USTER® *AFIS PRO 2*

Application Report

A new single fiber testing system for the process control in spinning mills

Textile Technology / July 2008 / SE 625

USTER®
Think quality

veronesi\TT\Application Reports\USTER AFIS \ SE-625_A new single fiber testing system for the process control in spinning mills

Contents

1 Introduction

It is well known in the textile industry that the raw material costs represent a considerable part of the entire manufacturing costs in a spinning mill. Therefore it is of utmost interest for spinners to optimize the utilization of raw material and to check at every stage of the spinning process whether the quality characteristics of fibers deteriorate or improve.

In, Fig. 1, the production costs of ring yarns in different countries are given as an example. As we can see, the raw material costs are mostly more than 50% of the total manufacturing costs of a spinning mill. Fig. 1 shows, in addition to raw material, the costs for capital, materials, power, labor and waste for various countries. It can be noticed that there are significant differences between these countries with respect to capital, labor and power.

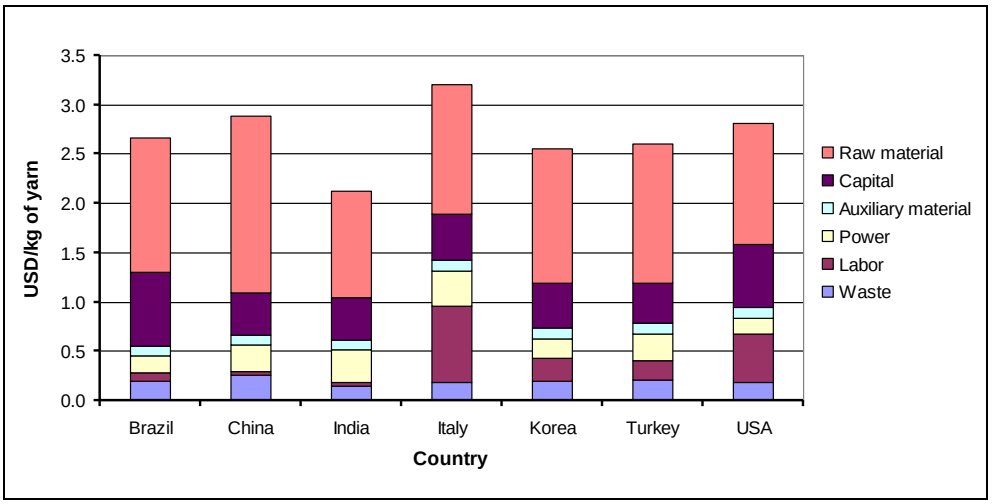


Fig. 1
Ring yarn production costs (Source: ITMF International Production Cost Comparison 2006)

The calculation are based on the following conditions:

- Yarn: Cotton/polyester
- Waste: Costs for waste minus revenues from sale of waste
- Labor: Social charges and shift work, premiums included
- Power: Power consumption of machines, illumination and air conditioning
- Auxiliary material: Spare parts, lubricants, maintenance work on buildings
- Capital: Consisting of depreciation and interest. Depreciation: Machines, accessories, buildings Interest: Cost of capital interest

For details please refer to the “International Production cost comparison” ITMF, December 2006.

It is obvious when analyzing the costs in Fig. 1 that significant steps towards cost reduction can be undertaken if the quality characteristics of fibers can be measured and is used to optimize the raw material purchasing and the spinning process.

In 1993 Uster Technologies introduced a single fiber testing instrument, the Advanced Fiber Information System (USTER® *AFIS*). This measuring instrument permitted the automatic count of the number of neps and the neps size of cotton for the first time. Up until 2003, additional features were developed for this instrument such as the seed coat neps, the fiber length, the short fiber content, the maturity, the fiber fineness, and the number of dust and trash particles. In 2007 the second generation was introduced in the market.

Fig. 2 shows the latest generation of USTER® *AFIS* testers, the USTER® *AFIS PRO 2 AUTOJET* with the automatic sample feeder.

Fig. 2
The USTER® AFIS PRO 2 / Second generation of single fiber testing system

Today, the USTER® *AFIS PRO 2* gives the users the opportunity of testing bales through roving and providing data on neps & seed coat neps classification, length, short fiber content & maturity measurement, trash, dust, and visible foreign matter in percent measurement. Due to its new reporting features, the USTER® *AFIS PRO 2* helps the user to perform process controlling for the spinning preparation processes and can be used in continuous improvements of machine performances, setting optimizations and maintenance. The USTER® *AFIS PRO 2* can bring real benefits to the modern yarn production mill, in terms of both quality and economic efficiency.

2 The new features of the USTER® *AFIS PRO 2*

When we compare the latest USTER® *AFIS PRO 2* with the one generation before, we can see that although the dimensions are bigger than the previous generation, the side parts are eliminated so that the machine is more compact. The system has a Windows XP PRO Operating System and Multi-Language MMI capability (English, Chinese, Spanish, and Turkish) and it includes a reporting manager which creates different reports. The hard disk capacity is increased, it can be 80 GB or more and this gives the opportunity of long-term storage and long-term reports. The printer of the system is hidden inside of the compact cover. For data transfer, CDs, memory stick and USB connection can be used. The user interface of the USTER® *AFIS PRO 2* is also user-friendly.

The new USTER® *AFIS PRO 2* provides the Uster Statistics Percentile, fiber nep count, dust size, roll spacing diagram, critical nep size, removal efficiency, control charts and long-term data storage additionally. The USTER® *AFIS PRO 2* provides many different reports which help the user to manage process control. The long-term reports are also another new and very important feature of the new system.

The operator can also decide whether or not to compare the test results to the USTER® *STATISTICS*. Both the latest 2007 and the previous 2001 edition are available for comparison.
When the operator chooses the USTER® *STATISTICS,* the USP (USTER® *STATISTICS* Percentile Value) will be added at the bottom of the data table (Table 2).

Not only 100 % cotton but also the blends can be tested up to a ratio of 50% cotton / 50% synthetics. The USTER® *AFIS PRO 2* is now reporting dust size and trash size separately. The trash module measures dust and trash particles per gram, in accordance with ITMF recommendations. The previous generation was only supplying the total number of neps and the nep size per gram. The new USTER® *AFIS PRO 2* also reports the fiber nep count and the fiber nep size per gram additionally. In Table 1, we can see the comparison of the two USTER® *AFIS* generations.

