Research Record No. 177

K2 Supplement Knitting - 18 Gauge

Production and Greige Dimensions

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Classification: Fabrics/Knitted/Production
Key Words: Single Jersey, Grey Dimensions
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Contents

Introduction

In the original K2 project, no 18-gauge single jersey fabrics were mercerised because, at the time, all the commercial interests were in the finer gauge fabrics from 24- and 28-gauge machines. Upon reflection and after seeing the effect of mercerisation on some of the heavier 24-gauge fabric it was thought that we may be missing out on a possible market by not looking at the full potential of mercerising through the full spectrum of single jersey machines.

As we were planning to carry out further mercerising trials at the firm of TEBE in Portugal with some of the reserve fabric from the original K2 project, it was decided that we should knit two sets of 18-gauge fabrics in both singles and two-fold over five stitch lengths with a resultant yarn count of Ne 20. These will be mercerised with the K2 fabrics to complete the picture.

Machinery and Instrumentation

The knitting machine used in these trials was an 18-gauge Camber Velnit, 26" diameter, 36 feeder, 1500 needles, fitted with triptape positive feed and side creels. Course length (run-in) was measured using a Welmstar electronic course length yarn speed meter. Yarn input tension was measured using a Schmidt yarn tension meter.

Knitting Plan

Construction: plain single jersey

		Stitch length (cm)	T.F.	Revs
a)	Ne 1/20's	.327	16.61	3750
		.344	15.79	3333
		.362	15.00	3125
		.380	14.29	2708
		.399	13.61	2500

x 2 = 10 pieces approximately 75 metres long. First piece marked /6, second piece marked /15.

		Stitch length (cm)	T.F.	Revs
a)	Ne 2/40’s	.327	16.61	3750
		.344	15.79	3333
		.362	15.00	3125
		.380	14.29	2708
		.399	13.61	2500

x 2 = 10 pieces approximately 75 metres long. First piece marked /6, second piece marked /15.

Yarns Used

Ne1/20 quality KCW

Ne 2/40 quality SLX

Yarns purchased from Courtaulds - similar qualities as per the original K2 work. The singles yarn was ordered with a Z twist to a twist factor of 3.5.

Upon delivery and before knitting began the yarns were checked in the IIC laboratories for count, twist factor, coefficient of friction against steel, twist liveliness, single-end strength and extension. Unfortunately, upon delivery of the yarns to TRD it was discovered that they had delivered short against the amount ordered and therefore a further 22 kilos had to be produced to complete the original order. This additional amount was also tested at TRD.

a) the resultant counts tested were within 1 English yarn count

b) the twist factor tested out at 3.3 (singles) and 2.3 and 2.4 on the two-fold.

c) the coefficient of friction was below 0.15

d) SES of the singles tested out at 405.2g

e) SES for the two-fold tested out at 701.6g and 670.95g respectively.

f) extension of the singles was 6.5% and the two-fold 6.4% and 6.9%

(See test sheets - Tables 1 and 2)

Fabric Production

Coding of the pieces was identical to the original K2 and suffixed Supp. No problems were encountered during the knitting.

The machine speed was maintained at 15 rpm. As an ongoing check to ascertain if there is any correlation between fabric tightness and fault rates, the fabric faults were recorded.

Production sheets are shown in Tables 3 and 4.

Fault Rate

A detailed analysis of the fault rate, averaged to faults per 100,000 metres of yarn was carried out. It shows that in the case of the singles yarn there is evidence that the tighter fabrics give a higher fault rate. In the case of the twofold yarn there is no evidence of tightness affecting the fault rate.

See Tables 5 and 6.

Stitch Length

Analysis of the stitch length shows that the target stitch length was achieved to a very high degree of accuracy and in all cases was kept to within ± 1% of target.

See Figure 1.

Grey Fabric

Four metres of grey fabric was taken from the first roll produced on each stitch length and submitted for testing: five pieces from the singles yarn and five pieces from the twofold yarn.

See Test Sheets - Tables 7, 7A and 8, 8A.

Fully Relaxed Grey Fabric Dimensions

6.1. Yarn Count

Change in **Tex** after the TRD relaxation procedure (from test pieces) is as follows:

1/20Ne

.327	.344	.362	.380	.399	**ave**
-0.4	-0.1	-0.7	-0.5	-0.4	**-0.42**

2/40Ne

.327	.344	.362	.380	.399	**ave**
+0.2	-0.1	-0.1	-0.2	+0.2	**0.0**

6.2 Stitch Length

Change in **Stitch Length (mm)** after relaxation.

1/20Ne

.327	.344	.362	.380	.399	**ave**
-0.06	-0.07	-0.07	-0.06	-0.06	**-0.064**

2/40

.327	.344	.362	.380	.399	**ave**
-0.04	-0.05	-0.06	-0.05	-0.06	**-0.052**

6.3 Fabric Weight AW gsm

	.327	.344	.362	.380	.399
Singles	211.6	202.2	194.1	185.2	176.9
Twofold	202.0	192.6	182.1	170.1	163.0

6.4 Courses /3cm AW

	.327	.344	.362	.380	.399
Singles	54.9	51.9	47.9	46.4	43.9
Twofold	52.5	49.8	47.1	44.7	42.9

6.5 Wales /3cm AW

	.327	.344	.362	.380	.399
Singles	38.1	36.6	35.9	34.3	33.1
Twofold	38.8	36.5	35.8	33.5	32.6

6.6 Spirality Angle AW

	.327	.344	.362	.380	.399
Singles	9.5	11.8	13.3	14.9	18.1
Twofold	-1.1	-0.5	-0.9	0.2	-0.1

Table 1

International Institute For Cotton,
Kingston Road, Didsbury,
Manchester M20 8RD.
TECHNICAL RESEARCH DIVISION.

NAME: T.T.EATON.....

SAMPLE NO: S. 1 2 3 4 5 6 7 8
T.1.2.3.4.5.6.7.8

Knitting Ref. No.	Testing Lab. Ref. No.	Date Submitted	Date Returned
	964	22-4-83	3-5-83

Yarn Details: 1/20 S c.c.
2/40 S c.c. FROM COURTAULDS, FOR 18 G SINGLE JERSEY

		1/20 S c.c.		2/40 S c.c. RESULTS							TESTED BY
			95% cl		95% cl						
FRICTION	√	0·14	0·03	0·13	0·03						
COUNT Tex.	√	29·0	0·5	R 28·7	0·3						
c.c.	√	20·3		2/41·2							
TURNS/~~INCH~~ cm SINGLE	√	583·1	20·8	862·8	48·0						
FOLDED	√			428·8	22·3						
TWIST FACTOR Tex System.	√	31·4		22·9							
English		3·3		2·4							
TWIST LIVELINESS	√	22·0	0·6	4·9	0·4						
USTER BREAKING LOAD											
USTER EXTENSION											
USTER EVENESS											
SIS	√	405·2	13·0	701·6	12·5						
% oct.		6·5	0·2	6·4	0·1						

COMMENTS:

High friction on cone No. 6 of 2 fold.
High friction on cone No 1 of singles

cc:

Table 2

International Institute For Cotton,
Kingston Road, Didsbury,
Manchester M20 8RD.
TECHNICAL RESEARCH DIVISION.

NAME: F.J. BATON

SAMPLE NO: 9-10-11-12. 4 CONES.

Knitting Ref. No.	Testing Lab. Ref. No.	Date Submitted	Date Returned
	971	18-5-83	23-5.83

Yarn Details: 2/40 From Lauriewold
Second delivery of 22 Kg. to complete order.

		2/40 cc		RESULTS						TESTED BY
FRICTION	✓	0.13	0.03 (9562)							
COUNT Tex	✓	R28.4	0.2							
C.C.	✓	2/41.6								
TURNS/~~INCH~~ Metre SINGLE	✓	8383	29.5							
FOLDED	✓	404.2	17.9							
TWIST FACTOR Tex	✓	21.5								
English	✓	2.3								
TWIST LIVELINESS	✓	1.1	0.3							
USTER BREAKING LOAD										
USTER EXTENSION										
USTER EVENESS										
SBS	✓	6709S	13.5							
% EXT	✓	6.9	0.1							

COMMENTS:

High Friction on Cone N° 11 .

Table 3

Machine: CAMBER VELNIT Gauge: 18 Number of Needles: 1500

K2 SUP. 18G FOR MERCERISING TRIALS AT TEBE

Piece No.	Course Length Target	Mean CL at Start of Piece	Mean CL at End of Piece	C/3cm on Machine	Width at Roller	Width on Roll	Revs Produced	Piec Weig
18/1-20/327/6	490·5	490·5 W	489·6 W	45/45 (53)	82·5 cms	82·5 cms	3750	18·25
18/1-20/327/15	490·5	490·5 W	491·0 W	44/45	82·0 cms	82·0 cms	3750	19·75
18/2-40/327/6	490·5	490·5 W	490·5 W	44/44	81·5 cms	80·5 cms	3750	17·75
18/2-40/327/15	490·5	491·0 W	491·0 W	45/45	82·5 cms	82·5 cms	3750	18·75
18/2-40/344/6	516·0	515·0 W	516·0 W	40/40	82·0 cms	82·0 cms	3333	16·75
18/2-40/344/15	516·0	515·0 W	516·0 W	39/40	82·0 cms	82·0 cms	3333	17·75
18/1-20/344/6	516·0	515·0 W	515·0 W	39/40	82·0 cms	82·5 cms	3333	17·10
18/1-20/344/15	516·0	515·0 W	515·0 W	41/41	82·0 cms	82·5 cms	3333	18·0
18/1-20/362/6	543·0	542·0 W	542·0 W	36/36	82·0 cms	81·5 cms	3125	16·75
18/1-20/362/15	543·0	542·0 W	544·0 W	36/36	82·0 cms	82·0 cms	3125	17·9
18/2-40/362/6	543·0	544·0 W	543·0 W	35/36	82·0 cms	82·0 cms	3125	16·5
18/2-40/362/15	543·0	543·0 W	543·0 W	36/36	82·0 cms	82·0 cms	3125	17·25
18/2-40/380/6	570·0	571·0 W	571·0 W	32/32	82·0 cms	82·0 cms.	2708	15·0
18/2-40/380/15	570·0	572·0 W	571·0 W	32/32	81·5 cms	81·5 cms	2708	15·5
18/1-20/380/6	570·0	571·0 W	571·0 W	32/31	82·0 cms	82·0 cms	2708	15·25
18/1-20/380/15	570·0	570·0 W	571·0 W	32/32	82·0 cms	82·0 cms	2708	16·25
18/1-20/399/6	598·5	598·0 W	598·5 W	29·5/30	82·0 cms	81·5 cms	2500	14·50
18/1-20/399/15	598·5	598·0 W	598·0 W	30/30	82·0 cms	81·5 cms	2500	16·00

