

IIC/HANES INTERLABORATORY TRIAL (2)

STARFISH COMPARISON

AUTHOR: JILL C. STEVENS

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STARFISH

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1. INTRODUCTION

Following the 3 fabric set produced by Hanes Printables and later tested by Hanes, IIC and Cotton Incorporated (Research Record No. 193), Hanes produced another set of single jersey fabrics to investigate the influence on finished fabric properties of varying stitch length and compaction levels.

Ten fabrics were produced on an 18 gauge, 22" diameter 1244 needle single jersey machine using nominal Ne 1/20 cotton yarn. Five different stitch lengths were knitted and after dyeing the fabrics were finished to similar widths, with the exception of two qualities which were pulled wider, at different levels of compaction. Samples of greige and finished fabric were sent by Hanes to Cotton Incorporated along with a copy of their test results. Cotton Incorporated subsequently sent IIC a copy of the test data which was used to make a comparison with STARFISH 84 prior to the visit of S. Allan Heap and Jill Stevens to Hanes and CI in January 1985. At that stage, although shrinkage measurements had been made by Hanes after both 1 and 5 cycles of washing and tumble drying, reference state dimensions had not been established. However using Hanes test data for greige as knitted, finished as delivered, and shrinkage, a comparison with the STARFISH model for single jersey R-95 tubular finish was made and the level of agreement found to be encouraging.

Further discussions between Cotton Incorporated and Hanes however led to Hanes measuring reference courses, wales and weight. This data was made available in January 1985. At that point it was decided that as there was insufficient fabric for both CI and IIC to carry out testing, the samples would be sent to IIC. The test results obtained by IIC would then form the basis of a second interlaboratory comparison between Hanes and IIC and would provide additional data for a comparison with STARFISH 84.

2. TESTING

2.1. IIC

On receipt of the samples from Cotton Incorporated it was found that there was insufficient fabric to enable our standard relaxation procedure to be followed (5 x 50cm replications on all qualities) therefore the 25cm template was used. In addition for the greige samples there was insufficient fabric to carry out 5 replications. Consequently shrinkage results for samples No. 1047E-1 and 9 are based on two replications, for sample 2 on 4 replications and for samples 3,4,5,6,7,8 and 10 on 3 replications. The number of replications carried out for all other tests were according to IIC standard methods.

Therefore it must be pointed out that measurements made on greige reference state fabric may not be as representative of the bulk sample as would normally be expected if more fabric had been available.

Amongst the finished samples two fabrics were found to have been given the same code number - 1047E-3 - and there was no sample numbered - 1047E-2.

These samples were therefore numbered 1047E-3a and 1047E-3b on the IIC test sheet (see appendix).

Later it was possible to identify which was probably sample 2 and which was probably sample 3 from the fabric widths before wash, (sample 1047E-2 had been finished wider than sample 1047E-3 according to Hanes test data) therefore in the tables IIC number 3a has been renumbered 1047E-2 to conform to Hanes identification code.

All the samples both greige and finished were tested both as received, and after 5 wash/rinse and tumble dry cycles. In addition, shrinkage measurements were made after 1 wash and tumble dry cycle. All results were reported by the laboratory in metric units but for the purposes of this analysis were converted to imperial units. Only those results relevant to the interlaboratory/STARFISH comparisons are included in the tables but a copy of IIC's full test report is included in the Appendix.

2.2. Hanes

Yarn count was tested, before knitting, from the package. The yarn supplier was H & H. Hanes do not measure stitch length in greige fabric but run-in or Draw is measured during knitting. Stitch lengths quoted are therefore calculated from the measured run-in divided by the number of needles in the machine. Courses, wales and weight were measured on greige fabric, on finished fabric before compaction, finished fabric after compaction and finished fabric after 5 wash and tumble dry cycles. Shrinkage after both 1 and 5 cycles was measured before and after compaction. Fabric weight, with the exception of greige fabric, is quoted by Hanes in lb/sq. inch. For the purposes of this analysis weight measurements have been converted to oz/sq. yard. A copy of the yarn and fabric test results quoted by Hanes is included in the Appendix.

3. RESULTS

IIC test results are shown in Tables 1-4, Hanes test results are given in Tables 5-8.

