

CHAPTER 4CONCLUSIONS

The prime objective of this survey on Twist, Breaking strength and Count variation is to arrive at National Norms for Sri Lankan Spinning Mills. According to the work done by the author, it has been observed that the current National Norms for Twist, Breaking strength and Count Variations for Cotton yarns produced in Sri Lanka is 7, 15 and 5 respectively.

The manufacturers of the "Uster Tester" have prepared a set of standards¹ based on the results of tests carried out on many yarns from different countries. The standards are for carded and combed yarns spun from various raw cotton varieties and different twist factors.

The test results give a mean twist factor of about 3.9 for carded, 20 tex yarn. For the same yarn, according to this standard chart, a CV percentage of 12 is indicated for the degree of variation of Breaking Strength. Similarly ASTM standard² gives the following limits for the CV% of individual observations.

	Carded CV%	Combed CV%
Yarn numbers	5	4
Breaking load, skein	8	6
Breaking load, single strand	18	16
Twist (direct-counting method)	25	22

Comparing Sri Lankan spun carded yarns against Uster statistics and ASTM standards on breaking strength (single strand) variation, it could be said that the quality of the Sri Lankan spun yarn is satisfactory. In the same way it can be noted that the CV% of twist is also very much lower than the ASTM standards.

According to Uster News Bulletin¹⁷ Zellweger Uster has done work on count variation on 414 samples from many parts of the world. The Uster statistics are expressed in CV% for carded yarns and combed yarns as follows :

	CV%
Carded	2.4
Combed	2.2

When Sri Lankan spun carded yarns are compared against Uster statistics on count variation, it would appear that they are worse than the world average. Although according to the Uster Bulletin¹⁷, the count variations of CV% > 3% can negatively influence the appearance of the finished fabric, the ASTM standard² and Sri Lanka standard¹⁸ give the upper limit for the count variation as 5%. Obviously a yarn with CV% of 3 is a better yarn compared with one having a CV% of 5. However the acceptance of the 5% limit by the ASTM & Sri Lanka standard suggests that this value is not excessive in respect of most end uses.

Further it has been observed by a group of experts¹⁹ after studying various aspects of quality control such as quality control in spinning, that norms supplied by Uster which are based on international surveys may not be applicable in developing countries due to the differences in raw materials and less sophisticated machinery.

The author wishes to suggest the upper limits for National Norms as follows.

	CV%
Twist	7
Breaking strength (single strand)	15
Count	5

Table 1 - Mean Values of Yarn Twist Measurements - 20 TexYarn from Mill A

26.80	20.20	19.00	18.40
23.40	21.40	18.40	18.40
22.00	20.80	19.80	19.00
19.60	20.00	20.20	16.00
21.60	19.00	19.40	21.20
20.40	18.40	20.80	20.80
19.20	18.80	19.60	19.20
22.20	19.60	18.60	18.00
21.60	20.00	17.40	19.40
22.40	18.20	19.40	19.60
22.20	19.60	20.20	18.40
24.00	16.60	19.20	22.60
22.00	18.40	18.40	19.40
20.40	18.60	18.00	19.40
21.40	18.60	18.80	17.40
21.60	19.00	18.20	16.80
21.00	18.60	18.00	19.20
20.20	19.00	18.60	17.40
21.60	18.80	18.00	22.20
21.20	18.60	17.60	19.80
21.00	19.60	18.80	21.60
20.20	19.20	16.80	18.80
20.00	19.60	16.80	17.40
19.80	20.20	17.60	24.60
18.60	20.00	19.20	19.80

Table 2 - Mean Values of Yarn Twist Measurements - 20 Tex

Yarn from Mill B

24.20	21.80	20.60	21.80
23.40	23.60	22.40	20.80
21.60	24.20	22.00	21.80
22.00	22.80	22.80	21.20
21.80	21.60	21.40	21.00
20.00	20.00	21.80	22.80
21.40	22.40	23.00	21.20
21.00	19.40	21.00	20.40
20.40	24.60	23.60	21.00
22.80	20.60	24.00	22.00
24.60	23.00	20.00	19.80
24.80	22.20	22.00	23.80
22.00	22.60	21.00	22.00
20.60	23.80	22.40	21.60
22.00	22.40	21.40	21.20
21.60	21.40	21.20	20.80
21.40	21.60	23.60	23.60
24.00	20.60	22.00	22.40
21.20	22.00	21.60	23.20
22.80	22.00	19.80	25.20
21.00	22.00	21.60	22.20
22.80	22.40	20.20	20.40
23.40	22.20	19.80	20.80
23.60	21.40	22.00	21.20
21.20	20.00		

