A Practical Study Of The Tensile Strength Of Yarns In The Process Of Adding And Winding To Obtain Baked Yarn Of A Complex Structure

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ABSTRACT

In this article, the tensile strength of the yarns during the process of adding and winding to obtain a baked yarn with a complex structure was theoretically analyzed. The analysis of the field research shows that the expansion of the assortment of textile yarns, the production of spun yarns by joining two or more single yarns at the same tension, the yarn at the same tension during the winding process, the further improvement of the product and the provision of an efficient process in the technological system have been determined. By using it, it is possible to implement more technological processes at high speed to obtain better quality products, the results of research work and a comparative analysis were developed. Based on these analyses, recommendations were made.

Keywords: twisted yarn of complex structure, tensile strength, tension, twist, coil, taper, cylinder, section, splicing, tensioning device, linear density.

Introduction

In order to produce uniform and high-quality spun yarn of a complex structure with specified properties in accordance with current standards, it is very important that the yarns being joined are joined at the same tension. The main stage of preparing single threads for cooking is the process of twining single threads. In this process, two or more single threads that are being paired are mainly equalized according to their tension, that is, if the condition P1=P2= =Pn=const is sought to be fulfilled, on the other hand, in this process It is considered to make the values of individual threads that are being paired as uniform as possible in terms of their linear density (Tip) and their thickness (Rip).

The technological processes of joining and winding threads in preparing them for baking are now mainly performed in the equipment of joint winding. The implementation of these processes is carried out in automatic winding machines in textile industry enterprises designed for the production of almost all modern spun yarn assortments.

As mentioned above, one of the main tasks of the process of preparing threads for baking was considered to be the uniformity of the tension of single threads [55; p. 195-202, p. 56-46-58].

From the analysis of the literature, it can be seen that there have been very few studies aimed at analyzing the tension of single and paired threads. Theoretically, reducing the dispersion of individual threads in terms of tension should lead to positive results in all cases. However, the experimental study of thread tension in new modern cooking machines, which work at high speeds and are designed for the production of various types of threads, may provide an opportunity to check

the adequacy of many theoretical views in this regard.

In the classical literature, it is indicated that the yarns obtained as a result of pairing at the same tension in the winding machines of two or more single yarns are called added yarns.

Most splicing machines are equipped with a specially designed yarn tensioning device equidistant from the splicing guide, which joins two or three single yarns at the same tension and forms the added yarns into a cylinder. is wrapped in the form.

Practical studies were carried out in the actual production modes of the SSM TW2-D splicing machines of the preparation department of the "ART soft Holding" LLC enterprise.

In this research, we used an electrical device consisting of a special strain gauge, an analog-to-digital converter (hx711) and an Arduino 2560 platform to practically study the tension force of single threads. The strain gauges were installed between the tensioning device and the yarn guide uniting the single yarns at an angle α relative to the horizontal axis (Fig. 1). Experimental researches were carried out at the company "RARFEN" LLC in the process of adding and wrapping yarns, which are being prepared for the type=29.4 tex linear density of the terry cloth floor.

Figure 1. A strain gauge installed in a tension control device

Here is the 1st friction reducing roller, 2nd strain gauge,

3. The device for fixing the strain gauge with the base, 4. The base, which is attached to the tension control device and serves as a base for the strain gauge.

Taking into account that the process of measuring the tension of threads in winding machines is carried out for the first time, the structure, operation and obtaining of results of an electrical device consisting of a special strain gauge, an analog-to-digital converter (hx711) and an Arduino 2560 platform Information about the procedure is given below. A strain gauge (Fig. 2) is a device that measures thread tension based on the generation of an electric current through deformation.

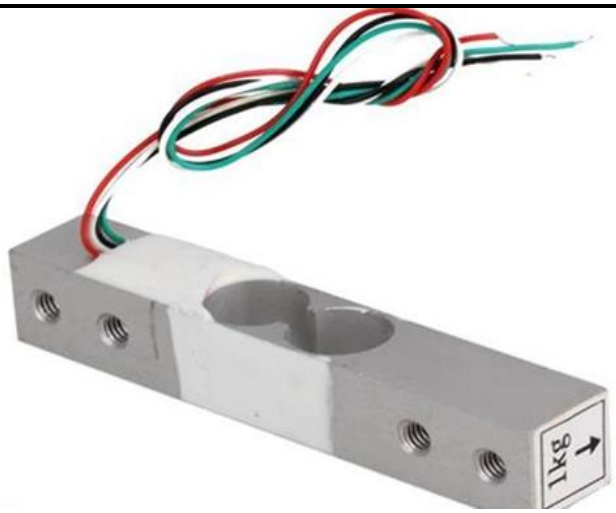

Figure 2. General view of strain gauge

This sensor can operate with an error of 0.03 - 0.25% and can detect a maximum tensile force of 1000 newtons. The device operates at a voltage of 3-12 volts in working condition. Rated output voltage

It can work at -200 and + 600 Celsius external temperature with 1-1.5mV.

