Proceedings of Online International Conference on Innovative Solutions and Advanced Research
Organized by Novateur Publications, Pune, Maharashtra, India
JournalNX- A Multidisciplinary Peer Reviewed Journal
ISSN: 2581-4230, Website: journalnx.com, October 11th, 2020

THE EFFECT OF THE NUMBER OF TWISTS ON THE PHYSICAL AND MECHANICAL PROPERTIESOF WELDED YARNS

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Abstract

The article is devoted to the problem of determining the coefficient of toughness, which is one of their main mechanical properties in the production of baked yarn, depending on the number of twists applied per 1 meter of length. Based on the research, it was possible to compare the quality of yarn obtained on two different methods of the existing baking process in enterprises, and based on the research, it was found that there is a possibility to increase the productivity of the technological process.

Keywords: solitary yarn; twisted yarn; hardening factor; number of twisted yarns; strength; elongation at break; coefficients of variation.

Introduction

It is known that in the special literature (1; 2) one of the main properties of baked yarns is their toughness, the tensile strength is determined by following formula:

$$P_{пиш} = P_{якка} \cdot m \cdot \mathrm{K}_{\text{пиш}}$$

Where: Рпиш-is the tensile strength of the baked yarn, at sN;
Рякка-is the tensile strength of individual yarns, at sN;
m-is the number of baked threads;
Кпиш-coefficient of increase of tensile strength or coefficient of increase of toughness of baked yarns as a result of baking;

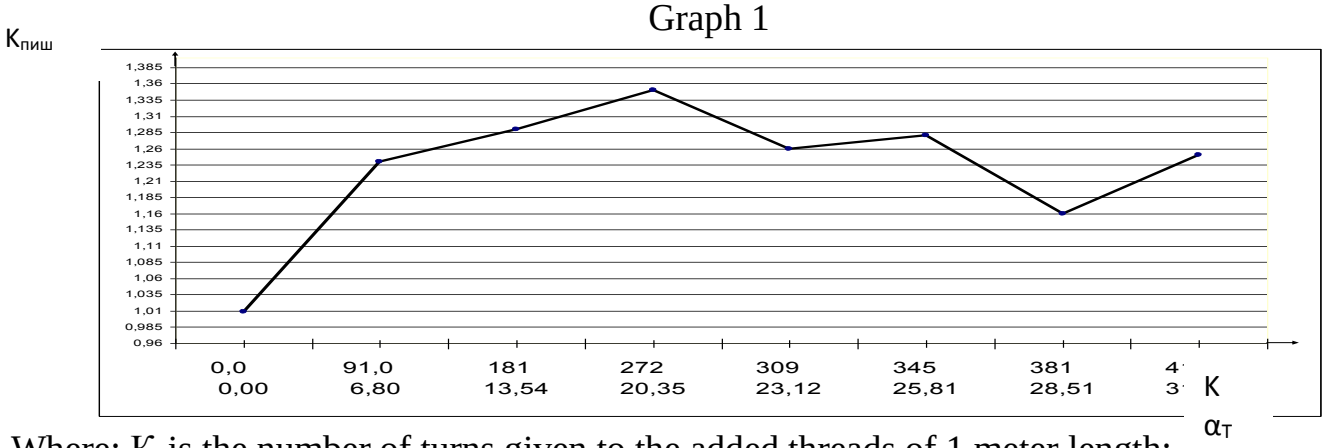
The coefficient of toughness depends on the linear densities of individual yarns, and the number of twists per 1 meter, the number of twists added, the tension applied to individual yarns in the spinning equipment the number of twists given to the added yarns. And the number of twists given to the yarns that are finally added is one of the key factors in the efficiency of baking machines.

In order to optimize the technological process of single-step addition of yarns installed at the enterprise ‘’ MRT textile’’ M.Ch.J. the effect of the number on the coefficient of increase in toughness was studied. The physical and mechanical properties of the individual yarn were determined using the User Tensorapid 3 measuring equipment in the enterprise laboratory, and the data are given in Table 1. Various twisting and breaking forces of the yarns were performed on the KU-500 yarn and RM-3 yarn toughness instruments installed in the laboratory of the Namangan Institute of Engineering Technology.Stones weighing 20 g were hung on each individual thread with special clamps so that each of the threads was of the

same tension. Due to the fact that it is difficult to give different levels of twists to the yarns, this process was carried out in the laboratory on KU-500 yarn measuring device.

The yarns with the specified twists were glued on both sides with cling film to prevent the twists from spreading. The average values of the tests performed with different torsions (10 each) and the coefficients of variation calculated on their basis are given in Table 1. The degree of dependence of the values of the coefficient of increase in hardness, calculated on the basis of the obtained test results, is shown in figure1.

