PRACTICAL CASE

Weft break optimization

Weft yarns with the same specification from two spinning mills were found to be performing differently in the weaving mill. How did the weaver deal with this anomaly? Uster Tester 6 and Uster Tensojet did a great job in identifying the yarn that was causing weft breaks. Solving the problem led to improved efficiency and significant cost savings.

A vertical international textile company with spinning, weaving, and finishing operations realized that when weft yarns from two spinning mills were processed in the weaving mill, they were performing differently.

USTER solution

The test reports from Uster Tester 6 and Uster Tensojet helped the textile mill to identify variations and weak points associated with one of the yarns, so that it could be diverted for use in a more suitable application.

Both spinning mills were producing the Ne 20 yarn from 100% carded cotton, using the same raw material and the same technical specifications. But an investigation of the weft breaks showed that the yarn from one spinning mill had 2.7 breaks per 100,000 wefts, while the yarn from the other spinner had 3.5 breaks per 100,000 wefts.

The mill analyzed this difference and tested the delivered yarns in the laboratory with the Uster Tensojet, looking specifically at their tensile properties. At first glance, there were no clear differences. For both deliveries, the average yarn strength (16.9 cN/tex; +/- 0.5) and elongation (6.5%; +/- 0.1) were found to match the specifications (Figs. 1 & 2 – highlighted in red).

Nr	B-Force	Elong.	Tenacity	B-Work
	cN	%	cN/tex	cN.cm
1/1000	509.1	6.41	17.24	868.3
2/1000	522.6	6.46	17.70	893.4
3/1000	510.0	6.40	17.27	870.8
4/1000	502.5	6.38	17.02	853.6
Mean	511.1	6.41	17.31	871.5
s	39.41	0.42	1.335	111.1
CV	7.71	6.56	7.71	12.75
USP™13	62	< 5	63	39
Q95	1.222	0.01	0.041	3.44
Min	304.9	3.61	10.32	302.6
Max	647.7	7.79	21.94	1290
UTRexp*	448.2		15.23	772.8
P0.01 (0)				
P0.05 (2)	358.4	4.18	12.14	402.0
P0.1 (4)	372.3	4.48	12.61	475.5
P0.5 (20)	393.5	5.08	13.33	555.6
P1.0 (40)	411.6	5.28	13.94	589.5

Fig. 1: Uster Tensojet report of yarn from spinning mill 1

Nr	B-Force	Elong.	Tenacity	B-Work
	cN	%	cN/tex	cN.cm
1/1000	485.7	6.56	16.45	867.3
2/1000	491.8	6.58	16.66	882.1
3/1000	484.2	6.37	16.40	847.6
4/1000	485.9	6.34	16.46	853.6
Mean	486.9	6.46	16.49	862.7
s	35.39	0.50	1.198	115.0
CV	7.27	7.78	7.27	13.33
USP™13	74	< 5	76	41
Q95	1.097	0.02	0.037	3.57
Min	331.0	3.77	11.21	345.8
Max	601.9	7.93	20.38	1217
UTRexp*	428.1		14.59	762.5
P0.01 (0)				
P0.05 (2)	344.9	4.36	11.68	435.4
P0.1 (4)	358.5	4.49	12.14	477.0
P0.5 (20)	388.3	5.02	13.15	556.9
P1.0 (40)	400.0	5.19	13.55	589.8

Fig. 2: Uster Tensojet report of yarn from spinning mill 2

Comparison of the yarn uniformity with Uster Tester 6 also showed no clear cause for the different running behavior of the yarns. Both the yarn evenness CVm (15.2%; +/- 0.5%) and the hairiness H (7.00; +/- 0.20) were within the specifications (Figs. 3 & 4 – highlighted in red).

