International Institute for Cotton

Manchester

Research Record No: 85

Project 761 Part II

Effect Of Yarn Count And Stitch Length On The Physical And Dimensional Properties Of 18 Gauge Plain Single-Jersey Fabrics

Jill C. Stevens

June 1978

Key Words: Single Jersey, 18 Gauge, Yarn Count, Stitch Length, Shrinkage, Spirality, Courses & Wales, Tightness Factor, Weight, Burst Strength, Extensibility.

Digital Version: April 2009 : Spreadsheet is *RR85.xls*

Introduction

This report deals with Part II of Project 761 and looks at the effect of yarn count and stitch length on 18G single jersey fabrics.

Some considerable time has elapsed between the completion of Part I and this report while, firstly, test methods were evaluated and, secondly, a decision was made whether or not to test these fabrics or redesign the whole project in the light of recent developments and requirements. Eventually, the decision was made to go ahead so that if and when a further investigation is carried out to look at finishing, a good deal of the ground work will have already been done therefore making planning easier.

The 28G fabrics (Part III) have now also been tested and the report on these should follow shortly. After the completion of Part III, detailed comparisons between the fabrics from all three gauges of machine will be made and reported in a concluding Part IV.

Knitting on 18g Camber Velnit

The knitting of the 18G fabrics was carried out by Treffor Davies at TRD under the supervision of J.T. Eaton. Twenty fabrics, using four separate yarn counts each at five different stitch lengths were produced. The details of the full experimental procedure are contained in the thesis *'The Relationship Between Yarn Count and Gauge on Single-Jersey Machinery*', which is on file in the knitting department.

The yarn was supplied by Carrington Viyella and tested at Leeds University.

Yarn testing results and fabric specifications on-machine are shown in *Tables 1 & 2*.

Test Methods

During and after the completion of the report on Part I of the investigation, which looked at the effect of yarn count and stitch length on 24G plain single-jersey fabrics (*Research Record 64*), the test methods used by IIC for evaluating cotton weft knitted fabrics have been carefully reappraised. Several evaluation trials, e.g. *Research Record Nos. 59 and 65* and a statistical analysis of tests from past results (*Research Record No. 60*) have been carried out and, as a result of these and other trials not yet fully documented in *Research Records*, amendments have been made to existing methods and, where necessary, new methods devised. The amended testing procedures have now been collected into a booklet entitled, "*IIC Methods of Test for Cotton Weft Knitted Fabrics*", - May 1978.

The standardised methods detailed in the booklet are essentially the same as those used for testing the 18G fabrics therefore only where the method used differs is this indicated.

The following tests were carried out on all the 18G fabrics greige (as received) and after five wash and tumble dry cycles followed by a final press. In all cases, the measurements carried out after relaxation were distributed evenly over the five replications to give a good representation of the sample, e.g., where 10 measurements were made, 2 were taken on each replication.

Dimensional Stability:

> IIC Method KT1A, May 1978 *'Determination of the dimensional changes induced in cotton weft knitted fabrics by a specified relaxation process*' - all the samples received a press after the final tumble dry cycle.

Spirality:

IIC Method KT2, May 1978 '*Determination of the angle of spirality in weft knitted fabrics*'.

Stitch Length:

IIC Method KT3, May 1978 *'Determination of stitch length in weft knitted fabrics'.*

Weight per Unit Area:

IIC Method KT4B, May 1978, *'Determination of the weight per unit area of fabric'.*

Burst Strength:

IIC Method KT5, May 1978 *'Determination of the bursting strength of weft knitted fabrics*' - 7.07 cm^2 test area.

Courses and Wales:

IIC Method KT6, May 1978 *'Determination of the number of visible courses and wales per 3cm*' - courses and wales were counted over 3 inches and quoted per inch; ten measurements were taken in each direction.

Directional Extensibility using the Instron:

This is not a standard test, but the method used has been evaluated in *Research Record No. 65*.

After conditioning, ten test specimens in each direction are prepared from the sample. Each specimen is 10" wide by 8" long. For the length test, 8" is measured along two wales 10" apart and cut square. For the width test 8" is measured along two courses 10" apart and cut square. The test length on the Instron is 4" using 2" jaws. The chart/crosshead speed is set at 100 mm/min. Measurements of extension are taken from the chart at l kg, 5 kg and breaking load. The mean, 95% confidence limits and % accuracy for extension at l kg, 5 kg and total and for breaking load are calculated.

Results

The results for all the tests carried out on the 18G fabrics are detailed in *Table 3*. In addition, for convenience of analysis, comparison charts have also been compiled which either show the results of an individual test across the range of fabrics, or document effects calculated from the original test figures - *Tables 4-9*. For easier visual assessment the majority of the results have been translated onto graphs - *Figures 1-11*.

As noted under Section III Test Methods, in all cases testing after relaxation was carried out on the fabrics after they had received a final press instead of after five wash and tumble cycles only. However, on the evidence of the results reported in the shrinkage evaluation trial (*Research Record 59*), the final press should not have had a significant effect on the results. It may have affected the size or spread of the actual numbers slightly, but as each fabric received the same treatment, any distortion should be reasonably consistent throughout. Therefore, this has been largely ignored when assessing the major trends.

Where it has been necessary to omit detailed tables and graphs for the sake of brevity, these can be found in the project file in the Knitting Department.