Table 4

Machine: CAMBER V3LNIT Gauge: 18 Number of Needles: 1500

K2 SUP 18G FOR MERCERISING TRIALS AT TEBE

Piece No.	Course Length Target	Mean CL at Start of Piece	Mean CL at End of Piece	C/3cm on Machine	Width at Roller	Width on Roll	Revs Produced	Piec Weight
18/2-40/394/6	598·5	598·0 W	598·0	29/29·5	81·0 cms	80·0 cms	2500	14·80
18/2-40/399/15	598·5	598·0 W	598·0	29·5/29·5	81·0 cms	80·0 cms	2500	15·4

Table 5

YARN COUNT NE 1/20Z MACHINE GAUGE: 18

PIECE NO.	FAULTS	LENGTH OF YARN KNITTED PER PIECE-METRE	LENGTH OF YARN KNITTED PER SL METRES	CALCULATED FAULTS PER 100,00M OF YARN	
18/1-20/327/6	8	662,175	1,324,350	1.21)	1.13
18/1-20/327/15	7	662,175		1.06)	
18/1-20/344/6	7	619,138	1,238,276	1.13)	1.05
18/1-20/344/15	6	619,138		0.97)	
18/1-20/362/6	6	610,875	1,221,750	0.98)	0.98
18/1-20/362/15	6	610,875		0.98)	
18/1-20/380/6	4	555,681	1,111,362	0.72)	0.54
18/1-20/380/15	2	555,681		0.36)	
18/1-20/399/6	5	538,650	1,077,300	0.93)	0.65
18/1-20/399/15	2	538,650		0.37)	

TOTAL LENGTH OF YARN KNITTED = 5,973,038
TOTAL FAULTS = 53
AVERAGE FAULTS PER 100,000 METRES OF YARN = 0.88

Table 6

YARN COUNT NE 2/40 MACHINE GAUGE: 18

PIECE NO.	FAULTS	LENGTH OF YARN KNITTED PER PIECE-METRE	LENGTH OF YARN KNITTED PER SL METRES	CALCULATED FAULTS PER 100,000M OF YARN	
18/2-40/327/6	2	662,175	1,324,350	0.30)	0.15
18/2-40/327/15	0	662,175		0)	
18/2-40/344/6	0	619,138	1,238,276	0)	0.08
18/2-40/344/15	1	619,138		0.16)	
18/2-40/362/6	0	610,875	1,221,750	0)	0.08
18/2-40/362/15	1	610,875		0.16)	
18/2-40/380/6	3	555,681	1,111,362	0.72)	0.54
18/2-40/380/16	1	555,681		0.36)	
18/2-40/399/6	2	538,650	1,077,300	0.37)	0.27
18/2-40/399/15	1	538,650		0.18)	

TOTAL LENGTH OF YARN KNITTED = 5,973,038
TOTAL FAULTS = 11
AVERAGE FAULTS PER 100,000 METRES OF YARN = 0.18

Table 7

INTERNATIONAL INSTITUTE FOR COTTON. KNITTING REF. LAB. REF. 985 SUBMITTED BY. ITB DATE 13 July 83

TESTS REQUIRED			18/2-40/327 ①	95%CL	18/2-40/344 ④	95%CL	18/2-40/342 ③	95%CL	18/2-40/380 ⑤	95%CL	18/2-40/399 ②	95%CL		95%CL		95%CL		9
ABRIC WEIGHT	BW	✓	152·6	3.8	141·0	3·3	134·0	4·0	122·8	2·9	115·8	1·3						
G.S.M.	AW	//	202·0	1·3	192·6	1·8	182·1	0·4	170·1	1·3	163·0	1·8						
/3 CM	BW	//	53·4	0·5	48·1	0·2	43·1	0·5	38·6	0·4	35·5	0·4						
	AW	//	525	0·5	49·8	0·7	47·1	0·6	44·7	0·5	42·9	0·4						
/3 CM	BW	//	27·5	0·4	27·0	0	27·1	0·2	26·6	0·5	27·2	0·3						
	AW	//	38·8	0·5	365	0·5	35·8	0·5	33·5	0·5	32·6	0·5						
ITCH LENGTH	BW	//	3·258	0·01	3·43	0·01	3·62	0·01	3·80	0·01	4·00	0·01						
MM	AW	//	3·24	0·01	3·38	0·01	3·56	0·01	3·75	0·01	3·94	0·01						
RST STRENGTH	BW	//	953·4	20·2	909·2	23·6	820·9	28·0	814·5	29·5	815·1	28·0						
Kn/m2	AW	//	896·6	32·2	855·7	25·6	821·6	26·8	791·4	37·3	746·7	24·6						
ISTENSION	BW	//	21·2	1·5	20·1	2·0	20·1	1·3	22·2	2·4	20·2	1·2						
mm	AW	//	21·5	0·6	22·5	1·0	22·5	0·9	22·2	0·9	22·1	1·0						
PIRALITY ANGLES	BW	//	−0·3	0·4	−0·1	0·6	−0·5	0·6	−0·7	1·0	1·1	0·8						
	AW	//	−1·1	0·2	−0·5	0·4	−0·9	0·4	0·2	0·4	−0·1	0·6						
IDTH	BW	//	82·2	1·4	81·8	0·9	82·8	0·7	83·4	1·5	84·0	2·2						
HICKNESS	BW	//	682·9	13·4	650·6	11·4	654·7	5·5	634·5	8·3	620·9	7·1						
	AW	//	884·6	24·0	908·9	26·6	915·6	22·5	918·4	23·2	908·9	14·7						
ARN COUNT	BW	//	28·1	3·8	28·5	0·2	28·7	0·7	28·3	0·5	28·3	0·6						
EX	AW	//	28·3	0·3	28·4	1·3	28·6	3·1	28·1	1·0	28·5	0·8						
.E.S. g	BW	//	651·2	13·7	655·8	21·3	648·4	18·1	647·3	19·0	661·3	13·4						
	AW	//	652·6	19·2	649·7	20·1	632·6	16·5	646·6	14·6	633·3	18·1						
EXT	BW	//	7·7	0·3	7·7	0·4	7·6	0·2	7·5	0·3	7·8	0·3						
	AW	//	8·1	0·3	8·1	0·3	8·1	0·2	8·2	0·3	7·8	0·2						

COMMENTS:

FABRIC DETAILS: Supp. to K2 project for TEBE

18 G SINGLE JERSEY TWOFOLD YARNS

ALL PIECES NO 6

Table 7a

% SHRINKAGE

		18/2-40/327		18/2-40/344		18/2-40/362		18/2-40/380		18/2-40/399	
		(1)	95%CL	4	95%CL	3	95%CL	5	95%CL	2	95%CL
WASH + TUMBLE DRY	LENGTH										
	WIDTH										
1 WASH + 4 RINSES + TUMBLE DRY ✓	LENGTH	0.4 (2nd)	0.6	5.1	0.4	8.5	0.3	14.5	0.7	17.4	0.3
	WIDTH	28.2	0.3	25.6	0.7	22.3	0.5	19.1	0.4	17.0	0.6
WASH + LINE DRY	LENGTH										
	WIDTH										
1 WASH + 4 RINSES + LINE DRY	LENGTH										
	WIDTH										

SIZE TESTED	50CM ✓	NO. REPS TUMBLE	50	5	NO. REPS LINE 50
	25CM		25		25

Table 8

INTERNATIONAL INSTITUTE FOR COTTON. KNITTING REF. LAB. REF. 983 SUBMITTED BY. JTE DATE 13 July 83

TESTS REQUIRED			18/1·20/327	95%CL	18/1·20/344	95%CL	18/1·20/362	95%CL	18/1·20/380	95%CL	18/1·20/399	95%CL		95%CL		95%CL		95%CL
			(6)		(9)		(9)		(10)		(7)							
FABRIC WEIGHT	BW	✓	156·2	4·3	149·7	4·3	142·6	3·3	138·8	2·8	131·8	3·8						
G.S.M.	AW	✓	211·6	0·8	202·2	1·1	194·1	1·5	185·2	2·7	176·9	1·2						
C/3 CM	BW	✓	54·6	0·4	49·3	0·5	44·7	0·5	41·4	0·4	37·1	0·5						
	AW	✓	54·9	0·5	51·9	0·7	47·9	0·7	46·4	0·4	43·9	0·4						
W/3 CM	BW	✓	27·4	0·4	26·9	0·5	27·3	0·5	27·5	0·5	27·1	0·5						
	AW	✓	38·1	0·2	36·6	0·4	35·9	0·5	34·3	0·4	33·1	0·5						
STITCH LENGTH	BW	✓	3·29	0·01	3·45	0·01	3·62	0·01	3·80	0·01	3·99	0·01						
MM	AW	✓	3·23	0·01	3·38	0·01	3·55	0·01	3·74	0·01	3·93	0·01						
BURST STRENGTH	BW	✓	726·2	32·2	666·7	29·9	635·7	23·5	619·5	21·4	591·8	12·2						
Kn/m²	AW	✓	710·2	34·0	681·0	29·1	668·8	27·0	618·3	23·6	574·5	18·8						
DISTENSION	BW	✓	19·6	1·8	20·8	1·7	21·0	2·6	21·7	1·1	20·1	2·2						
mm	AW	✓	22·2	1·0	22·2	0·8	22·6	1·2	22·9	0·9	22·5	0·9						
SPIRALITY ANGLES	BW	✓	3·2	0·4	4·1	0·5	4·7	0·6	5·3	0·6	6·1	1·0						
	AW	✓	9·5	0·5	11·8	0·4	13·3	0·5	14·9	0·4	18·1	0·5						
WIDTH	BW	✓	82·5	1·2	82·6	1·4	83·7	1·4	80·7	1·4	83·8	1·4						
THICKNESS	BW	✓	732·4	11·8	707·3	8·0	694·5	7·4	712·4	9·1	690·0	11·6						
	AW	✓	972·6	28·2	993·6	17·4	987·6	13·2	999·9	14·5	1038·1	22·7						
YARN COUNT	BW	✓	29·3	1·0	29·0	2·2	29·5	2·2	29·5	0·9	29·2	0·6						
TEX	AW	✓	28·9	2·3	28·9	1·4	28·8	1·7	29·0	0·3	28·8	1·2						
S.E.S. g	BW	✓	370·1	19·8	370·6	22·6	372·1	22·4	364·0	15·8	346·7	11·8						
	AW	✓	355·3	13·4	354·6	14·3	336·6	20·0	345·5	14·9	341·2	16·9						
% EXT	BW	✓	7·0	0·3	7·3	0·2	7·0	0·3	7·2	0·3	7·0	0·2						
	AW	✓	7·9	0·3	7·8	0·7	7·6	0·3	8·1	0·2	8·1	0·4						