Modules/Features	USTER® *AFIS PRO*	USTER® *AFIS PRO 2*
NC Module	✓	✓
Total Nep Count and Size/gram	✓	✓
Fiber Nep Count and Size/gram		✓
Seed Coat Nep Count and Size/gram	✓	✓
Length & Maturity Module	✓	✓
Single Fiber Length by (n) & (w)	✓	✓
Short Fiber Content (%) by (n) & (w)	✓	✓
Maturity Ratio	✓	✓
Fineness	✓	✓
Immature Fiber Content [%]	✓	✓

Modules/Features	USTER® *AFIS PRO*	USTER® *AFIS PRO 2*
Trash Module	✓	✓
Total Trash Count (Dust particles included)	✓	✓
Trash Count / gram	✓	✓
Dust Count / gram	✓	✓
Total Trash Size (Dust particles included)	✓	✓
Trash Size (mean)	✓	✓
Dust Size		✓
Visible Foreign Matter [%]	✓	✓
Autojet	✓	✓
Reports/Data Product	✓	✓
Summary Report	✓	✓
Uster Statistics Percentile		✓
Histograms	✓	✓
Roll Spacing Diagram		✓
Critical Nep Size		✓
Removal Efficiency		✓
Control Charts		✓
Long-Term Data Storage		✓
Operating System		✓
Windows XP/Modern GUI		✓

Table 1 A comparison of the two USTER® *AFIS generations*

3 The reports of the USTER® *AFIS PRO 2*

The user can get different kind of reports from the USTER® *AFIS PRO 2*. These are data reports, application reports and control charts, respectively. The data reports contain individual histograms, summary histograms and summary tables. The histogram reports show the distribution of each fiber property compared to its size group, visualizing the impact of a process on the fiber material. The summary table is also known as the “numeric report” (Table 2) and it provides numeric data on fiber length, fineness, maturity, nep, trash and dust.

As an addition to the numeric report, a summary of the values in the numeric report is given in Table 3. The graphic reports and the control charts will be explained in the following chapters of this article. The fiber sample used for the following tables and graphs was taken from a cotton bale.

Summary Table

USTER® AFIS PRO 2

Company	Uster Technologies AG	AFIS SW version	1.0.4.22
Sample Type	BALE	Report ID	1.0
Program ID		USTER® *STATISTICS*	2007: 100% CO, bale
Blend Level	100% COTTON	Location	

NEP	Rep	Total NepCnt [Cnt / g]	Total Nep Mean Size [µm]	Fiber Nep Cnt [Cnt / g]	FibNep Mean Size[µm]	SCNep Count [Cnt/g]	SCNep Mean Size [µm]
	1	226	825	188	730	38	1'293
	2	114	774	96	652	18	1'425
	3	132	889	100	686	32	1'522
	4	134	700	108	600	26	1'113
	5	134	690	120	618	14	1'311
	6	138	770	108	660	30	1'165
	7	156	789	128	663	28	1'368
	8	114	789	94	643	20	1'475
	9	108	788	86	639	22	1'370
	10	76	716	68	618	8	1'550
n	10						
Mean		133	773	110	651	24	1359
CV%		29.4	7.8	29.5	5.8	38.1	10.6
Q99%		34	52	28	33	8	126
USP	[2007]	18				77	

LEN	Rep	L(w) [mm]	L(w) CV% [%CV]	SFC(w) %<12.7 mm	UQL(w) [mm]	L(n) [mm]	L(n) CV% [%CV]	SFC(n) %<12.7 mm	5% L(n) [mm]	Fineness [mtex]	Maturity Ratio	IFC [%]
	1	24.4	36.5	9.8	30.4	19.2	52.0	28.0	34.1	169	0.92	6.1
	2	25.2	38.1	10.4	32.0	19.4	54.9	29.9	36.1	167	0.93	5.7
	3	24.8	37.6	9.8	30.7	19.3	53.7	28.6	35.1	159	0.91	6.1
	4	25.4	37.5	9.6	31.6	19.8	53.1	27.9	36.1	161	0.91	6.0
	5	24.6	36.5	8.3	29.8	19.5	51.0	25.2	34.9	155	0.89	5.7
	6	27.0	35.1	7.2	33.2	21.4	51.4	23.9	37.8	165	0.92	5.1
	7	24.5	38.6	10.7	31.0	19.1	53.5	29.1	34.9	174	0.95	4.3
	8	26.1	36.2	8.2	32.7	20.4	53.1	25.9	36.5	162	0.93	4.9
	9	25.5	36.2	8.4	31.2	20.2	50.9	25.2	35.8	164	0.92	5.3
	10	27.0	35.7	7.1	33.0	21.4	51.2	23.4	37.7	175	0.96	4.4
n	10											
Mean		25.4	36.8	8.9	31.6	20.0	52.5	26.7	35.9	165	0.92	5.4
CV%		3.8	3.0	14.2	3.7	4.3	2.6	8.5	3.4	3.8	2.3	12.5
Q99%		0.9	1.0	1.1	1.0	0.8	1.2	2.0	1.1	5	0.02	0.6
USP	[2007]			91				89		<5	35	30

TRASH	Rep	Total Trash Count [Cnt/g]	Total Trash Size [µm]	Dust Count [Cnt/g]	Dust Mean Size [µm]	Trash Count [Cnt/g]	Trash Mean Size [µm]	VFM [%]
	1	426	319	356	182	70	1'016	1.62
	2	220	313	188	193	32	1'016	0.86
	3	584	247	530	136	54	1'334	2.19
	4	178	291	148	178	30	848	0.47
	5	510	204	482	155	28	1'038	0.89
	6	1'412	251	1'286	147	126	1'310	5.34
	7	848	241	784	176	64	1'040	2.01
	8	280	273	258	188	22	1'261	0.86
	9	472	314	392	191	80	919	1.64
	10	320	292	282	170	38	1'196	1.41
n	10							
Mean		525	275	471	172	54	1'098	1.73
CV%		70.2	13.8	72.6	11.4	58.9	15.2	80.1
Q99%		323	33	299	17	28	146	1.21
USP	[2007]			45		30		75