Discussions

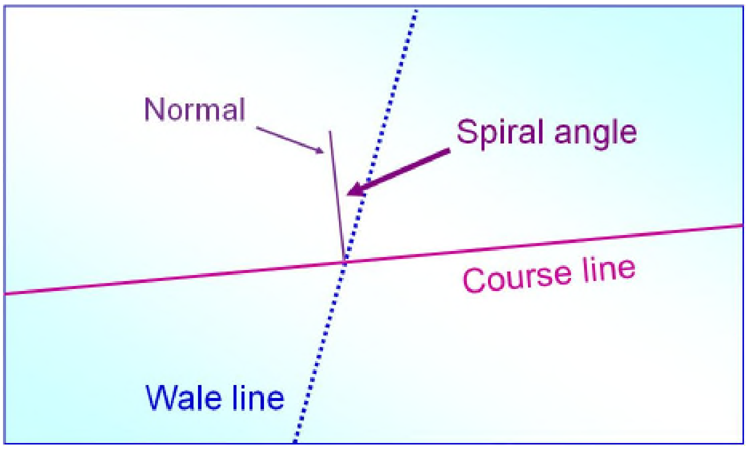
Although a great deal of time has been spent evaluating and discussing test methods, and in particular the shrinkage test method, they have still not been finally resolved. The methods of test now in standard use at TRD have, on the whole, been found to give reliable and consistent results, but as more knowledge is gained about the behaviour of knitted fabrics, especially the behaviour of plain single-jersey fabrics, doubts are once again raised.

One of the inherent properties of the single-jersey plain knit structure is its tendency to spiral. It is this property more than any other which can affect how other properties of the fabric are measured and also how results are interpreted.

At present, the method of determining the amount of potential shrinkage in a fabric relies on measuring the changes in distance between fixed points marked on the fabric, before and after a relaxation procedure (IIC Method KT1A and B, May 1978). However, because of the change induced in the angle of spirality* during relaxation the percentage changes in dimensions calculated by measuring between these marks can, in fact, be very misleading.

It is possible, because of changes in the geometry, to either measure much more or much less directional shrinkage than in fact has actually occurred.

*NB: The angle of spirality is defined as the angle by which the line of wales deviates from the normal to the line of courses.



It is therefore important to take into account the angle of spirality in a fabric both before and after relaxation as it is the size of the change which can ultimately affect both the interpretation of results and, perhaps more importantly, determine whether or not a fabric is commercially viable, i.e. if it can be stabilised sufficiently during finishing to avoid spirality problems in garment form.

The difficulties of actually obtaining realistic test figures have also been highlighted by another test which, until recently, was thought to give a very accurate description of the dimensions of a knitted fabric - that is the measurement of courses and wales. Where directional percentage changes in dimensions are calculated from course/wale measurements one would expect them to agree with those changes predicted by the shrinkage test. In fact, this is often not the case. In single-jersey fabrics where spirality is high, on the whole, the discrepancies can be explained by the changes in fabric geometry caused by spirality. In double jersey fabrics however, it is not yet clear whether the discrepancies recorded are due to random variations or whether a systematic difference is being reported by the two different tests.

Although the questions concerning shrinkage determination, the measurement of courses and wales and the effect spirality can have on both have been briefly mentioned, it is outside the scope of this report to deal with these subjects in detail. Work is proceeding at present in an attempt to tie down the effects of spirality and when all the relevant data and information have been collected, separate reports will be prepared. It was, however, necessary to mention these points at this stage as the results in this report will be presented on the whole in such a way as to be comparable with Part I of the investigation (*Research Record No. 64*). This means that the shrinkage results are taken as measured, without making corrections or allowances for spirality, and courses and wales figures are allowed to stand as representing the 'true' dimensions of the fabric. In addition, however, graphs depicting how spirality develops during relaxation and how it is influenced by stitch length and yarn count are included.

Shrinkage

Figure 1 shows shrinkage plotted against stitch length. As stitch length increases length shrinkage increases and width shrinkage decreases. For all yarn counts the cross-over point, i.e. the point where length and width shrinkages are equal, falls approximately at a stitch length of 0.39 cm.

This trend confirms the findings of the 24G trials, although the cross-over points for the yarn counts on 24G fell between stitch lengths of 0.34 cm and 0.36 cm. A possible explanation for why the cross-over points were not at a similar stitch length for 24G would be that relaxation of the 24G samples was effected by one wash-and-tumble-dry cycle only. This means that they were not as near their 'fully relaxed' state as the 18G fabrics. However, the definite differences between the cross-over stitch lengths on 18G and 24G suggests a gauge effect.

Spirality

Figure 2 shows the angle of spirality, before and after laundering, plotted against stitch length. In all cases the amount of spirality generated during relaxation increases as stitch length increases: the degree of change is shown in *Table 4*. The amount of inherent spirality in a fabric appears to be a function of tightness. *Figure 3* shows the angle of spirality after relaxation plotted against Tightness Factor ($K = Sqrt(tex) / StLen$). The calculated Tightness Factors are given in *Table 5*.

The relationship, calculated using least squares fit, has a correlation coefficient of -0.979 ($R^2 = 0.9584$). As tightness factor is increased, spirality is reduced. The graph shows that the shortest stitch length using the coarsest count of yarn, i.e. the highest tightness factor, gives the lowest spirality after relaxation.

Spirality in single-jersey fabrics is very dependent on the amount of twist in the yarn. All of the yarns used in this trial were spun to a similar twist factor ($TF = tpi / Sqrt(Ne)$) but, as twist factor is a function of the count of yarn and the number of turns in it, to maintain the same twist factor for a finer yarn count, more turns have to be inserted. This could be one explanation why the finer yarns generate the highest spirality, at the longest loop length. The smaller the loop length and the fewer turns per unit length in the yarn, the less freedom each loop length has to spiral and the less torque is available to drive the spiraling.

Courses & Wales

Figure 4 shows measured course and wale densities plotted against stitch length. As expected, the longer the stitch length the lesser are the course and wale densities.

Table 6 and *Figure 5* show shrinkage calculated from measured courses and wales using the formula

$$S\% = 100\ (1 - G/W)$$

where G = greige measurement and W = after-wash measurement.

On the whole, length shrinkage calculated from courses agrees with measured shrinkage; the small discrepancies are probably due to random variation.