Table 3 - Mean Values of Yarn Twist Measurements - 20 TexYarn from Mill C

26.00	24.20	23.60	23.40
21.60	22.40	24.60	25.20
23.40	23.20	24.20	24.40
22.80	23.20	24.60	22.80
29.00	23.60	23.60	22.40
24.80	22.20	21.40	21.80
23.40	21.60	22.60	23.80
23.80	22.40	23.20	21.60
23.60	23.00	24.00	18.60
27.20	24.20	20.20	22.40
23.60	22.20	24.00	24.40
22.80	24.00	26.60	25.40
24.40	22.80	24.20	23.20
24.60	23.00	26.40	23.40
23.00	21.60	22.40	24.20
22.20	21.80	22.40	19.80
25.40	26.00	22.20	21.80
20.60	22.80	18.60	19.20
21.60	22.60	23.20	22.60
21.80	24.60	23.80	21.60
22.80	25.00	21.80	20.80
25.00	25.60	25.60	17.60
23.00	26.20	24.00	18.80
23.40	23.40	24.40	19.60
24.40	24.00	21.00	21.80

Table 4 - Mean Values of Yarn Twist Measurements - 14.5 TexYarn from Mill A

20.80	25.60	20.20	23.40
22.20	22.00	22.40	21.40
21.00	21.20	22.60	20.80
21.80	21.20	26.60	24.00
20.00	19.40	22.20	22.00
20.00	22.60	21.80	24.60
20.00	27.20	21.00	21.20
19.20	21.40	24.20	23.60
18.40	24.40	22.20	18.80
22.80	22.20	21.60	22.40
23.80	21.00	24.60	21.00
22.80	24.00	24.00	22.20
21.00	22.20	18.80	21.40
21.80	19.60	22.00	21.00
22.40	21.40	21.40	23.40
22.60	21.80	23.60	21.40
24.40	23.80	21.80	22.00
21.60	25.60	25.60	23.40
22.00	21.60	22.20	20.80
21.00	18.60	21.60	24.80
21.20	18.20	22.40	20.80
22.60	19.40	20.00	23.40
23.80	22.40	20.80	22.00
21.60	21.20	22.40	21.00
21.00	22.80	21.00	22.00

Table 5 - Mean Values of Yarn Twist Measurements - 14.5 TexYarn from Mill B

26.00	22.40	22.20	25.00
25.00	24.60	24.40	23.40
20.80	22.40	23.80	22.60
25.60	27.60	22.80	25.00
23.40	22.60	22.60	23.80
24.20	23.20	25.60	20.80
24.20	25.00	25.00	21.80
26.60	22.00	23.40	23.20
23.80	23.40	25.00	22.60
22.60	21.80	24.60	24.00
21.80	23.40	24.40	22.40
23.80	24.80	25.40	22.40
23.00	22.60	23.20	23.80
22.40	25.40	27.20	25.20
25.20	22.80	22.80	23.40
21.60	22.60	25.40	22.60
26.40	24.60	26.00	22.80
23.60	23.40	26.20	24.20
22.60	24.80	26.60	21.80
22.80	22.60	23.00	21.00
21.60	22.40	23.60	25.80
21.60	23.60	24.00	22.60
22.00	22.40	24.20	23.80
23.40	22.00	26.20	23.60
23.80	24.60	22.40	21.80

Table 6 - Mean Values of Yarn Twist Measurements - 14.5 TexYarn from Mill C

24.20	24.40	23.60	23.80
23.80	23.20	23.40	20.40
22.40	22.60	23.20	21.00
24.60	25.00	23.40	28.00
23.80	23.80	23.80	26.80
23.00	23.00	24.40	24.20
24.40	23.00	24.40	21.60
24.00	25.00	22.20	24.20
24.40	24.80	23.80	22.40
23.20	22.80	20.40	24.80
22.60	25.40	21.00	25.40
25.00	23.80	28.00	20.40
23.80	24.80	26.80	25.20
23.00	24.20	24.20	23.60
23.00	24.00	21.60	23.20
25.00	23.20	24.20	25.80
24.80	23.00	22.40	23.20
22.80	24.80	24.80	24.00
25.40	23.40	25.40	25.80
23.80	23.60	20.40	24.40
24.80	23.20	25.20	24.20
24.20	23.40	23.60	24.80
24.00	23.20	23.20	20.60
23.20	21.60	25.80	22.40
23.00	22.80	23.20	23.40