Graph 1



Where: К-is the number of turns given to the added threads of 1 meter length;

α_T -cooking coefficient;

$К_{пиш}$ -is the coefficient of increase of toughness;

Table 1

№	Cooking coeff. α_T	The number of turns per 1 meter	Elongation at break,%	Coefficient of variation in elongation at break,%	Elongation at break, mm	Breakage elongation, coefficient of variation,%	Interruption power, sN	Breakdown force variation coefficient, %	Relative tensile strength, sN / tex	Coefficient of increase of hardness in baking, $К_{пиш}$
1	2	3	4	5	6	7	8	9	10	11
Single thread Ne=21/1 Nm=35,7 T=28,01										
1	38,79	733	3,84	14,51	-	-	327,4	12,47	11,68	-
Added threads Ne=21x2 Nm=35,7x2 T=28,01x2										
1	0	0	4,84	14,42	24,2	14,42	661	9,4	11,8	1,009
Baked yarn Ne=21x2 Nm=35,7x2 T=28,01x2										
1	6,8	91	5,76	9,37	28,8	9,37	817	7,49	14,58	1,24
2	13,54	181	5,96	16,72	29,8	16,72	851	12,63	15,19	1,29
3	20,35	272	6,92	10,83	34,6	10,83	885	8,41	15,8	1,35
4	23,12	309	6,52	17,12	32,6	17,24	830,5	16,13	14,83	1,26
5	25,81	345	6,68	11,04	34,4	8,9	843	12,26	15,05	1,28
6	28,51	381	5,76	17,84	28,8	17,81	761	19,43	13,58	1,16
7	31,27	418	5,74	12,36	28,7	12,51	821	9,1	14,6	1,25

In the above method, two linear densities with a linear density of NE=20/1 (Nm=34.17; 29.26 tex) are produced in two-stage baking equipment manufactured by the Swiss company

Hamel, installed at the enterprise ‘’Namangan fluffy towels’’ M.Ch.J. studies to determine the properties of baked yarn consisting of a single yarn were also conducted. In this method, the individual yarns added in the first stage are given a primary twist, wrapped in coils, and these coils are baked in a capping machine with the desired yarn. The results of the tests are given in Table 2. The dynamics of the relationship between the number of turns per 1 meter and the coefficient of increase in stiffness calculated based on the test results is shown in Figure 2. In the analysis of the test results, 2 single twisted yarns were given different yarns in the dry state. It was found that the number of turns per 1 meter was achieved when (Кпиш=1.48).

In the two-stage method, when the baked yarns were first spun and then baked, it was found that their coefficients of increasing hardness were 10% higher. It was noted that as the number of twists in 1 meter continued to increase, the coefficients of increasing the strength of the baked yarns did not increase and vice versa.