In the width direction, however, shrinkage calculated from wales is always greater than measured shrinkage and the discrepancy increases as stitch length increases. At the longest stitch length a shrinkage was predicted by the calculation whereas an extension was found by measurement. A part of this difference may be explained by the final pressing operation. Pressing is more likely to have had a greater effect on the slacker more extensible fabrics than on the tighter ones, but the majority is almost certainly due to spirality. This is because spirality increases as stitch length increases, thus the error becomes greater.

Weight per Unit Area

Figure 6 shows relaxed weight against stitch length for all yarn counts and *Figure 7* shows the same plotted against Tightness Factor.

At the longest stitch lengths the fabric is lighter; at the shortest stitch lengths it is heavier. The percent increase in weight from grey to relaxed over the range of stitch lengths for a given count is on the whole reasonably constant although there is a tendency for this to increase as loop length increases (*Table 7*). This follows with shrinkage: longer loop lengths generate a higher degree of shrinkage in a fabric than shorter loop lengths.

Figures 6 & 7 again illustrate that many combinations of yarn count and stitch length are possible to arrive at the same relaxed weight. Of course all the other properties of the fabric have to be taken into account when deciding which is the best combination to achieve a particular weight.

Burst Strength

Figure 8 shows burst strength plotted against stitch length. Burst strength increases as stitch length is decreased for a given yarn count, but coarser counts at the same stitch length give a higher burst strength.

These trends again confirm the findings of the 24G investigation. Fabric strength depends on the strength of the yarn i.e. a coarser count of yarn will normally have a higher single-end strength than a finer count. Also, as the stitch density of the fabric increases, i.e. shorter stitch length, the fabric becomes stronger.

These results also confirm that there is little difference in fabric strength before and after relaxation (*Table 8*). The differences between the means are randomly lower or higher and in the vast majority of cases the differences can be accounted for by the spread of the results, i.e. they are within the 95% confidence limits.

Figure 9 shows the relationship between fabric weight and burst strength after relaxation and shows a very good straight line progression with a high correlation: as fabric weight increases, burst strength increases. This could have been anticipated as both properties are directly influenced by yarn count and stitch length and, in this particular case, all the yarns have approximately the same strength i.e. approximately 12 g/tex. However if a set of yarns with a higher or lower g/tex rating were to be used, the position of the line would probably change either above or below that illustrated. This would need further confirmation by experimentation however.

Fabric Width

Figures 10 & 11 and also *Table 9* show the effect of yarn count and stitch length on the relaxed width of a fabric.

In commission finishing especially, it is very common for fabrics of similar construction to be finished at the same width.

These graphs which have been calculated from the measured wales illustrate the possible danger of processing in this way without taking into account the way a fabric has been knitted. Even quite small changes in construction can affect the relaxed width of a fabric with the obvious effect on shrinkage if they are all finished to the same width.

Directional Extensibility

Although the fabrics were tested for directional extensibility on the Instron by the method quoted, the results have not been included in this report.

This is primarily because the results obtained were so irregular that it is difficult to sort out a trend or definite relationship between extensibility, count and stitch length, unlike previous occasions. It seems likely that something went wrong during testing. In addition, it has been decided that the load range at present used is too high and the test should be re-evaluated and redesigned using a much lower load range and incorporating measurements of recovery as well as extensibility. This will be of more practical use in trying to relate fabric testing to garment performance.

Conclusions

On the whole, the results of the 18G investigation have confirmed the major trends identified from the 24G trials. The effect of yarn count and stitch length on the physical and dimensional properties of single-jersey plain knit fabrics are now better documented and becoming more thoroughly understood.

When the results of the 28G testing are analysed it should also become possible to really tie down the effect (if any) of machine gauge on fabric properties and decide if there really is a count/gauge relationship for single-jersey cotton as (it is said) there is for wool.

These results have also shown that although our test methods are now much more under control, there are still areas where more work must be carried out. Only when every test is giving consistently reliable information about the physical and dimensional properties of knitted fabrics can accurate statements be made and proper comparisons drawn.

Tables

All of the tables and graphs are re-built for the Digital version. There are some differences from the original report. Copies of the original tables and graphs are in *RR85 Original Tabs&Figs.doc*. Note that the original tables include 95% confidence limits for the test data.

In the column headings, BW indicates measurements of samples in the Greige state (Before Washing); AW indicates measurements on samples that have had five cycles of laundering, including tumble drying & pressing (After Washing).

Table 1: Yarn Test Results (measured at Leeds University)

Yarn Count		Twist Factor	Mean Breaking Load	Mean Extension at Break	Friction against steel
Ne	**tex**	α_e	**g**	**%**	**μ**
1/16	36.9	3.5	469	6.6	0.11
1/20	29.2	3.5	371	7.9	0.10
1/24	24.6	3.3	274	6.3	0.10
1/26	23.3	3.5	287	6.9	0.12

Table 2: Knitting Specifications for 18 Gauge Samples

	Nominal St.Len		Nominal	on-machine
Roll ID	inch	mm	T.F.	CPI
SJ16/549	0.216	5.486	11.38	16
SJ16/500	0.197	5.004	12.42	20
SJ16/450	0.177	4.496	13.87	24
SJ16/389	0.153	3.886	15.86	32
SJ16/330	0.130	3.302	18.63	46
SJ20/549	0.216	5.486	10.06	15
SJ20/490	0.193	4.902	11.33	20
SJ20/429	0.169	4.293	13.08	25
SJ20/361	0.142	3.607	15.48	33
SJ20/300	0.118	2.997	18.13	47
SJ24/549	0.216	5.486	9.12	15
SJ24/480	0.189	4.801	10.42	19
SJ24/419	0.165	4.191	12.07	24
SJ24/361	0.142	3.607	14.13	33
SJ24/290	0.114	2.896	17.22	47
SJ26/549	0.216	5.486	8.81	15
SJ26/480	0.189	4.801	10.10	18
SJ26/419	0.165	4.191	11.44	24
SJ26/361	0.142	3.607	13.99	34
SJ26/290	0.114	2.896	16.82	47