COMMENTS:

FABRIC DETAILS: Supp. to K2 project for TIBIE
18 G SINGLE JERSEY. SINGLES YARNS
ALL PIECES NO 6

Table 8a

% SHRINKAGE

		18/1-20/327		18/1-20/344		18/1-20/362		18/1-20/380		18/1-20/399	
		6	95%CL	9	95%CL	8	95%CL	10	95%CL	7	95%CL
WASH + TUMBLE DRY	LENGTH										
	WIDTH										
1 WASH + 4 RINSES + TUMBLE DRY ✓	LENGTH	1.4	0.4	5.8	1.0	9.6	0.5	11.3	0.7	16.1	0.9
	WIDTH	27.1	0.3	24.2	0.5	21.7	0.6	17.6	0.2	16.5	0.6
WASH + LINE DRY	LENGTH										
	WIDTH										
1 WASH + 4 RINSES + LINE DRY	LENGTH										
	WIDTH										

SIZE TESTED					
50CM ✓	NO. REPS TUMBLE	50	5	NO. REPS LINE	50
25CM		25			25

Figure 1

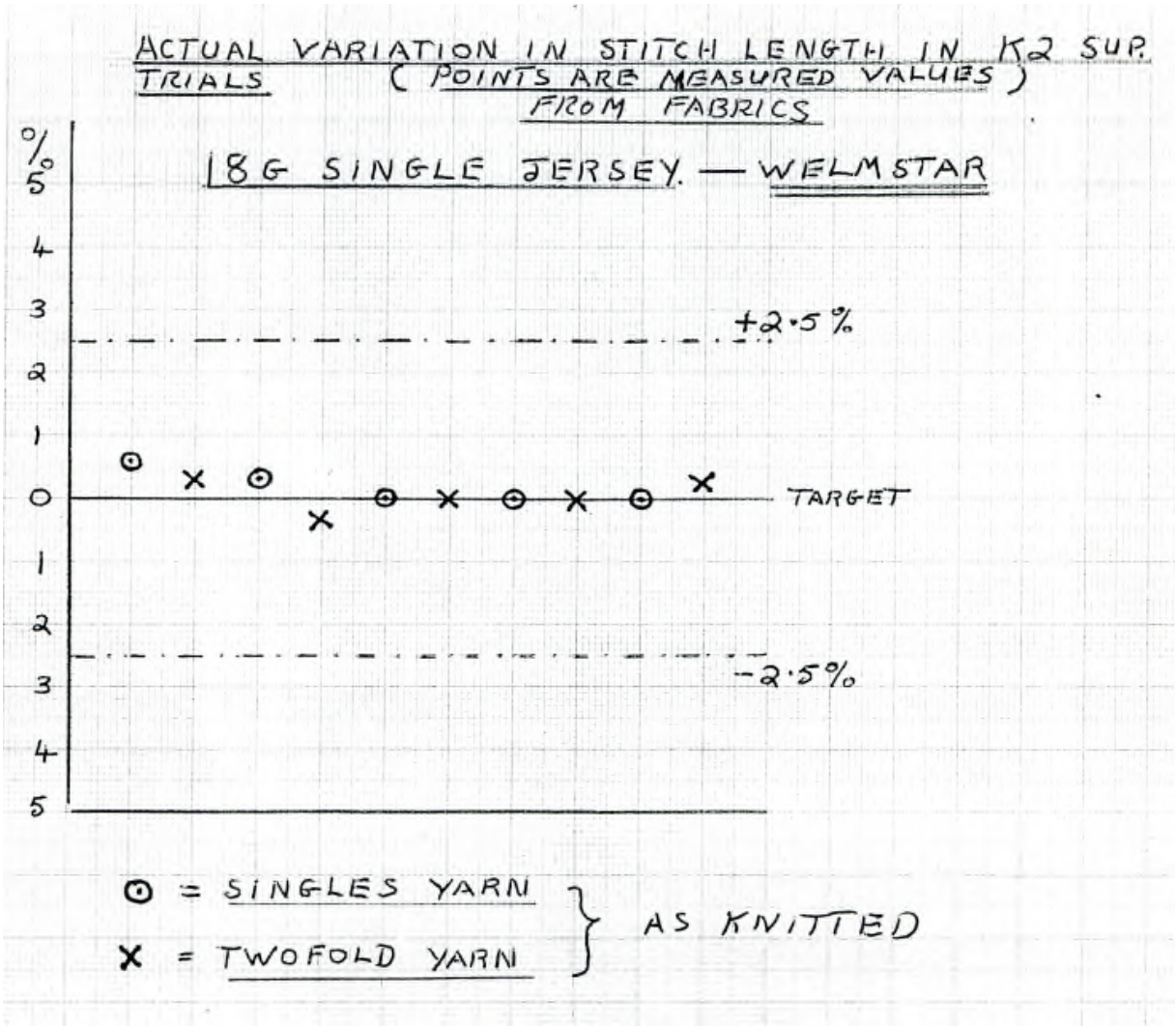

ACTUAL VARIATION IN STITCH LENGTH IN K2 SUP. TRIALS
(POINTS ARE MEASURED VALUES FROM FABRICS
18G SINGLE JERSEY — WELMSTAR
%
5
4
3
2
1
0
1
2
3
4
5
+2·5%
-2·5%
TARGET
⊙ = SINGLES YARN
× = TWOFOLD YARN
AS KNITTED