Graph 2

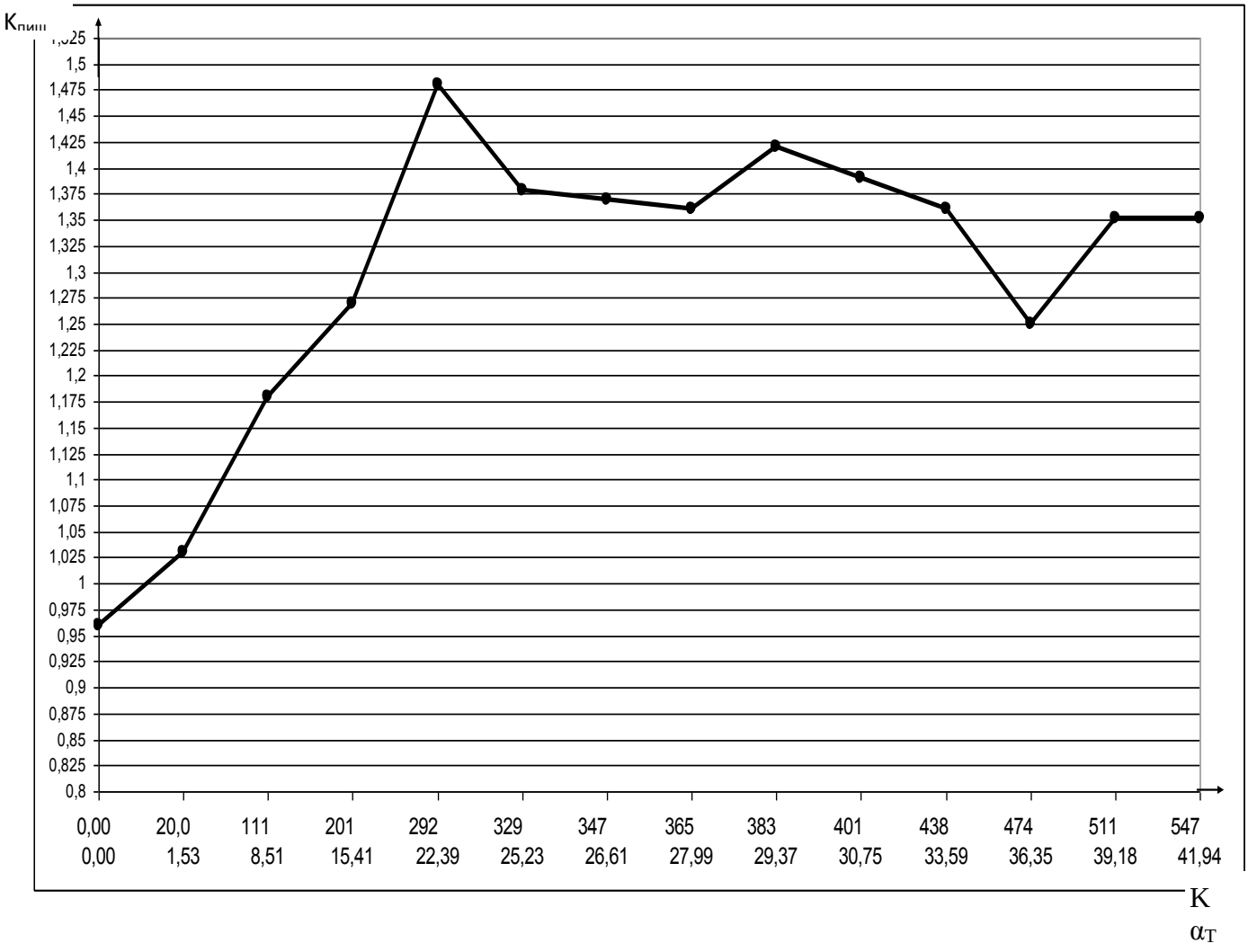


Table 2

№	Cooking coeff α_T	The number of turns per 1 meter	Elongation at break,%	Coefficient of variation in elongation at break,%	Elongation at break, mm	Breakage elongation, coefficient of variation,%	Interruption power, sN	Breakdown force variation coefficient,%	Relative tensile strength, sN / tex	Coefficient of increase of hardness at baking, $К_{нити}$
1	2	3	4	5	6	7	8	9	10	11
Single thread Ne=20/1 Nm=34 T=29,41										
1	47,29	872,6	4,13	9,13	-	-	307,0	7,55	10,49	-
2	48,8	902	4,16	8,30	-	-	319,6	6,98	10,92	-
Added and primary yarn given yarn Ne=20x2 Nm=34x2 T=29,41x2										
1	0	0	4,80	13,66	-	-	603,9	11,02	10,26	0,96
2	1,53	20	4,74	15,17	-	-	650,7	6,91	11,06	1,03
Baked yarn Ne=20x2 Nm=34x2 T=29,41x2										
1	8,51	111	4,27	13,56	21,4	14,139	744,5	7,69	12,65	1,18
2	15,41	201	5,53	7,84	27,5	7,9	797	9,11	13,54	1,27
3	22,39	292	4,86	11,8	24,3	11,8	933,5	8,19	15,87	1,48
4	25,23	329	5	20,91	25,1	20	864	11,35	14,68	1,378
5	26,61	347	5,98	25,24	29,9	25,24	858,5	10,92	14,59	1,370
6	27,99	365	5,02	25,22	25,6	28,3	853,5	10,95	14,51	1,36
7	29,37	383	5,36	19,17	26,7	19,89	895,5	6,14	15,22	1,42
8	30,75	401	5,25	20,85	26,1	21,55	874	8,69	14,85	1,39
9	33,59	438	5,7	23,69	28,5	23,69	854,5	11,19	14,52	1,36
10	36,35	474	5,1	15,16	25,5	15,16	784,5	15,56	13,33	1,25
11	39,18	511	5,56	15,33	27,8	15,33	846,5	9,36	14,39	1,3511
12	41,94	547	5,6	23,02	27,9	23,07	847	10,516	14,4	1,3519

Conclusion

1. It was found that the maximum value of the coefficient of hardness increase in the single-stage welding method is 1.35 when two individual yarns are dried in ZS structure, and in the two-stage baking method it is 1.48, the number of turns per 1 meter is 272 and 292.
2. The test results showed the advantage of the two-stage yarn cooking method.

3. Assuming that the number of products in the process in the process of growth in enterprises (currently 500:550) is equal to 250:300 (at= 20:23%) instead, it can increase the efficiency of cooking equipment.
4. In the introduction of woven fabrics from low-density baked yarns, especially down towels, there is an opportunity to improve their physical and mechanical properties (softness, increase moisture absoption).

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