Table 3: IIC TRD Laboratory Test Data

	Shrinkage *		Area Weight, gsm		Courses /in		Wales /in		Stitch Length, mm		Burst Kn/m^2		Spirality, deg	
	Len %	**Wid %**	**BW**	**AW**	**BW**	**AW**	**BW**	**AW**	**BW**	**AW**	**BW**	**AW**	**BW**	**AW**
SJ16/549	25.37	**-4.34**	134.18	191.04	20.70	27.00	21.30	23.20	5.34	5.22	609.09	599.40	14.00	34.73
SJ16/500	23.97	0.82	146.75	200.50	23.60	30.20	22.30	24.40	4.89	4.76	657.97	634.60	11.43	30.80
SJ16/450	19.61	7.77	156.64	216.39	27.70	33.70	22.50	26.00	4.38	4.27	726.31	684.90	9.83	24.48
SJ16/389	9.78	14.25	189.41	243.39	35.90	39.70	23.40	28.40	3.83	3.77	856.60	792.50	6.39	15.85
SJ16/330	**-2.61**	26.37	215.10	282.60	49.30	48.00	22.80	31.20	3.26	3.22	973.84	954.50	4.76	11.35
SJ20/549	26.55	**-6.20**	104.11	156.78	20.30	27.40	21.60	23.70	5.37	5.21	433.96	465.00	13.02	42.68
SJ20/490	22.98	3.35	112.41	168.22	23.90	30.40	22.40	25.50	4.77	4.68	494.41	478.10	13.06	36.47
SJ20/429	18.70	12.59	128.71	185.55	28.90	35.20	22.80	28.50	4.13	4.08	593.90	569.80	9.58	28.30
SJ20/361	7.35	22.42	147.86	209.00	39.10	41.50	22.80	30.50	3.49	3.46	640.12	685.60	7.90	19.66
SJ20/300	**-9.51**	33.88	177.27	250.37	58.40	53.30	22.50	34.80	2.98	2.92	835.25	752.50	4.60	13.79
SJ24/549	30.08	**-13.03**	84.61	127.28	19.60	27.20	21.50	25.50	5.44	5.27	353.29	357.40	14.19	43.49
SJ24/480	25.98	2.86	89.33	135.87	22.90	30.00	22.00	27.60	4.76	4.66	382.94	435.30	11.52	38.92
SJ24/419	17.85	14.26	100.36	154.58	28.60	34.80	22.70	29.90	4.11	4.02	473.95	439.50	9.57	33.11
SJ24/361	8.99	24.24	117.45	174.57	38.90	42.10	23.00	32.40	3.51	3.40	486.36	517.39	7.60	24.88
SJ24/290	**-9.64**	35.19	151.67	209.16	59.80	54.10	22.70	35.60	2.88	2.81	629.09	635.90	3.62	17.98
SJ26/549	29.96	**-12.23**	91.20	128.65	19.20	27.90	21.40	25.90	5.48	5.31	318.80	352.60	16.00	46.45
SJ26/480	25.47	**-0.23**	87.82	141.49	23.30	31.30	22.90	29.40	4.78	4.68	371.67	396.00	15.86	43.78
SJ26/419	18.57	13.17	99.33	147.42	29.00	35.10	23.10	30.70	4.22	4.03	433.96	458.55	13.47	37.23
SJ26/361	9.65	26.10	113.19	175.53	38.40	41.70	23.20	34.10	3.45	3.42	471.88	536.70	10.47	29.68
SJ26/290	**-9.59**	33.59	143.08	205.39	58.70	53.80	23.10	37.20	2.87	2.83	598.75	624.90	5.47	20.86

*** After 5 W&T+Press : Negative value = Extension**

Table 4: Spirality Angles

Sample	Spiral Angle, deg		
	BW	AW	Change
SJ16/549	14.00	34.73	20.73
SJ16/500	11.43	30.80	19.37
SJ16/450	9.83	24.48	14.65
SJ16/389	6.39	15.85	9.46
SJ16/330	4.76	11.35	6.59
SJ20/549	13.02	42.68	29.66
SJ20/490	13.06	36.47	23.41
SJ20/429	9.58	28.30	18.72
SJ20/361	7.90	19.66	11.76
SJ20/300	4.60	13.79	9.19
SJ24/549	14.19	43.49	29.30
SJ24/480	11.52	38.92	27.40
SJ24/419	9.57	33.11	23.54
SJ24/361	7.60	24.88	17.28
SJ24/290	3.62	17.98	14.36
SJ26/549	16.00	46.45	30.45
SJ26/480	15.86	43.78	27.92
SJ26/419	13.47	37.23	23.76
SJ26/361	10.47	29.68	19.21
SJ26/290	5.47	20.86	15.39

Table 5: Tightness Factor

K = Sqrt(tex) / StLen

Sample	Yarn Count	Tightness Factor, K	
	tex	BW	AW
SJ16/549	36.9	11.38	11.64
SJ16/500	36.9	12.42	12.76
SJ16/450	36.9	13.87	14.23
SJ16/389	36.9	15.86	16.11
SJ16/330	36.9	18.63	18.87
SJ20/549	29.2	10.06	10.37
SJ20/490	29.2	11.33	11.55
SJ20/429	29.2	13.08	13.24
SJ20/361	29.2	15.48	15.62
SJ20/300	29.2	18.13	18.51
SJ24/549	24.6	9.12	9.41
SJ24/480	24.6	10.42	10.64
SJ24/419	24.6	12.07	12.34
SJ24/361	24.6	14.13	14.59
SJ24/290	24.6	17.22	17.65
SJ26/549	23.3	8.81	9.09
SJ26/480	23.3	10.10	10.31
SJ26/419	23.3	11.44	11.98
SJ26/361	23.3	13.99	14.11
SJ26/290	23.3	16.82	17.06

Table 6: Shrinkage Calculated from Course & Wale Densities

After 5 W&T + Final Press

Shr % = 100 * (1 - BW/AW)

