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ANALYSIS OF QUALITY INDICATORS OF COTTON FIBER BASED ON VARIETIES

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Abstract
Cotton fiber is an important raw material in the textile industry, and improving its quality indicators can be achieved by enhancing technological processes. Based on the available cotton selection varieties, it is necessary to analyze the machine construction to improve the initial processing stages.

Keywords: Yarn, type classification, HVI, CSP, fiber, micronaire, linear density, relative breaking strength, selection variety, elongation at break, spinnability, uniformity index.

Introduction

The implementation of advanced technology and machinery is a key factor in producing high-quality textile products that meet international standards. Such technologies and equipment are manufactured in many European countries. Among them are globally recognized companies such as Truetzschler, Schlafhorst, Volkmann (Germany), Marzoli, Savio (Italy), Murata (Japan), and Rieter (Switzerland), as well as China's Zhengzhou textile machinery plant, which specializes in cotton fiber processing and yarn spinning equipment.
Considering the advantages mentioned above, designing and utilizing spinning enterprises based on the equipment from these firms can be a significant source of efficiency. It should be noted that these are not the only companies in this field.

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Many other firms, concerns, and factories around the world are also actively operating in this industry. One of the main reasons we place great emphasis on the companies listed above is that their equipment was introduced into our country's industry during the independence period and has been functioning effectively.

Raw material selection plays a critical role in textile enterprises since raw materials make up a significant portion of the yarn's production cost. The choice of raw material is primarily based on calculating the strength characteristics of the intended yarn. Similarly, other yarn properties, such as unevenness, can also be predicted.

Research Methodology

In order for textile enterprises in Uzbekistan to fully meet the task of producing competitive finished products in line with international standards, it is necessary to adopt methods practiced in the enterprises of textile-industrialized countries. The HVI (High Volume Instrument) testing device is widely used for the rapid assessment of cotton fiber property indicators. Currently, cotton fiber testing is conducted on this equipment, and one of the output results is the CSP indicator. The company provides the following formula to calculate CSP, which allows forecasting the yarn strength. The quality control center uses these exact formulas.[1]

$$SSP = -741{,}08 + 8{,}24 * RT - 97{,}8 * M + 850{,}9L + 15{,}20 * UI + 14{,}84 * Rd - 27{,}87 * b - 5{,}02$$

According to Leaf (1), the following formula based on HVI system indicators can be used to calculate CSP . [2]

For carded yarn:

$$CSP = 165\sqrt{\frac{L * R_T}{M}} + 590 - 13N_e$$

For combed yarn:

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$$CSP = 165\sqrt{\frac{L * R_T}{M}} + 590 - 13N_e\left(1 + \frac{Y}{100}\right)$$

Where:
L – upper half mean length of the fiber, mm;
For S-6524 cotton: L = 1.1215 × 25.4 = 28.48 mm
RT – relative breaking strength of the fiber, gk/tex; (e.g., 32.83 gk/tex)
M – micronaire value, mg/inch; (e.g., 4.50)
Ne – yarn count in English system; (e.g., 30)
Y – amount of trash, %; (e.g., 16%)

Quality Indicators of Medium-Staple Cotton Fiber in the Republic of Uzbekistan
Test Results from HVI Laboratory System
(Fiber Variety: Andijan-35)

№	HVI (High Volume Instruments) Quality Indicator Name	Fiber Quality from Existing Saw Gin with Saw Disk
1	Len. Upper Half Mean Length.dyum (mm)	1.19 (35.6 mm)
2	SFI. SHort Fiber Index %	5.46
3	Unf. Uniformity Index %	84.5
4	Str. Strength.. gf/tex. gs/teks	33.88
5	Mic. Micronare (basis 3.5-4.3)	4.0-4.1
6	Elg. elongation	6.5-7.8
7	Cnt. Trash Count	21-30
8	Area. Trash Area %	0.8-1.2
9	Trash Trash Code.	2
10	Rd. Reflectance. %	73.8
11	tb. Yellowness	8.3

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Test Results from HVI Laboratory System

(Fiber Variety: S65-24)

№	HVI (High Volume Instruments) Quality Indicator Name	Fiber Quality from Existing Saw Gin with Saw Disk
1	Len. Upper Half Mean Length. dyum (mm)	1.20 (35.9 mm)
2	SFI. SHort Fiber Index %	6.10
3	Unf. Uniformity Index. %	85.8
4	Str. Strength. gf/tex. gs/teks	32.86
5	Mic. Micronare (basis 3.5-4.3)	4.4-4.5
6	Elg. Elongation	7.0
7	Cnt. Trash Count	24
8	Area. Trash Area %	1.4
9	Trash Trash Code.	3
10	Rd. Reflectance. %	77.6
11	tb. Yellowness	8.0