The analog signals received from the strain gauge are converted using the hx711 analog-to-digital converter. The strain gauge directly connected module is equipped with hx711 - 24-bit signal amplifier manufactured by "Avia Semiconductor". The input multiplexer is equipped with a low-noise programmable chip (based on PGA technology).

Channel A of the module can amplify the signal by 128 or 64 times (programmable) corresponding to a full-scale differential input voltage of ± 20mV or ± 40mV, respectively, when connected to a 5V AVDD analog power supply. A complete description of the sensor can be found in Table 1.

Table 1. General characteristics of the strain gauge.

№	Description indicators	Dimensions
1	Nominal load capacity	1000 N
2	Operating voltage	3~12 VDC
3	Operating voltage	15 VDC
4	Nominal output	1,0±0,15 mV/V
5	Fixed output error	0,03% F.S
6	Delay	0,03% F.S
7	Repeatability	0,03% F.S
8	Effect of output on temperature	0,01% F.S/C
9	Output impedance	1000±10% Om
10	Input impedance	1115±10% Om
11	Insulation resistance	1000 Om
12	Overload resistance level	1,5 kg
13	Permissible operating temperature	-20^0 va $+ 60^0$ selsiy
14	Dimensions	12,7x12,7x80 mm

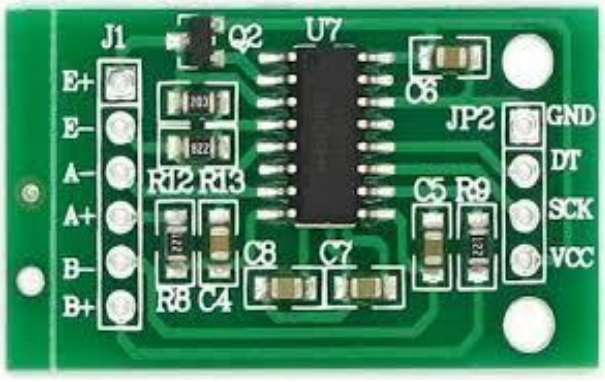

Figure 3. Overview of hx711

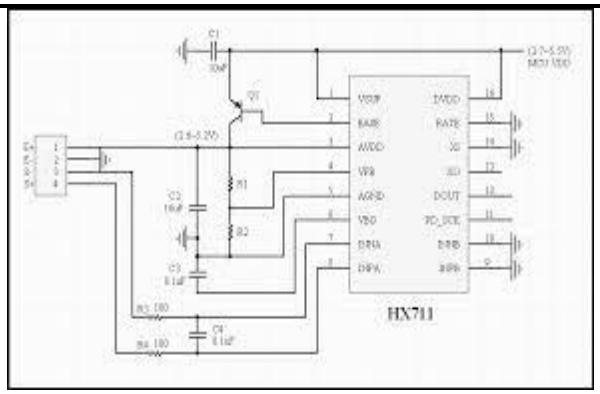

Figure 4. The main diagram of the hx711 module

According to the plan of conducting practical research, experiments were carried out by changing the initial tension forces applied to the thread while determining the tension force of individual threads using a tensometer. For this, the tension control device 2 shown in Figure 3-4 above, put the loads attached to the tensioning device 4 in the amount of m1=8.4 grams, m2=14.3 grams and m3=20.4 grams, and put them on the thread the original tension was changed. In the first option, i.e., in the case where a load of 8.5 grams was placed on the tensioning device, the tension force of individual threads was determined on separate sensors at intervals of 0.2 c for t=10 seconds.

Summary

The importance of their mechanical properties in the formation of the quality indicators of baked yarns of a complex structure is considered very high. Taking into account this situation, theoretically, the laws of change in time of the longitudinal relative deformation formed at the stage of winding in single and paired threads were studied.

In practice, in most cases, the geometric dimensions of the cylindrical coil produced in the winding machine are also an important controlled parameter to ensure the quality of the cooked yarns and to achieve the optimal performance of the equipment. But, on the other hand, it is not a secret that one of the necessary conditions is to take into account the values of tension and relative deformation of single and paired threads when justifying the geometric dimensions of the winding. Therefore, in this theoretical study, the variation of thread tension and relative deformation values was studied according to the width of the winding.

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