RESEARCH RECORD NO: 256

STARFISH - STUDY OF DOUBLE LACOSTE-KNITTING

AUTHOR: JAMES T. EATON

DATE: JANUARY 1989

CLASSIFICATION: FABRICS/KNITTED/PROPERTIES

KEY WORDS: SINGLE JERSEY, DOUBLE LACOSTE, GREIGE, RELAXED STRUCTURE YARN.

C O N T E N T S

		Page
1.	OBJECTIVE	1
	1.1. Background	1
2.	OUTLINE OF PROJECT	1
	2.1. Plan of Work	1
3.	CO-OPERATION	2
	3.1. Committments	2
	3.2. Confidentiality	2
	3.3. Division of Cost	2
4.	KNITTING	2
5.	TESTING	4
	5.1. Yarn	4
	5.2. Greige Fabric	4
	5.3. Stitch Lengths	5

APPENDICES

Figure 1 Production sheet for 24 gauge
Figure 2 Production sheet for 28 gauge
Figure 3 Stitch lengths knitted compared to stitch lengths measured

Table 1 Yarn test results
Table 2 and 2a Greige fabric test results

1. OBJECTIVE

To derive information on the performance and dimensions of Lacoste fabrics which can be added to the existing data on plain single jersey, rib and interlock fabrics.

1.1. Background

STARFISH information developed by IIC over the last decade is now in regular and successful use by knitgoods producers and retail stores in several countries. It is being used to develop new products, improve quality, prepare new specifications and improve the utilisation of yarn supplies and machinery. However, the data produced to date is confined to three fabric constructions; plain single jersey, interlock and 1 x 1 rib. Although the principles which have been developed are of general applicability, there is a demand for quantitative information on other fabrics, notably Lacoste constructions.

2. OUTLINE OF PROJECT

The name Lacoste is one which is given to various cross-tuck constructions. However, one of the most common structures within the cross-tuck Lacoste range is the one known as Double Lacoste. This construction consists of a four-feeder repeat pattern and will form the basis of this study.

Feeder 1 = knit even needles, tuck odd needles
Feeder 2 = knit even needles, tuck odd needles
Feeder 3 = tuck even needles, knit odd needles
Feeder 4 = tuck even needles, knit odd needles

With Lacoste fabrics, appearance is probably as important as performance. Thus the distinctive diamond pattern has to be maintained as well as low levels of shrinkage. This particular construction is usually produced on the finer gauges of knitting machine, i.e. 24 and 28 gauge, using yarns in the region 1/24's cc to 1/34's cc.

2.1. Plan of Work

In order to obtain a secure database we used four counts of yarn with each yarn covering four stitch lengths.

24 gauge using Ne 1/24's 19" diameter
stitch lengths in cms: 0.283, 0.297, 0.312, 0.327

24 gauge using Ne 1/26's 19" diameter
stitch lengths in cms: 0.271, 0.283, 0.297, 0.312

28 gauge using Ne 1/30's 26" diameter
stitch lengths in cms: 0.247, 0.260, 0.269, 0.286

28 gauge using Ne 1/34's 26" diameterstitch lengths in cms: 0.234, 0.247, 0.260, 0.269

Two pieces of each quality, approximately 35 metres in length to be produced in order to make up two complete sets: one complete set to be winch dyed (white) and one complete set to be jet dyed (navy).

Yarns

All yarns for this exercise to be Courtaulds LW quality. Twist factor to be close to 3.5.

3. CO-OPERATOR

As we no longer have knitting facilities of our own at TRD, we have to look towards the industry for co-operation. For this project we were able to interest the following knitting and making-up company:

Abbey Hosiery Mills Limited
Avenue Road
Nuneaton
Warwickshire CV11 4LY

An agreement was signed between IIC and Abbey Hosiery covering the following points:-

3.1. Committment

IIC will submit a confidential report upon completion of this study. This report will contain all the details of the processing together with all the test results.

The equation derived from the exercise will be made available to Abbey Hosiery. IIC reserves the right to use the said equation in their STARFISH predictive model, but will not refer to the origin of the data.

