

ISSN 2181-8622

Manufacturing technology problems



Scientific and Technical Journal Namangan Institute of Engineering and Technology

INDEX  COPERNICUS
INTERNATIONAL

**Volume 9
Issue 3
2024**



UDS 677.051.

IMPACT OF SAW SPACING ON LINT REMOVAL EFFICIENCY AND QUALITY IN THE LINTING PROCESS

MADRAHIMOV DILSHODBEK

PhD, Senior Researcher of JSC "Пахтасаноат илмий маркази", Tashkent, Uzbekistan
Phone.: (0890) 325-0610, e-mail.: madrahimov_dilsh@mail.ru

TUYCHIEV SHERZOD

PhD student of Andijan Mashine building institute, Andijan, Uzbekistan
Phone.: (0897) 422-0727, e-mail.: sherzodtuychiye368@gmail.com
**Corresponding author*

Abstract: This article presents the results of experimental studies conducted in laboratory conditions to investigate the impact of the saw spacing in linting equipment, enhanced with a working gin chamber, on the performance of lint removal and the quality of the obtained lint and linted seeds. The experiments focus on how different saw intervals affect the productivity and the quality of both the lint and the linted seeds.

Keywords: improved, linter, saw, spacing, lint removal, productivity, trash impurities.

Introduction. In the linting process, the spacing between the saws is a critical factor that directly influences the performance of the linter, the lint yield, the type and quality of the lint, as well as the proportion of whole seeds and trash impurities. Furthermore, it has a direct correlation with the seed roll density in the chamber and the mechanical damage to the seeds.

Methodology & empirical analysis. For the improved linter, the UMPD working chamber of the gin and the 4DP-130 model gin grates were selected. In the process of separating lint from the seed, the traditional method using a saw cylinder and slotted grate was applied. The experimental linter was developed based on the working chamber of the gin, with a length of 485 mm. On the laboratory stand, the saw spacing in the 5LP linter was maintained at 8.75 mm, with 50 saws installed. When the saw spacing was adjusted to 8.75 mm and 9.75 mm, the number of saws in the working chamber naturally decreased. During the experiments, to ensure that the saw cylinder operates under almost constant voltage and to create uniform conditions for comparing the parameters of the experimental linter, the amount of seed fed into the working chamber is regulated using an ammeter connected to the seed mixer's electric motor circuit. The productivity of the linter is determined by the mass of the seed processed during the test. Subsequently, the density of the seed roll is calculated as the ratio of its mass to the volume of the working chamber.

Results. In the improved linter device, experiments were conducted by maintaining the speed of the seed agitator at 500 rpm and the saw cylinder at 730 rpm. The distance between the seed agitator and the saw cylinder was set at 20 mm, and the distance between the seed comb and the saw cylinder was maintained at 25 mm. To study the impact of saw spacing on lint removal from ginned seeds and the productivity of the linter, tests were carried out by reducing the number of saws on the saw cylinder and

adjusting the saw spacing to 8.75 mm, 9.75 mm, and 10.75 mm. Average samples of lint and seeds were collected, and the following quality indicators were determined in the laboratory:

- the amount of defects and trash impurities in the lint;
- the staple mass length of the lint;
- the degree of mechanical damage to the seeds;
- the complete fuzziness of the seeds.

The introduction of seeds into the linter's working chamber was regulated by the linter's feeder. For each experiment repetition, 50 kg of uniformly fuzzy seeds were used. Each experimental variation was repeated three times. Before starting the experiments on the linter, the necessary adjustments planned for each experimental variant were made. The results of the experimental trials are presented in Table 1.

As seen from the indicators in Table 1, the spacing between the saws in the linter has a direct impact on the linter's productivity, the lint yield, its staple mass length, the amount of trash impurities, the proportion of whole seeds, the density of the seed roll in the working chamber, and the mechanical damage to the seeds.

For instance, when the saw spacing was set to 10.75 mm, the density of the seed roll in the chamber was relatively low, measuring 294 kg/m³. The residual fuzz on the linted seeds was 8.2%, which exceeded the standard requirements. Due to the higher residual fuzz on the linted seeds, the productivity of the linter in terms of lint removal was relatively low, at 4.1%. However, the staple length of the obtained lint was 7/8 mm, which classified it as type "A."