Negative value indicates Extension

Sample	Measured		Calculated	
	Length	Width	Length	Width
SJ16/549	25.37	**-4.34**	23.33	8.19
SJ16/500	23.97	0.82	21.85	8.61
SJ16/450	19.61	7.77	17.80	13.46
SJ16/389	9.78	14.25	9.57	17.61
SJ16/330	**-2.61**	26.37	**-2.71**	26.92
SJ20/549	26.55	**-6.20**	25.91	8.86
SJ20/490	22.98	3.35	21.38	12.16
SJ20/429	18.70	12.59	17.90	20.00
SJ20/361	7.35	22.42	5.78	25.25
SJ20/300	**-9.51**	33.88	**-9.57**	35.34
SJ24/549	30.08	**-13.03**	27.94	15.69
SJ24/480	25.98	2.86	23.67	20.29
SJ24/419	17.85	14.26	17.82	24.08
SJ24/361	8.99	24.24	7.60	29.01
SJ24/290	**-9.64**	35.19	**-10.54**	36.24
SJ26/549	29.96	**-12.23**	31.18	17.37
SJ26/480	25.47	**-0.23**	25.56	22.11
SJ26/419	18.57	13.17	17.38	24.76
SJ26/361	9.65	26.10	7.91	31.96
SJ26/290	**-9.59**	33.59	**-9.11**	37.90

Table 7: Area Weight, g/m^2

Sample	Area Weight, gsm		
	BW	AW	% Change
SJ16/549	134.18	191.04	42.38
SJ16/500	146.75	200.50	36.63
SJ16/450	156.64	216.39	38.14
SJ16/389	189.41	243.39	28.50
SJ16/330	215.10	282.60	31.38
SJ20/549	104.11	156.78	50.59
SJ20/490	112.41	168.22	49.65
SJ20/429	128.71	185.55	44.16
SJ20/361	147.86	209.00	41.35
SJ20/300	177.27	250.37	41.24
SJ24/549	84.61	127.28	50.43
SJ24/480	89.33	135.87	52.10
SJ24/419	100.36	154.58	54.03
SJ24/361	117.45	174.57	48.63
SJ24/290	151.67	209.16	37.90
SJ26/549	91.20	128.65	41.06
SJ26/480	87.82	141.49	61.11
SJ26/419	99.33	147.42	48.41
SJ26/361	113.19	175.53	55.08
SJ26/290	143.08	205.39	43.55

Table 8: Burst Strength, Kn/m^2

	Burst Strength Kn/m^2		
Sample	**BW**	**AW**	**% Change**
SJ16/549	609.09	599.40	-1.59
SJ16/500	657.97	634.60	-3.55
SJ16/450	726.31	684.90	-5.70
SJ16/389	856.60	792.50	-7.48
SJ16/330	973.84	954.50	-1.99
SJ20/549	433.96	465.00	7.15
SJ20/490	494.41	478.10	-3.30
SJ20/429	593.90	569.80	-4.06
SJ20/361	640.12	685.60	7.10
SJ20/300	835.25	752.50	-9.91
SJ24/549	353.29	357.40	1.16
SJ24/480	382.94	435.30	13.67
SJ24/419	473.95	439.50	-7.27
SJ24/361	486.36	517.39*	6.38
SJ24/290	629.09	635.90	1.08
SJ26/549	318.80	352.60	10.60
SJ26/480	371.67	396.00	6.55
SJ26/419	433.96	458.55*	5.67
SJ26/361	471.88	536.70	13.74
SJ26/290	598.75	624.90	4.37

* Retest

Table 9: Fabric Open Width Calculated from Wale Density

Width, cm = No. Machine Needles / Wales per cm

	Open Width, cm	
Sample	**BW**	**AW**
SJ16/549	178.87	164.22
SJ16/500	170.85	156.15
SJ16/450	169.33	146.54
SJ16/389	162.82	134.15
SJ16/330	167.11	122.12
SJ20/549	176.39	160.76
SJ20/490	170.09	149.41
SJ20/429	167.11	133.68
SJ20/361	167.11	124.92
SJ20/300	169.33	109.48
SJ24/549	177.21	149.41
SJ24/480	173.18	138.04
SJ24/419	167.84	127.42
SJ24/361	165.65	117.59
SJ24/290	167.84	107.02
SJ26/549	178.04	147.10
SJ26/480	166.38	129.59
SJ26/419	164.94	124.10
SJ26/361	164.22	111.73
SJ26/290	164.94	102.42

Graphs

All of the tables and graphs have been re-built for the Digital version. There are some differences from the original report. Copies of the Original tables and graphs are in *RR85 Original Tabs&Figs.doc*. Note that some of the sets of Original individual graphs (where the separate yarn counts were shown separately) have been combined into one, with the separate yarn counts identified by different colours and symbols. For example, *Original: Figures 1 to 4* are condensed into *Digital: Figure 1*.