Test Results from HVI Laboratory System

(Fiber Variety: Namangan-77)

№	HVI (High Volume Instruments) Quality Indicator Name	Fiber Quality from Existing Saw Gin with Saw Disk
1	Len. Upper Half Mean Length. dyum (mm)	1.17 (35.1 mm)
2	SFI. SHort Fiber Index %	6.9
3	Unf. Uniformity Index. %	85.7
4	Str. Strength. gf/tex. gs/teks	33.8
5	Mic. Micronare (basis 3.5-4.3)	4.1
6	Elg. Elongation	7.2
7	Cnt. Trash Count	21
8	Area. Trash Area %	1.6
9	Trash Trash Code.	4
10	Rd. Reflectance. %	76.8
11	tb. Yellowness	7.6

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For example, the strength indicator (SSP) of combed yarn spun from first-grade cotton fiber of the S-6524 selection variety with a yarn count of Ne = 30 is calculated as follows.

From the physical and mechanical property indicators of the fiber determined by the HVI system in Table 1, we have the following values:

upper half mean length of the fiber: L = 28.48 mm,

relative breaking strength: RT = 32.83 gk/tex,

micronaire: M = 4.5,

trash content: Y = 16%.

By substituting these values into the third formula, we obtain the following:

$$CSP = 165\sqrt{\frac{28{,}48 * 32{,}83}{4{,}5}} + 590 - 13 * 30\left(1 + \frac{16}{100}\right) = 2516$$

$$\mathbf{CSP = 2516}$$

The value indicated by the "Quality" center for SSP (according to the table) is 2208.26.

Thus, since the tabular SSP value 2208.26 is less than the calculated value 2516, the raw material is considered correctly selected.

To verify whether the raw material meets the requirements for yarn of the given count (Ne), the yarn's breaking length — referred to as Rkm — is calculated and checked.

The Rkm value for combed yarn is calculated using the fiber indicators determined by the HVI system as follows:

$$R_{km} = 1{,}1\sqrt{\frac{L * R_T}{M}} + 4{,}0 - 13\frac{N_e}{150} \text{ (For the carding system)}$$

$$R_{km} = 1{,}1\sqrt{\frac{L * R_T}{M}} + 4{,}0 - 13\frac{N_e}{150}\left(1 + \frac{Y}{100}\right) \text{ (For the combing system)}$$

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$$R_{km} = 1{,}1\sqrt{\frac{28{,}48 * 32{,}83}{4.5}} + 4{,}0 - 13\frac{30}{150}\left(1 + \frac{16}{100}\right) = 20{,}02 \quad \frac{gk}{teks};$$

This indicator is compared with the standard values of yarn. The standards are provided in the USTER STATISTICS tables.
The calculated value Rkm.x must be greater than Rkm.j {N}, meaning that if it exceeds any of the yarn quality classes (5, 25, 50, 75, or 95%), the selection of the raw material is considered justified.

Conclusion

If the indicator falls below the fifth class (95%), the raw material must be replaced.
In our example, the calculated Rkm.x value is 20.02 gk/tex, which is 0.1% higher than the Rkm.j value of the 5% class (20.0 gk/tex).
Therefore, the selected raw material — cotton fiber of the S-6524 selection variety — can be accepted for the project.

References:

1. Q.J Jumaniyazov va boshqalar «To‘qimachilik mahsulotlari texnologiyasi va jihozlari». «G‘.G‘ulom» T. 2012y.
2. Q.J. Jumaniyazov, YU.M. Polvonov «Paxta yigirish texnologik jarayonlarini loyihalash» TTESI. 2007 y.
3. Shuhratjon Imomkulov. The effect of increasing the working spaces of the teeth of the genie saw. AIP Conf. Proc. 3045, 030087 (2024), https://doi.org/10.1063/5.0197303
4. Dadajanov A., Imomqulov SH. “Studying of parameters of the directing mechanism of a mesh plane by is difficult-harmonious vibrating movement”, DOI: 10.5281/zenodo.10071293, The SeyBoldReport journail. 2024.
5. M.T. Hojiyev, S.A. Hamroyeva, A.M. Salimov. “Tola sifatini aniqlash”. o‘quv qo‘llanma TOSHKENT «TURON-IQBOL» 2006