Figure 2

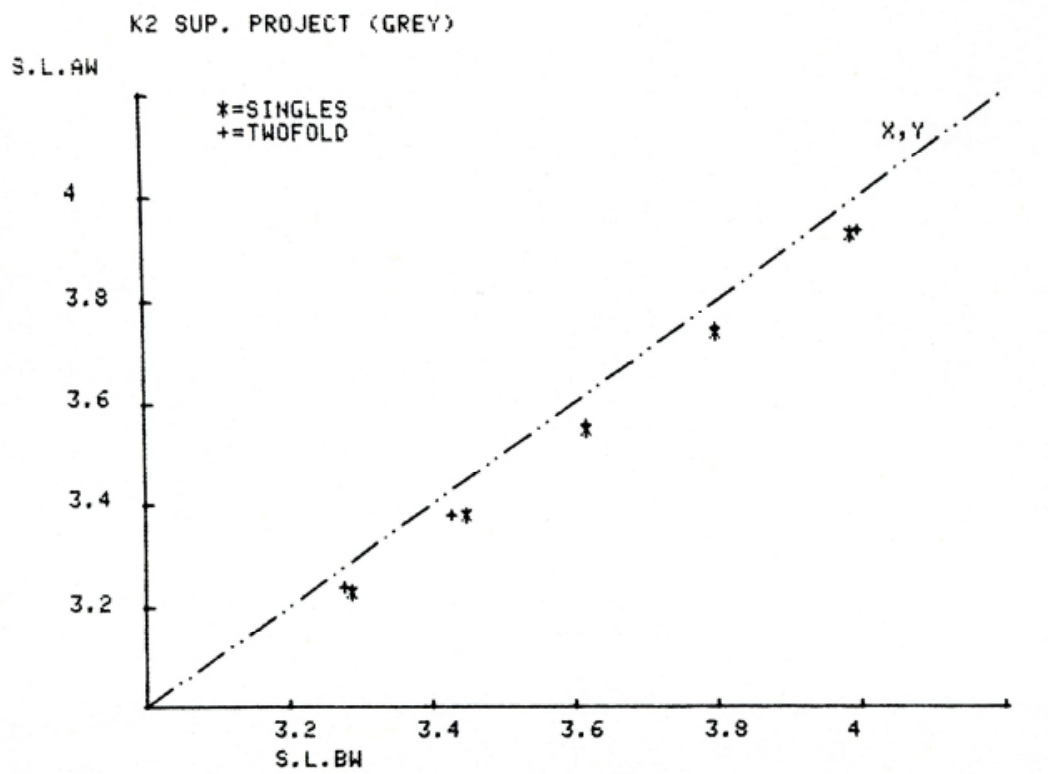


Figure 3

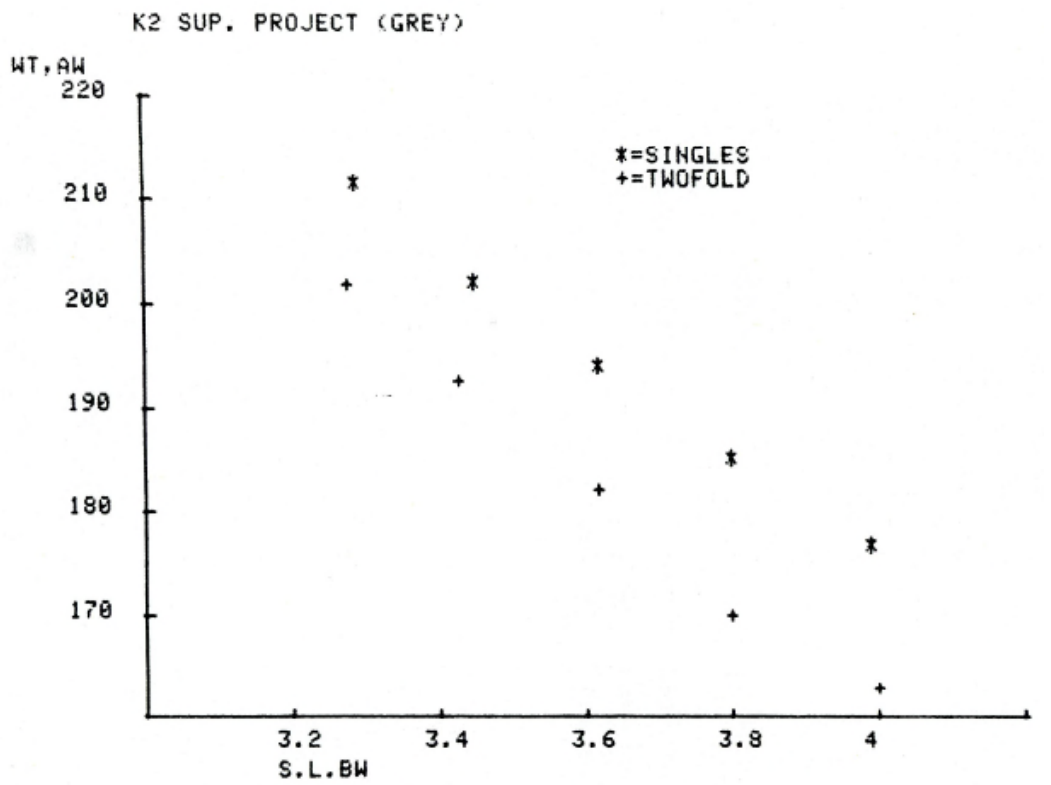


Figure 4

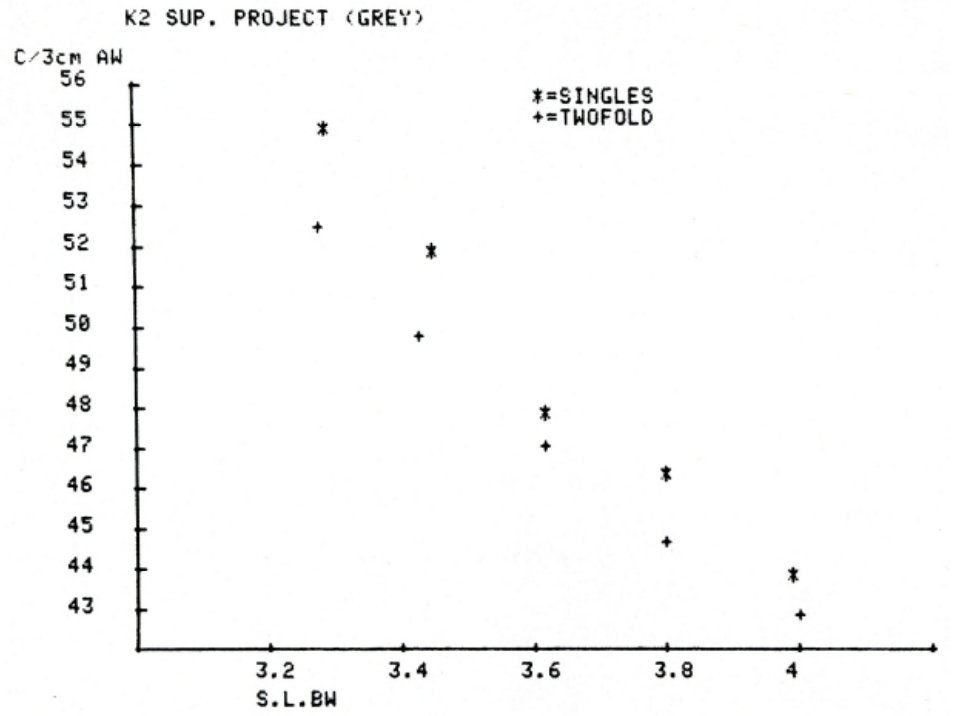


Figure 5

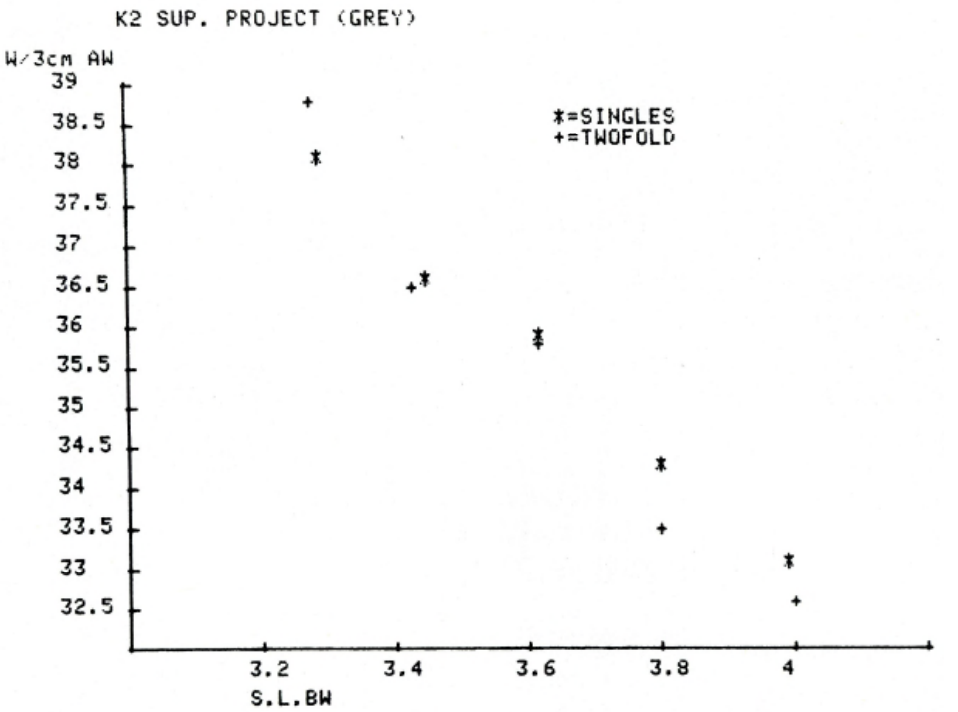
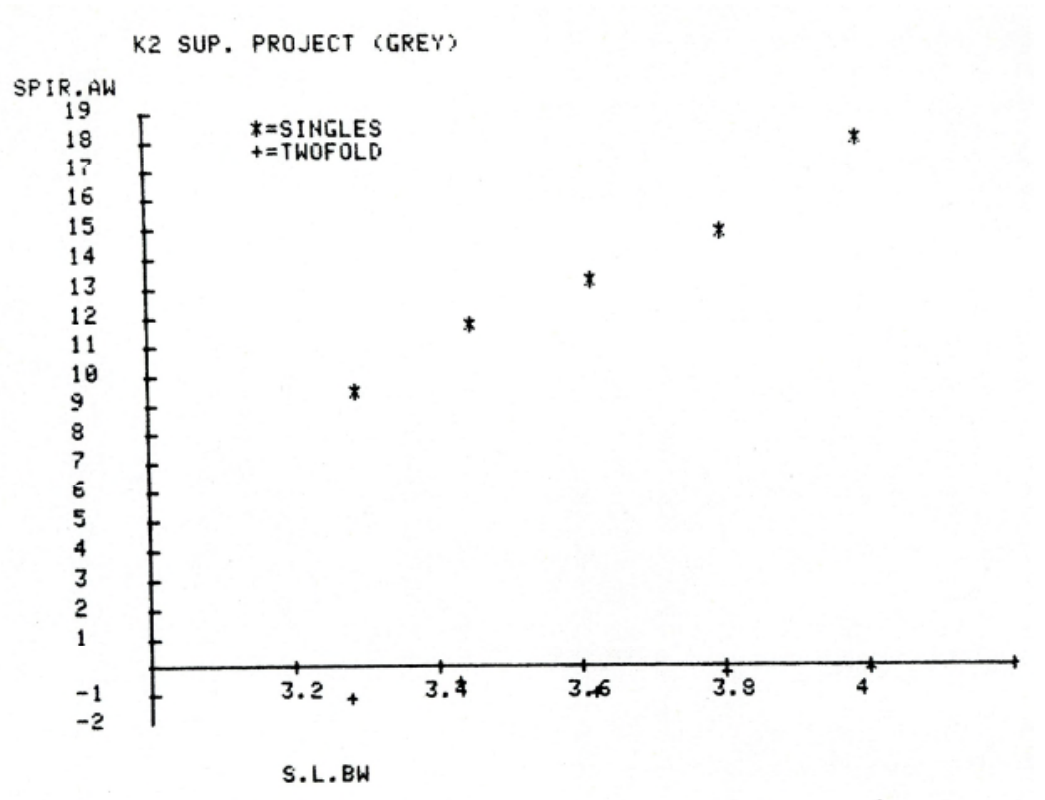


Figure 6


K2 SUP. PROJECT (GREY)
SPIR.AW
19
18
17
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
-1
-2
*=SINGLES
+=TWOFOLD
3.2
3.4
3.6
3.8
4
S.L.BW

Appendix A

This appendix compares the fully relaxed dimensions against the ones obtained in the original K2 project

Comparisons between the original K2 measurements and the K2 supplement

Yarn as knitted

(A)	K2 Av Tex	K2 Supp. TRD Meas. Tex	Difference
1/20's cc	29.7	29.0	0.7 Tex
2/40's cc	29.1	28.55	0.55 Tex

Percentage differences 1/20's cc = 2.36%
2/40's cc = 1.89%

(B)	K2 TRD Meas.Tex	K2 Supp. TRD Meas.Tex	Difference
1/20's cc	29.2	29.0	0.2 Tex
2/40's cc	28.9	28.55	0.35 Tex

Percentage differences 1/20's cc = 0.68%
2/40's cc = 1.21%

A = Comparison between the K2 average tex and K2 supplement as measured tex.

B = Comparison between the K2 TRD measured tex and K2 supplement as measured at TRD.

STITCH LENGTH

Change in stitch length due to TRD relaxation procedures (Greige)

	Nominal Stitch Length					
	.327	.344	.362	.380	.399	
K2						
1/20's cc	-0.031	-0.072	-0.071	-0.019	-0.121	(mm)

Mean change due to washing (5 cycles) = 0.063mm

K2 Supp.						
1/20's cc	-0.06	-0.07	-0.07	-0.06	-0.06	(mm)

Mean change due to washing (5 cycles) = -0.064mm

K2						
2/40's cc	+0.024	-0.024	-0.072	-0.017	-0.098	(mm)

Mean = -0.037mm

K2 Supp.					
2/40's cc	-0.04	-0.05	-0.06	-0.05	-0.06

Mean = -0.052mm

WEIGHT AW

Difference in fully relaxed weight (greige) between K2 and K2 Supp. (Singles yarn) 18 gauge.

	K2 Wt C+W A	K2 Supp. Meas.Wt.AW	Difference	% Difference
1-20/327	214g/m^2	211.6	-2.4	-1.12%
1-20/344	206.2	202.2	-4.0	-1.94%
1-20/362	196.5	194.1	-2.4	-1.22%
1-20/380	187.2	185.2	-2.0	-1.07%
1-20/399	188.7	176.9	-11.8	-6.25%

Average percentage difference from K2 = -2.32%

Difference in fully relaxed weight (greige) between K2 and K2 Supp. (Twofold Yarn) 18 Gauge

	K2 Wt C+W A	K2 Supp. Meas.Wt.AW	Difference	% Difference
2-40/327	207.5g/m^2	202.0	-5.5	-2.65%
2-40/344	195.3	192.6	-2.7	-1.38%
2-40/362	179.2	182.1	+2.9	+1.62%
2-40/380	172.2	170.1	-2.1	-1.22%
2-40/399	167.3	163.0	-4.3	-2.57%

Average percentage difference from K2 = 1.24%

SEE FIGURES 7 and 8

COURSES AW

Difference in fully relaxed courses (greige) between K2 and K2 Supp. (Singles Yarn) 18 Gauge.

