Influence of short fibers on the quality characteristics of the product, yield of yarn and waste of cotton fiber

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ABSTRACT: This article is devoted to the influence of short cotton fibers and trash on the yarn quality parameters, as well as the yield of yarn and waste of cotton fiber. Carding process at a spinning mill is the last step of removing trash and defects such as neps, peel, seed count neps. Flaws found in the card sliver directly affect the number of defects in the yarn. These defects can not be detected by weight testing and roving sliver. In order to determine short fibers in the card sliver modern fiber measuring instrument USTER AFIS PRO-2 is used. As an object three different lots of cotton fiber of sort 1 in 4 types of selection C-6524 were taken from three different cotton cleaning factories. Studies have shown that removal of neps, short fibers and trash are not dependent on each other. As well as analysis of the results showed that the yarn produced from cotton fibers in cotton cleaning factory-1 meets 5% level according to international standard USTER tester. In this factory cotton fiber have been reported with short fiber content of about 5.6%, and the number of neps 227 units per gram of fiber. Second and Third cotton factories' fibers comprising a short fiber content of 8.7% and 10.3%, and the number of neps are 269 and 280 units respectively. Studies showed that the content amount of short fibers is not changed, and in the process of carding even increases so that it requires careful research.

KEYWORDS: fiber, nep, seed count nep, sliver, roving, carding, yarn, spinning.

1 INTRODUCTION

In the textile industry it is well known that, price of raw materials is a significant part of the cost of production in spinning factories. Hence - the process of optimizing the use of raw materials is the main objective of control and requires changes in the properties of the fibers in the spinning process.

Carding department at spinning mill is the most demanding area to support the management of this process. Carding process is the last opportunity to remove trash and defects such as neps, peel, seed count nep in the card sliver before spinning. Without considering combing process it is difficult to remove trash and vices.

Number of defects such as neps and thickened place on yarn directly related to neps, skin particles, seeds and short fibers that are in the card sliver. Neps and short fiber content are in carding and tape can not be detected by testing the weight and roving.

As a result, it is possible that the tape with an acceptable coefficient of variation and roving can create ineffective spinning that causes the production of low-quality yarn.

2   RESEARCH AND ANALYSIS OF THE EFFECTIVENESS OF CARDING COTTON FIBER

2.1   SHORT FIBER CONTENT (SFC)

Applied information in this article focuses on the changes in neps, quantity of short fibers and trash in the spinning process.

Short fiber content (SFC) - an assessment of short fiber included in cotton fiber. During the calculation method used «suter-web» - the array to measure the number of fibers in each group lengths or mass fraction, expressed as a percentage of the quantitative. It is known that fibers with a length less than 0.5 inches (12.7 mm) are not used in the spinning process and removed as waste. \

In the process of carding short fibers and neps should be removed, however experiments showed that these trashes are partially removed.

2.2   REMOVAL EFFICIENCY OF NEPS, TRASH AND SHORT FIBER IN CARDING TAPE

Checking the contents of the number of neps, short fibers, trash and cleaning efficiency on carding machines showed that removal of neps, short fibers and trash are not dependent on each other.

Removal efficiency of defects in carding tape of fiber 1-grade 4-type selection C-6524 in cotton factories of Uchkurgan, Namangan and Pop-3 are shown below (Figure 1)
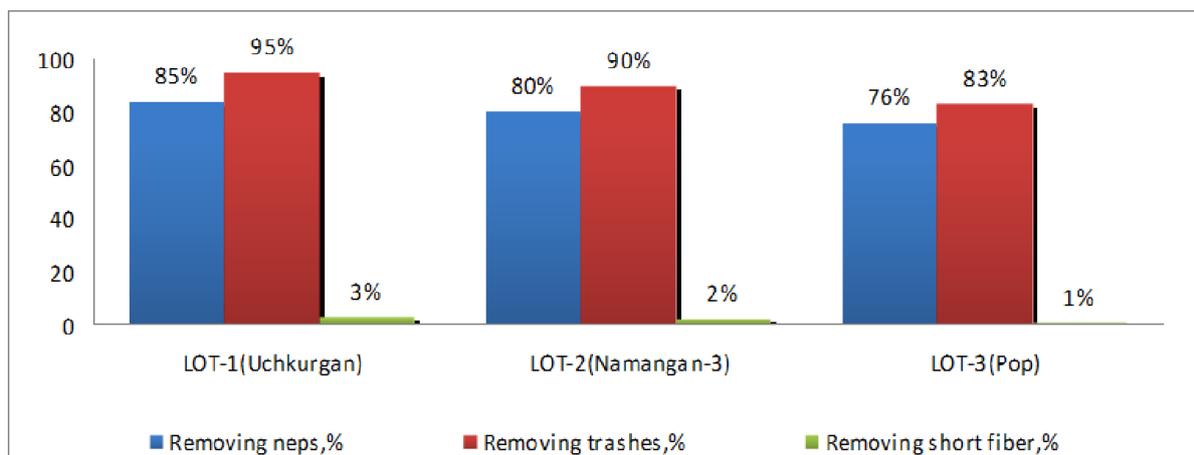