APPENDIX B

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(Tables 7 to 12)

Table 7 - Mean Values of Yarn Breaking StrengthMeasurements - 20 TexYarn from Mill A

252.50	271.00	225.50	209.00
267.00	242.00	198.50	186.50
224.50	178.50	194.00	218.00
252.00	256.50	236.00	192.60
235.00	166.50	173.50	230.50
233.00	209.00	192.50	231.00
185.50	274.00	194.50	249.00
235.90	271.00	274.50	184.00
234.50	247.50	204.50	219.50
179.00	184.00	250.00	234.00
176.50	167.00	245.50	265.00
247.50	223.50	213.50	248.50
184.00	178.50	264.50	212.50
227.50	234.50	222.50	227.00
220.50	279.50	145.50	192.00
191.50	292.50	219.50	222.50
235.50	215.50	226.00	307.50
187.00	207.00	235.00	196.50
210.00	256.50	195.50	230.00
220.50	195.00	179.00	249.50
232.00	225.00	262.50	230.00
220.00	220.00	199.50	255.50
252.00	219.50	206.00	218.00
205.00	210.50	273.50	250.00
169.50	172.00	225.50	269.00

Table 8 - Mean Values of Yarn Breaking StrengthMeasurements - 20 TexYarn from Mill B

199.50	191.90	190.50	232.50
246.00	213.50	251.00	224.00
219.10	200.50	228.00	221.00
209.50	243.50	202.50	221.00
253.50	240.00	235.50	202.50
173.50	256.50	185.00	188.00
202.50	202.00	198.00	208.50
182.50	228.50	284.50	228.50
218.50	228.50	187.50	228.50
222.00	244.50	201.50	228.00
247.50	221.50	192.50	233.00
244.50	134.50	260.50	233.50
210.00	212.50	208.00	219.00
224.00	250.70	216.50	229.00
206.90	214.50	226.00	251.50
228.50	225.00	235.00	206.50
204.00	206.00	181.50	224.00
249.50	260.00	165.00	216.00
231.40	200.10	181.00	235.50
269.00	219.50	232.50	220.00
257.50	211.50	166.50	219.00
203.50	251.50	224.00	231.00
235.30	182.00	223.50	249.00
234.80	212.20	181.50	176.50
235.50	209.00	177.00	245.00

Table 9 - Mean Values of Yarn Breaking StrengthMeasurements - 20 TexYarn from Mill C

196.50	239.50	198.50	221.50
257.50	315.50	247.00	261.50
258.50	230.00	223.00	206.00
295.00	230.00	256.50	206.50
247.00	237.00	251.00	209.50
250.50	272.00	243.50	304.50
221.50	258.50	214.00	247.10
222.50	257.00	221.00	259.00
252.00	236.50	244.50	238.00
246.00	190.00	237.50	276.50
277.50	244.00	257.50	323.00
246.50	204.00	264.50	310.00
242.00	263.50	229.00	222.50
229.00	273.50	263.80	222.00
225.00	207.50	249.00	257.00
262.50	221.00	280.00	230.00
294.50	220.50	203.50	241.50
241.50	241.00	274.50	228.00
288.00	267.00	215.50	305.50
260.50	203.00	206.50	281.00
233.50	209.00	209.50	210.00
297.00	252.50	252.00	272.00
193.00	232.00	256.00	328.50
251.50	234.50	238.00	246.00
242.50	239.50	182.50	304.50

Table 10 - Mean Values of Yarn Breaking StrengthMeasurements - 14.5 TexYarn from Mill A

199.50	143.60	146.50	192.50
199.50	188.00	146.50	196.00
209.50	211.00	218.00	165.00
191.00	174.00	178.00	175.00
185.00	159.00	150.00	176.00
183.00	210.00	177.00	193.00
166.50	196.50	176.00	172.50
158.50	169.50	174.00	213.50
122.00	188.00	170.50	157.50
144.50	173.00	178.00	159.50
233.60	181.50	152.50	190.50
201.60	179.00	166.00	200.00
155.50	204.50	196.00	160.44
190.50	168.50	163.50	181.00
163.00	165.50	205.00	209.50
269.00	147.50	154.00	155.50
155.50	232.50	170.00	140.50
152.00	174.00	152.00	164.00
186.00	168.50	195.00	153.00
183.50	149.50	184.00	172.00
151.00	149.00	208.00	244.00
190.00	177.50	206.50	197.50
158.00	182.00	182.50	202.00
198.50	209.00	195.00	131.50
205.50	165.00	170.50	178.00