Table 2 The USTER® AFIS PRO 2 Summary Table / Numeric Report

Test Result	Abbreviation	Mean Value	USTER® *STATISTICS 2007*
NC Module			
Total Nep Count per gram (Fiber neps + seed coat neps)	Tot. Nep [Cnt/g]	133	18%
Total Nep Mean Size [micron] (Fiber neps + seed coat neps)	Tot. Nep Size [µm]	773	
Fiber Nep Count per gram	Nep [Cnt/g]	110	
Fiber Nep Mean Size [micron]	Nep Size[µm]	651	
Seed Coat Nep Count per gram	SCN [Cnt/g]	24	77%
Seed Coat Nep Size [micron]	SCN Size [µm]	1359	
L&M Module			
Mean Length by weight	L(w) [mm]	25.4	
Length Variation by weight	L(w) CV%	36.8	
Short Fiber Content by weight	SFC (w)	8.9	91%
Upper Quartile Length by weight	UQL (w)	31.6	
Mean Length by number	L(n)	20.0	
Length Variation by number	L(n) CV%	52.5	
Short Fiber Content by number	SFC (n)	26.7	89%
5%-Length by number	L(n) 5%	35.9	
Fineness [millitex]	FINE [mtex]	165	< 5%
Maturity Ratio	MAT	0.92	35%
Immature Fiber Content [%]	IFC [%]	5.4	30%
T Module			
Total Trash Count per gram (Dust particles included)	Tot. Trash [Cnt/g]	525	
Total Trash Size [micron] (Dust particles included)	Tot. Trash Size [µm]	275	
Dust Count per gram	Dust [Cnt/g]	471	45%
Dust Mean Size [micron]	Dust Size [µm]	172	
Trash Count per gram	Trash [Cnt/g]	54	30%
Trash Mean Size [micron]	Trash Size [µm]	1098	
Visible Foreign Matter [%]	VFM [%]	1.73	75%

Table 3 The summary values of the numeric report in Table 2

4 The USTER® *AFIS PRO 2* Modules, their functions and the histograms

The USTER® *AFIS PRO 2* histograms show the distribution of the fiber length, fineness, maturity, nep, trash and dust. Every histogram can be presented as an individual or a summary histogram and they both can be defined in percentage or numeric values. In this article, the modules and the histograms are explained with practical examples taken from Table 3 (Table 2) and the general ranges for fiber length, short fiber content, maturity, the amount of neps, seed coat neps, dust, trash, and V.F.M. in raw cotton are also given additionally.

4.1 The NC Module: Measurement of neps and seed coat neps

The NC Module is included in the basic configuration of the USTER® *AFIS PRO 2*. NC stands for “Nep Classification” and measures the amount and the size of neps and seed coat neps in raw cotton, card mat, sliver and roving.

In Fig. 3, the blue colored bars on the neps / seed coat neps histogram show fiber neps and the red colored bars show seed coat neps. In our sample, the number of neps per gram is 133. This value is a low value for bales according to the general ranges and it is equivalent to 18% of the USTER® *STATISTICS*. The number of seed coat neps per gram is 24. According to general ranges in raw cotton, it is a medium value and is equivalent to 77% of the USTER® *STATISTICS*. Table 4 represents the experience values for nep counts.

The Ranges of Neps and Seed Coat Neps in Raw Cotton (short/medium staple)		
Neps/ g	**Seed coat neps / gram**	**Description**
< 100	< 10	Very Low
101 – 200	11 – 20	Low
201 – 300	21 – 30	Medium
301 – 450	31 – 45	High
> 451	> 46	Very High

Table 4 Nep counts

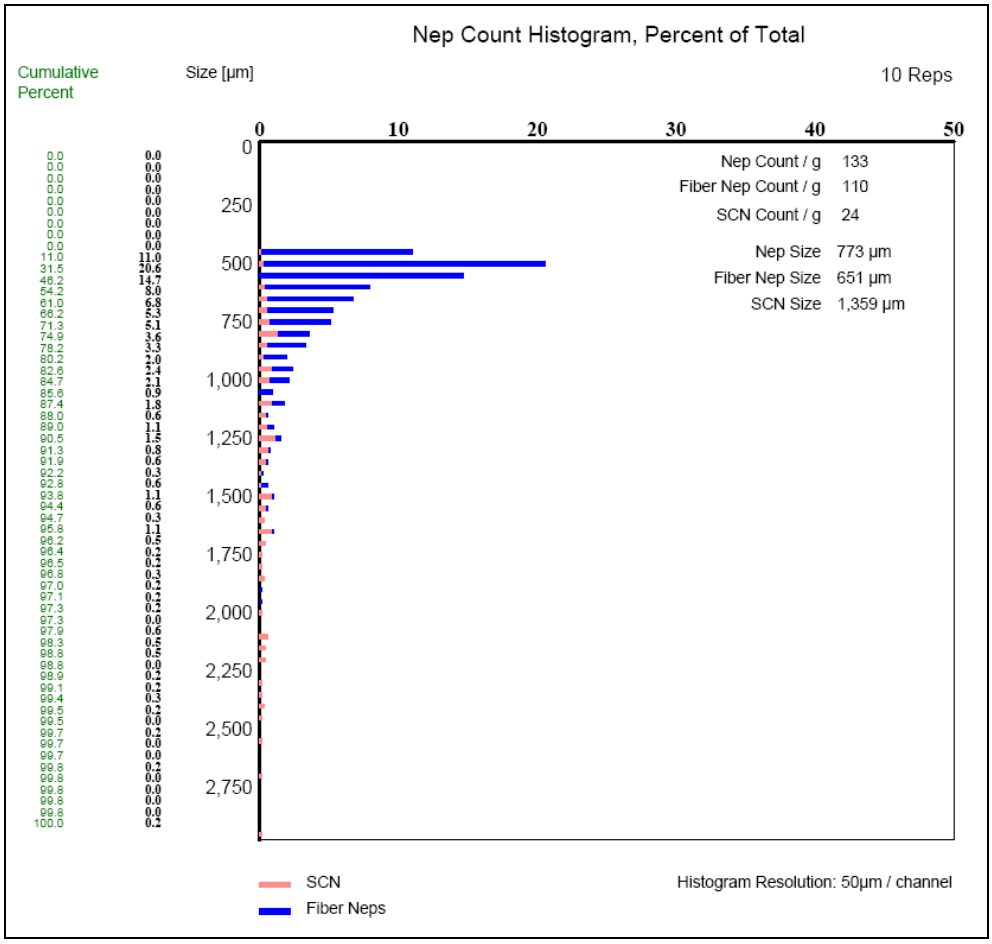


Fig. 3
The USTER ® AFIS PRO 2 Neps / Seed Coat Neps histogram, Summary

4.2 The L&M Module: Measurement of the fiber length of cotton

The L&M Module measures fiber length and maturity in raw cotton, card mat, sliver and roving. The length is measured based on single fibers in order to get a true fiber length distribution within a cotton sample.

Since the single fiber measuring system is able to measure each individual fiber, it is possible after the test to mathematically arrange the fibers as an end-aligned staple diagram. Such a staple diagram is shown in Fig. 4 which shows the fiber length definitions.

