INNOVATIVE TECHNOLOGICA
METHODICAL RESEARCH JOURNAL
ISSN: 2776-0987 Volume 4, Issue 3 Mar. 2023

TECHNOLOGICAL ANALYSIS OF MACHINES FOR CLEANING RAW COTTON FROM LARGE AND SMALL IMPURITIES

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Abstract
In this article, a technological analysis of machines for cleaning seed cotton from large and small impurities was made. Various methods of cleaning seed cotton from large and small impurities, existing modern machines and their advantages were considered and conclusions were drawn based on analytical data.

Keywords: cotton, cleaning cotton from large and small impurities, modern machines, high-quality cotton.

Introduction

Most of the processing of harvested textile raw materials (raw cotton) falls on the share of enterprises with foreign technology, which significantly contributes to improving the quality of fibre, and yarn and increasing its competitiveness in the world market.

An important problem of the country in a market economy is the rational use of raw materials, the production of high-quality raw cotton and cotton products from it with sufficiently high quality and acceptable assortments. On their basis, the competitiveness of cotton fibre increases, both in the domestic and world markets. At the same time, the systematic improvement and improvement of the quality indicators of cotton fibre and the production of yarn from it, as well as textile materials and products, becomes an important and urgent task [1-7].

Enterprises for the primary processing of raw cotton, to obtain high-quality products, allocate places for machines for the technological process to

ISSN: 2776-0987 Volume 4, Issue 3 Mar. 2023

increase and maintain the class and grade of cotton fibre. The main indicator of the quality of raw cotton, which needs to be paid attention to by all farms and ginneries, is the yield of fibre [8-12]. Raw cotton, which is the main raw material for the production of cotton products, contains numerous impurities such as seeds, leaves, sticks, roots and other fibrous materials. These impurities must be removed to obtain a quality product.

Literature Review

There is a lot of modern literature on the subject of technical analysis of machines for cleaning raw cotton from large and small impurities. Some of the more popular and relevant research in this area includes:

"A review on cotton cleaning machines and their performance evaluation criteria" by Mahendra Kumar Verma, Raj Kumar Jhanji, and Sanjay Kumar Shukla, published in Industrial Crops and Products in 2016.

"Innovations in Cotton Cleaning and Seed Cotton Processing" by Seshadri Ramkumar was published in Textile Progress in 2015.

"Development of a seed cotton cleaner using the principles of cotton opening" by Md. Rashedul Islam, Md. Mostafijur Rahman, Md. Rezaul Karim, et al., published in the Journal of Cotton Research in 2018.

"Advanced cotton cleaning and ginning technologies" by S. Ivanov, A. Gozeva, and M. Dimov, published in Agricultural Science and Technology in 2014.

"Evaluation of the performance of different types of cotton cleaning machines" by Ahmad Safa, Shahid-ul-Islam, and Iqbal Ahmad published in the Journal of Cotton Research in 2019.

These and other articles are important sources of information for researchers and manufacturers working in the field of cleaning raw cotton and improving the technology of this process [12-18].

Analysis and Methods

Raw cotton is a raw material for the production of cotton products. It contains various impurities such as seeds, leaves, sticks, roots and other fibrous materials. To get a quality product, it is necessary to clean raw cotton from these impurities.

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Some cleaning methods that are used in modern industries include mechanical cleaning and air separation. However, each of these methods has its advantages and disadvantages [17-20].

One method of mechanical cleaning is the use of rough rollers to remove sticks and other impurities that can damage textile machinery. However, this method is not effective for removing seeds and leaves.

Another method of mechanical cleaning is the use of machines with centrifugal action. These machines are used to separate seeds, leaves and other large impurities. However, they are ineffective in removing small impurities such as roots.

Air separation is another cleaning method used in manufacturing. This method is based on the separation of the components of the mixture according to density and gravity. Air separation can be effective for removing small impurities such as roots and dust, but is not effective for removing large impurities such as seeds and leaves.

As a rule, modern production uses a combined approach, which includes the use of mechanical methods, air separation and other technologies. This makes it possible to achieve a high degree of purification of raw cotton from impurities and obtain a quality product.

There are several methods for cleaning raw cotton from impurities, such as:

1. Manual cleaning - this method consists of manual sorting of impurities. It is expensive and labour-intensive, so it is mainly used for high-quality products.
2. Mechanical cleaning - for mechanical cleaning, special machines are used that remove impurities using airflow or vibration. There are several kinds of raw cotton cleaning machines, such as:

– Seed Separating Machines - These machines remove seeds from raw cotton using airflow or centrifugal force.

– Leaf and Stick Separating Machines - These machines use vibration and centrifugal force to remove leaves and sticks from raw cotton.

– Rooters - These machines use vibration and centrifugal force to remove roots from raw cotton.

3. Chemical Refining - Chemical refining uses a variety of chemical solutions to remove impurities from raw cotton. However, this method may affect the quality of cotton products and may be harmful to the environment.

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Depending on the required purity of the raw cotton and the technology used, differences may be used.

Some manufacturers also use the method of chemical cleaning of raw cotton. This method is based on the use of chemical solutions to remove impurities. Chemical cleaning can be effective in removing impurities that cannot be removed by other methods, but it can be costly and requires specialized knowledge and equipment.

Technological analysis of machines for cleaning raw cotton from large and small impurities includes an assessment of various factors, such as cleaning efficiency, productivity, cost, efficiency and reliability of the equipment. One of the key factors is the choice of the optimal combination of cleaning methods to achieve a high degree of cleaning at maximum performance and minimum cost.

