INNOVATIVE TECHNOLOGICA
METHODICAL RESEARCH JOURNAL
ISSN: 2776-0987 Volume 3, Issue 9, Sep. 2022

SUBSTANTIATION OF THE DIRECTION OF RESEARCH TO INCREASE THE PERFORMANCE OF LINTERS

D. U. Madrahimov
PhD, JSC "Paxtasanoat Ilmiy Markazi"
Madrahimov_dilsh@mail.ru

Tuychiyev Sh. Sh.
Senior teacher at "Higher mathematics" department
Andijan Machine Building Institute,
E-mail: sherzodtuychiyev368@gmail.com, Phone: +998974220727.

Abstract
This article proposes an analysis of the development trend in the design of linters, the main shortcomings of the 5LP grade linters used in the production, on the basis of which the directions for further research to improve the performance of linters are selected.

Keywords: linter, chamber volume, lint, agitator, performance, saw cylinder, direction, research.

Introduction

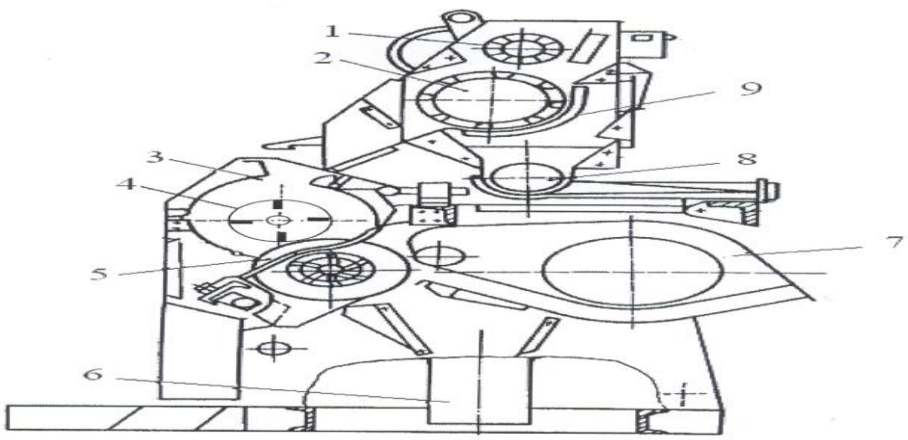
Analysis of the phased improvement of linters showed that the increase in production performance was mainly due to the following trends:
- Increase in the volume of the working chamber of the linter;
- Increase in the diameter and speed of the agitator;
- Increasing the number of saws on the saw cylinder shaft.

Nowadays, in the technological process of seed lintering, linters of the 5LP brand [1] are used at ginneries in the technological process of seed linting, which consists of a feed roller 1, a leveling drum 2, a working chamber 3, a tedder 4, a saw cylinder 5, a luke extractor pipe 6, an air chamber 7, an auger for litter 8, perforated mesh 9 (Fig. 1). The lintering process on these machines is carried out by feeding the flow of seeds into the working chamber of the linter and scraping the linter with saw teeth from the surface of the seeds of the fibrous cover lint and taking it out of the grate. Seeds, as they are removed from the lint and exposed, stand out from the mass of the seed roller and are dumped onto the grate, along which they roll down onto the seed conveyor. The degree of lint removal is

INNOVATIVE TECHNOLOGICA
METHODICAL RESEARCH JOURNAL
ISSN: 2776-0987 Volume 3, Issue 9, Sep. 2022

determined by the gap between the end of the vertical part of the agitator blade and the surface of the saw cylinder headset. Due to the significantly low percentage of lint removal (1.5-2.0%), it is difficult to remove the seeds from the working chamber, which leads to a long stay in the linting zone, while increasing the mechanical damage to the seeds and reducing the quality of the lint. In addition, according to the technical specifications, the productivity of the 5LP linter during the first linting is 2000-2300 kg/mach.hour, during the second and third linting 1500-1700 kg/mach.hour and 1200-1300 kg/mach.hour, respectively [2]. The conducted experimental studies in the field of cotton seed linting, as well as the practice of operating 5LP linters in production, showed that the 5LP linter equipped with a serial working chamber (UMPL) provides 50-60% of the performance specified in the passport [3]. The low productivity of the 5LP linter on seeds is characterized by inefficient scraping of the fibrous cover from the surface of the seeds. Therefore, to ensure the required productivity of the plant in the production line, according to the regulations [4], two batteries of linters are installed, each of which consists of 6 machines (a total of 12 pieces) of the 5LP type.

It is known [5] that the process of linting, as well as the process of ginning, is carried out as a result of the interaction of the saw cylinder with the mass of seeds, which forms a seed roller rotating in the working chamber of the linter. These processes differ in that raw cotton is processed in sawn gins, consisting of 30-35% of spinnable fiber, 11-17% of lint and 50-60% of seeds, and in linters - ginned seeds with a relatively small fibrous cover, mainly from short fibres.



1- feeder; 2- leveling drum; 3- working chamber; 4- seed agitator; 5- saw cylinder; 6- ulukovoy pipe; 7-air chamber; 8-screw for litter; 9- perforated mesh.