The results of studying the impact of saw spacing on the productivity of the improved linter in terms of lint and seed processing, as well as the quality of the lint and seeds, are as follows:

- Saw Spacing and Productivity: As the saw spacing increased, the productivity of the linter in removing lint from the seeds generally decreased. Larger spacing resulted in lower seed roll density in the chamber and, consequently, less efficient lint removal.

- Lint Quality: The staple length of the lint tended to increase with larger saw spacing, resulting in better quality lint, particularly in terms of staple mass length. However, at wider saw spacing, the presence of residual fuzz on the seeds increased, leading to a higher percentage of uncleaned seeds.

-Seed Quality: Wider saw spacing also led to a greater amount of mechanically damaged seeds and a higher content of trash impurities. The residual fuzz percentage on the seeds rose as the saw spacing increased, which negatively affected the overall seed quality.

In conclusion, while wider saw spacing improved the staple length and quality of the lint, it reduced overall productivity and increased the percentage of residual fuzz on the seeds, indicating a trade-off between quality and efficiency.

Results of Saw Spacing on Linter Performance and Lint Quality:

Table 1.

Indicators	Saw Spacing (mm)		
	8,75	9,75	10,75
On ginned seed:			
- fuzz percentage	12,2	12,2	12,2
- mechanical damage percentage	2,4	2,4	2,4
After processing in improved linter:			
-trash and whole seed content in lint	6,7	6,9	8,2
Residual fuzz percentage on seed:			
-lint type	B	A	A
-staple mass length (mm)	6/7	7/8	7/8
Linter productivity:			
- seed processed (kg/h)	210	242	258
- lint produced (kg/h)	11,55	12,82	10,32
-lint yield (%)	5,5	5,3	4,0
-seed roll density in chamber (kg/m ³)	316	312	294
-number of saws on saw cylinder	50	45	41

When analyzing the improved linter with different saw spacings, we observe the following:

1. Saw Spacing of 8.75 mm:

- Residual Lint Percentage: At this spacing, the residual lint percentage was 6.7%, which meets the standard requirements.

- Lint Quality: The obtained lint had a staple length of 6/7 mm, classified as type "B."

- Productivity: The linter achieved a processing rate of 210 kg/hour. This is 32 kg/hour lower compared to the 9.75 mm spacing variant.

- Impurities and Whole Seed Content. The impurity content and whole seed content in the lint were higher, at 5.7% and 4.93%, respectively. This indicates that the mechanical damage to the seeds was relatively high.

2. Comparison with 9.75 mm Saw Spacing:

- Residual Lint Percentage: The residual lint was slightly lower (by 0.2%) with 9.75 mm spacing.

- Productivity: The linter's productivity increased to 242 kg/hour with 9.75 mm spacing.

- Lint Quality: The lint produced had a better staple length of 7/8 mm, classified as type "A."

- Impurities and Whole Seed Content: With 9.75 mm spacing, impurities and whole seed content were lower compared to 8.75 mm spacing, making it a better option in terms of quality and productivity balance.

Conclusion:

- Optimal Saw Spacing: A saw spacing of 9.75 mm provides a good balance between productivity and lint quality. It offers higher productivity and better staple length of the lint compared to 8.75 mm spacing.

- Trade-offs: Although 8.75 mm spacing meets the standard requirements, it results in higher residual lint and increased mechanical damage. Conversely, 9.75 mm spacing minimizes impurities and improves overall lint quality while maintaining higher productivity.

Conclusions. In summary, for the improved linter, a saw spacing of 9.75 mm is recommended as it offers better performance in terms of both productivity and lint quality, while minimizing mechanical damage and impurity levels.

- while wider saw spacing improved the staple length and quality of the lint, it reduced overall productivity and increased the percentage of residual fuzz on the seeds, indicating a trade-off between quality and efficiency.

- while the 10.75 mm saw spacing yields the highest productivity and good quality of lint with low impurity and whole seed content, it also results in higher residual lint. This indicates that although the linter processes seeds effectively, the residual lint might exceed the acceptable limits set by standards.

Thus, while the 10.75 mm spacing is effective in terms of throughput and maintaining lint quality, it is crucial to balance this with the acceptable residual lint levels. This finding suggests that optimization of saw spacing might be needed to achieve a balance between productivity and meeting all quality standards.

These conclusions ensure that the linter achieves the best average performance indicators and complies with the relevant industry standards.