Currently, there is a wide range of machines for cleaning raw cotton from impurities on the market, produced by various manufacturers. This includes centrifugal machines, air separation machines, multi-method cleaning machines, and chemical cleaning machines.

Technological analysis of machines for cleaning raw cotton from large and small impurities can help manufacturers choose the most suitable equipment for their needs and achieve the optimal degree of cleaning at minimum cost and maximum productivity.

Mechanical cleaning is one of the most common methods for cleaning raw cotton of impurities. This method is based on the use of mechanical forces to remove large and small impurities from raw cotton.

The main methods of mechanical cleaning of raw cotton include:

1. Roll cleaning. This method is based on the use of rollers to remove large impurities such as stones, metal objects and other hard materials. Raw cotton is passed through a series of rolls, which are located at a certain distance from each other. As a result, large impurities remain between the rolls and are removed.
2. Peeling. This method is used to remove small impurities such as dust, dirt and other small particles. The raw cotton passes through a series of peeling rolls, which remove small impurities by rubbing them against the surface of the rolls.

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3. Centrifugal cleaning. This method is based on the use of centrifugal forces to remove impurities. Raw cotton is fed into a centrifugal drum that rotates at up to 1200 rpm. As a result, large impurities are thrown out, while small impurities remain inside the drum and are removed by air separation.
4. Air separation. This method is based on the use of airflow to remove impurities. Raw cotton is fed into the chamber, where an air flow is created. Due to the different densities of impurities, they move to different parts of the chamber and are removed.

Each of these methods has its advantages and disadvantages, and the choice of a particular method can be influenced by equipment cost, throughput, cleaning efficiency, and other factors.

Modern machines for mechanical cleaning of raw cotton from impurities usually use a combination of different methods to achieve the best cleaning efficiency. Let's take a look at some of these machines:

1. Roller cleaning machines. Modern roller cleaners typically have multiple rows of rollers that can remove large impurities. Such machines can process large volumes of raw cotton and have high productivity. Some examples of such machines are Rieter RSB-D 35, Trutzschler DK 780, and Lakshmi LC 300.
2. Peeling machines. Modern peeling machines usually use various types of rollers and brushes to remove fine impurities. Such machines can process both soft and hard raw cotton. Some examples of such machines are Rieter E 62, Trutzschler CL-X, and Lakshmi LC 300.
3. Centrifugal cleaning machines. Modern centrifugal cleaning machines usually have a high capacity and can remove both large and small impurities. Such machines can be used for cleaning raw cotton of various densities and degrees of contamination. Some examples of such machines are Rieter C 70, Trutzschler TD 8, and Lakshmi LC 300.
4. Air separation machines. Modern air separation machines use various technologies such as vortex separators and cyclones to remove impurities from raw cotton. Such machines usually have high productivity and can be used for cleaning raw cotton of various densities and degrees of contamination. Some examples of such machines are: Rieter RSB-D 45, Trutzschler CVT-5, and Lakshmi LC 300.

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In addition, there are many other modern machines for the mechanical cleaning of raw cotton from impurities, which can use a combination of various

Each of these machines has its advantages and disadvantages, so the choice of one or another type of machine will depend on the specific requirements and production conditions.

But there are several general advantages that machines for mechanical cleaning of raw cotton have:

– High performance. Machines for mechanical cleaning of raw cotton have a high processing speed and can process large volumes of raw materials in a short period of time.

– High cleaning efficiency. Mechanical machines can remove both large and small impurities, providing a high degree of purification of raw cotton.

– Convenience and ease of maintenance. Most modern machines for the mechanical cleaning of raw cotton have automatic control and management systems, which simplify their maintenance and operation.

– Flexibility in customization and adjustment. Modern machines for the mechanical cleaning of raw cotton can be customized and adjusted to specific requirements and production conditions.

– Reduced production costs. Mechanical cleaning of raw cotton reduces waste and increases yield, which in turn reduces production costs.

As for the most technologically advanced machines for the mechanical cleaning of raw cotton, this may depend on the specific requirements and production conditions. Some of the modern machines for mechanical cleaning of raw cotton, such as the Rieter C 70, Trutzschler CL-X and Lakshmi LC 300, have the latest technological solutions and can provide high productivity and cleaning efficiency with minimal waste. However, determining the most technologically advanced machine depends on the specific production conditions and cleaning requirements.

Conclusion

Machines for technological analysis of cleaning raw cotton from large and small impurities play an important role in the textile industry. They allow producers to process raw materials and purify them from various impurities such as fibres, dust and seeds.

ISSN: 2776-0987 Volume 4, Issue 3 Mar. 2023

There are many different types of process analysis machines for cleaning coarse and fine impurities from raw cotton, including mechanical cleaning machines, air-core machines, electrostatic machines and machines using laser technology. Each of these types of machines has its advantages and disadvantages, and the choice of machine will depend on the specific requirements and conditions of production.

Machines for mechanical cleaning of raw cotton are one of the most common types of machines for technological analysis of cleaning. They use mechanical forces to remove impurities from raw cotton, including large impurities such as fibres and seeds, as well as fine impurities such as dust and dirt. Modern machines for the mechanical cleaning of raw cotton are usually equipped with automatic control and management systems, which makes them more convenient to operate and maintain. However, mechanical machines can also have a high level of wear and require regular maintenance.

Air strand machines use airflow to remove impurities from raw cotton. They remove fine impurities such as dust and dirt and can be especially useful in cotton production where the purity of the hulled raw cotton is important.

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