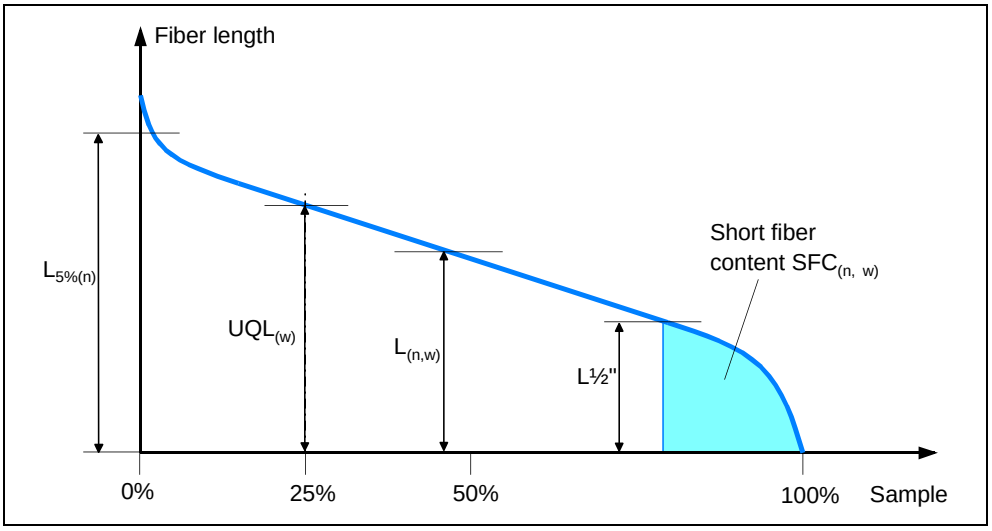


Fig. 4
Staple diagram and fiber length definitions

$L_{5\%(n)}$ represents the fiber length which is only exceeded by 5% of all fibers.

$UQL_{(w)}$ represents the Upper Quartile Length. This is the most important length definition. This value is equivalent to the classer's staple.

L(n,w) is the mean length by number or by weight.

L½" is the length (12,7mm) which defines the amount of short fibers. Fibers below this length are counted as short fibers. However in China, fibers below 16,5 mm (0.65 inch) are counted as short fibers. The USTER® *AFIS PRO 2* gives the user the chance of defining the required short fiber length before the measurement begins.

The "by number" distribution shows the true fiber length distribution in the sample. It is the direct result of counting every single fiber during measurement. Short and long fibers are treated equally.

The "by weight" distribution is based on the weight of the fibers and is always biased towards the longer fibers since the longer fibers weigh more than the shorter fibers.

Example:

In Table 2 the short fiber content by number SFC(n) is 26,7%, i.e. 26,7% of all fibers are shorter than 12,7 mm. If we put this amount of fibers on a scale, it represents only 8,9% of the sample (SFC(w)).

The length by number is determined by the USTER® *AFIS PRO 2* by counting each fiber and determining the length of the fibers. The length by weight is a calculated value.

In Fig. 5, while the blue colored bars on the Summary L (n) histogram (by number) are showing the fibers having normal length, the red colored bars are showing short fibers. In our example (Fig. 5), the short fiber content by number in percent (SFC (n)) is 26.7 and this value corresponds to 89% of the USTER® *STATISTICS*. Table 5 represents the experience values for short fiber content.

The Ranges of Short Fiber Content (n) and (w) in Raw Cotton (short/medium staple)		
Short Fiber Content by number	**Short Fiber Content by weight**	**Description**
< 18	< 5	Very Low
19 – 23	6 – 8	Low
24 – 28	9 – 11	Medium
29 – 33	12 – 14	High
> 34	> 15	Very High

Table 5 Short Fiber Content by number and by weight

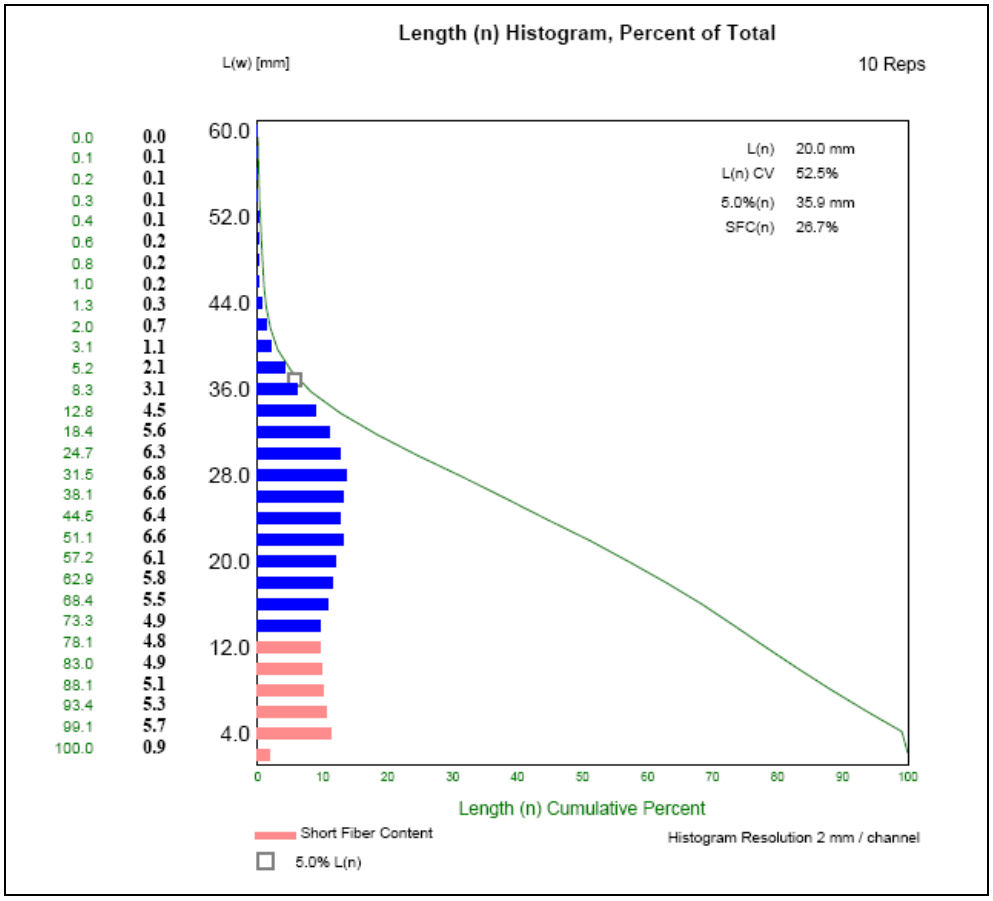


Fig. 5
The USTER ® AFIS PRO 2 L (n) histogram (by number) & Dstribution Curve, Summary

Fig. 5 is based on the sample of Table 2.

4.3 The L&M Module: Measurement of the fibers fineness

Fiber Fineness [mtex] is determined optically by the USTER® *AFIS PRO 2* by analyzing the fiber shape passing the sensors. The mature fibers contain more cellulose than immature fibers. Thus, mature fibers are also heavier fibers than immature fibers. This results in a higher fineness value for mature fibers. Immature fibers contain less cellulose, therefore result in a lower fineness value.