3.2. Confidentiality

IIC will not divulge any confidential information obtained during any part of this study.

3.3. Division of Cost

IIC will cover the cost of yarn, testing, analysis and reporting. Abbey Hosiery will cover the cost of knitting and finishing.

4. KNITTING

The knitting took place at Abbey Hosiery during the period 31 October - 9 November 1988.

Two machines were allocated for this exercise:

24 gauge Mayer and Cie, Model MV4II-W. 19" diameter with 40 feeders and 1440 needles.

28 gauge Camber, Model Cheminit W, 26" diameter with 48 feeders and 2304 needles.

Comments on the Knitting

The yarn was provided by Abbey from their standard stock. Ten cones of each count were brought back to TRD for testing (See test results). The first machine used was the Mayer 24 gauge. This machine was quite new and appeared to be in very good mechanical condition. the tightest possible fabric was established by knitting 1/24's at a stitch length of 0.283 (T.F. 17.53).

An attempt was made to knit tighter but cutting occurred and holes appeared in the fabric. This was therefore deemed the tightest commercial fabric on this particular machine with this particular yarn. The proposed knitting plan was not fully completed as the slack quality of 1/24's at 0.327 proved difficult to knit.

We may have been able to knit this quality given more time to adjust the machine settings but unfortunately the machine was required for production work and so the time allocation for this exercise was limited. However if one looks at the production sheet (figure 1) we see that the T.F. range was only from 15.27 to 17.58.For most of these qualities the yarn tension was controlled between 3-5 grams, but for the two slacker qualities this had to be increased to approximately 7 grams in order to clear the stitch.

The machine was run between 20 and 40 rpm. Dropped stitches occurred if one tried to increase the machine speed before it had warmed up (say after one hour of running). This emphasises the point that this particular fabric construction is a critical one, demanding quite a degree of skill to set up and knit. Full production details are given on the production sheet (Figure 1).

The second machine used was a Camber Cheminit 28 gauge. This machine was a wrap finger machine. It had not run on either Lacoste or cotton for a long time. The machine cams were badly worn and therefore were difficult to set correctly.

However, the full planned programme was completed on this machine. If one looks at the remarks (see Figure 2), the T.F. of 17.96 resulted in quite a few broken needles and the T.F. of 15.51 resulted in quite a lot of dropped stitches, once again indicating a similar knittable range as with the 24 gauge. Yarn tension was maintained between 3-5 grams for all qualities.

The courses recorded on the production sheets are visible courses as seen on the technical face of the fabric. This in fact led to an error in calculating fabric length as the visible courses represent only half of the actual courses present within the fabric. Therefore, instead of producing 35 metres of each quality as per the original plan, only 17.5 metres of each quality was produced.

Fabrics Produced

Each piece of approximately 17.5 metres was marked at the beginning and end of each piece with piece identification numbers:

Code: 24/1-24/297/1
Decode: 24g/Ne1/24's/0.297cm SL/piece no. 1

The course length recorded on the production sheets was obtained using the Abbey Hosiery Welmstar course length meter, each figure is the mean of approximately 5 readings. Two sets comprising 15 qualities marked either 1 or 2 are now available for finishing trials.

It is envisaged that the dyeing and finishing will take place at South Knighton Dyeworks.

Note: All 24 gauge fabrics have no cutting line
All 28 gauge fabrics have a cutting line

The weight of each piece is recorded on the production sheet and the total weight of each set is:-

Set 1 = 65.9 kilos
Set 2 = 66.3 kilos

In addition to the 17.5 metre lengths, approximately 4 metres was produced of each quality for testing purposes.

5. TESTING

5.1. Yarn

10 cones of each count were brought back to IIC for testing. The results are given in Table 1 and give the mean results of the 10 cones.

5.2. Grey Fabric

The grey fabric test results are given in Tables 2 and 2a. With both yarn and grey fabric test results no attempt has been made to analyse these data at this stage; they are recorded here for information only.

5.3. Stitch Lengths

The stitch lengths were measured in the TRD laboratory and were compared against the stitch lengths measured on the knitting machines. These are shown graphically in Figure 3.