	K2 C/3cmA	K2Supp. C/3cm AW	Difference	% Difference
1-20/327	55.9	54.9	-1	-1.79%
1-20/344	52.2	51.9	-0.3	-0.57%
1-20/362	48.5	47.9	-0.6	-1.24%
1-20/380	46.5	46.4	-0.1	-0.20%
1-20/399	43.6	43.9	+0.3	+0.69%

Average percentage difference from K2 = -0.62%

Difference in fully relaxed courses (greige) between K2 and K2 supp. (Twofold Yarn) 18 Gauge

	K2 C/3cmA	K2Supp. C/3cm AW	Difference	% Difference
2-40/327	53.8	52.5	-1.3	-2.42%
2-40/344	51.2	49.8	-1.4	-2.73%
2-40/362	46.9	47.1	+0.2	+0.43%
2-40/380	44.3	44.7	+0.4	+0.90%
2-40/399	42.7	42.9	+0.2	+0.47%

Average percentage difference from K2 = -0.67%

SEE FIGURES 9 AND 10

WALES AW

Difference in fully relaxed wales (greige) between K2 and K2 Supp. (Singles Yarn) 18 gauge

	K2 W/3cmA	K2 Supp. W/3cm AW	Difference	% Difference
1-20/327	38.2	38.1	-0.1	-0.26%
1-20/344	36.6	36.6	0	0
1-20/362	35.3	35.9	+0.6	+1.7%
1-20/380	34.1	34.3	+0.2	+0.58%
1-20/399	33.9	33.1	-0.8	-2.36%

Average percentage difference from K2 = -0.07%

Difference in fully relaxed wales (greige) between K2 and K2 Supp. (Twofold Yarn) 18 gauge

	K2 W/3cmA	K2 Supp. W/3cm AW	Difference	% Difference
2-40/327	38.8	38.8	0	0
2-40/344	37.0	36.5	-0.5	-1.35%
2-40/362	35.0	35.8	+0.8	+2.28%
2-40/380	33.9	33.5	-0.4	-1.18%
2-40/399	32.5	32.6	+0.1	+0.31%