Fig. 1. Removal efficiency of neps, trash and short fiber in carding tape

The share of fibers with a length of less than 0.5 inches should range from 2% to 20%. [2]

2.3   QUALITATIVE INDICATORS OF COTTON FIBER

The level of short fiber content should be verified by the card sliver using modern fiber measuring instrument USTER AFIS PRO2 on ENTERPRISE LLC HAIN TEX. As an experimental object, we took three different lots of cotton fiber of sort- 1, type-4, selection C-6524 from three different cotton factories. (Table 1)

Qualitative indicators of 4-type, 1-sort cotton used for the production of ring yarn T = 19,8 tex (Ne = 30 'S) are given below:

Table-1. Qualitative indicators of cotton fiber

Fiber lots	Total Nep Count [Cnt/g]	Seed Count Neps [Cnt/g]	L(w) [inch] Average length	Short Fiber Content (w) %0.5inch	Average Upper Length(w) [inch]	L(n) [inch]	SFC(n) % 0.5 inch	5% L(n) [mm]
LOT-1(045)	227	16	24,58	5,63	29,5	20,45	17,37	33,7
LOT-2(042)	269	22	24,0	8,7	29,2	20,0	22,63	33,4
LOT-3(028)	280	28	24,2	10,3	29,04	20,01	27,1	33,2

Table 1. Continuation

Fiber Lots	Maturity Ratio	IFC [%]	Total Trash Count [Cnt/g]	Dust Count [Cnt/g]	Trash Count [Cnt/g]	VFM [%] Visible Trash	Fineness [mtex]
LOT-1(045)	0,93	4,85	307	268	33,4	1,015	166
LOT-2(042)	0,91	5,02	444	398	39	1,091	164
LOT-3(028)	0,92	5,4	880	805	74	1,7	165

Optimization the process of removing neps, short fibers and trash on carding machine is one of the most important tasks in the development of yarn. On this occasion, all three parties of fibers were tested on laboratory equipment for cotton - fiber content on the number of neps and short fibers. The result of the analysis is given below (Fig. 2).
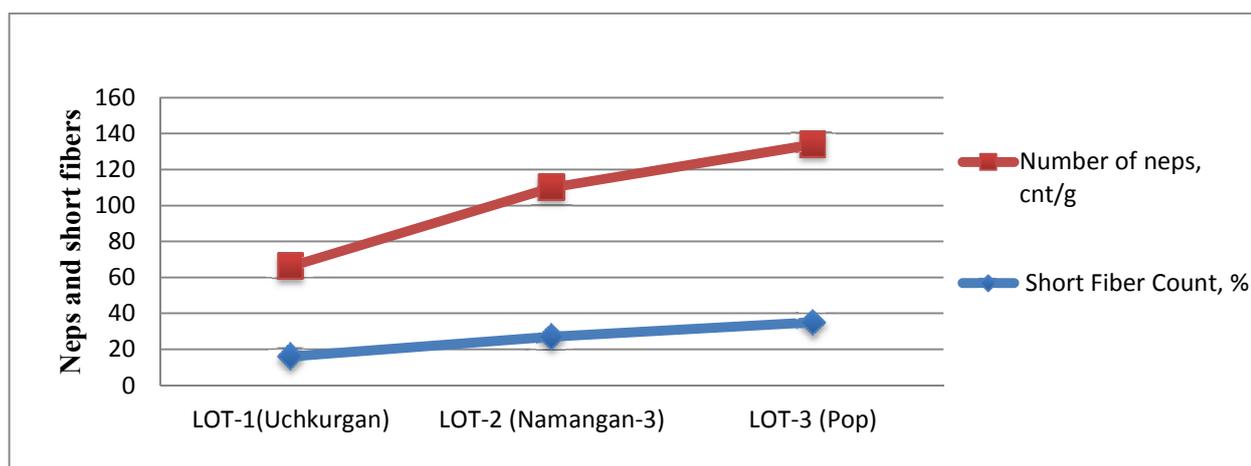