Figure 1

Figure 2

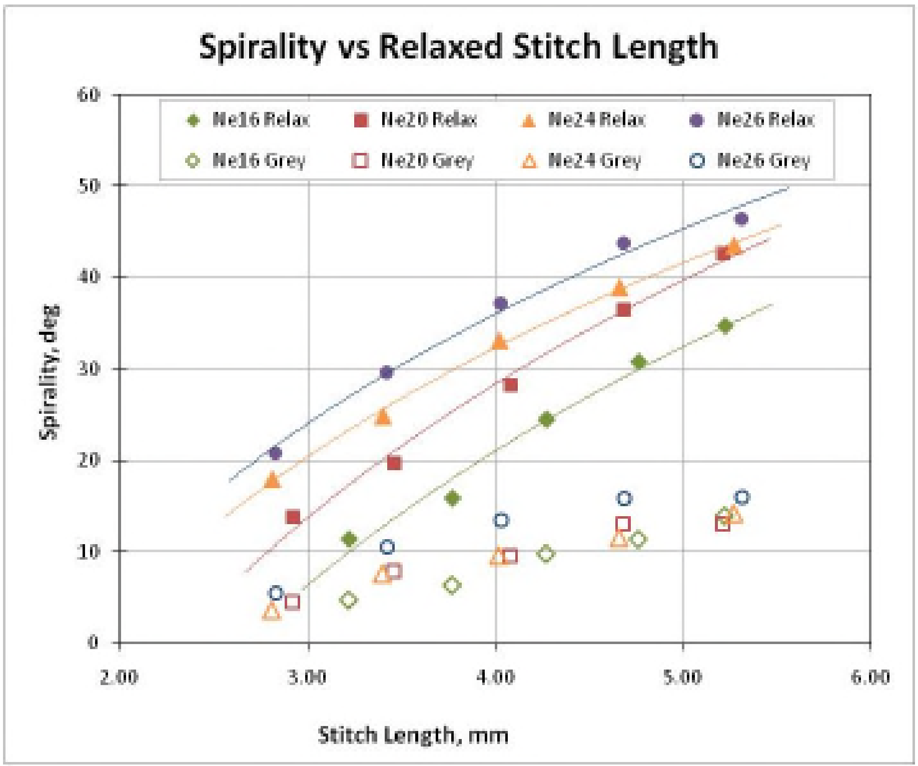


Figure 3

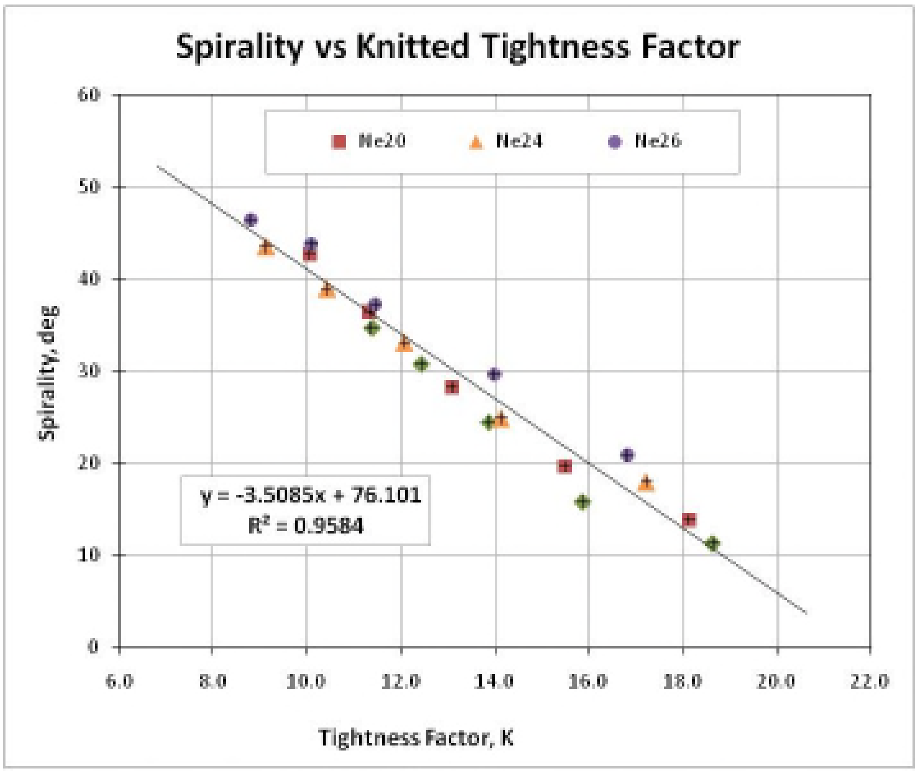


Figure 4

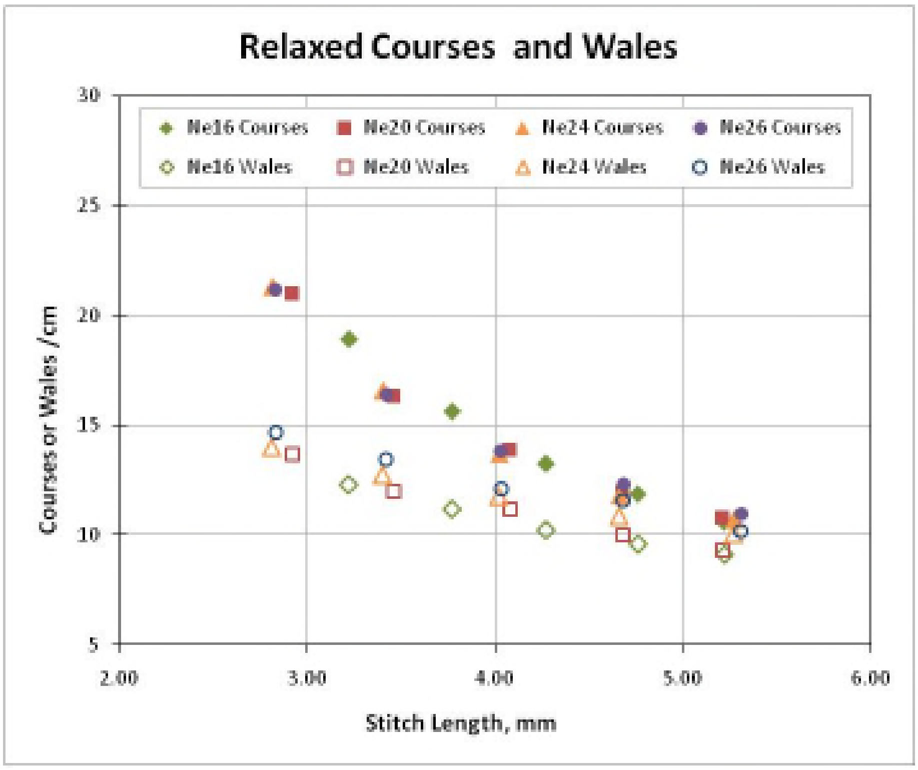