Average percentage difference from K2 = ± 0.012%

SEE FIGURES 11 AND 12

Figure 7

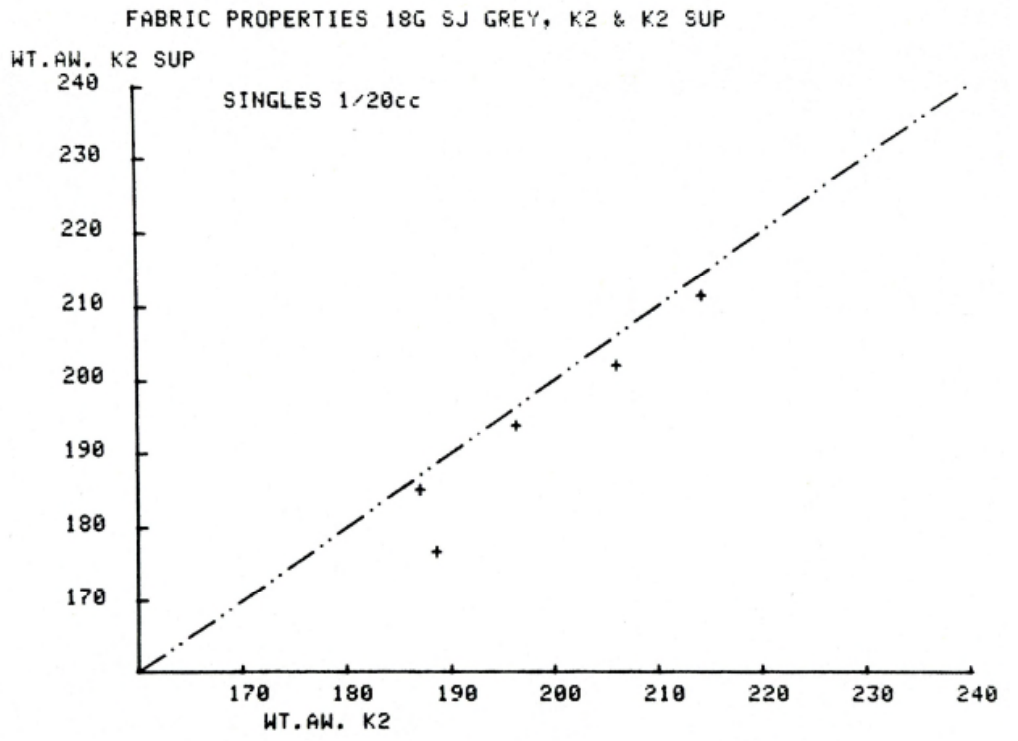


Figure 8

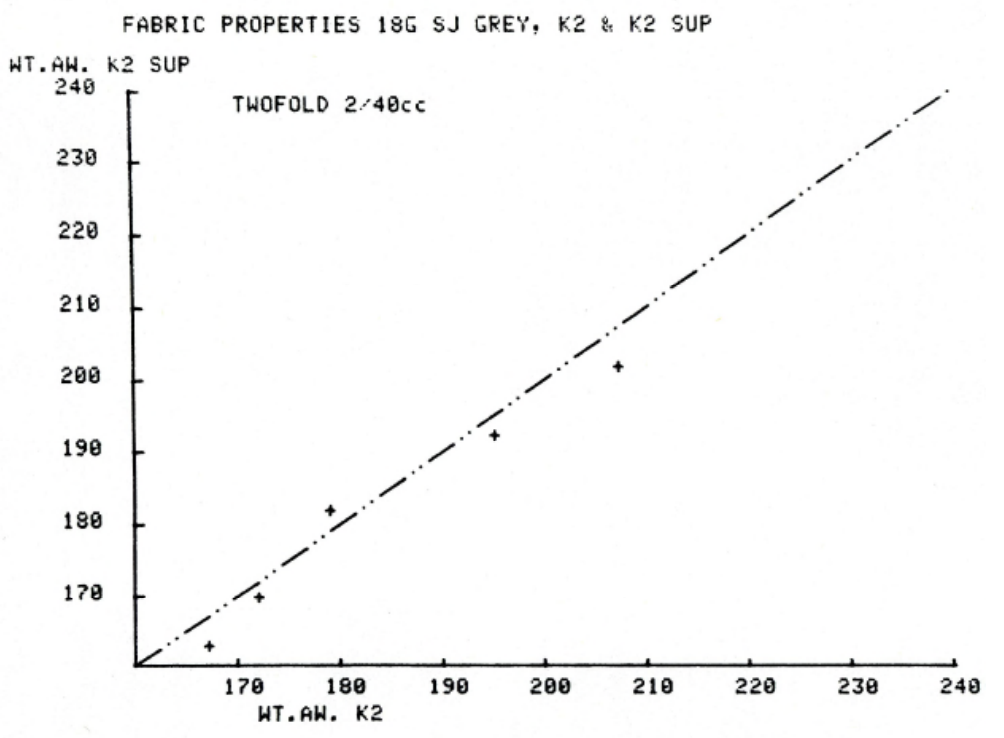


Figure 9

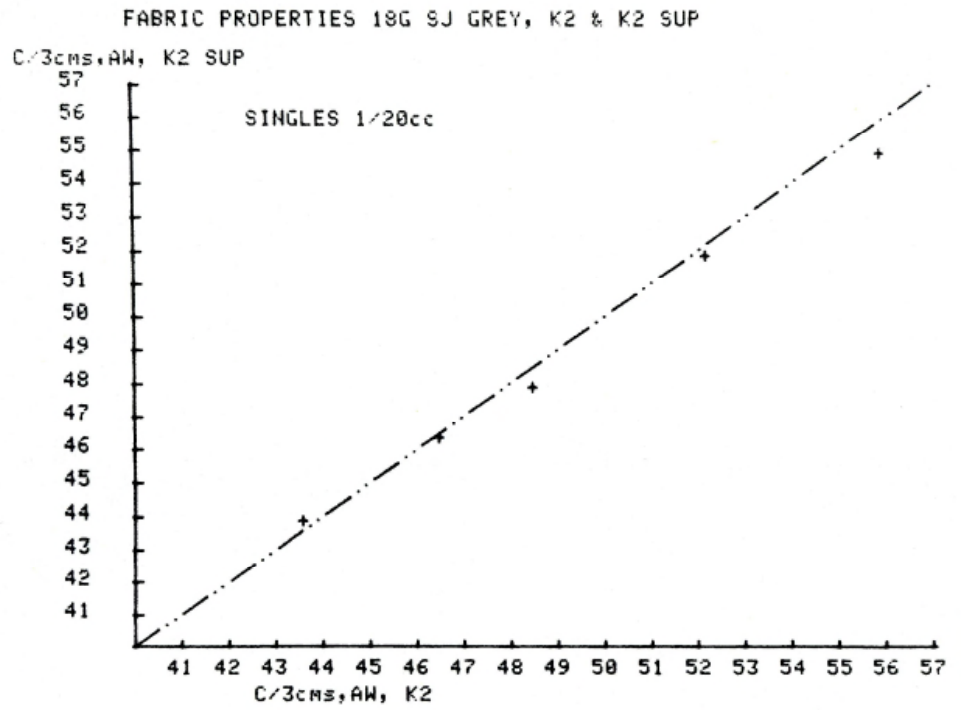


Figure 10

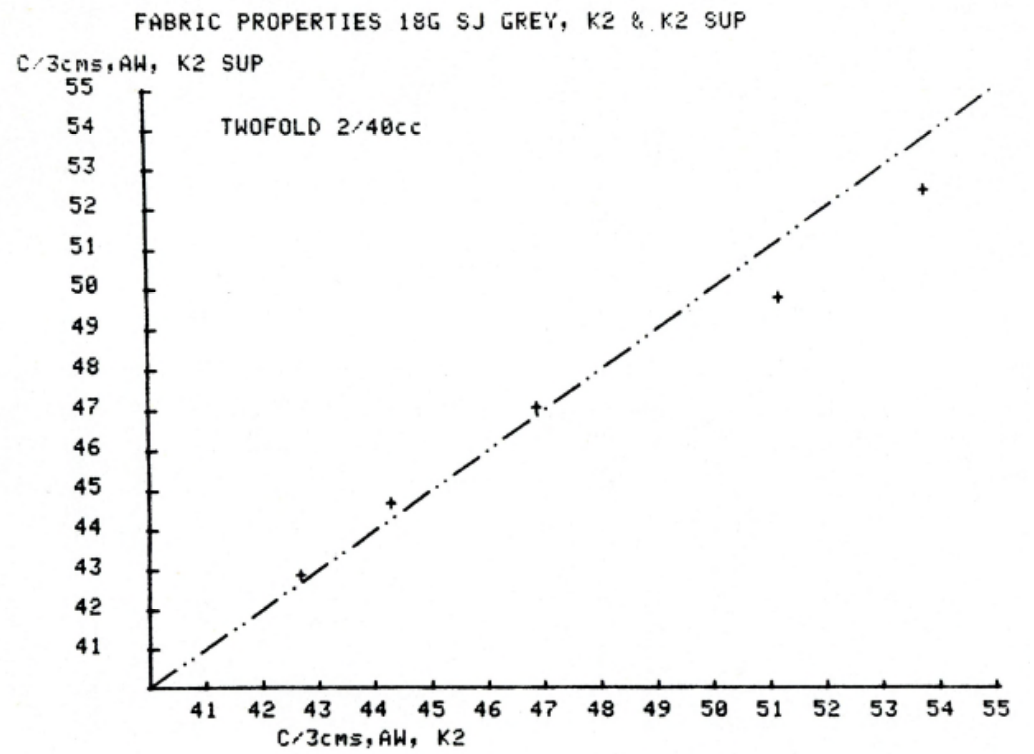


Figure 11

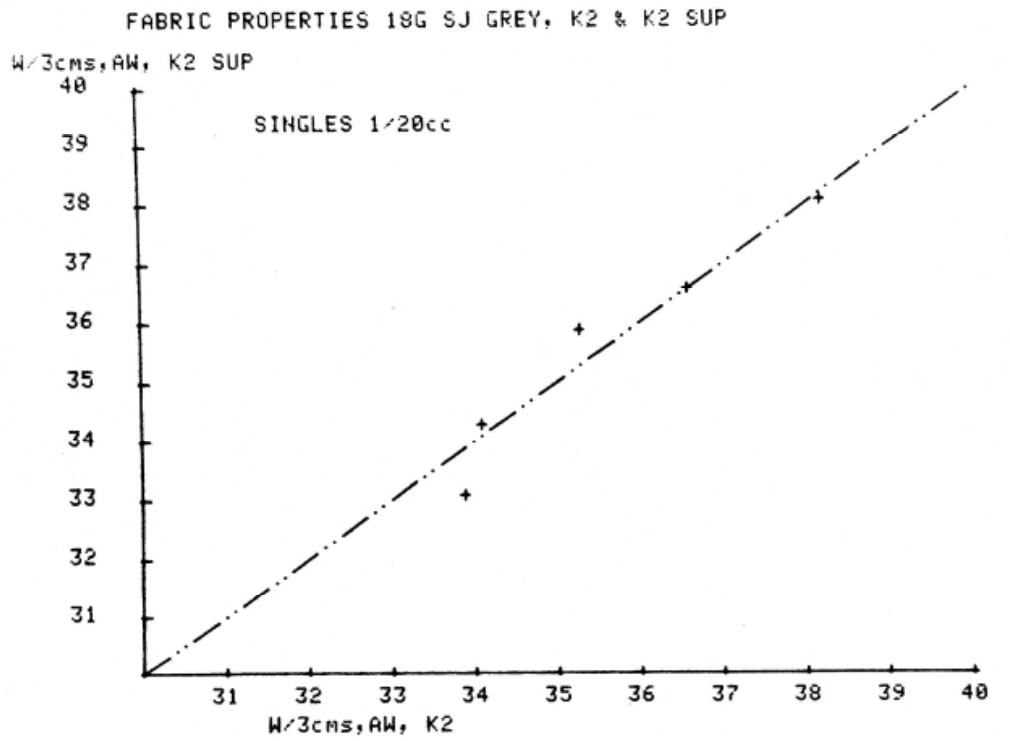
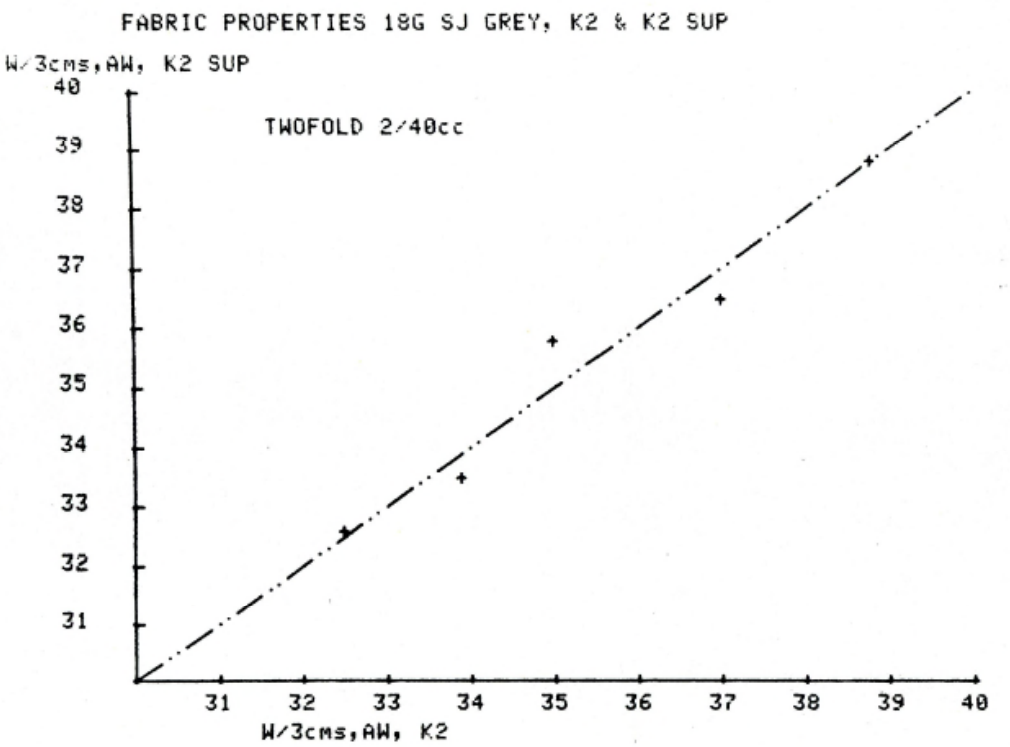


Figure 12



Appendix B

This appendix compares the fully relaxed dimensions of the greige state fabrics from the K2 supplement work against the fully relaxed dimensions predicted from the STARFISH model (August 1983).

The input for the model was the measured yarn from the package and the lab-measured stitch lengths from the greige before-wash fabrics.

Note:

No comparison is made of the yarn change due to the relaxation procedure, as the measurements used in these predictions were from the yarn package and after relaxation from the fabric, hence the two methods of measuring are different.

At this stage, we have not ascertained if there are differences in these two methods of measuring yarn count.

STITCH LENGTH

Change in the stitch lengths due to the TRD relaxation procedure (Greige)

	NOMINAL STITCH LENGTH					
	.327	.344	.362	.380	.399	
K2 Supp. 1/20's cc	-0.06	-0.07	-0.07	-0.06	-0.06	(mm)

Mean change due to washing (5 cycles) = -0.064mm

Predicted 1/20's cc	-0.04	-0.05	-0.06	-0.07	-0.07	(mm)

Mean predicted change = -0.058mm

K2 Supp. 2/40's cc	-0.04	-0.05	-0.06	-0.05	-0.06	(mm)

Mean change due to washing (5 cycles) = 0.052mm

Predicted 2/40's cc	-0.03	-0.03	-0.04	-0.05	-0.05

Mean predicted change = 0.040mm

WEIGHT AW

Difference in fully relaxed weight (greige) between K2 Supp. measured and STARFISH predicted

Nom. SL	K2 Supp. Meas.Wt AW	Predicted Wt AW	% Difference
1-20/327	211.6 g/m^2	208.0	+ 1.73%
1-20/344	202.2	199.2	+ 1.50%
1-20/362	194.1	190.7	+ 1.78%
1-20/380	185.2	182.6	+ 1.42%
1-20/399	176.9	174.7	+ 1.26%

Average percentage difference from predicted = ± 1.54%

2-40/327	202.0	196.4	+ 2.85%
2-40/344	192.6	187.8	+ 2.56%
2-40/362	182.1	177.8	+ 2.42%
2-40/380	170.1	169.3	+ 0.47%
2-40/399	163.0	160.7	+ 1.43%

Average percentage difference from predicted = ± 1.95%

SEE FIGURES 15 & 18

COURSES

Difference in the fully relaxed courses (greige) between the K2 Supp. measured and the STARFISH predictions.

Nom SL	K2 Supp. Meas.C/3cm AW	Predicted C/3cm AW	% Difference
1-20/327	54.9	55.0	- 0.18%
1-20/344	51.9	52.2	- 0.57%
1-20/362	47.9	49.5	- 3.23%
1-20/380	46.4	46.9	- 1.06%
1-20/399	43.9	44.5	- 1.35%

Average percentage difference from predicted = - 1.28%

2-40/327	52.5	52.7	- 0.38%
2-40/344	49.8	50.1	- 0.60%
2-40/362	47.1	47.0	+ 0.21%
2-40/380	44.7	44.4	+ 0.67%
2-40/399	42.9	41.8	+ 2.63%

Average percentage difference from predicted = +0.51%

SEE FIGURES 16 & 19

WALES

Difference in the fully relaxed wales (greige) between the K2 Supp. measured and the STARFISH predictions.

