

THE DETERGENT IN THE STARFISH REFERENCE RELAXATION PROCEDURE

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INTRODUCTION

Internationally-agreed domestic washing and drying procedures for textile testing are set down in ISO Standard 6330 : 1984.

The STARFISH Reference Relaxation Procedure (1) developed and specified by IIC for the evaluation of cotton knitted fabrics differs in several respects from the recommendations of ISO 6330. Among the differences observed, the following may be particularly noted:

1. the washing machine; a comparison of the requirements of ISO 6330 with the machine in use at TRD is shown in Table I. Major differences are clearly apparent.
2. the detergent; ISO 6330 specifies that one of two standard detergents, designated as ECE and IEC reference detergents, should be used (figure 1). The STARFISH Reference Relaxation Procedure specifies merely the use of "a normal domestic automatic washing powder which does not contain softener or fabric conditioner".
3. loading fabric; ISO 6330 specifies the use of either knitted polyester, or woven cotton-polyester fabric. The STARFISH Reference Relaxation Procedure specifies fabric which is similar to the fabric under test (and therefore cotton).

This report describes work carried out to explore the possibility that use of the ECE standard detergent in the STARFISH Reference Relaxation Procedure might give significantly different results, in comparison with the commercial product in general use at TRD.

EXPERIMENTAL

Ten knitted cotton fabrics, chosen at random from past experimental studies at TRD, were used in the laundering trials. These are listed in Table II.

The automatic washer was a Hoover Electron 800 as described in Table I. The washing procedure consisted of one wash at 60°C, with normal mechanical agitation as specified in BS 2747 : 1986; followed by tumble drying, and subsequently by four rinse and tumble dry cycles, as specified in the STARFISH Reference Relaxation Procedure.

The detergents used in the study were:

1. ECE Reference Detergent, as specified in ISO 6330 : 1984 (figure 1)
2. New Persil Automatic (Lever Bros.) as customarily used at TRD.

The concentration of detergent used in each case was about 3g/l.

The loading fabric was a cotton knitted construction.

TESTING AND EVALUATION

Measurements of course and wale densities, fabric weight, yarn count (tex) and stitch length were carried out on the relaxed fabric samples and these are shown in Table III, and in graphical form in Figures 2-6.

Statistical analysis of the data was carried out to establish whether any differences could be attributed to the detergent used. Table IV shows the results of applying Student's t-test to indicate statistical differences between the two sets of data.

No significant differences were shown by the course or wale densities, fabric weight or yarn count data. However, a difference, significant at the 5% level but not at the 1% level, was found in the stitch length data.

CONCLUSION

Some evidence, although slight, has been found to indicate that the detergent used at TRD may not give exactly the results which would be obtained by use of the ECE Reference Detergent. The discrepancy is not large, and more exhaustive testing may show that the difference is not significant. However, commercial detergent formulations change from time to time, and further comparisons along the lines of this study may be advisable.

REFERENCE

1. The STARFISH Approach to High Quality Cotton Knitgoods, IIC 1988.

TABLE I

AUTOMATIC WASHING MACHINES USED IN TESTING

	<u>Wascator</u> <u>(ISO 6330)</u>	<u>Hoover</u> <u>Electron 800</u>
Drum diameter	51.5 cms	42 cms
Drum depth	33.5 cms	30 cms
Spin Speed	530 rpm	800 rpm
Load	4 kg	2.75 kg
Volume	not directly specified	42 litres

TABLE II

TEST FABRICS

1.	Single jersey	28/1-36/287M
2.	" "	24/2-56/321C
3.	" "	18/2-40/381M
4.	" "	24/1-28/321C
5.	Interlock	42/340/8 WDH
6.	"	42/324/5 MJDH
7.	"	34/340/8 WDH
8.	Rib	30/267/21
9.	"	26/326/22 pc13
10.	"	34/285/22 pc5

TABLE III. DETERGENT STUDY - Reference State Data

ECE Reference Detergent						Persil				
Courses per 3cm	Wales per 3cm	Weight	Tex	Stitch length		Courses per 3cm	Wales per 3cm	Weight	Tex	Stitch length
1	51.6	55.6	140.4	16.2	2.72	54.9	55.5	148.2	16.1	2.77
2	50.2	39.2	144.7	20.8	3.16	51.8	39.1	146.6	20.6	3.17
3	39	40.6	189.8	30.2	3.48	40.6	40.8	198.8	30.5	3.49
4	52.6	40.1	150.7	20.4	3.18	52.5	40.1	153.6	20.2	3.19
5	44.9	44	196.0	13.5	3.35	44.8	44.4	197.9	13.5	3.38
6	44.1	53.3	236.3	15.1	3	43.1	53.8	237.9	15	3.02
7	45.8	41.6	233.7	16.3	3.36	45.6	42.3	236.3	16.3	3.39
8	57.4	33.9	223.2	18.9	2.66	57.9	34.1	226.3	18.8	2.67
9	45.3	29.5	217.2	21.7	3.29	44.7	29.3	211.2	21.7	3.28
10	51.2	33	185.7	16.6	2.84	51.9	34.3	183.6	16.4	2.85