Fig. 2. Analysis of the number of neps and short fibers on the card sliver

Proceeding with research, in the development of given yarn there is linear density and determined amount of short fibers on transition to spinning.
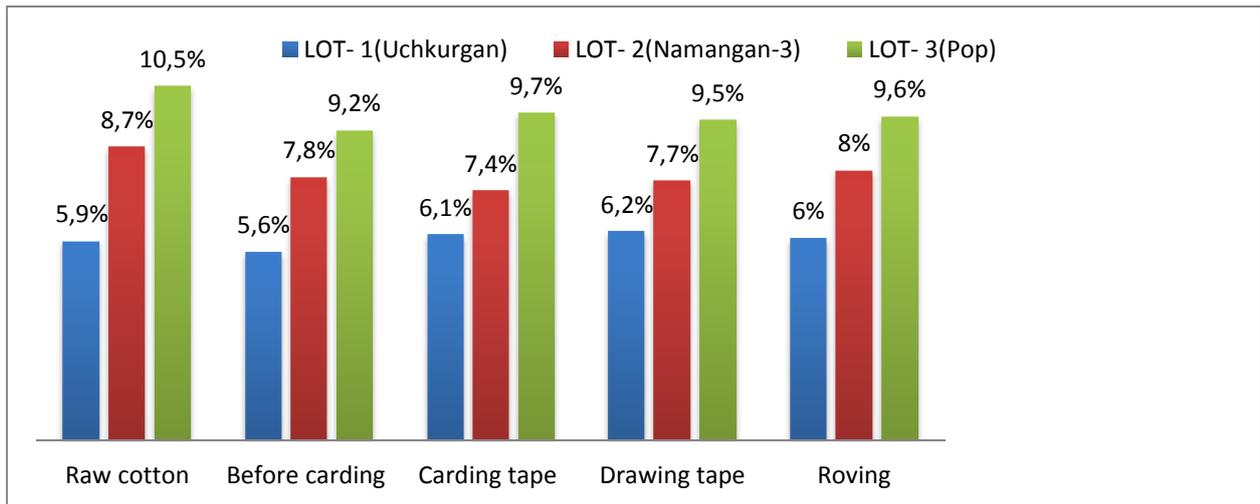
Fig. 3. Analysis of the amount of short fiber content (SFC) in the spinning process at the transitions, %

As seen in the Fig.3 number of short fiber content is not changed, but even in the carding process increases. It follows that the carding process requires careful research.

3   RESEARCH TO DETERMINE THE QUALITATIVE INDICATORS OF SINGLE YARN

Quality indicators on a single yarn, such as values, thick places (THICK +50%) and neps (NEPS +200%) in and Lot -2, Lot -3 relatively higher than Lot-1. According to laboratory tests processed, cotton yarn fibers Lot-1 showed better results and it is included in the 5% level according to international standard Uster, (Table 2) [3]. Exactly this standard is used in most of the Uzbek textile enterprises. This is due to the fact that the party on the cotton fibers LOT-1 was made with the presence of short fibers in the fiber limit, 5.6%, and the amount of neps 227 pcs. per gram of fiber. Lot-2 and Lot-3 content of short fibers is within 8.7% and 10.3% respectively. The number of neps are 269 and 280 pc. per gram of fiber (Table 1). This proves that the short fibers and the number of neps have a major impact on the quality characteristics of manufactured product and can be one of the aspects that affect badly to the quality of yarn.

Table 2. Qualitative indicators of single yarn Ne 30S '(19,8 tex) generated at spinning factory SP LLC HAIN TEX from three different lots of cotton fiber

	LOT	Uster statistics-2001			KCD 30'		
		5%	25%	50%	LOT-1	LOT-2	LOT-3
	COUNT (Ne)	30	30	30	30,00	29,90	29,90
	CV % / Count	1,00	1,50	1,90	1,76	1,88	1,93
	Rkm	18,80	16,80	15,70	15,97	15,40	14,65
	CV % / CV_{RKM}	8,10	8,70	9,30	9,05	9,97	10,02
	ELONGATION /	6,50	6,20	5,80	5,24	5,10	5,03
	CV % / CV_{Elang}	6,80	7,40	8,20	7,73	8,33	7,17
	U % /	11,20	12,00	12,80	11,95	12,23	12,55
	CV % /	14,00	15,00	16,00	15,17	15,62	15,96
I.P.I.	THIN -50% (km) /	6	12	18	8	10	20
	THICK+50% (km) /	100	170	210	160	224	244
	NEPS +200% (km) /	150	220	350	195	238	286
	HAIRINESS /	4,7	5,2	5,5	6,0	6,0	6,0