Date: 31 Oct - 9 Nov 1988

PRODUCTION SHEET

MACHINE GAUGE 24

Machine Type: Mayer & Cie

Model MV4II-W

Needles = 1440

Diameter = 19"

40 Feeders

40F

Piece No.	T.F	Courses off m/c per 3cms	Revs produced	Piece Weight in Kilos	Measured course length in cms	Remarks
24/1-26/271/1	17.58	36	1050	3.8	391	
24/1-26/271/2	17.58	36	1050	3.8	391	
24/1-26/283/1	16.84	34	1000	3.6	408	
24/1-26/283/2	16.84	34	1000	3.8	408	
24/1-24/283/1	17.53	34	1000	4.0	408	
24/1-24/283/2	17.53	34	1000	3.8	408	
24/1-24/297/1	16.70	32	1000	4.0	428	
24/1-24/297/2	16.70	32	1000	4.0	428	
24/1-26/297/1	16.05	32	1000	3.6	428	
24/1-26/297/2	16.05	32	1000	3.6	428	
24/1-26/312/1	15.27	30	950	3.6	450	
24/1-26/312/2	15.27	30	950	3.6	450	
24/1-24/312/1	15.90	30	950	4.0	450	
24/1-24/312/2	15.90	30	950	4.0	450	
24/1-24/327/1	NOT PRODUCED					Unable to knit
24/1-24/327/2						Too slack

General Comments:

Machine equipped with central adjuster for stitch length

Positive feed through 2 trip tapes set on alternate feeders
Meminger storage unit fitted on all feeds
No cutting line in fabric
Unable to knit last quality (too slack) excessive dropped stitches
Each piece was made to approximately 17.5 metres in length
Courses off machine are visible courses on the technical face

FIGURE 1

Date: 31 Oct - 9 Nov 1988

PRODUCTION SHEET

MACHINE GAUGE 28

Needles =2304

Machine Type:— Camber Cheminit W and model

Diameter = 26"

Piece No.	T.F.	Courses off m/c per 3cms	Revs produced	Piece Weight in kilos	Measured course length in cms	Remarks
28/1-34/234/1	17.80	43	1045	4.7	539	
28/1-34/234/2	17.80	43	1045	5.2	539	
28/1-34/247/1	16.87	42	1020	4.9	570	
28/134/247/2	16.87	42	1020	5.1	570	
28/1-30/247/1	17.96	42	1020	5.5	570	Quite a few
28/1-30/247/2	17.96	42	1020	5.3	570	broken needles
28/1-30/260/1	17.06	40	972	5.4	598	
28/1-30/260/2	17.06	40	972	5.5	598	
28/1-34/260/1	16.03	40	972	4.8	598	
28/1-34/260/2	16.03	40	972	4.7	598	
28/1-34/269/1	15.49	34	826	4.3	620	
28/1-34/269/2	15.49	34	826	4.2	620	
28/1-30/269/1	16.49	34	826	4.8	620	
28/1-30/269/2	16.49	34	826	4.8	620	
28/1-30/286/1	15.51	32	800	4.9	659	Quite a few
28/1-30/286/2	15.51	32	800	4.9	659	dropped stitches

General Comments:

Machine equipped with single feed tape driving IRO-IPF storage units
Cutting line set in fabric
Cadratex type fabric spreader fitted to take down
Each piece was made to approximately 17.5 metres in length
Courses off machine are visible courses on the technical face