Based on the conducted experiments, it is appropriate to adopt the inter-tooth spacing of 9.75 mm for the improved linter equipment for future research. This spacing has the most favorable impact on the linter's operational efficiency and the quality of the lint. In subsequent experiments, it is necessary to maintain the inter-tooth spacing of 9.75 mm across all variants.

References

1. Паспорт линтера 5ЛП-Ташкент: ТГСКБ по хлопкоочистке, 1981. -18 с.
2. Сулаймонов Р.Ш., Каримов У.К., Маруфханов Б.Х. «Изучение технологий и оборудования зарубежного производства по джинированию хлопко-сырца, линтерованию семян, очистки волокна и линта, эксплуатируемого на отечественных хлопкозаводах с выдачей рекомендаций». Отчет АО «Пахтасаноат илимий маркази». Ташкент-2016. - 28 с.
3. Первичная обработка хлопка. М., «Легкая индустрия», 1978. 430 с.
4. D. U. Madrahimov, T. S. (2022 г.9-сентябр). 6. D. U. Madrahimov, Substantiation of the direction of research to increase the performance of linters. 6. D. U. Madrahimov, T. S. (2022 г.9-сентябр). 2. D. U. Madr Substantiinnovative technologica, 159-163 стр.



5. Linterlarning faoliyatini oshirish bo'yicha tadqiqot yo'naligini asoslash. D.U.Madrahimov, T.S.Sh–Innovatsion Technologica: Metodical Research Journal, 2022.
6. Усовершенствование основных узлов рабочей камеры линтера // Universum: технические науки : электрон. научн. журн. Сулаймонов Р.Ш. [и др.]. 2022. 3(96).

C O N T E N T S

PRIMARY PROCESSING OF COTTON, TEXTILE AND LIGHT INDUSTRY

Dadadzhonov Sh., Akhunbabaev O., Muxamadrasulov Sh., Akhunbabaev U., Erkinov Z.	3
Practice of production of polycomponent threads from a mixture of natural and chemical fibers	
Korabayev Sh.	13
Determining the direct resistance coefficient of cotton fiber in the confuser tube	
Kulmatov I.	19
Study of a new technological equipment for cleaning cotton raw materials from gross pollution	
Musayeva L., Polatova S.	24
Choosing the main features of special clothing for riders, taking into account the requirements of consumers	
Djurayev A., Khudayberdiyeva M., Urmanov N.	31
Kinematic analysis of a cam mechanism with elastic elements of the mechanism with elastic elements of paired cams of a boel mechanism of a weaving loom	
Rakhmonov H., Matyakubova J., Sobirov D.	41
Analysis of the influence of the filling coefficient of the screw cleaner system with seeded cotton on the current consumption of the system	
Madrahimov D., Tuychiyev Sh.	48
Impact of saw spacing on lint removal efficiency and quality in the linting process	
Monnopov J., Kayumov J., Maksudov N.	53
Analysis of mechanical properties of high elastic knitted fabrics for sportswear design	
Kamolova M., Abdulkarimova M., Usmanova N., Mahsudov Sh.	59
Study of the Prospects for the Application of Digital Technologies in the Fashion Industry in the Development of the Creative Economy	
Ergasheva R., Khalikov K., Oralov L., Samatova Sh., Oripov J.	71
Comprehensive assessment of two-layer knitted fabrics	

GROWING, STORAGE, PROCESSING AND AGRICULTURAL PRODUCTS AND FOOD TECHNOLOGIES

Aripov M., Kadirov U., Mamatov Sh., Meliboyev M.

Experimental study of sublimation drying of vegetables by applying ultra – high frequency electromagnetic waves	74
Alamov U., Shomurodov D., Giyasova N., Zokirova Sh., Egamberdiev E.	81
Chemical composition analysis of miscanthus plant leaves and stems	81
Vokkosov Z., Orifboyeva M.	88
Production of technology for obtaining oil from peanut kernels and refining the oil obtained in short cycles	88
Khalikov M., Djuraev Kh.	95
The importance of systematic analysis in the drying process of fruit and vegetable pastilla	95