TABLE IV

STUDENT'S t-TEST

	<u>t</u>			
Courses per 3cm	1.39	not significant at 5%		
Wales per 3cm	1.93	"	"	"
Weight	1.53	"	"	"
Yarn count (tex)	0.93	"	"	"
Stitch length	2.90	significant at 5%, not significant at 1%		

Annex A

AATCC reference detergent WOB (without optical brightener)

(Forms an integral part of the Standard.)

Nominal percentage composition

Linear alkylsulfonate — Sodium salt (LAS)	14,0
Alcohol ethoxylate	2,3
Soap — high molecular mass	2,5
Sodium tripolyphosphate	48,0
Sodium silicate ($\text{SiO}_2/\text{Na}_2\text{O} = 2,0 : 1$)	9,7
Sodium sulfate	15,4
Carboxymethylcellulose	0,25
Moisture	7,85
	100,00

Annex B

ECE and IEC reference detergents

(Forms an integral part of the Standard.)

Nominal percentage composition	ECE detergent	IEC detergent
Linear sodium alkyl benzene sulfonate (mean length of alkane chain: $\text{C}_{11,5}$)	8,0	8,0
Ethoxylated tallow alcohol (14 EO)	2,9	2,9
Sodium soap (chain length C_{12-22})	3,5	3,5
Sodium tripolyphosphate	43,7	43,7
Sodium silicate ($\text{SiO}_2/\text{Na}_2\text{O} = 3,3 : 1$)	7,5	7,5
Magnesium silicate	1,9	1,9
Carboxymethylcellulose	1,2	1,2
Ethylendiaminetetraacetic acid (tetrasodium salt)	0,2	0,2
Sodium sulfate	21,2	21,0
Optical brightener for cotton (dimorpholinostilbene type)		0,2
Moisture	9,9	9,9
	100,0	100,0

