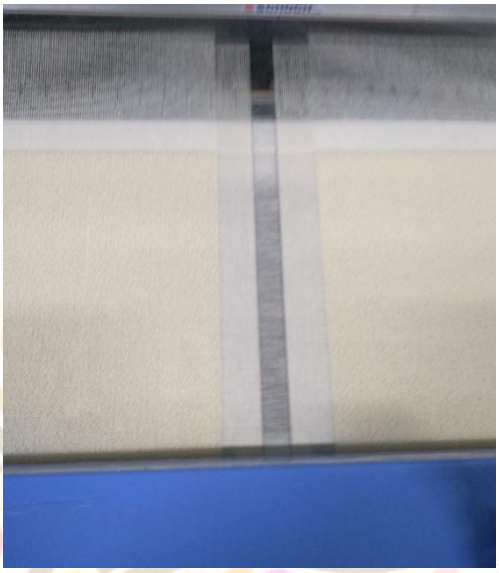

Figure 2. The gap between the canvases in the middle

To calculate the yarn consumption for the formation of a false edge, we will consider a false edge (Fig. 3-4) as a by-product produced in the process of manufacturing the main fabric [7-10].

Figure 3. False edge formation on the machine

Figure 4. Accumulation of cut false edge

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False Edge Warp Threads

$$M_{олк} = \frac{T_{рк} \cdot n_{олк} \cdot 100}{10^6 (1 - 0{,}01 a_{ок})} = \frac{50{,}8 \cdot 36 \cdot 100}{10^6 (1 - 0{,}01 \cdot 10)} = 0{,}203 \text{ кг}$$

Taking into account burnout

$$M_{олку} = \frac{M_{олк}}{1 - 0{,}01 \cdot y_o} = \frac{0{,}203}{1 - 0{,}01 \cdot 0{,}7} = 0{,}204 \text{ кг}$$

False edge weft threads

$$M_{улк} = \frac{T_{ру} \cdot 10 P_y \cdot 2 B_{лк} \cdot 100}{10^6 \cdot (1 - 0{,}01 a_y)} = \frac{37 \cdot 10 \cdot 178 \cdot 2 \cdot 0{,}06 \cdot 100}{10^6 (1 - 0{,}01 \cdot 5{,}1)} = 0{,}833 \text{ кг}$$

Taking into account burnout

$$M_{улку} = \frac{M_{улк}}{1 - 0{,}01 \cdot y_o} = \frac{0{,}833}{1 - 0{,}01 \cdot 0{,}3} = 0{,}836 \text{ кг}$$

The total mass of yarn used to form a false edge, taking into account waste

$$M_{слк} = M_{олку} + M_{улку} = 0{,}204 + 0{,}836 = 1{,}040 \text{ кг}$$

The total weight of the yarn used to produce 100 running meters. terry cloth will be equal to:

$$M_c = M_o + M_y = 133{,}181 + 25{,}778 = 158{,}959 \text{ кг}$$

Taking into account burnouts

$$M_{су} = M_{оу} + M_{уу} + M_{слк} = 134{,}221 + 25{,}856 + 1{,}040 = 161{,}117 \text{ кг}$$

Thus, we get the consumption of yarn, taking into account all waste, including the false edge cut-off, 161.117 kg per 100 running meters of terry fabric.

CONCLUSION

This calculation system allows you to determine all the costs of yarn by item and type of raw material, and also makes it possible to separately determine the total mass of yarn spent on the cut false edge.

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Knowing all the costs of yarn, it will be possible to systematize them and specifically deal with reducing costs by item and type, knowing their conditions of occurrence.

Naturally, reducing the cost of yarn to a minimum leads to a decrease in the cost of production and an increase in the competitiveness of the product.

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