



Results of Production-Condition Tests of the Aspiration System of the UXK Cotton Cleaning Unit

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Abstract: This article presents the results of comparative tests under production conditions of the current and improved aspiration systems of the UXK cotton cleaning unit in cotton processing enterprises.

Keywords: Aspiration system, fan, electric motor, filter, LKM laboratory, diffuser, cyclone, inlet hood.

As emphasized in scientific studies, the main function of the aspiration system of the UXK cotton cleaning unit is to suck up the impurities generated during its operation using air, transfer them to a cyclone through a centrifugal fan in the system, and separate the dust from the air there. The efficiency of the aspiration system is characterized by the amount of dust removed from the dusty air.

As objects of comparison, the current aspiration system of the UXK cotton cleaning unit at the Angor Cotton Processing Plant in Surkhandarya region and the improved aspiration system, based on the results of the dissertation research, of the UXK cotton cleaning unit at the Beshariq Cotton Processing Plant in Fergana region were conditionally selected.[1]

To ensure the reliability of the indicators during the comparison of test results, it was ensured that the impurity level and moisture content of the raw cotton initially fed for cleaning were the same in both selected cotton processing plants.

In the improved aspiration system of the UXK cotton cleaning unit at the Beshariq Cotton Processing Plant in Fergana region, a **55 kW electric motor with a Y1BIQ fan** was used instead of the 1BIQ fan driven by a 75 kW electric motor, compensating for the reduced required air flow. In this setup, the **volume of suction air** was maintained at a maximum of approximately **4.5 m³/s**.

In the current aspiration system of the UXK unit at the Angor Cotton Processing Plant, a 1BIQ fan driven by a 75 kW electric motor is installed.

Before conducting the experimental tests, the air pneumatic transport pipelines, connections to the cyclone, and fans were thoroughly inspected, and the airtightness of the aspiration systems was ensured.

During the comparative experiments at the Angor Cotton Processing Plant in Surkhandarya region, Bukhara-102 variety cotton of the 2nd industrial grade was used. After drying, the cotton had an impurity level of 8.6% and a moisture content of 9.2%. When analyzed using an LKM laboratory device, the impurity content was confirmed to be 8.6%, of which 58% was fine impurities and 42% was coarse impurities.



During the experiments, the processing capacity of the UXK cotton cleaning unit was 6.8 tons per hour. The dust content of the air entering the inlet pipe to the cyclone and exiting from the cyclone outlet was measured during the experiments.[2]

Initially, the dust content of the air being transferred from the fan's blowing air pipe to the cyclone was determined using a filter with an air-permeable size of 0.8×0.8 mm. The filter exposure time was set to 20 seconds. To determine the dust content of the air exiting from the cyclone outlet, a soft bag filter was used.

The same method was applied during experiments in the improved aspiration system of the UXK cotton cleaning unit at the Beshariq Cotton Processing Plant in Fergana region. Bukhara-35 variety cotton of the 2nd industrial grade was used. After drying, the cotton had an impurity level of 8.8% and a moisture content of 9.0%. According to measurements with the LKM laboratory device, the impurity content was 8.8%, of which 64% was fine impurities and 36% was coarse impurities. During the experiments, the processing capacity of the UXK cotton cleaning unit was 6.8 tons per hour. [3,4]

The results obtained from the comparative experiments are presented in **Table 1.1**.

1.1- Table
Comparative Experimental Results of the UXK Unit's Aspiration System in Production

Object of Comparative Experiments	Dust Content of Air Entering the Centrifugal Cyclone, d_1 (mg/m ³)	Dust Content of Air Exiting the Centrifugal Cyclone to Atmosphere, d_2 (mg/m ³)	Dust Removal Efficiency of the Aspiration System, %
UXK Unit with Existing Aspiration System	147.3	36.3	75.4
UXK Unit with Improved Aspiration System	236.2	27.9	88.2

As seen from the results presented in Table 1.1, the dust removal efficiency of the existing UXK cotton-cleaning unit at the Angor Cotton Processing Plant in Surkhandarya region is 75.4%. In the existing UXK unit, the required air volume is relatively high, reaching 5.5 m³/s, while the proportion of fine impurities in the cotton is relatively low. As a result, the dust content of the air entering the centrifugal cyclone is lower compared to the improved aspiration system, amounting to 147.3 mg/m³ instead of 236.2 mg/m³, and the dust removal efficiency remains relatively low at 75.4%. Another reason is that the air velocity at the inlet of the centrifugal cyclone was measured at 26.6 m/s. According to existing recommendations, the velocity of dust-laden air entering the cyclone



should not exceed 14–20 m/s. Exceeding this range has been found to negatively affect the cyclone's cleaning efficiency.[5.6.7]

From the data in Table 1.1, it can be seen that the dust removal efficiency of the improved aspiration system of the UXK cotton-cleaning unit is 88.2%. In the improved UXK unit, the required air volume is relatively lower, amounting to 4.5 m³/s, and the proportion of fine impurities in the cotton is relatively higher. As a result, the dust content of the air entering the centrifugal cyclone is higher than in the existing aspiration system, reaching 236.2 mg/m³, while the dust removal efficiency is 88.2%. Another reason is that, due to the rational selection of the diffuser expansion angle in the improved aspiration system, the air velocity at the inlet of the centrifugal cyclone was measured at 20.0 m/s.

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