Figure 2. DETERGENT STUDY - Courses per 3 cm

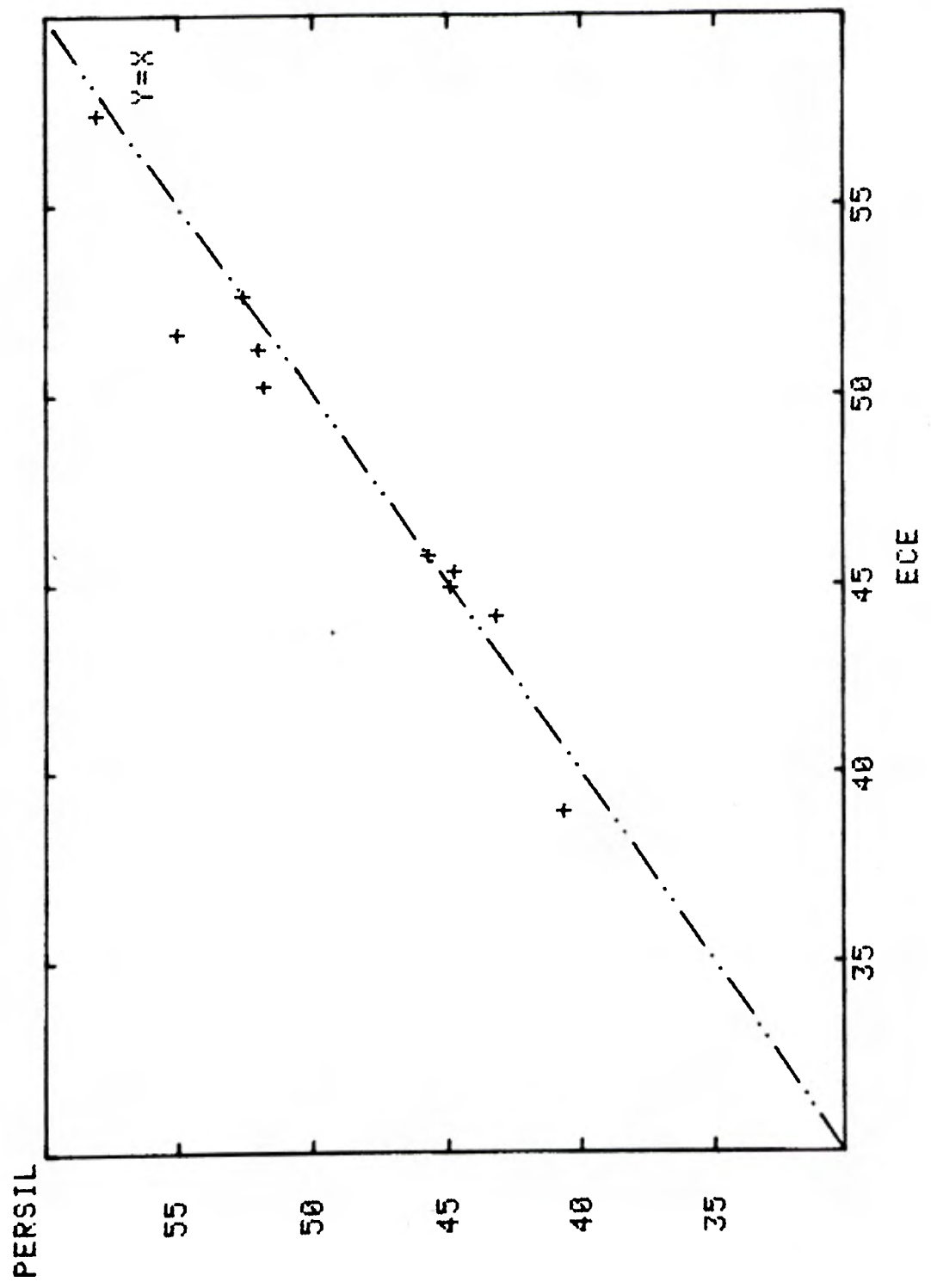


FIGURE 3

Figure 3. DETERGENT STUDY - Moles per 3 cm