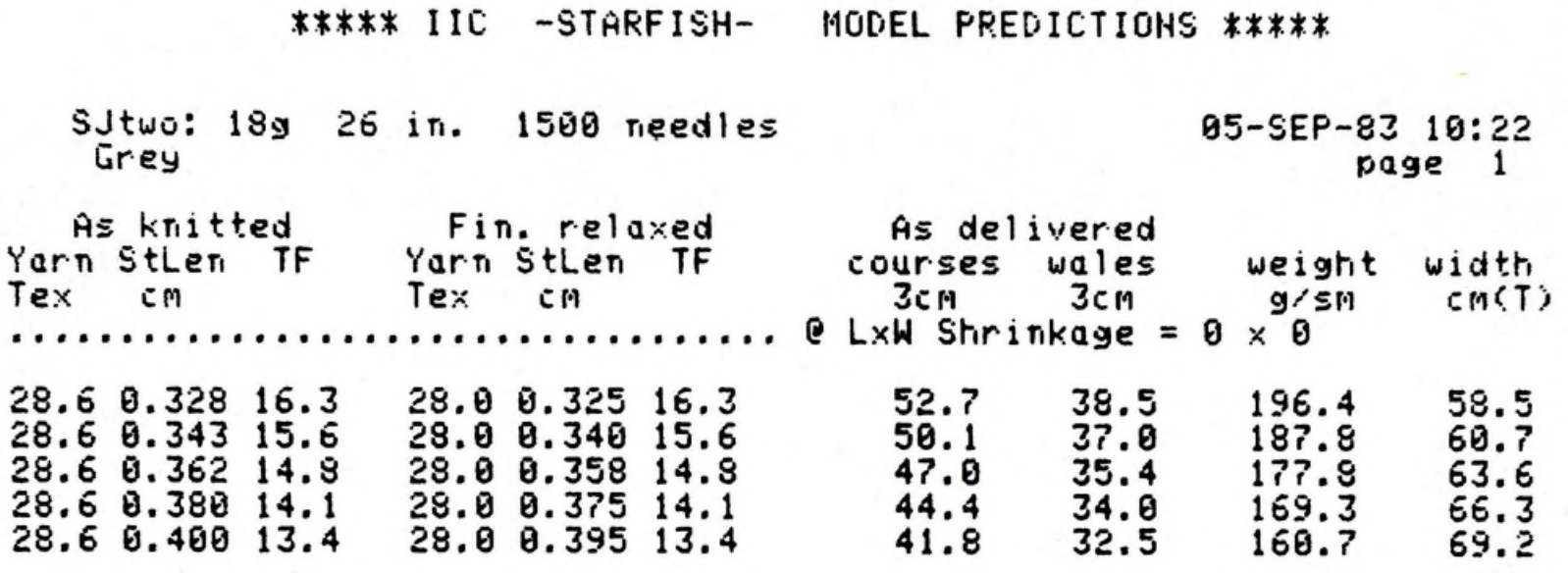
Nom. SL	K2 Supp. Meas. W/3cm AW	Predicted W/3cm AW	% Differene
1-20/327	38.1	38.8	- 1.80%
1-20/344	36.6	37.5	- 2.40%
1-20/362	35.9	36.3	- 1.10%
1-20/380	34.3	35.1	- 2.28%
1-20/399	33.1	34.0	- 2.65%

Average percentage difference from predicted = - 2.05%

2-40/327	38.8	38.5	+ 0.78%
2-40/344	36.5	37.0	- 1.35%
2-40/362	35.8	35.4	+ 1.13%
2-40/380	33.5	34.0	- 1.47%
2-40/399	32.6	32.5	+ 0.30%

Average percentage difference from predicted = - 0.12%

SEE FIGURES 17 & 20



```
***** IIC  -STARFISH-   MODEL PREDICTIONS *****

   SJtwo: 18g  26 in.  1500 needles                    05-SEP-83 10:22
    Grey                                                      page  1

   As knitted        Fin. relaxed        As delivered
Yarn StLen  TF    Yarn StLen  TF      courses  wales     weight  width
Tex   cm          Tex   cm            3cm      3cm       g/sm    cm(T)
..................................... @ LxW Shrinkage = 0 x 0

28.6 0.328 16.3   28.0 0.325 16.3      52.7     38.5      196.4    58.5
28.6 0.343 15.6   28.0 0.340 15.6      50.1     37.0      187.8    60.7
28.6 0.362 14.8   28.0 0.358 14.8      47.0     35.4      177.8    63.6
28.6 0.380 14.1   28.0 0.375 14.1      44.4     34.0      169.3    66.3
28.6 0.400 13.4   28.0 0.395 13.4      41.8     32.5      160.7    69.2
```

Figure 13

Figure 14

***** IIC -STARFISH- MODEL PREDICTIONS *****

SJsin: 18g 26 in. 1500 needles 05-SEP-83 10:19
Grey page 1

As knitted			Fin. relaxed			As delivered			
Yarn Tex	StLen cm	TF	Yarn Tex	StLen cm	TF	courses 3cm	wales 3cm	weight g/sm	width cm(T)
..... @ LxW Shrinkage = 0 x 0									
29.0	0.329	16.4	28.1	0.325	16.3	55.0	38.8	208.0	58.0
29.0	0.345	15.6	28.1	0.340	15.6	52.2	37.5	199.2	60.0
29.0	0.362	14.9	28.1	0.356	14.9	49.5	36.3	190.7	62.0
29.0	0.380	14.2	28.1	0.373	14.2	46.9	35.1	182.6	64.0
29.0	0.399	13.5	28.1	0.392	13.5	44.5	34.0	174.7	66.2