Figure 5

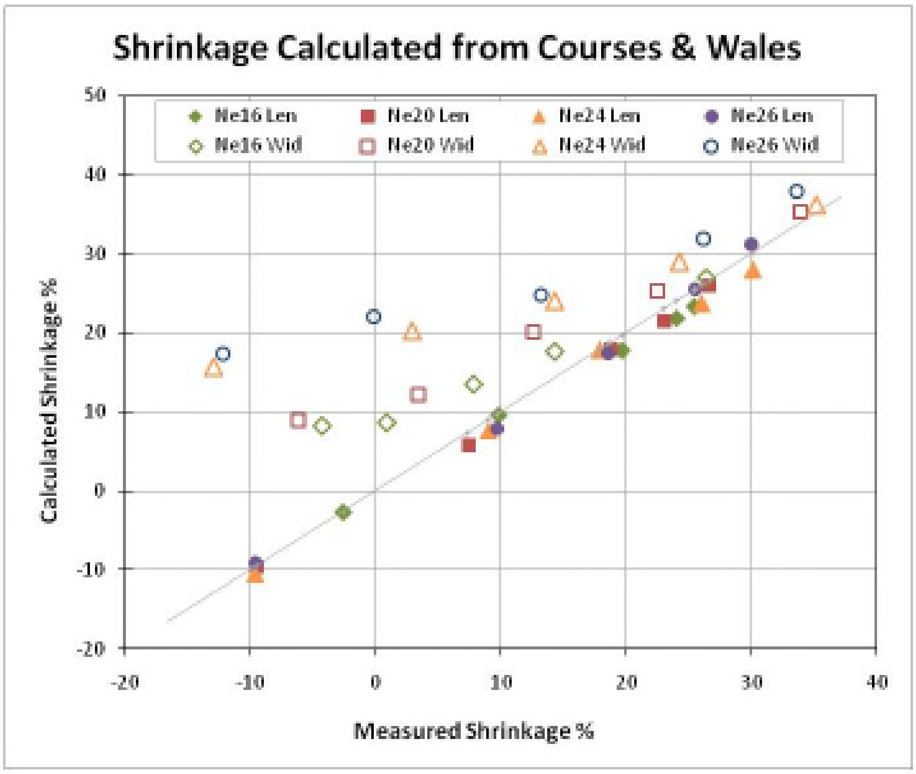


Figure 6

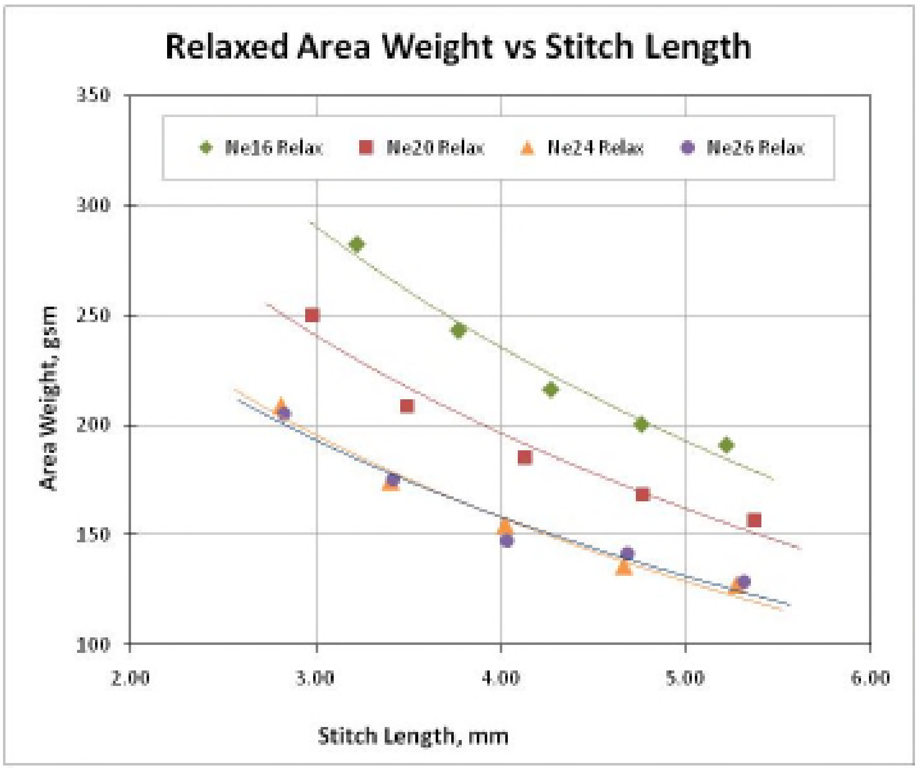


Figure 7