In Fig. 6, the blue colored bars on the fineness histogram show the fineness of the fibers. In our sample, the mean fiber fineness is 165 mtex. This value is equivalent to the 5%-line of the USTER® *STATISTICS*, i.e. for a fiber length UQL(w) of 31,6 mm it represents a coarse fiber.

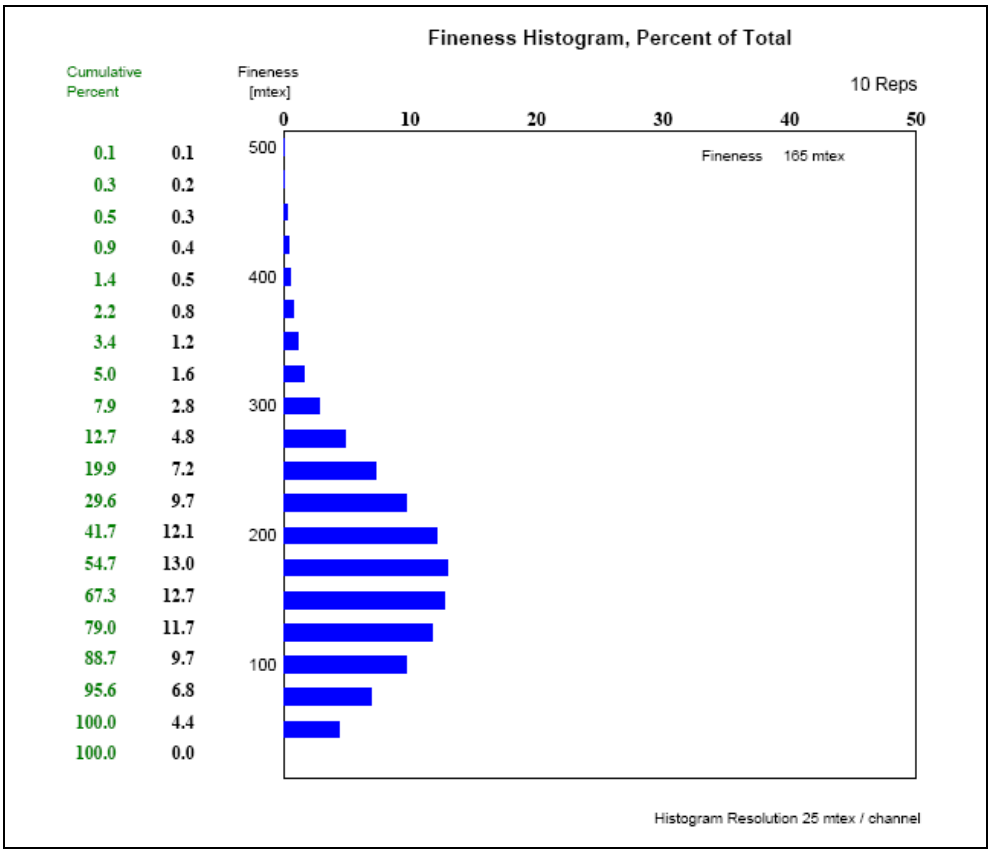


Fig. 6
The USTER® AFIS PRO 2 Fineness histogram, Summary

Fig. 6 is based on the sample of Table 2.

4.4 The L&M Module: Measurement of the maturity of cotton fibers

The fiber maturity is an important quality parameter of cotton. Since immature fibers can only absorb a reduced amount of dyestuff, shade variations must be expected in woven or knitted fabrics, particularly if immature fibers are not evenly distributed.

In Fig. 7, the blue colored bars on the maturity histogram show the mature fiber content and the red colored bars show immature fiber content. In our sample, the maturity ratio is 0.92. According to general ranges, we can say that the fibers are mature and the maturity ratio value is equivalent to 35% of the USTER® *STATISTICS*. The immature fiber content is 5.4% in our example, and this represents a low value. This value corresponds to 30% of the USTER® *STATISTICS.* Table 6 represents the experience values for fiber maturity for the sample shown in Table 2.

The Ranges of Maturity and Immature Fiber Content in Raw Cotton (short/medium staple)			
Maturity	**Description**	**Immature Fiber Content %**	**Description**
< 0.75	< Very immature	> 15	Very High
0.76 – 0.85	Immature	12 – 14	High
0.86 – 0.90	Mature	9 – 11	Medium
0.91 – 0.95	Mature	6 – 8	Low
> 0.96	> Very mature	< 6	Very Low

Table 6 Fiber maturity

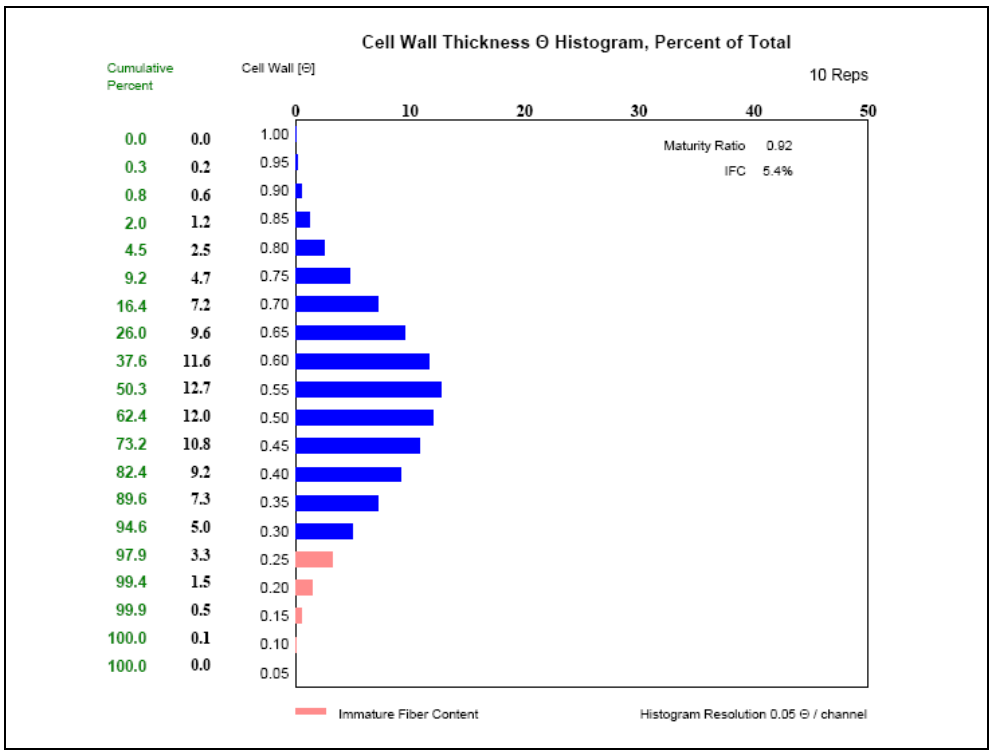


Fig. 7
The USTER® AFIS PRO 2 Maturity histogram, Summary

4.5 The T Module: Measurement of trash and dust in cotton fibers

The T Module measures the amount and size of dust and trash particles in cotton fibers. The Trash Module measures dust and trash particles per gram, in accordance with ITMF recommendations. Trash and dust particles are foreign particles which are mostly part of the cotton plant (leaf or stem fragments, etc.). These particles need to be extracted during the ginning and spinning process.