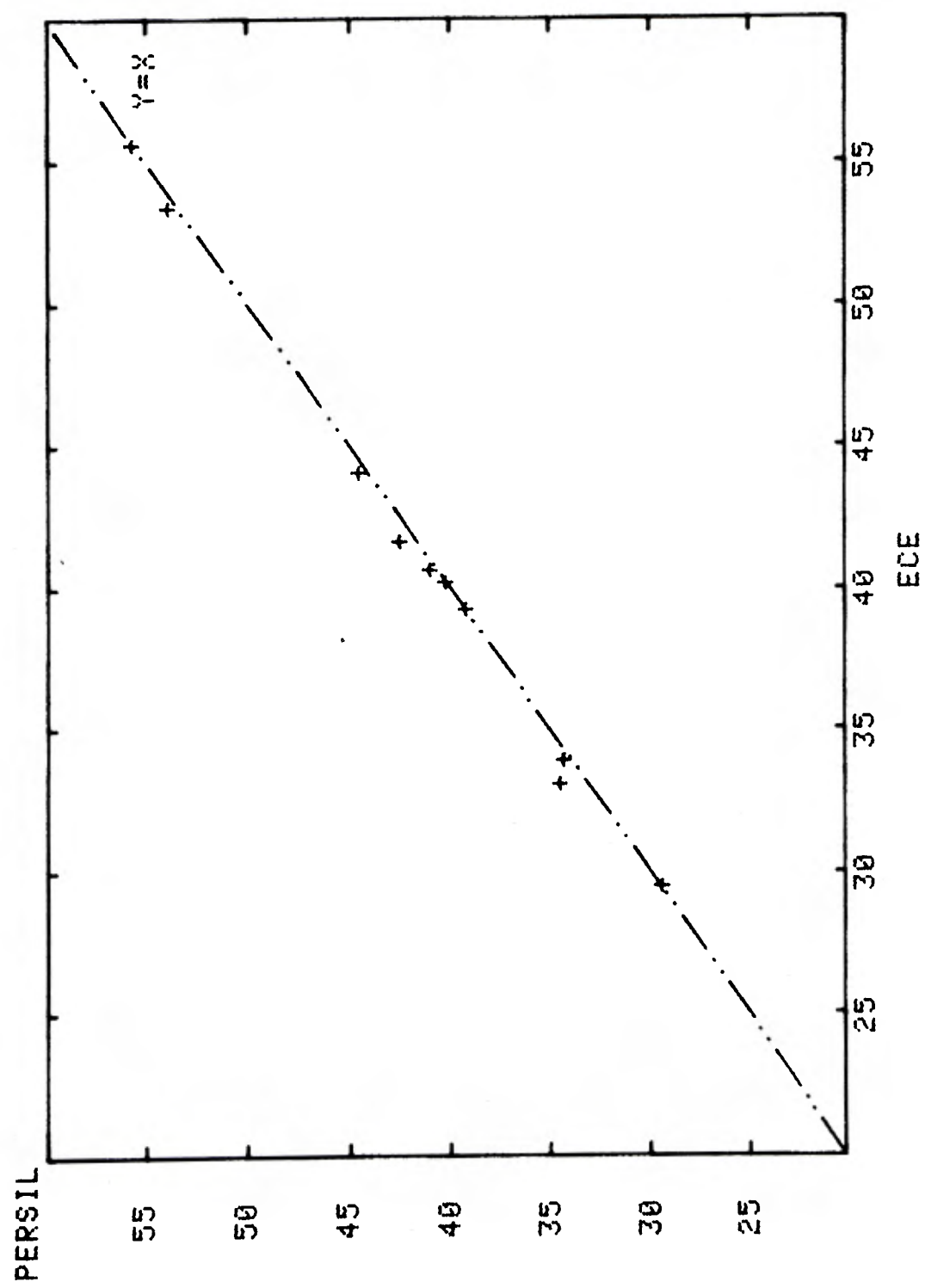


Figure 4. DETERGENT STUDY - Fabric Weight

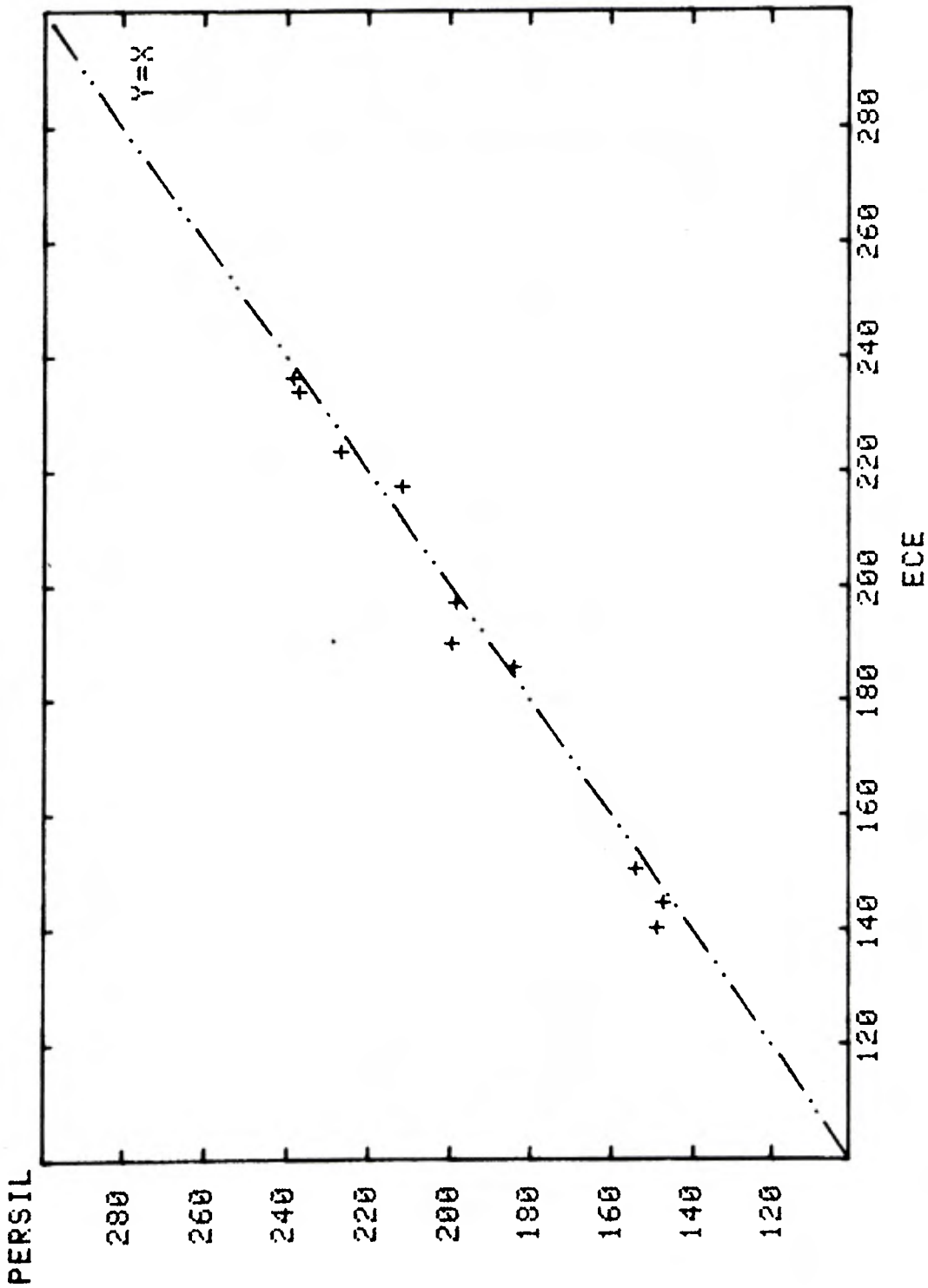