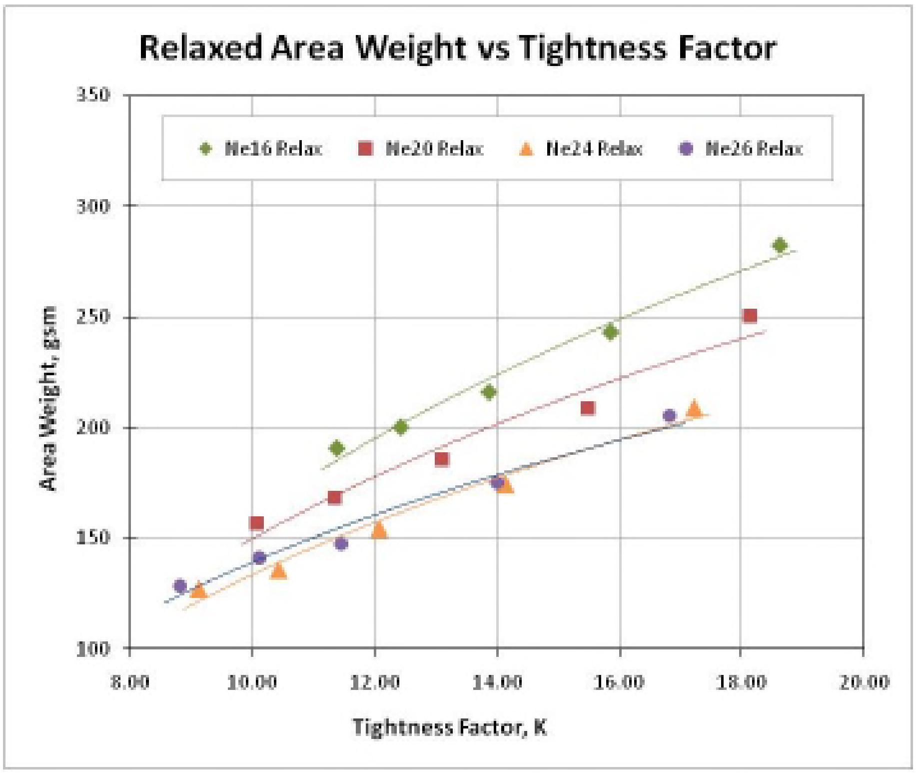


Figure 8

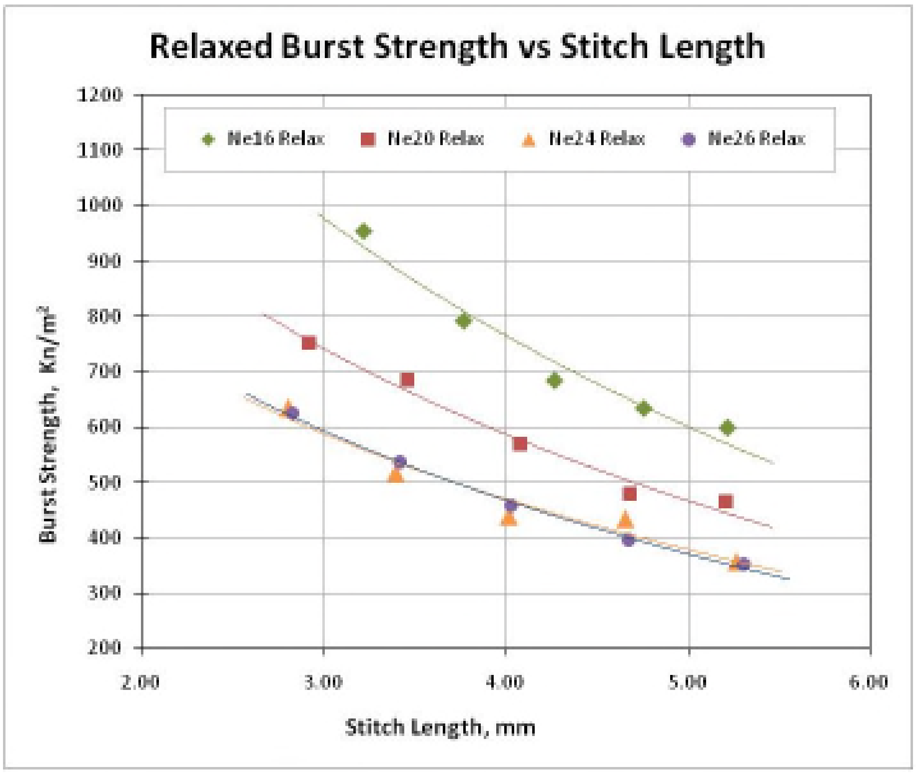


Figure 9

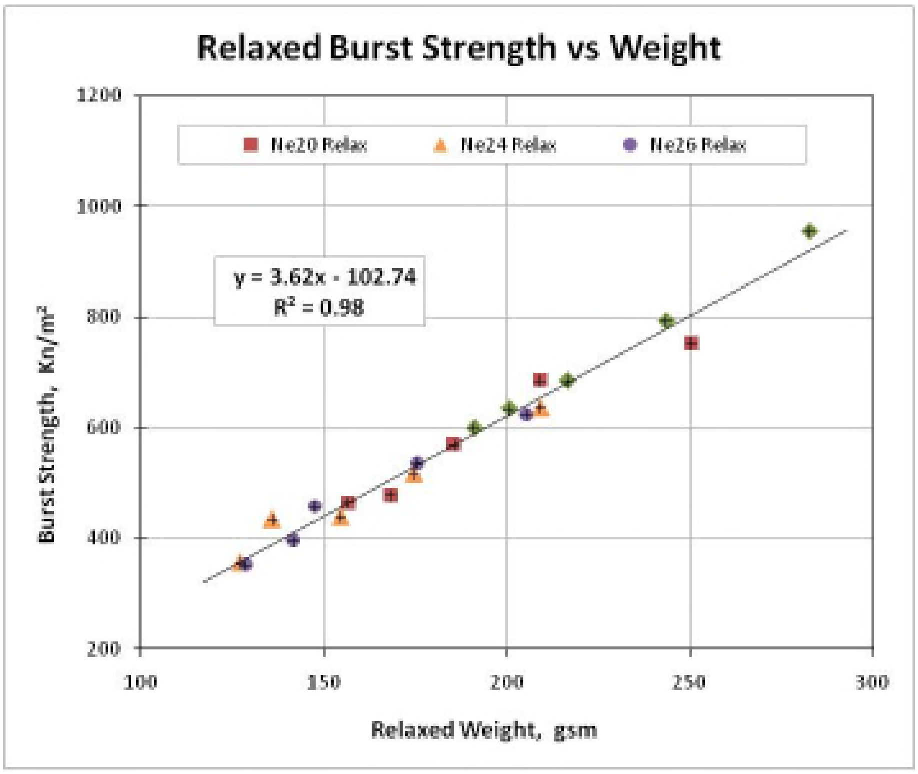


Figure 10

Figure 11