Table 11 - Mean Values of Yarn Breaking StrengthMeasurements - 14.5 TexYarn from Mill B

179.50	145.00	115.50	149.50
158.00	153.50	187.00	153.50
192.50	137.50	163.00	132.00
182.00	175.00	136.50	182.50
173.00	152.00	151.50	142.12
141.00	139.00	141.50	150.50
158.90	227.00	125.50	153.50
204.00	153.00	142.50	178.50
171.00	153.00	132.50	173.00
165.50	142.50	136.50	169.51
156.00	149.00	144.00	149.50
155.00	146.50	178.00	155.00
142.50	155.50	153.00	158.00
158.00	126.50	150.50	144.00
152.50	156.20	146.00	139.50
164.00	154.50	158.00	131.00
157.50	130.50	143.00	150.50
139.00	122.50	153.00	128.00
194.00	125.00	135.00	161.50
160.00	173.00	143.50	142.00
142.50	133.50	142.50	124.00
115.50	180.00	155.50	176.50
131.00	132.50	214.00	152.50
132.50	137.00	150.00	148.00
166.50	158.00	162.50	138.00

Table 12 - Mean Values of Yarn Breaking StrengthMeasurements - 14.5 TexYarn from Mill C

184.00	152.50	164.00	147.50
152.00	170.00	161.00	143.00
154.50	145.50	154.50	165.50
169.56	153.00	138.00	179.00
168.00	137.00	156.50	159.00
138.00	154.00	134.50	149.20
163.50	130.00	171.50	159.00
166.00	155.00	147.50	150.60
147.00	138.00	160.50	149.50
147.50	158.50	160.50	150.50
145.00	156.50	134.00	203.00
130.50	140.00	148.00	174.00
152.50	141.00	136.00	152.50
152.00	133.00	126.00	138.50
166.50	137.00	155.00	183.50
161.00	145.50	151.50	139.50
165.50	136.50	147.50	162.50
151.00	123.50	147.00	143.00
135.00	156.00	152.00	178.00
165.40	132.00	143.00	156.50
173.50	142.50	146.50	156.50
151.50	156.50	153.50	144.00
151.00	142.50	136.50	144.00
168.00	185.50	153.50	173.50
124.50	136.00	168.50	146.00

APPENDIX C



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(Tables 13 to 18)
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Table 13 - Yarn Count Measurements for 20 TexYarn from Mill A

19.03	20.71	19.13	20.47
20.09	19.61	20.15	20.66
20.58	19.37	19.38	19.74
19.16	19.12	19.02	18.12
18.27	19.24	19.02	20.35
20.03	19.07	20.69	18.85
19.68	19.66	18.87	18.43
19.41	18.19	19.00	19.00
20.51	18.95	20.36	19.00
19.37	18.86	19.12	19.00
18.59	19.31	19.70	20.77
19.24	18.95	19.51	19.16
19.69	19.00	18.24	18.41
18.19	19.59	18.36	19.74
20.12	19.65	19.75	19.79
20.71	18.00	20.00	18.80
21.00	19.19	19.82	18.04
19.22	18.51	20.12	18.07
19.11	19.65	18.81	19.21
20.46	18.82	17.24	23.70
19.79	20.50	17.34	19.75
21.41	17.79	20.65	18.74
19.35	18.83	17.33	19.75
18.83	19.50	19.72	18.63
19.66	18.28	18.79	20.56

Table 14 - Yarn Count Measurements for 20 TexYarn from Mill B

19.48	19.20	20.23	19.00
18.60	21.00	18.50	18.09
18.55	18.87	18.00	20.21
21.82	20.00	20.31	18.84
20.44	18.95	18.71	20.21
20.44	19.12	19.77	20.82
20.80	19.31	20.53	20.55
19.70	19.61	20.62	18.52
17.12	19.91	20.32	19.71
19.72	20.32	19.49	19.63
19.47	20.64	19.89	19.31
20.00	19.82	18.05	18.96
20.17	20.14	19.72	19.44
18.54	19.21	18.72	18.13
18.00	21.06	19.83	20.00
17.87	20.00	19.65	19.61
19.65	19.55	19.84	20.37
19.84	19.14	19.00	18.10
21.39	20.98	19.33	19.83
19.38	20.61	18.00	19.00
20.16	19.75	18.68	20.25
19.00	19.86	20.00	19.29
19.90	18.50	18.43	19.33
19.58	19.30	19.77	20.00
19.87	19.66	19.93	18.44

