RESEARCH TO IMPROVE THE WORKING PARTS OF A PNEUMO-MECHANICAL SPINNING MACHINE

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The production of quality competitive products based on the use of high, cost-effective technologies is also the most important task of the textile industry. The quality of textile products largely depends on the smoothness, purity and strength of the yarn. This goal can be achieved through the introduction and use of modern equipment based on more advanced technological principles [1-3].

The large number of factors influencing the quality of yarns obtained from pneumo-mechanical spinning machines indicates that this process is a complex technological process. Nowadays, among the quality indicators of yarn, its purity is one of the main quality indicators. Among the main factors affecting the quality of yarn in a pneumo-mechanical spinning machine, we can also include the working and technological parameters of its suction pipe. Also, the repair forces between the disc teeth of the pneumatic mechanical spinning machine, the headset teeth, and the fibres are factors that affect quality. That is, the interaction between the fibre bundle and the headset teeth occurs according to two schemes. In the first scheme, the teeth of the headset act on the fibre with the front side, and in the second scheme, the frictional force is generated by the side of the headset tooth, which serves to separate the fibres from the handle [3-6].

The pneumo-mechanical spinning machine waste suction pipe will consist of a polygonal (four, six, etc.) metal pipe that does not change along the cross-section along the entire length of the machine. This is at the end of the machine where the waste is attached to the collection cabinet. However, each spinning device of the multi-sided waste pipe machine has holes for connecting the waste separating glass pipes with the waste suction pipe. The exhaust pipe is connected to a central fan to create a flow of exhaust air. It is known that waste has a negative impact on the properties of the yarn and its ability to be processed in later stages. The above-mentioned waste suction pipe design has the following shortcomings:

- As the number of sections of the machine increases (up to 20 sections) [7-11], the amount of waste also increases, resulting in a decrease in the vacuum for transporting waste. That is, as the amount of waste increases, their resistance to transportation also increases, and at the same time leads to a decrease in energy consumption, which leads to a decrease in airflow;
- As a result of the reduced efficiency of waste absorption, there is a deterioration in the quality of the yarn. This situation is explained by a decrease in the transport of waste, especially in the last sections of the machine, as a result of a decrease in the suction airflow (vacuum).

On the basis of scientific research, the possibilities of waste transportation to increase the efficiency of waste transportation in the waste pipeline by ensuring the uniformity of the vacuum (suction) level along the entire length of the waste pipeline were studied. To solve this problem, a versatile waste suction pipe design in the shape of a truncated pyramid is proposed. The beginning of this new structural section is (2 ÷ 2.5)% larger than its end. This new design is shown in the figure below, which shows the general view of the 1st suction pipe and the views of the 2nd section A-A.

The waste suction pipe is made of a polygonal (hexagonal), variable cross-section in the form of a truncated pyramid with holes in the two side walls. In the proposed new design, waste transportation is carried out as follows. The waste separated from the fibrous mass is delivered to the waste pipe by means of pipe 1 (not shown in the diagram), through a hole 2 in the sidewalls of the waste pipe, and by means of an air stream to the waste collection cabinet. The waste suction pipe is also made with a variable cross-section.

$$\frac{S_1 - S_2}{S_1} \cdot 100\% = 2.0 - 2.5\%$$

Here, S_1 is the cross-sectional area of the starting section of the exhaust pipe section, S_2 is the cross-sectional area of the end section of the exhaust pipe section. Thus, it is possible to ensure that the airflow remains variable along the entire length of the section. This condition ensures that the spinning machine pulls uniformly through all 16 holes of the two sections of the waste suction pipe 1. Studies have shown that the exhaust suction pipe is reduced by 1.8 ÷ 2.8% (the pressure created by the fan varies from 980 to 1030 Pa). In addition, the holes of the waste suction pipe 1 were made in 2 different diameters.

$$\frac{d_1 - d_2}{d_1} \cdot 100\% = 2.0 \div 2.5\%$$

Here, d_1 is the diameter of the hole at the beginning of the section of the suction pipe; d_2 is the diameter of the hole at the end of the section.

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