Figure 5. DETERGENT STUDY - Tex

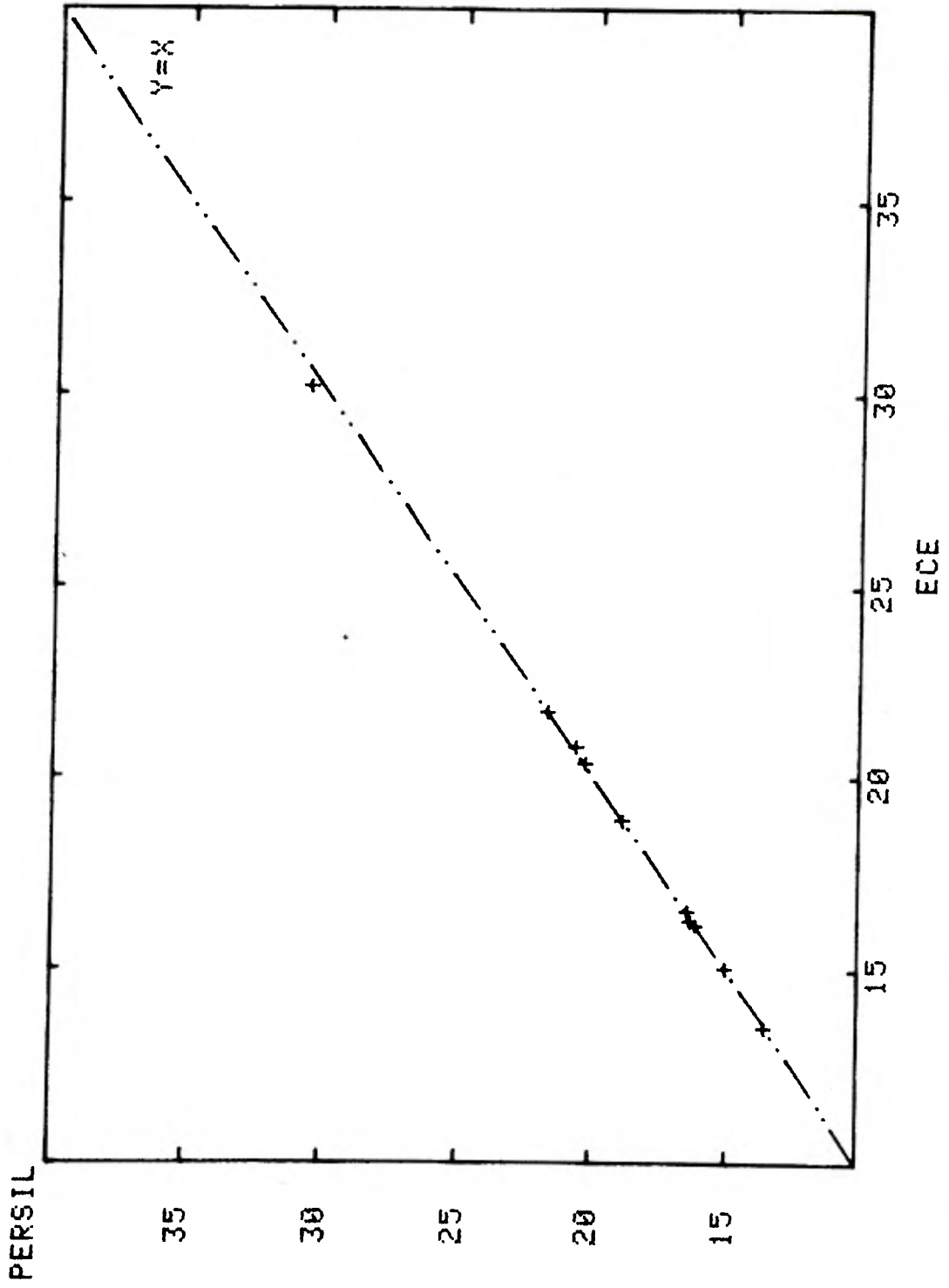


Figure 6. DETERGENT STUDY - Stitch length