CHEMICAL TECHNOLOGIES

Kuchkarova D., Soliyev M., Ergashev O.	101
Production of coal adsorbents by thermochemical method based on cotton stalks and cotton shells and their physical properties	101
Askarova D., Mekhmonkhonov M., Ochilov G., Abdikamalova A., Ergashev O., Eshmetov I.	108
Some definitions about the mechanism of public-private partnership and its role in strengthening the activities of business entities and small businesses	108
Ganiyeva N., Ochilov G.	117
Effect of bentonite on benzene vapor adsorption in order to determine the activation conditions of log bentonite	117
Kayumjanov O., Yusupov M.	122
Synthesis of metal phthalocyanine pigment based on npk and calculation of particle size using the debye-scherrer equation	122
Mukumova G., Turaev Kh., Kasimov Sh.	127
Sem analysis and thermal properties of synthesised sorbent based on urea, formaldehyde, citric acid	127
Amanova N., Turaev Kh., Beknazarov Kh., Sottikulov E., Makhmudova Y.	133
Corrosion resistance of modified sulfur concrete in various aggressive environments	133
Eshbaeva U., Alieva N.	141
Study of the effect of adhesive substances on paper strength properties	141
Turayev T., Bozorova G., Eshankulov N., Kadirov Kh., Dushamov A., Murtozoeva Sh.	146
Cleaning of saturated absorbents used in natural gas cleaning by three-stage filtration method and analysis of their properties	146

Muxamedjanov T., Pulatov Kh., Nazirova R., Khusenov A.	158
Obtaining of phosphoric cation-exchange resin for waste water treatment	
MECHANICS AND ENGINEERING	
Abdullaev A., Nasretdinova F.	165
Relevance of research on failure to power transformers, review	
Muhammedova M.	173
Anthropometric studies of the structure of the foot	
Sharibayev N., Nasirdinov B.	181
Measuring the impact of mechatronic systems on silkworm egg incubation for premium silk yield	
Abdullayev L., Safarov N.	189
Electron beam deposition of boron-based coatings under vacuum pressure and experimental results of nitrogenation in electron beam plasma	
Kadirov K., Toxtashev A.	195
The impact of electricity consumption load graphs on the power	
Makhmudov I.	204
Theoretical basis of the methodology of selecting wear-resistant materials to abrasive corrosion	
Adizova A., Mavlanov T.	209
Determining optimal parameter ratios in the study of longitudinal vibrations of threads in weaving process using a model	
Turakulov A., Mullajonova F.	215
Application of the dobeshi wavelet method in digital processing of signals	
Djurayev Sh.	222
Analysis and optimization of the aerodynamic properties of a new multi-cyclone device	
Djurayev Sh.	228
Methods for improving the efficiency of multi-cyclone technology in air purification and new approaches	
Ibrokhimov I., Khusanov S.	236
Principles of improvement of heavy mixtures from cotton raw materials	
Utaev S.	241
Results of a study of the influence of changes in oils characteristics on wear of diesel and gas engine cylinder liners	
Abdovakhidov M.	249
Review of research issues of determination of mechanical parameters of compound loading structures and working bodies	
Abdovakhidov M.	256
Equilibrium analysis of flat elements of the saw working element package	

Kudratov Sh., Valiyev M., Turdimurodov B., Yusufov A., Jamilov Sh.	
Determining the technical condition of diesel locomotive diesel engine using diagnostic tools	262

Juraev T., Ismailov O., Boyturayev S.	
Effective methods of regeneration of used motor oils	269

Umarov A., Sarimsakov A., Mamadaliyev N., Komilov Sh.	
The oretical analysis of the fiber removing process	276

Tursunov A.	
Statistical evaluation of a full factorial experiment on dust suppression systems in primary cotton processing facilities	282

ADVANCED PEDAGOGICAL TECHNOLOGIES IN EDUCATION

Yuldashev A.	
Historical theoretical foundations of state administration and the issue of leadership personnel	294

ECONOMICAL SCIENCES

Israilov R.	
Criteria, indicators and laws of small business development	299

Eshankulova D.	
Demographic authority and its regional characteristics	305

Kadirova Kh.	
Assessment of the efficiency and volatility of the stock market of Uzbekistan	310

Mirzakhlikov B.	
Some definitions about the mechanism of public-private partnership and its role in strengthening the activities of business entities and small businesses	316

Ganiev M.	
Income stratification of the population and opportunities to increase incomes	321

Aliyeva E.	
Assessment of innovation activity enterprises using the matrix method	327

Azizov A.	
Industry 4.0 challenges in China	335

Azizov A.	
Industrie 4.0 implementation challenges in Germany	341