

**DESIGN OF THE CLEANING DEVICE FOR SEED PRODUCTION
HARVESTERS**

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Summary. *This research presents the design of a target-detection-based cleaning device for seed production harvesters. The device incorporates target detection technology, using a visual camera to locate residue positions and adjust the device's orientation based on the position information, enabling precise and efficient residue cleaning. This improves cleaning efficiency, avoids unnecessary movements and rotations, and saves cleaning time.*

The level of mechanization of grain harvest in our country has reached 90 %, and the mechanized harvest of major grain crops such as corn, rice and wheat has been basically realized, and can meet the market large-scale mechanized harvest of the basic needs. However, the mechanization of seed production is still in the initial stage, so it is necessary to improve the mechanization level of special seed production to ensure high purity of harvest process. The common combine harvester does not have a high demand for the cleaning of residual seeds, so it is not possible to clean up the seeds in the equipment. If there are residual seeds in the seed harvester, it will result in the mixture of different varieties in the next harvest, which is not in accordance with the requirements of seed harvesting.

This article proposes a target-detection-based cleaning device for seed production harvesters. The design of the cleaning device is shown in Figure 1. The entire cleaning device consists of a base, flange, nozzle bracket, drive motor, and other components. The base is connected to rail fittings with bolts to enable rotational movement. At the center of the base is the motor's output shaft, which connects to the nozzle bracket via the flange to allow the entire nozzle bracket to rotate. An electric push rod is installed on the nozzle bracket to facilitate horizontal movement of the servo bracket. The tail end of the electric push rod is attached to a mounting ear at the bottom end of the nozzle bracket, while the head is connected to a mounting ear at the base of the servo bracket, enabling horizontal movement of the servo bracket. A servo is mounted on the servo bracket, and its output shaft connects to the nozzle mechanism via a connector. The servo rotates to drive the connector and nozzle mechanism. This device achieves three degrees of freedom of motion.

The device is installed inside the harvester and remains inactive during harvesting operations. To prevent interference with harvesting, the nozzle mechanism of the cleaning device is designed to be rotatable and includes a storage function. The nozzle mechanism can be folded and stored in the space between the connector and the nozzle bracket. This design not only increases

the degree of freedom, allowing for more precise cleaning of residues and more efficient movement, but also enables the nozzle mechanism to fold away during harvesting, preventing interference with operations and protecting the nozzle mechanism.

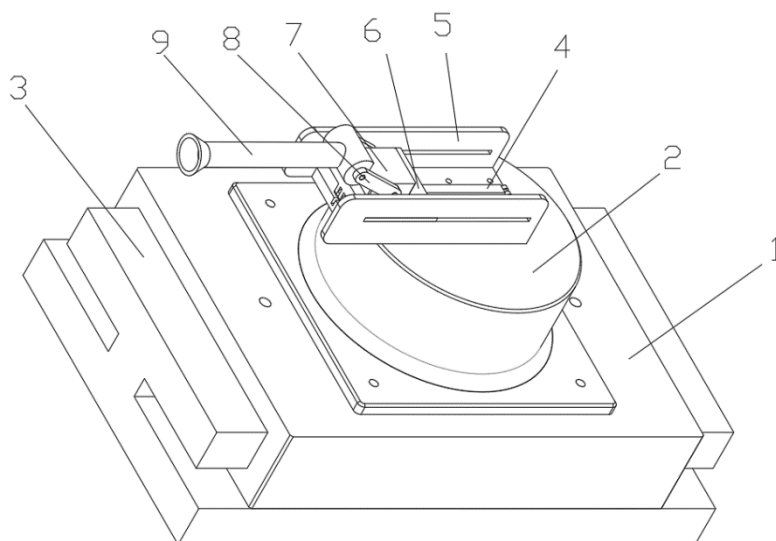


Figure 1 – Schematic diagram of the structure of the cleaning device:
 1 – rail accessories; 2 – base; 3 – slide rails; 4 – electric push rod; 5 – nozzle holder; 6 – steering gear bracket; 7 – steering gear; 8 – connectors; 9 – nozzle

In addition, target detection is introduced in the design, and the position of the residue is determined by taking photos with a visual camera, and the position information of the residue is sent to the controller, which drives the execution part, the executing agency adjusts the movement according to the position information of the target detection directly, which greatly improves the cleaning efficiency, avoids the invalid movement and rotation, and saves cleaning time

The design aims to solve the technical problems in the existing technology that the residues in the crop harvester are difficult to be cleaned automatically and affect the purity and quality of seed production. Enhance the efficiency of the cleaning system to meet the standards of fast and thorough cleaning.

References

1. Wenyan Xu. Research and design of key technology and components of wheat breeding plot harvester [Electronic resource]/Xu Wenyan// Shandong Agricultural University.
2. Ildar Badretdinov. Mathematical modeling and research of the work of the grain combine harvester cleaning system [Electronic resource]/ Ildar Badretdinov, Salavat Mudarisov// Computers and Electronics in Agriculture. –2019. – № 165.