FIGURE 2

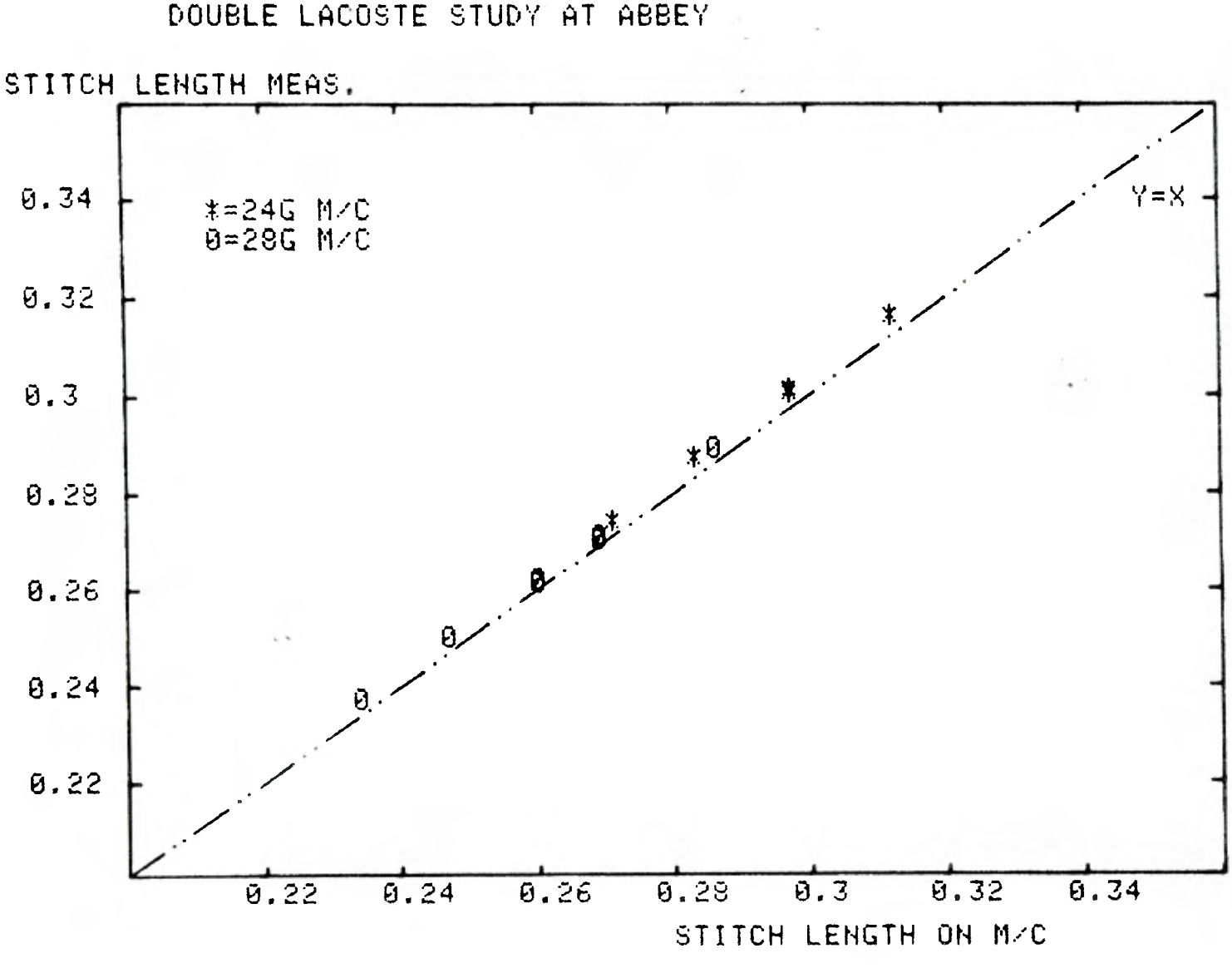
DOUBLE LACOSTE STUDY AT ABBEY
STITCH LENGTH MEAS.
*=24G M/C
0=28G M/C
Y=X
0.34
0.32
0.3
0.28
0.26
0.24
0.22
0.22
0.24
0.26
0.28
0.3
0.32
0.34
STITCH LENGTH ON M/C

FIGURE 3

TABLE 1

Lab Ref No. 1344 15-DEC-88 LABDATA13

Lacoste Project - Yarns

SAMPLE NO.	1	2	3	4
Yarn count (Tex)	19.60	17.46	24.74	22.89
Twist (turns per metre)	797	831	694	729
Single end strength (g)	287.26	245.42	348.66	327.63
Extension at break (%)	6.29	6.09	6.46	6.41
Coefficient of friction (mu)	0.13	0.13	0.13	0.12
Twist liveliness (tpm)	59.60	63.20	48.90	54.80
Yarn count (Ne)	30.13	33.83	23.87	25.80
Turns per inch	20.24	21.09	17.61	18.52
Twist Factor - alpha Tex	35.29	34.70	34.50	34.87
Twist Factor - English	3.69	3.63	3.61	3.65
Tenacity (g./Tex)	14.65	14.06	14.09	14.32