Figure 15

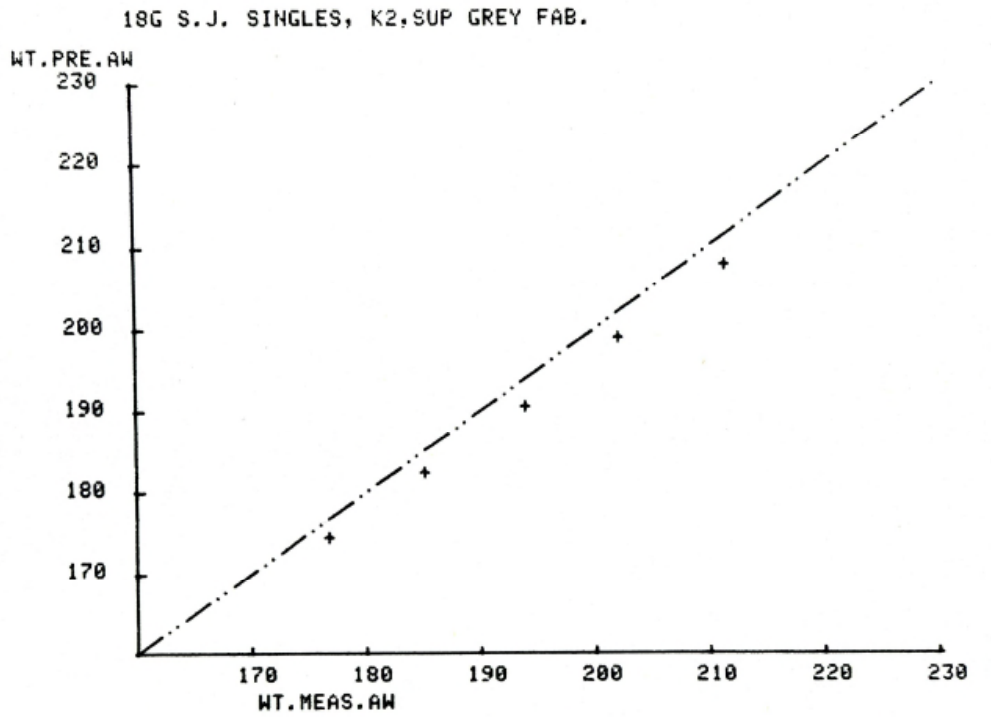


Figure 16

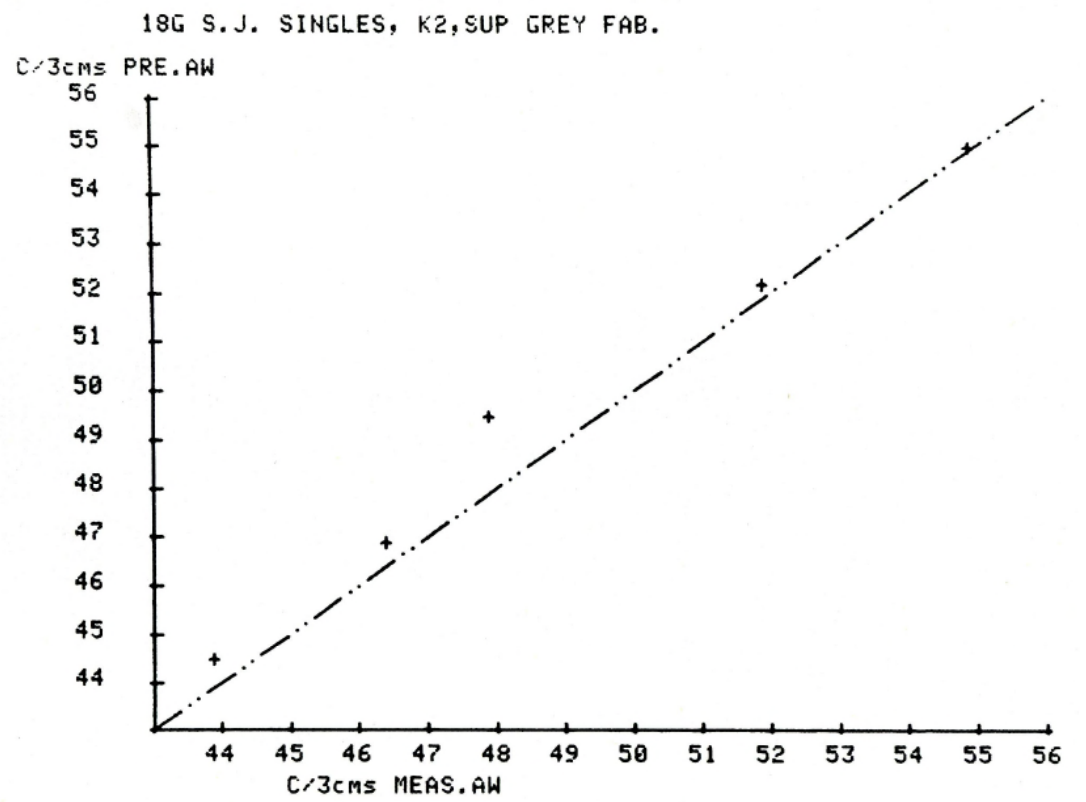


Figure 17

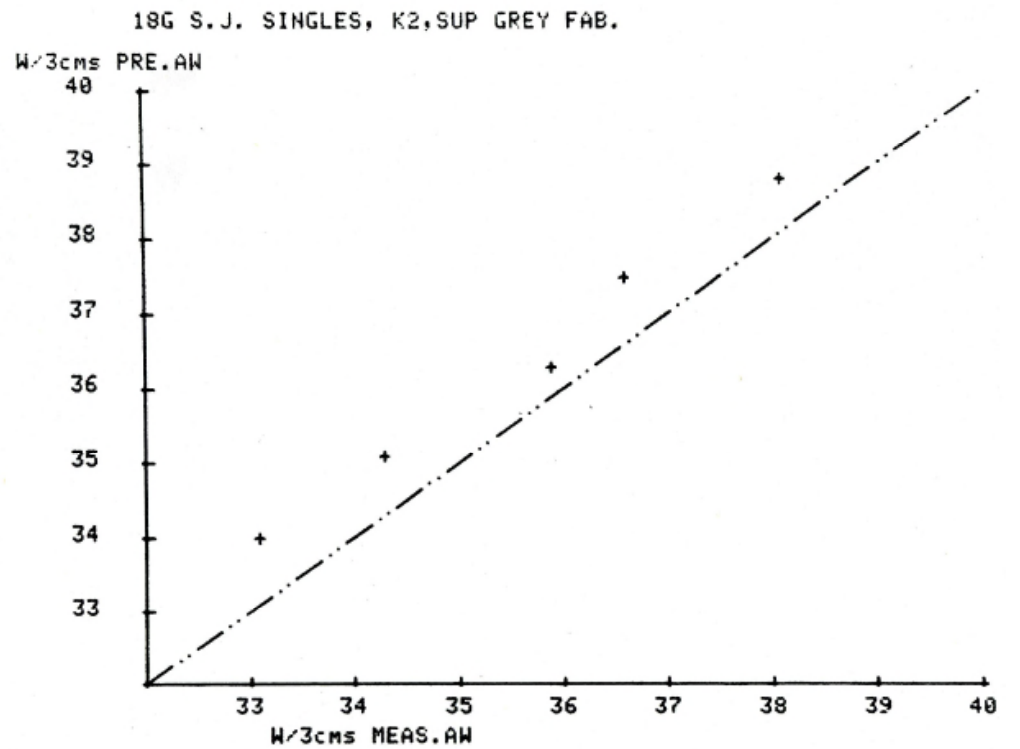


Figure 18

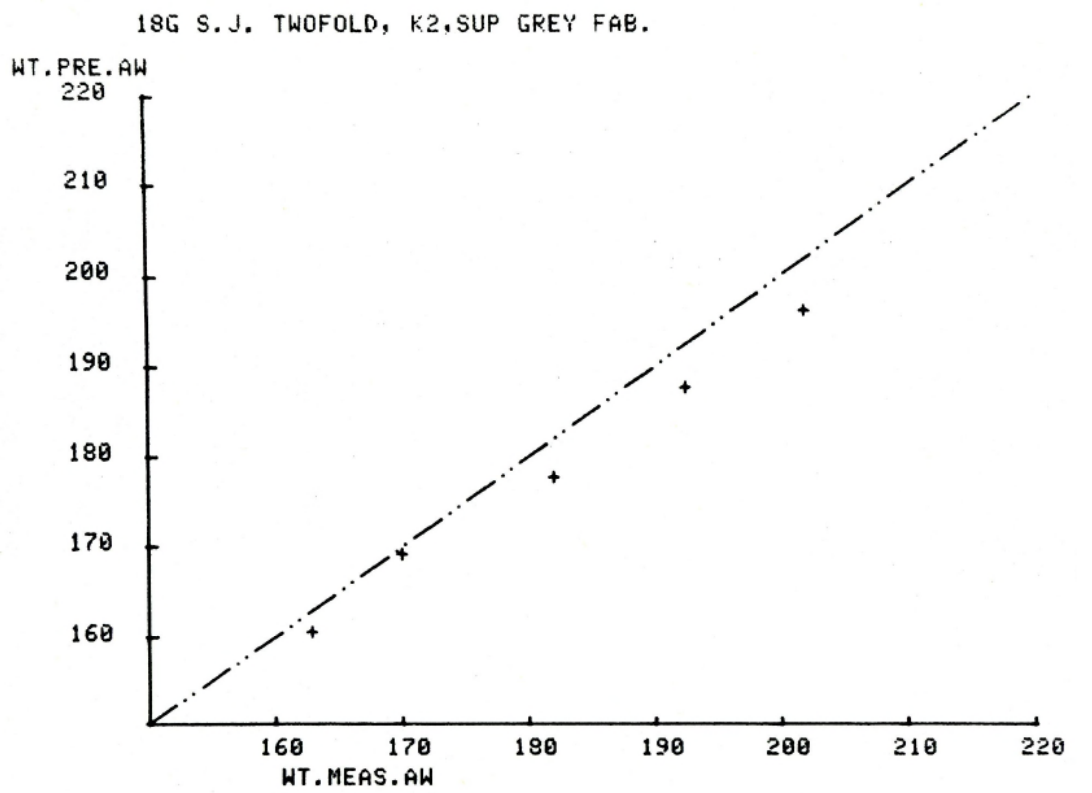


Figure 19

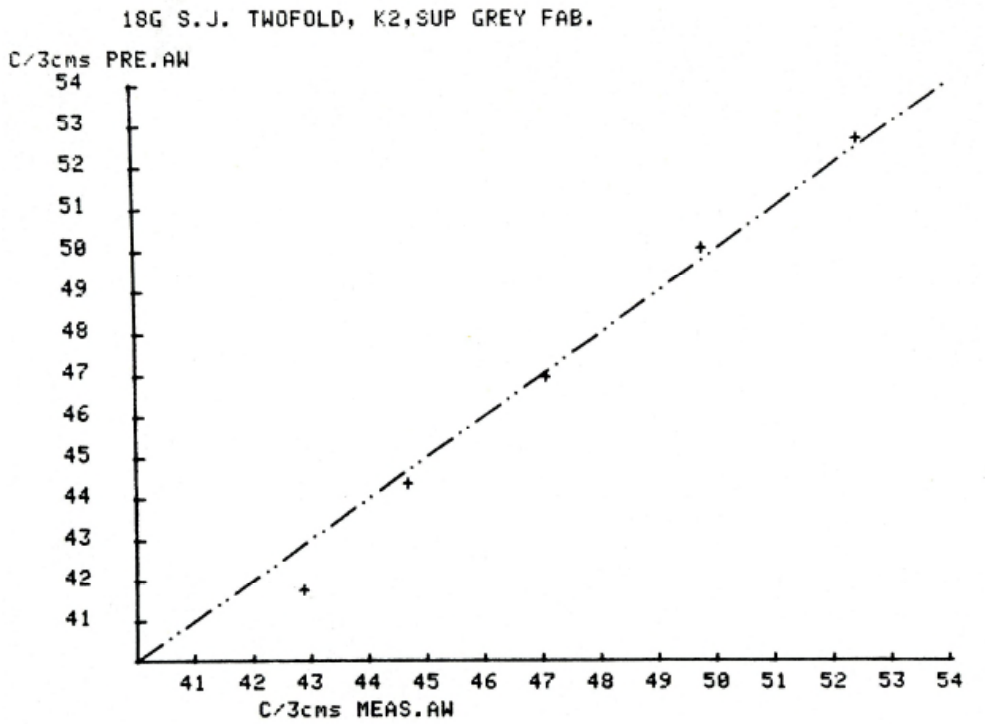
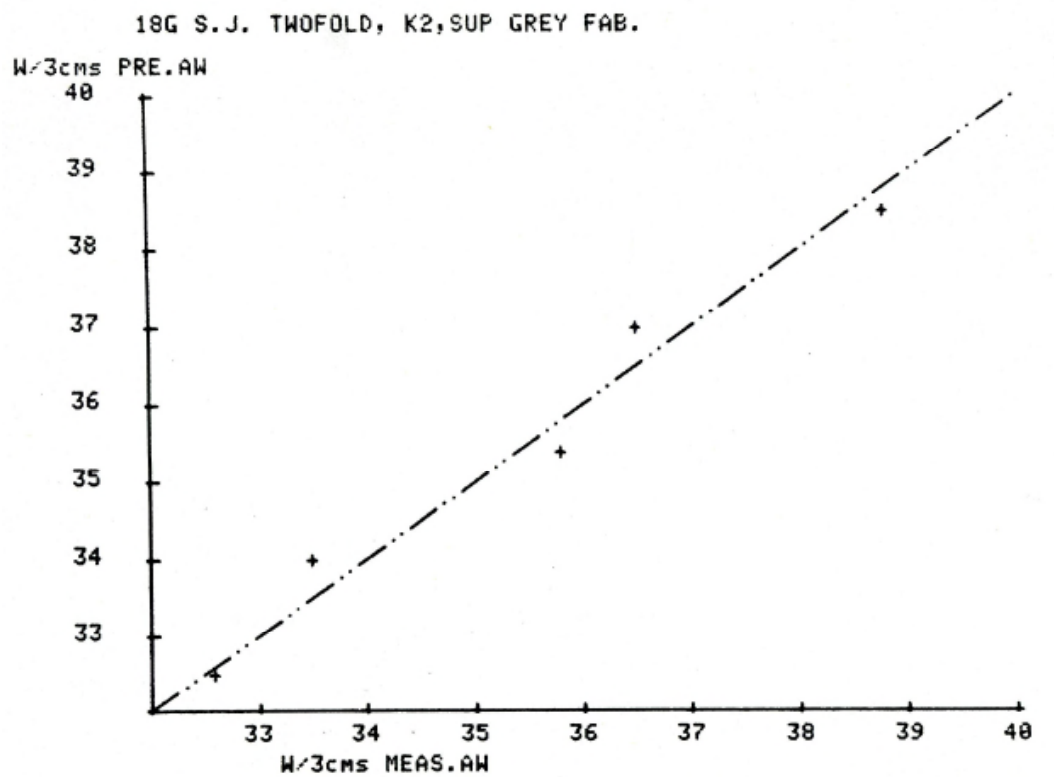


Figure 20



Observations

1. The yarn for this project tested out within acceptable tolerances and is in quite good agreement against the yarns used in the original K2 work. The stitch lengths were maintained within tolerances. Therefore, the performance of these fabrics should be very similar to the original K2 project fabrics.
2. Analysis of the fault rates during knitting showed that the singles yarn indicated a higher fault rate for the tighter fabrics. This was not evident in the original K2 work.
3. After 5 wash and tumble cycles the fully relaxed behaviour pattern was similar to the original K2 work and showed once again dimensional differences between fabrics produced from singles yarn and fabrics produced from twofold yarns.
4. A comparison of the changes that take place on greige fabrics as a result of our relaxation procedure (i.e. 5 wash and tumble cycles) between this fabric set (K2 supp.) and the original set (K2) show the following:
   a) the change in stitch length due to the washing procedure was quite close between the K2 and K2 Supp. sets.
   b) the fully relaxed weight of the greige fabrics from the singles yarn were lighter in every stitch length than the original K2 weights (approximately 2.3% mean)
   c) the twofold yarn displayed a similar trend although not to the same degree (1.2% mean)
   d) a good agreement of fully relaxed courses and wales was recorded between the K2 and K2 supp. sets.
5. A comparison was made of the fully relaxed greige dimensions of the K2 supp. set against the dimensions predicted by the STARFISH model. This shows the following:
   a) the stitch length changes due to the TRD washing procedure show a good measure of agreement between the K2 supp. measured and the STARFISH predictions,
   b) the fully relaxed weights of the K2 supp. samples were heavier than predicted with a mean difference of 1.7%,
   c) courses measured in the K2 supp. set against courses predicted produced a high degree of agreement with differences of approximately 1.3% on the singles and 0.5% on the twofold,
   d) wales compared showed differences of approximately 2% on the singles and 0.12% on the twofold.
   e) the overall agreement between the measured dimensions and the predicted dimensions could be considered to be quite good.