DEPENDENCE OF THE THICKNESS OF RAW SILK ON THE REGULATION METHOD, THE PERIOD OF COMPENSATION OF ROSES AND THE SPEED OF UNWINDING OF COCOONS

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Annotation. The article studied the dependence of the thickness of raw silk on the control method, the rose compensation period and the speed of unwinding of cocoons and revealed that an increase in the rose compensation period leads to a slight increase in linear density and an increase in the square deviation. When controlling the linear density with the number of cocoons, it was noticed that the proportion (%) of the coefficient of variation in the thickness of raw silk, depending on the unevenness of the cocoon threads, decreases with increasing speed.
Key words: cocoon, unwinding, thickness, thread, raw silk, length, number of cocoons in a rose, square deviation.

The purpose of the cocoon unwinding process is to obtain a continuous technical complex thread with a given thickness and uniform quality characteristics in terms of thickness, strength, elasticity, cohesion, purity, etc. This thread is called raw silk and is obtained by folding a certain number of cocoon threads during the process of unwinding cocoons. A collection of cocoons, the threads of which, when unwinding, are folded into one complex thread, is called a rose.

In relation to the process of unwinding itself, cocoons that are just beginning to unwind are called new, and those whose unwinding is nearing completion are called old. A rose always unwinds a mixture of new and old cocoons.

Due to the unequal length of the threads, the cocoons in a rose are not wound at the same time: some quickly, while others, with longer threads, take longer. The rose is replenished with cocoons as needed, not immediately, but after some time necessary to detect a deviation in the number of cocoons in the rose from the specified one or, which is approximately the same, after detecting a decrease in the actual thickness from the specified norm. The time that elapses from the moment the need arises to replenish the cocoon rose until the end of the new cocoon thread is attached to the unwinding threads is called the rose compensation period tk and is calculated by the formula

$t_k = S/\vartheta$

where ϑ is the speed of unwinding cocoons, m/s; S is the length of the raw silk section with the missing cocoon thread against the target, m.

During the process of unwinding cocoons, the thickness of raw silk can decrease in two ways - continuously and spasmodically. The first is a consequence of the natural thinning of the cocoon threads from the outer to the inner layers of the cocoon shell, and the second is a consequence of the thread breaking or coming off during the winding of the shell. The thickness of raw silk can only increase in leaps and bounds, since only a whole cocoon thread can be attached to the threads of cocoons in a rose.

When working on machines of any design, the main operations when unwinding cocoons are: control and regulation of the linear density of raw silk; attaching the ends of the cocoon thread to the threads of cocoons unwinding in the rose; forming a thread of raw silk; elimination of raw silk breaks; harvesting raw silk for a given package, harvesting the remains of cocoons.

The objective of any method of monitoring and regulating the thickness of raw silk during its production is to obtain information that reflects the current target thickness of the filament thread as reliably as possible and timely restoration of the thickness in case of deviation from the specified value. Here it must be borne in mind that with automatic cocoon reeling, the thickness of the raw silk is adjusted only when it becomes thinner.

When the thread thickens compared to the specified one, which is possible, its newly attached cocoon thread is thicker than necessary, the reverse adjustment is not made, and the cocoon is not intentionally torn off from the rose. The exception is manual unwinding of cocoons on mechanical machines. There are many ways to control the thickness of raw silk. All of them can be divided into direct and predetermining control. Direct are all methods in which parameters are controlled and regulated, one way or another expressing the linear density of the thread. These include methods of control and regulation by changing the cross-sectional area of the thread, its diameter, the integral thickness of the thread segment, the volume of the thread segment, etc.

Predetermining methods are those in which the characteristics of raw silk are controlled and regulated, only indirectly related to linear density. These are, for example: the number of cocoons in a rose, the tensile force of the thread with its constant linear deformation, and vice versa, the force of tangential friction of the thread, the electrical conductivity of the thread, periodic nutrition of the rose, etc. Currently, three methods are practically used in industry - according to the number of cocoons in a rose, stretching and tangential friction force of the thread. Methods

for regulating the integral thickness of a piece of thread and periodically feeding roses and others are under research.

In the research work, the dependence of the thickness and unevenness of the thickness of raw silk on the control method, the rose compensation period and the speed of unwinding the cocoons was studied.

Table

Dependence of the thickness and unevenness of the thickness of raw silk on the control method, the rose compensation period and the speed of unwinding cocoons

Method for adjusting thread thickness	Rose compensation period in seconds	Cocoon unwinding speed in m/min	Average thickness of raw silk in tex	Standard deviation of the weight of skeins in mg	Coefficient of variation of 25 m long skeins in %	The share (in%) of the coefficient of variation in the thickness of raw silk depending on the unevenness of
According to the number of cocoons in a rose	2	60	2.12	6.63	12.54	95
		80	2.13	6.34	11.92	92
		100	2.19	6.32	11.72	91
		120	2.16	6.76	12.49	89
	5	60	2.13	6.26	11.82	87
		80	2.13	6.65	12.58	83
		100	2.15	6.11	11.39	78
		120	2.17	6.91	12.72	75
By stretching	2	60	2.20	4.66	8.45	89
		80	2.20	4.55	8.25	87
		100	2.30	4.63	8.50	84
		120	2.25	5.29	9.23	77
	5	60	2.13	4.80	9.0	74
		80	2.21	5.03	9.03	71
		100	2.27	5.23	9.21	67
		120	2.18	5.16	9,55	41

The results obtained showed that increasing the rose compensation period led to a slight increase in linear density and an increase in the square deviation. When controlling the linear density with the number of cocoons, it was noticed that the proportion (%) of the coefficient of variation in the thickness of raw silk, depending on the unevenness of the cocoon threads, decreases with increasing speed.