DESCRIPTION AND METHODOLOGY OF AN EXPERIMENTAL DEVICE FOR STUDYING THE TRANSFER OF FIBRES INSIDE THE CONFUSER DEVICE OF A PNEUMOMECHANICAL SPINNING MACHINE

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Abstract
In this article, the description and methodology of a special Benetech GM8903 Thermo anemometer device for studying the aerodynamic properties of cotton fibres during the longitudinal deflection by airflow in a pneumomechanical spinning machine is studied.

Keywords: spinning, rotor, BeneTech GM8903, air, flow.

The pneumomechanical spinning technique is widely used in the textile industry due to its excellent economic prospects. The rotor is the most important component of the pneumomechanical spinning machine, and its speed has a significant effect on the yarn quality. In the research of R.H. Chen and K. Slater [1], the flow behaviour in the rotor changes significantly with the increase in speed. E. Kocyo and C.A. Lawrencye [2] conducted studies on twisting mechanics and rotor spinning under different operating conditions. The effect of rotor speed and geometrical parameters on airflow was analyzed by M.N. Xiao et al. [3] and they found that angular speed and slip angle achieved good axisymmetry of spiral structure in rotor meridional plane.

Some studies have been done on the airflow in the confusion of a rotor-spinning machine. C.A. Lawrence and K.Z. Chen [4, 5] used a high-speed camera to capture the fibre morphology during fibre transmission and optimized the design of the confounder combined with an empirical formula. Kong and Platfoot [6, 7] found that changing the geometric dimensions of the baffle or the speed of the discrete drum affects the shape of the airflow in the baffle. Then the airflow changes the configuration of the fibres flowing inside the channel. They also studied the effect of rotating zones on the fibre configuration during transmission within the channel.

Lin et al. [8-11] studied the influence of the geometrical parameters of the baffle and the spatial position between the rotor and the channel on the airflow characteristics in the rotor-spinning machine [12-17].

It is known that the dimensions of the transport channel depend on the length of the processing fibres. Long staple lengths of cotton fibre (up to 36-40 mm) require the use of channel construction used for medium-length fibres. This condition is fulfilled by the Autocoro 9

pneumomechanical spinning machine. Experience shows that the universal use intended for medium fibres is economically feasible.
Based on an aerodynamic device for studying the aerodynamic characteristics of cotton fibres during the longitudinal deflection by the airflow, in which the airflow is formed in the space as a flow bounded by the walls in the form of a flat drag. An overview of the equipment is presented in Fig. 1.

Figure 1. Benetech GM8903 Thermoanemometer for studying aerodynamic properties of fibres

Benetech GM8903 thermoanemometer is a device for measuring air speed, air consumption and air temperature, which differs from traditional thermoanemometers by its high sensitivity and the ability to store more than 350 data in its memory. To start the device, a 12A battery is placed at the bottom of the back of the device. When installing the battery, make sure that the poles of the battery and the device (negative or positive) match each other. We install the handle, which is the main working part of the device, on the top of the device. The handle is easy to use and can be extended up to an additional 50 cm, and the inner 10 cm of the handle is flexible, which is convenient for certain operations.
The three parts of the handle are equipped with a sensor that allows high-sensitivity detection of air consumption, air speed, and air temperature. As a protection, a case is put on the sensor. In the process of work, this case is removed, when the work is finished, it is advisable to put the case back on the sensor in order not to damage the sensor. When determining air consumption or air speed, we should pay attention to the arrow on the three parts of the handle. The red button in the middle of the device is used to turn the device on or off.
With the help of the "UNIT" button on the device, you can choose the unit of air consumption (cubic meters, cubic feet) or speed (meters, kilometers/second, hours) you need. when determining the air consumption, the cross-section of the area where the air flow is leaking into the device is entered.

Press the Flow button on the device, then press the Area button, then the screen will display the word "cape" and enter the cross-sectional area of the area where the air flow is leaking using the keys from 0 to 9 on the device (for example, 15). After that, press Enter.
Use the UNIT button to select the required unit of air consumption (cubic meters, cubic feet). In this way, we can configure the device to determine air consumption. The device automatically calculates the air consumption per minute based on the cross-section of the area and the velocity of the outgoing air. Pressing the "HOLD" button on the device saves the measured values on the screen. In order to analyze or extract data from the device memory, we can install the program on the device disk to the computer and access the device memory to get the data.

Table 1. Technical parameters of "Benetech GM8903" Thermo anemometer

Airspeed measurement range, m/sec	*0-30*
Level of accuracy in airspeed measurement, m/sec	±0.1
Temperature measurement range, °C	0-45
Accuracy level in air temperature measurement, °C	±1
Diameter of measuring sensor, mm	30.5
Length of measuring sensor, mm	305
Air flow measurement range. m3/min	0-999900
Dimensions	145 x 72 x 35 mm
Weight	330 g

Cotton fibres range in size from ultra-fine Sea Island cotton at 5 cm in length and 1 dtex to coarse Asian cotton at 1.5 cm and 3 dtex. This corresponds to average linear thicknesses of 10 to 20 mm. Most of the world's crops fall in the middle of the range. Maturity can be defined as the ratio of the cell wall area to the size of the same perimeter circle and is usually about 0.85 for mature fibres. An excess of immature fibres with a value of less than 0.5 is undesirable. Length, fineness and ripeness and their variability are considered important indicators of fibre quality. The cell wall density of cotton is 1.55 g/cm^3 dry, 1.52 g/cm^3 at 65% relative humidity, and 1.38 g/cm^3 wet. Effective density is low when cell space is taken into account.
The investigated fibres are suspended on pegs with a diameter of 4 mm, which in turn are hung on girders fixed to columns with a millimetre scale to fix the change in the amount of movement of the vertical peg scale by means of elastic-belt elements, or is the deformation of the elastic-belt element measuring the force acting on the fibre.
The incoming flow velocity was determined using a tube connected to the top and bottom of the chamber by a Benetech GM8903 Thermo anemometer. For the reliability of the measurement results, the speed was also determined by measuring the pressure using a tube inserted through the slot of the transport channel model and measuring the static pressure in the right slot using a Thermo anemometer GM8903. During the research, an August aspiration psychrometer was used to measure the relative humidity of the environment, a thermometer

was used to measure the temperature, and a stationary mercury barometer was used to measure the atmospheric pressure.

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