Table 3. Yield of waste and yarn at different contents of short fibers from three different lots of fiber, the calculation is made in 100 tons of cotton fiber

Lot number of cotton fiber	Short Fiber Content, %	Yield, %	Yield of Waste, %	Loss, %	Average price, USD/kg	Income, USD
LOT- 1(Uchkurgan)	5,6	86,3	11,5	2,2	3,1	266 600
LOT- 2 (Namangan-3)	8,7	85, 1	12,6	2,3	3,1	263 600
LOT- 3 (Pop)	10,5	84,2	13,4	2,4	3,1	261 020

It could be argued that the short fiber content has a significant impact at the spinning process, especially it affects the yield of the fiber yarn. As it can be seen in Table 3 on Lot-1, Lot-2 and 3, the yield of yarn decreased to 85.1% and 84.2%, and Waste increased 12.6% and 13.4%. It can be explained that the content of the short fibers on the fiber Lot-2 and Lot-3 varies, short fiber make up about 8.7%, 10.5% respectively. Short fiber Content on incoming fiber based on Lot-1 is about 5.6% and it shows significantly better results in comparison with LOT-2 and 3. Yield of the fiber yarn is 86.3%, while the yield of Waste is 11.5% (Table 3). To conclude that taking over fiber with the least amount of short fiber will be profitable for spinning mills, as this is the main goal of every company. Analysis of incoming raw materials can serve to solve the above mentioned reasons for spinning production [4].

Cost of raw material is more than 60% of the cost of production in most spinning factories. Having an excellent knowledge of the raw materials has always been the intention of the leaders and managers of factories as raw materials selection determines many reasons. Selection of raw materials is not only important, but using of raw materials is also efficient. This means that in order to control waste disposal, it is necessary to analyze the process of neps exploitation in carding machine. Technological Equipment Settings allow modernizing fiber defects, optimizing the quality and increasing revenue. Consequently management characteristics of fiber spinning factories, is needed to serve effectively in sequence to produce high quality product [1].
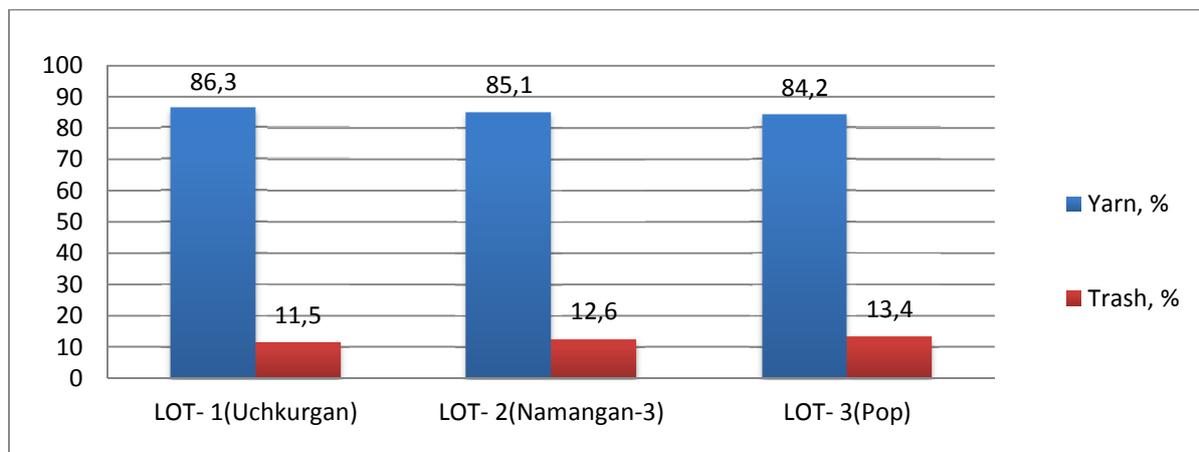

Fig. 4. Analysis of trash and yarn yield from two used fiber lots in the production, calculation is made by 100 tons

4   CONCLUSION

In developing given yarn linear density, we determined the content of short fibers over all transitions spinning.

Studies have shown that removal of neps, short fibers and trash are not dependent on each other. As well as analysis of the results showed that the yarn made from cotton fibers in the cotton factory-1 meets 5% level according to international standard USTER.

Cotton fiber of this factory has been reported with short fiber content of about 5.6%, and the number of neps 227 units per gram of fiber. Cotton fibers in Factories 2 and 3 comprised a short fiber content of 8.7% and 10.3%, the number of neps 269 and 280 units respectively.

Studies showed that short fiber content is not changed, however in the process of carding even increases so that it requires careful research.

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