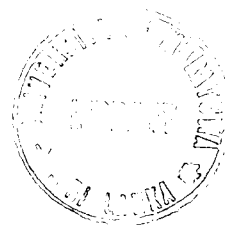


Table 15 - Yarn Count Measurements for 20 Tex

<u>Yarn from Mill C</u>			
19.12	19.35	19.46	20.26
20.54	19.69	18.52	18.50
20.51	19.70	20.00	20.82
20.41	20.52	19.34	20.42
18.43	18.77	20.67	19.00
19.81	19.87	20.00	20.00
18.00	19.00	20.20	19.85
19.96	20.75	21.21	19.00
20.33	20.50	18.48	19.72
19.00	20.44	19.37	19.60
19.73	20.17	18.72	19.59
20.05	20.48	19.61	19.61
19.35	20.84	20.23	19.68
19.85	18.91	21.00	18.46
18.85	19.50	20.26	19.13
20.25	19.33	18.88	20.39
19.69	20.00	20.57	20.30
19.66	19.70	19.30	18.53
19.74	19.66	18.82	18.13
19.37	19.19	18.76	19.00
20.00	20.13	18.21	19.63
19.22	20.11	20.26	18.94
19.53	18.00	21.19	18.87
19.82	20.58	20.37	19.85
19.56	20.93	20.00	20.00

Table 16 - Yarn Count Measurements for 14.5 TexYarn from Mill A

14.73	16.33	15.57	16.67
15.00	14.91	15.87	11.56
12.66	15.60	15.51	15.71
14.00	14.12	14.00	14.85
15.60	15.86	15.64	15.48
15.43	14.49	14.33	15.17
15.30	14.71	16.21	14.26
13.61	16.00	15.41	16.02
14.50	15.49	14.61	15.20
15.64	14.10	14.50	14.38
15.50	16.30	14.33	13.83
12.53	15.00	15.30	15.60
15.00	13.60	14.68	14.46
15.25	15.00	14.51	14.66
16.24	15.48	14.27	14.11
14.36	15.65	14.68	16.37
14.26	14.52	11.00	14.68
15.22	14.74	15.54	14.60
16.25	16.34	14.56	15.10
13.85	14.33	14.73	14.40
15.29	14.92	15.43	14.66
14.00	14.93	14.56	15.07
14.60	13.67	15.27	14.18
13.78	15.00	16.46	15.00
14.91	15.19	14.81	15.00

Table 17 - Yarn Count Measurements for 14.5 TexYarn from Mill B

14.47	15.45	15.48	14.74
15.86	12.80	13.40	14.96
15.29	14.00	14.44	14.87
13.54	15.00	15.00	15.95
15.24	14.50	15.00	14.00
15.00	13.81	16.00	16.29
11.95	13.71	15.48	14.00
15.47	14.54	13.85	14.96
12.55	16.00	14.93	14.58
15.00	15.79	13.72	14.70
12.11	15.74	14.83	14.88
15.00	12.89	16.07	14.45
14.00	15.74	14.58	15.35
13.24	15.00	14.75	14.53
14.82	15.00	15.36	14.00
14.18	14.82	13.74	14.38
14.66	12.00	14.15	14.71
14.14	14.61	14.79	15.77
15.71	14.37	14.56	14.56
13.28	14.88	14.73	13.67
15.38	14.63	14.44	14.68
14.61	14.80	14.90	14.00
13.81	15.16	14.59	14.26
13.64	13.60	15.92	13.43
13.73	14.16	15.00	13.64

Table 18 - Yarn Count Measurements for 14.5 Tex

<u>Yarn from Mill C</u>			
16.24	15.00	14.50	14.28
15.28	14.16	14.70	14.80
14.43	13.89	15.00	15.36
14.60	14.47	14.38	15.00
14.27	14.35	14.88	15.28
15.40	14.50	15.30	14.34
14.62	15.00	14.40	14.69
14.23	14.68	15.00	14.40
14.57	15.00	14.71	14.00
14.14	14.81	14.78	15.73
14.45	14.13	15.23	15.23
15.43	14.64	14.76	14.39
14.45	14.00	15.93	15.10
15.25	15.10	14.55	14.51
16.00	15.15	15.22	14.75
15.00	14.59	13.82	15.49
15.00	15.59	15.19	15.00
14.48	14.42	14.76	15.10
14.60	14.67	15.00	15.00
14.62	15.87	14.00	13.73
15.00	15.00	14.58	14.58
17.00	15.24	14.90	14.87
16.50	14.24	14.41	15.13
15.38	15.42	14.58	14.72
14.09	15.37	14.63	13.70

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