No.	U	CVm	Thin -40%	Thin -50%	Thick 35%	Thick 50%	Neps 140%	Neps 200%	Neps 280%	Neps 400%	Total IP Stand.	Total IP Sens.	Relative count total	H	sh
	%	%	/km	/km	/km	/km	/km	/km	/km	/km	/km	/km	%		
1 / 1	12.15	15.56	295	5	1,335	283	890	100	5	0	388	2,520	0.45	6.90	1.67
2 / 1	12.62	16.22	338	18	1,470	285	943	108	8	0	410	2,750	-1.51	7.20	1.77
3 / 1	11.98	15.17	228	5	1,160	203	863	138	13	0	345	2,250	1.06	6.99	1.72
4 / 1	12.23	15.52	290	8	1,320	220	955	110	8	3	338	2,565	0.00	7.00	1.72
Mean	12.24	15.62	288	9	1,321	248	913	114	8	1	370	2,521	0.00	7.02	1.72
CV	2.2	2.8	15.8	68.0	9.6	17.2	4.8	14.4	38.7	200.0	9.3	8.2		1.8	2.4
s	0.27	0.44	45	6	127	42	44	16	3	1	35	206	1.10	0.13	0.04
Q95	0.43	0.70	72	9	202	68	69	26	5	2	55	328	1.74	0.20	0.06
USP™ 2018		59	66	53	59	72	32	23						55	37
Min	11.98	15.17	228	5	1,160	203	863	100	5	0	338	2,250	-1.51	6.90	1.67
Max	12.62	16.22	338	18	1,470	285	955	138	13	3	410	2,750	1.06	7.20	1.77

Fig. 3: Uster Tester 6 test report of yarn from spinning mill 1

No.	U	CVm	Thin -40%	Thin -50%	Thick 35%	Thick 50%	Neps 140%	Neps 200%	Neps 280%	Neps 400%	Total IP Stand.	Total IP Sens.	Relative count total	H	sh
	%	%	/km	/km	/km	/km	/km	/km	/km	/km	/km	/km	%		
1 / 1	12.34	15.71	263	5	1,448	270	965	138	10	0	413	2,675	0.15	6.60	1.83
2 / 1	11.65	14.90	155	5	1,155	223	855	125	18	0	353	2,165	-1.20	6.78	1.82
3 / 1	11.91	15.16	155	3	1,115	233	790	70	5	5	305	2,060	-0.74	7.14	1.87
4 / 1	11.25	14.42	135	0	938	168	633	75	13	0	243	1,705	1.78	7.28	1.86
Mean	11.79	15.05	177	3	1,164	223	811	102	11	1	328	2,151	0.00	6.95	1.85
CV	3.9	3.6	32.7	76.6	18.2	19.0	17.1	33.7	46.3	200.0	22.0	18.6		4.5	1.4
s	0.45	0.54	58	2	211	42	139	34	5	3	72	401	1.31	0.31	0.03
Q95	0.72	0.85	92	4	336	67	221	55	8	4	115	638	2.09	0.50	0.04
USP™ 2018		46	40	22	51	67	26	19						52	49
Min	11.25	14.42	135	0	938	168	633	70	5	0	243	1,705	-1.20	6.60	1.82
Max	12.34	15.71	263	5	1,448	270	965	138	18	5	413	2,675	1.78	7.28	1.87

Fig. 4: Uster Tester 6 test report of yarn from spinning mill 2

However, a more detailed examination was more informative. Although the mean values of yarn evenness and hairiness for both yarns did not show any difference at first sight, the variation within the individual CVb tests did reveal a clear difference. The yarn from the first spinning mill had a CVb of CVm is 2.8% and the CVb of hairiness H was 1.8%. But these values were significantly higher in the yarn from the second mill – despite the better mean values (CVb of CVm at 3.6% and the CVb of H at 4.5%). This is shown in Figs. 3 & 4, highlighted in blue.

Furthermore, examination of the yarn strength and elongation results of the two deliveries showed differences in the P0.05 and the CVb values – without, however, giving a clear indication (Figs. 1 & 2 – highlighted in blue).

Only with the help of the Uster Tensojet could the problem be visualized.