The measurement of dust size is especially important for compact spinning. The bigger dust particles may cause a reduction in the air suction and a change in the yarn spinning curve during compact spinning process. As a result, the efficiency of the compacting process may decrease. Increased cotton dust levels result in higher abrasion in all stages of spinning and processing.
In addition, high dust content in finisher sliver can also cause a Moiré effect in open-end spinning, and increased ends-down levels in further processing. Also in OE-rotor and Airjet spinning, the amount of dust and trash is very important.

In Fig. 8, the blue colored bars on the trash histogram show the trash particles and the red colored bars show the dust particles. In our example, the number of the trash particles per gram is 54. We can say that this bale has a low amount of trash particles. This value is equivalent to 30% of the USTER® *STATISTICS*. The number of the dust particles per gram is 471. This is a medium value according to general ranges and it is equivalent to 45% of the USTER® *STATISTICS.* In Fig. 8, we can also see that the visible foreign matter value is 1.73%. This is a medium value and is equivalent to 75% of the USTER® *STATISTICS.* Table 7 represents the experience values for dust and trash.

The Ranges of Trash, Dust Content and Visible Foreign Matter in Raw Cotton (short/medium staple)			
Trash count / g	**Dust count / g**	**V.F.M. in %**	**Description**
< 25	< 200	< 0.60	Very Low
26 – 75	201 – 350	0.61 – 1.20	Low
76 – 110	351– 600	1.21 – 2.30	Medium
111 – 150	601 – 1000	2.31 – 3.00	High
> 151	> 1001	> 3.01	Very High

Table 7 Fiber dust and trash

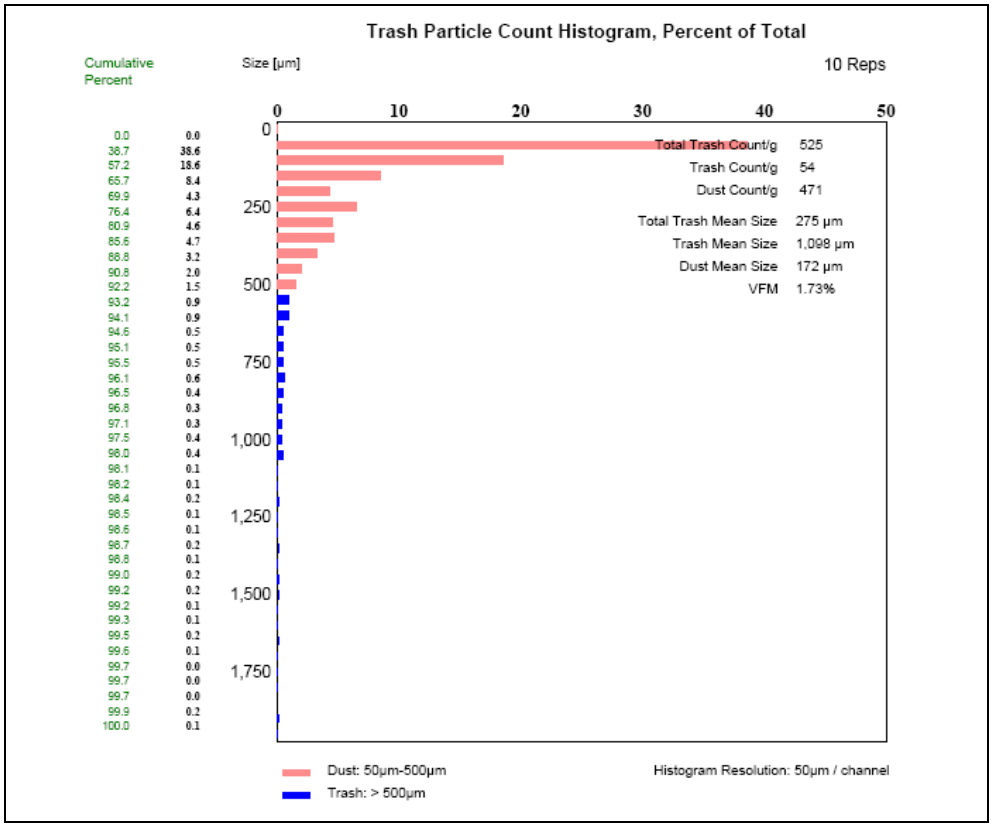


Fig. 8
The USTER® *AFIS PRO 2*
Trash histogram, Summary

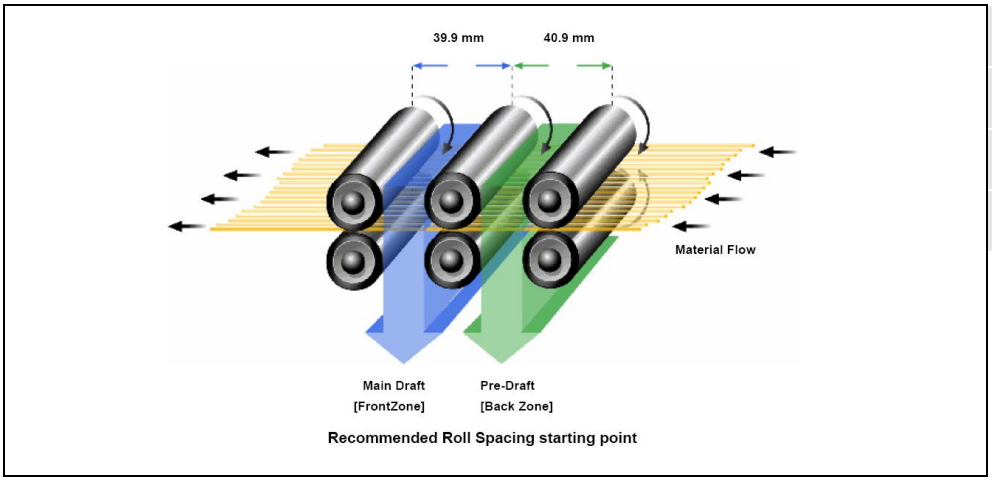
Fig. 8 is based on the sample of Table 2.

