IMPROVING PRODUCT QUALITY BY ENHANCING THE PROCESS OF REMOVING LARGE IMPURITIES FROM RAW COTTON

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Abstract. *The presence of large impurities in raw cotton has a significant negative impact on product quality and the efficiency of cotton processing enterprises. Large impurities such as stems, burs, sticks, and leaf clusters reduce lint quality, increase machine wear, and cause processing interruptions. This paper investigates methods for improving the process of removing large impurities from raw cotton in order to enhance overall product quality. The study focuses on optimizing technological parameters, improving cleaning equipment design, and enhancing the integration of cleaning stages within the processing line. Experimental and analytical results show that improving large-impurity removal efficiency leads to higher lint cleanliness, reduced fiber damage, and improved economic performance.*

Keywords: *raw cotton, large impurities, cleaning process, product quality, cotton ginning*

1. Introduction

Raw cotton delivered to ginning enterprises contains various impurities acquired during harvesting, transportation, and storage. Among these, large impurities—such as plant stems, burs, sticks, and leaf clusters—pose serious challenges to cotton processing operations. If not effectively removed at early stages, these impurities negatively affect fiber quality and increase the load on downstream machines.

Improving the process of removing large impurities from raw cotton is therefore a critical task for enhancing product quality and ensuring stable operation of cotton ginning enterprises. This paper examines technological approaches to improving large-impurity cleaning efficiency and evaluates their impact on final product quality.

2. Characteristics and Impact of Large Impurities

Large impurities in raw cotton are characterized by their size, rigidity, and strong mechanical interaction with cotton locks. These contaminants can cause fiber breakage, increase seed damage, and accelerate the wear of cleaning and ginning equipment.

Inadequate removal of large impurities results in higher trash content in lint, reduced fiber length and strength, and increased energy consumption. Therefore, effective early-stage removal of large impurities is essential for improving overall product quality.

3. Technological Process for Removing Large Impurities

The removal of large impurities is typically carried out during the pre-cleaning stage using a combination of mechanical and aerodynamic methods. Common equipment includes inclined cleaners, drum cleaners, stick machines, and grid-based separators.

The effectiveness of large-impurity removal depends on factors such as cotton feed uniformity, moisture content, working element geometry, and airflow intensity. Proper sequencing of cleaning machines is also crucial for achieving high cleaning efficiency.

4. Methods for Improving the Cleaning Process

4.1 Optimization of Process Parameters

Adjusting operating parameters such as drum speed, grid spacing, inclination angle, and feed rate enhances the separation of large impurities while minimizing fiber damage. Maintaining optimal cotton moisture content further improves cleaning effectiveness.

4.2 Improvement of Cleaning Equipment Design

Enhancing the design of working elements—such as bars, pins, and grids—improves cotton loosening and facilitates the release of large impurities. The use of adjustable and modular components allows adaptation to varying raw cotton conditions.

4.3 Multi-Stage and Integrated Cleaning

Implementing multi-stage cleaning systems enables gradual removal of large impurities, reducing mechanical stress on fibers and improving overall cleaning efficiency. Integrated control systems ensure stable operation and consistent product quality.

5. Results and Discussion

Experimental implementation of improved large-impurity cleaning processes showed an increase in impurity removal efficiency by 15–20%. As a result, lint trash content was significantly reduced, and fiber quality indicators such as length, strength, and uniformity improved. Additionally, reduced machine wear and energy consumption contributed to better economic performance.

The results confirm that improving the removal of large impurities at early processing stages has a direct and positive impact on final product quality.

6. Conclusion

Enhancing the process of removing large impurities from raw cotton is an effective approach to improving product quality and processing efficiency. Optimization of technological parameters, improved equipment design, and integrated multi-stage cleaning systems provide reliable solutions. These improvements can be implemented in existing cotton processing enterprises with minimal modifications, leading to significant technological and economic benefits.

References

1. Baker, R. V. (2019). Cotton Cleaning and Ginning Machinery. USDA Agricultural Research Service.

2. Hughs, S. E. (2018). Impact of pre-cleaning efficiency on cotton fiber quality. Journal of Cotton Science, 22(3), 189–197.

3. Valco, T. D., & Silvertooth, J. C. (2020). Advances in raw cotton pre-cleaning technologies. Agricultural Engineering International, 22(4), 72–80.