Fig. 1. 5LP linter scheme.

INNOVATIVE TECHNOLOGICA
METHODICAL RESEARCH JOURNAL
ISSN: 2776-0987 Volume 3, Issue 9, Sep. 2022

Due to the high adhesion forces between the individual cotton balls, the impulse received from the saw cylinder is sufficient to rotate the raw roller in the working chamber of the gin. When lintering, the connection between individual seeds is weaker, and one impulse from the saw cylinder is not enough to rotate the seed mass in the working chamber of the linter. Therefore, a turner is installed in the working chamber to rotate the mass of seeds.

The course of seed linting is greatly influenced by the speed of movement of the tops of the saw teeth and the agitator bars. For linters, the peripheral speed of the saw teeth is 12.2 m/s, and the peripheral speed of the ends of the tedder bars is 3.4 m/s. Due to the presence of such a relative speed in the area of the working impact of the saws, the seeds seem to be held by the bar of the agitator and the mass of the compacted layer of the seed roller, while they acquire the stability necessary to scrape the lint from the surface of the seeds with the working edges of the saw teeth.

The resistance of seeds is characterized primarily by the density of the seed roller: the denser it is, the greater their resistance. With insufficient roller density, the seeds are deprived of the necessary support, and the linting process slows down.

The movement of the seed roller is limited by the volume of the working chamber. Renewal of seeds in the working chamber occurs after a certain period of time, so the seed roller repeatedly makes a circular motion with the same seeds.

The residence time factor of seeds in the working chamber is essential in ensuring high productivity of the linter. This is confirmed by an equality that takes into account the continuity of the linting process:

$$B\frac{100-\Pi_1}{100-\Pi_2} = qt = \frac{100-\Pi_0}{100-\Pi_2}, \quad (1)$$

From this,

$$Q = \frac{B}{t}\frac{100-\Pi_1}{100-\Pi_0}, \quad (2)$$

where, q – seed linter throughput, kg/s;

B – seed roller weight, kg;

t – average residence time of seeds in the working chamber, s;

Π_1 – average pubescence of the seed roller, %;

Π_0 – pubescence of seeds entering the chamber, %;

Π_2 – pubescence of seeds emerging from the chamber, %.

If we designate $\frac{100-\Pi_1}{100-\Pi_0}$ by k,

$$\text{then } q=k\frac{B}{t} \quad (3)$$

With a steady linting process with a certain lint removal regime, k can be considered a constant value, therefore, an increase in linter productivity can be achieved either by increasing the mass of the seed roller, or, with its mass constant, by reducing the average residence time of the seeds in the working chamber [5].

The objective of our research is to increase productivity, which can be achieved by increasing the mass of the seed roller in the working chamber of the linter with an increased volume, thereby increasing the productivity of the linter in removing lint.

Based on the analysis of the above, the direction of further research was chosen to use the working chamber of a gin, shortened in length equal to the length of the working chamber of the linter 5LP, using gin grates polished to the desired width, linter dusts in the amount of 160 pcs with a saw-to-saw distance like that of a linter and a seed agitator with an increased diameter up to 200 mm. Due to the above distinctive features in the proposed working chamber, the mass of the seed roller increases, since the volume of the gin chamber is 1.5 times larger than that of the 5LP linter, it becomes possible to significantly improve the operation of the linter equipment, increase the productivity of the linter, due to more efficient lint removal.

References

1. Справочник по первичной обработке хлопка [Handbook to primary processing of cotton], книга II, НПО «Хлопкопром», Ташкент, «Мехнат», 1995 г.
2. Паспорт линтера 5ЛП.-Ташкент:ТГСКБ по хлопкоочистке, 1981.-18 с.
3. Сулаймонов Р.Ш., Каримов У.К., Маруфханов Б.Х. «Изучение технологий и оборудования зарубежного производства по джинированию хлопка-сырца, линтерованию семян, очистки волокна и линта, эксплуатируемого на отечественных хлопкозаводах с выдачей рекомендаций [Study of foreign-made technologies and equipment for raw cotton ginning, seed linting, fiber and lint cleaning, operated at domestic ginneries with the issuance of recommendations]». Отчет АО «Пахтасаноат илмий маркази». Ташкент-2016.- 28 с.
4. Пахтани дастлабки ишлаш мувофиқлаштирилган технологияси [Coordinated technology of cotton preliminary processing], ПДИ 70-2017, «Paxtasanoatilmiymarkazi» АЖ.-Тошкент, 2016.- 91 б.

INNOVATIVE TECHNOLOGICA
METHODICAL RESEARCH JOURNAL
ISSN: 2776-0987 Volume 3, Issue 9, Sep. 2022

5. Первичная обработка хлопка [Cotton primary processing]. М., «Легкая индустрия», 1978. 430 с.
6. To'ychiyev.Sh.Sh; Ahmadjonov.A. BA'ZI NOAN'ANAVIY MASALALARNING YECHIMLARI // Eurasian Journal of Mathematical Theory and Computer Sciences, 2022/6/30, ст: 65-68.