5 The new reporting features

The application reports and the control charts are the new reporting features on the USTER® *AFIS PRO 2*. The application reports of the USTER® *AFIS PRO 2* are the critical nep size, the roller spacing and the removal efficiency diagrams, respectively, and they are explained below with examples.

5.1 The roll spacing diagram

When mills change the usual cotton fiber, the 5% length value (by number) can be used to determine the critical starting point for properly setting drafting rolls. In Fig. 9, it is explained how to use this value for setting drafting rolls of a drawframe with the help of a roll spacing diagram. We can see in the table, Fig. 9, that the mill was previously using cotton fibers which had a 5% length of 42.4 mm and now begin to use a fiber having a 5% length of 35.9 mm. For this reason, it is recommended that the spinner changes his settings and uses 39.9 mm instead of 46.1 mm for the front zone and 40.9 mm instead of 47.1 mm for the back zone. As we have mentioned before, these values can be used as a first trial for a drawframe roll spacing settings. The final values should be determined by the user according to own experiences and the machine conditions.



Key Parameter	Original Cotton	*New Cotton*
AFIS L 5% (n)	42.4 mm	35.9 mm
Front Zone (mm)	46.1 mm	39.9 mm
Back Zone (mm)	47.1 mm	40.9 mm

Fig. 9
Roll spacing diagram of the USTER® *AFIS PRO 2*

The system automatically calculates the space settings based on the 5% length value by number.

5.2 The critical nep size diagram

The critical nep size in a yarn is equivalent to the size which can easily be seen in a yarn or in a fabric. The blue lines in Fig. 10 represent the critical size of the neps. It can easily be recognized that a nep has to be larger for coarse yarns to be disturbing in a yarn or fabric. These two investigations to determine the critical nep size (blue lines Fig. 10) were made in the laboratory of Uster Technologies.

The critical nep size diagram can be used for both ring and OE-rotor yarns. Managing the critical nep size in slivers at the last drawframe in ring and OE - rotor spinning will lead to reduced yarn nep defects and a better quality fabric. In Fig. 10, the diagram of the critical nep size for ring yarns is given. The sample in the upper diagram has a neps mean size of 773 micrometer.

When the spinner chooses a yarn count of Ne 40, the neps may be disturbing in the finished fabric. This fact is shown by a red dot in the first diagram in Fig. 10. A mean size of 773 micrometer in a yarn, count 20, is hardly disturbing (lower diagram, Fig. 10). This is represented by a green dot.

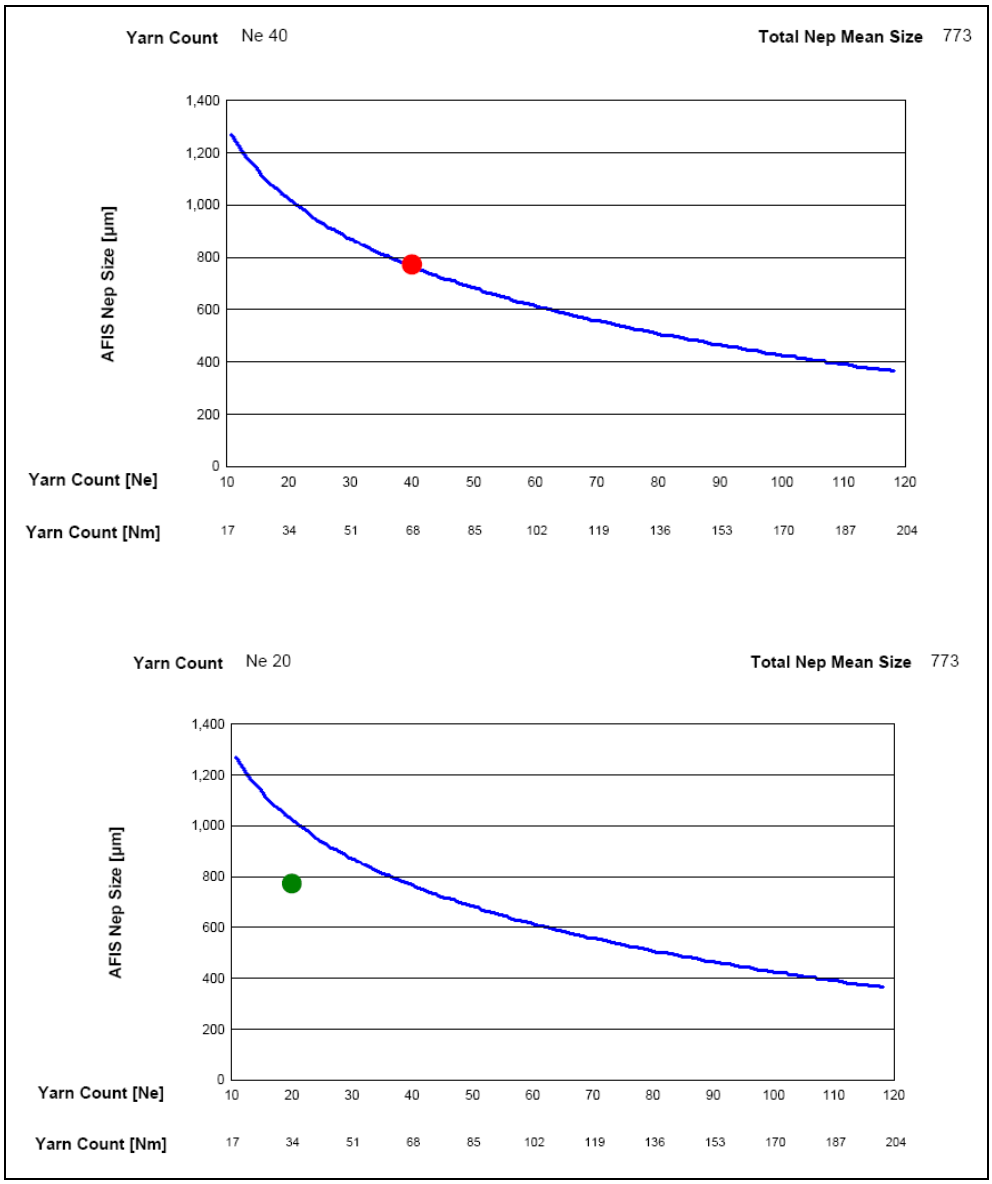


Fig. 10
Critical nep size for ring yarns (Ne 40, Ne 20)

5.3 The control chart

The control charts of the USTER® *AFIS PRO 2* can be used for comparing, controlling and monitoring production processes. In Fig. 11, an example for a multiple control chart is given. Here the red line shows the control line or control limit values which was established by the user. Establishing control limit values allow for monitoring machines, which exceed the tolerance limit, for better maintenance scheduling and minimizing off-quality yarn.