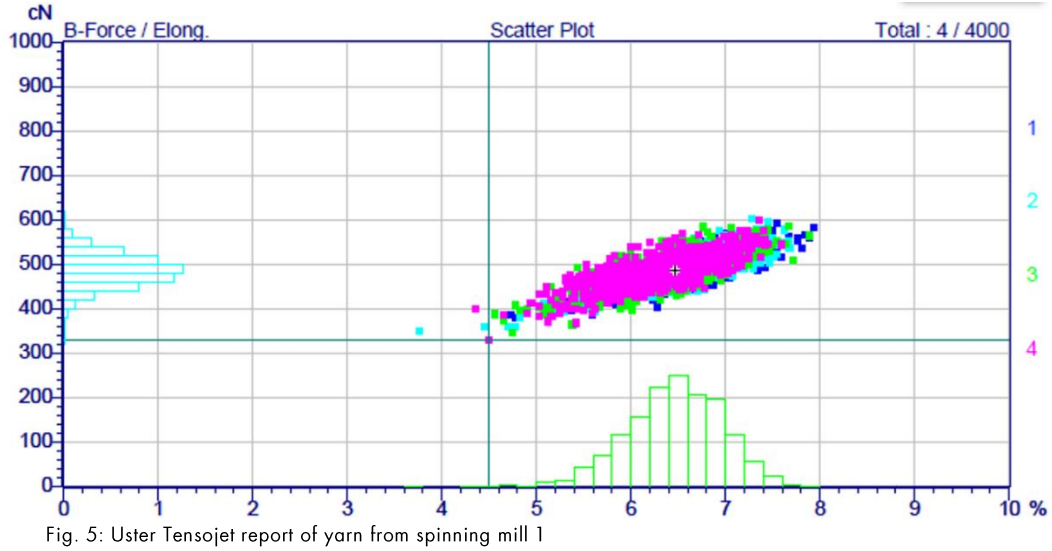

Fig. 5: Uster Tensojet report of yarn from spinning mill 1

The yarn from the second mill showed weak points below the minimum required absolute strength of 350 cN and elongation of 4.5%. These 'soft' yarn spots are a clear indication of possible weft breaks to be expected in the weaving mill (Figs. 5 & 6).

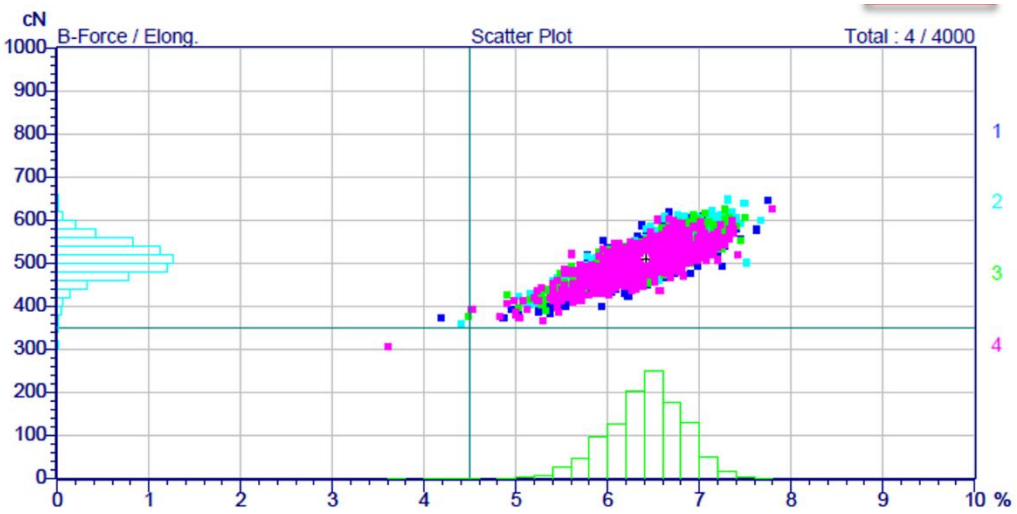

Fig. 6: Uster Tensojet report of yarn from spinning mill 2

Conclusion and Summary

- Average values are not the only important factor in evaluating the quality of a yarn. The variation – and especially the worst values – are decisive for the possible use of the yarn.
- With the help of test reports from Uster Tester 6 and Uster Tensojet, these weak points can be visualized.
- The textile mill in this example used the yarn from the first spinning mill for its normal application and switched the yarn from the second spinning mill to another, less demanding application.
- With this action, the textile mill managed to increase the efficiency of the weaving mill by 1%. This difference in efficiency resulted in savings (directly and indirectly) of around €2,500 per year and per weaving machine.

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