Nominal 1 = Ne 1/30's
2 = Ne 1/34's
3 = Ne 1/24's
4 = Ne 1/26's

Lacoste Project - Grey Fabrics (Abbey Hosiery)

24 GAUGE

	24/283	24/297	24/312	26/271	26/283	26/297	26/312
Weight (gsm), AW	261.32	250.18	235.52	255.73	241.29	230.03	217.69
Courses per 3cm, AW	54.75	51.60	48.80	50.20	55.40	52.00	49.40
Wales per 3cm, AW	32.40	30.90	29.70	33.80	32.40	31.25	29.90
Stitch length (mm) BW	2.87	3.01	3.16	2.74	2.87	3.00	3.16
Stitch length (mm) AW	2.82	2.97	3.11	2.70	2.82	2.96	3.12
Angle of spirality, AW	4.10	6.97	7.76	5.71	4.33	8.70	8.19
Width (cm), BW	71.67	74.00	75.40	71.20	71.93	73.77	75.20
Yarn count (tex), BW	24.37	24.28	24.45	22.34	22.47	22.79	22.47
Yarn count (tex), AW	23.59	23.85	23.81	22.08	22.30	22.23	21.79
Thickness (mm x 1000), BW	907	940	969	888	876	910	928
Thickness (mm x 1000), AW	1360	1385	1398	1295	1316	1336	1331
Turns per metre, BW	724	705	729	795	746	794	786
Twist liveliness, t/m, BW	53.30	57.75	55.80	58.60	54.75	65.55	64.00
Twist liveliness, t/m, AW	43.35	45.40	46.45	48.90	50.85	51.95	54.05

DATA CHECKS

Calc/Obs Wt BW							
Calc/Obs Wt AW	1.00	1.00	1.01	1.02	1.04	1.03	1.02
Calc/Obs Courses/3cm AW							
Calc/Obs Wales/3cm AW							

Note: BW = Before Wash
AW = After Wash

TABLE 2a

Lacoste Project - Grey Fabrics (Abbey Hosiery)

28 GAUGE

	30/247	30/260	30/269	30/286	34/234	34/247	34/260	34/269
Weight (gsm), AW	244.48	232.15	223.33	209.31	222.39	211.05	198.99	191.62
Courses per 3cm, AW	63.45	60.75	58.10	53.80	67.35	62.80	60.30	57.65
Wales per 3cm, AW	36.60	35.30	34.10	32.05	38.05	36.80	35.15	34.10
Stitch length (mm) BW	2.50	2.62	2.71	2.89	2.37	2.50	2.61	2.70
Stitch length (mm) AW	2.47	2.58	2.68	2.85	2.34	2.47	2.58	2.67
Angle of spirality, AW	8.16	9.62	10.00	11.73	9.52	11.42	11.55	12.36
Width (cm), BW	101.13	104.07	105.93	108.33	100.13	102.20	103.57	106.87
Yarn count (tex), BW	19.22	19.52	19.69	19.37	17.07	17.10	16.94	16.97
Yarn count (tex), AW	18.95	19.14	19.33	19.25	16.68	16.79	16.64	16.57
Thickness (mm x 1000), BW	815	840	866	878	732	771	784	809
Thickness (mm x 1000), AW	1168	1198	1227	1214	1113	1130	1140	1131
Turns per metre, BW	877	854	827	866	946	967	950	941
Twist liveliness, t/m, BW	62.20	64.65	63.50	69.00	66.35	73.65	72.00	73.25
Twist liveliness, t/m, AW	52.45	49.65	52.00	53.90	57.20	56.25	55.00	57.25

DATA CHECKS

Calc/Obs Wt BW								
Calc/Obs Wt AW	0.99	1.01	1.02	1.00	1.00	1.01	1.02	1.01
Calc/Obs Courses/3cm AW								
Calc/Obs Wales/3cm AW								