In this diagram, the seed coat neps, short fiber content and immature fiber contents of five different samples from the card mats were compared (the control limit values SCN = 20, SFC = 25% and IFC = 5% were selected). The same diagram can be drawn only for one machine but for a certain period, for example for six months, in order to get a long-term report.

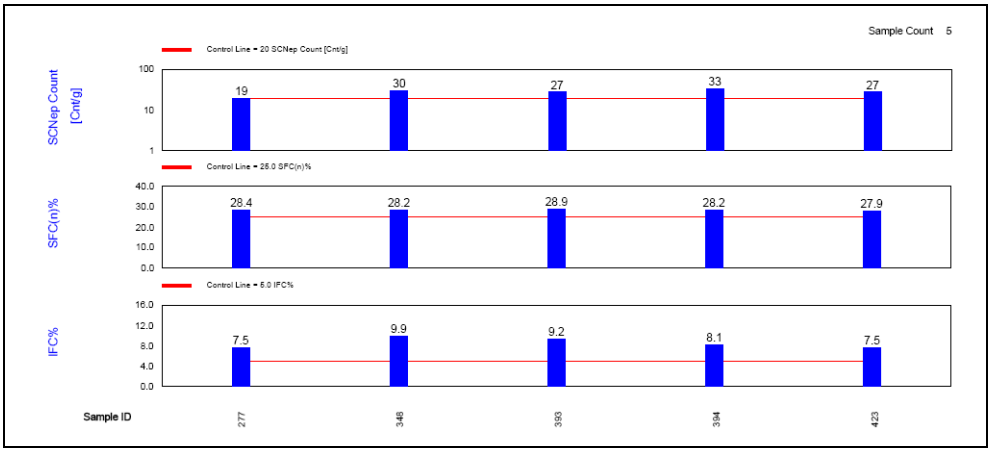


Fig. 11
The multiple control chart diagram of the USTER® AFIS PRO 2

5.4 The removal efficiency diagram

The user can determine neps, seed coat neps, trash, dust, visible foreign matter and short fibers removal efficiency of a certain machine (Fig. 12; cards) or by using the removal efficiency diagram. In Fig. 12, the nep removal efficiency of five cards (Input = card mat, output = card sliver) in a spinning mill was given. The control limit was determined as 80 % and as we can see from the figure, with the exception of the 5th card (78%), the nep removal efficiencies of the machines are fulfilling the requirements.

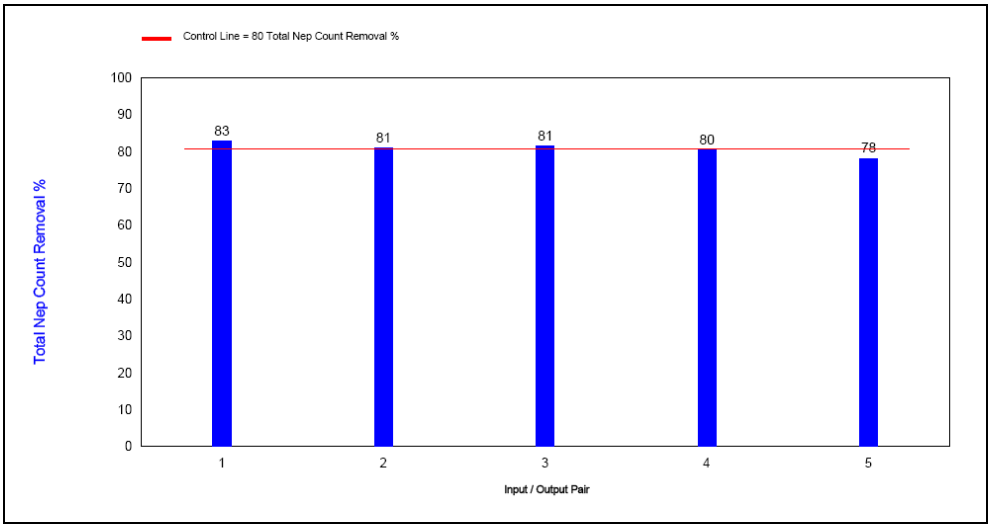


Fig. 12
Nep removal efficiency at a card (control line = 80%)

6 Conclusion

The raw material costs represent more than 50% of the entire manufacturing costs in most of the spinning mills. Therefore it was always the intention of mill owners and managers to have an excellent knowledge of the raw material, because the right selection of the raw material determines in many cases whether the mill generates a sufficient margin. But not only the right selection of raw material but also the efficient use of raw material are also very important. It means monitoring the preparation processes to control waste removal, nep removal, card maintenance, machine settings to minimize fiber damage, optimize quality, and increase profitability. Therefore, controlling the fiber characteristics is necessary for a spinning mill to operate efficiently and to consistently produce a quality product.

Today, the USTER® *AFIS PRO 2* gives the users the opportunity of testing bales through roving and providing data on neps & seed coat neps classification, length, short fiber content & maturity measurement, trash, dust, and visible foreign matter. Due to its new reporting features, it is also possible to have long-term reports. The USTER® *AFIS PRO 2* helps the user to perform process controlling for the Spinning Preparation Processes and can be used in continuous improvements of machine performances, setting optimizations and maintenance.

The USTER® *AFIS PRO 2* can bring real benefits to the modern yarn production mill, in terms of both quality and economic efficiency. Off-quality claims from the customers because of high nep levels can be reduced. There will also be extra cost savings at the vital preparation stages of opening, carding and combing, thanks to process optimization achieved through using the USTER® *AFIS PRO 2*. This in turn will cut out unnecessary waste and reduce the level of scheduled machine maintenance.

7 Literature

1. Lawrence, C.,A., “Fundamentals of Spun Yarn Technology”, CRC Press LLC, 2003.
2. Lord, P. R., “Handbook of Yarn Production: Technology, Science and Economics”, Woodhead Publishing Limited, 2005.
3. Furter, R., USTER® *AFIS PRO* Application Report: Application of single fiber testing systems for process control in spinning mills, SE 610, November 2007
4. Schleth, A., Peters, G., USTER® *AFIS PRO* Application Handbook: Single fiber testing of cotton, V2.1,245 654-04020, May 2005.

Uster Technologies AG
Sonnenbergstrasse 10
CH-8610 Uster / Switzerland

Phone +41 43 366 36 36
Fax +41 43 366 36 37

www.uster.com
textile.technology@uster.com

USTER®
Think quality