Tables 9-11 compare the relevant test results reported by the two laboratories.

Table 12-14 summarise the results of the statistical tests for significant differences between laboratories.

4. DISCUSSION

4.1. Greige Fabric (unrelaxed) Table 12

There is a statistically significant difference in N_e at the 95% level between the two laboratories. However this is almost entirely due to the arrangement of the data. Hanes made one determination of N_e on yarn taken from cone prior to knitting whereas IIC measured N_e on yarn taken from each greige fabric as received. It is therefore not possible to determine from this data whether or not a significant difference exists between laboratories. There is also a highly significant difference (99.9% level) in measured weight. IIC consistently measures heavier greige fabric than Hanes.

However, greige fabric is very unstable and the differences recorded in unrelaxed material can probably be attributed to partial relaxation of the fabric during transportation to IIC.

4.2. Finished Fabric (unrelaxed) Table 13

With the exception of fabric width there are no statistically significant differences in measurements between the two laboratories. There is a statistically significant difference (at the 95% level) between laboratories in the determination of fabric width but a mean difference of 0.1 ins has no practical significance.

4.3. Finished Fabric (reference state) Table 14

There are no statistically significant differences between laboratories in the measurement of courses and wales. However Hanes consistently measures heavier fabric than IIC (significant at the 95% level) but a mean difference of 0.08 oz/sq.yd. probably has no practical significance.

There is also a highly significant difference (99.9%) between laboratories for the measurement of length shrinkage after 1 wash and tumble dry cycle. In absolute terms IIC records a mean difference of 1.4% more length shrinkage than Hanes. However there is no evidence of a significant difference after 5 cycles and therefore this could perhaps be attributed to slight differences in relaxation method or equipment. It should also be pointed out that a mean difference of 1.4% is probably still within the limits of testing accuracy for shrinkage determination.

5. CONCLUSIONS

From the results of this trial it would appear that the two laboratories are generally in good agreement. Where statistically significant differences are recorded the practical importance of the differences are probably not significant.

In future trials it may be advisable for either Hanes to check the yarn count in the greige fabric and/or IIC to check the yarn count from the package to ensure that there are no hidden discrepancies in this very important STARFISH input parameter. Also a determination of greige reference weight by Hanes would enable the reason for the differences noted in greige unrelaxed weight measurement, currently attributed to relaxation during transit, to be confirmed. At this stage, the differences noted between length shrinkage measurements after one cycle can probably be ignored as both laboratories agree after the full five cycle test is carried out.

6. COMPARISON WITH STARFISH 84

In Research Record No. 193, the report on the previous interlaboratory trial between IIC/Hanes/CI, a criterion for judging the accuracy with which we can expect STARFISH to perform was constructed, using as a guide the level of variation

found in finished fabric dimensions obtained from a large scale study of single jersey fabric previously carried out by IIC at a highly competent and quality conscious knitgoods manufacturer. The variation coefficients found in the finished fabric in that trial were approximately $\pm 2\%$ for courses, $\pm 1.5\%$ for wales, and $\pm 3.5\%$ for weight. For greige yarn count and stitch length the variation coefficients were found to be about $\pm 2\%$ and $\pm 1\%$ respectively. Standard deviations for length and width shrinkage to a five cycle wash/rinse and tumble dry test were $\pm 2.8\%$.

Thus for measurements on individual samples, percentage differences between measured and predicted dimensions could be up to ± 2 times the CV% from the mean, while we would expect that the mean of 10 samples would not differ from predicted by more than ± 1 times the CV% if the STARFISH model is appropriate for the yarn and finishing route used at Hanes.

Therefore for this study we can judge if STARFISH is performing as well as can be expected if the mean percentage differences between measured and predicted dimensions are within ± 1 times the CV% or approximately:

| | |
|---------------|-------------|
| Ne | $\pm 2\%$ |
| Stitch length | $\pm 1\%$ |
| Courses | $\pm 2\%$ |
| Wales | $\pm 1.5\%$ |
| Weight | $\pm 3.5\%$ |
| % Shrinkage | ± 2.8 |

Using these criteria as a basis for judgement therefore the STARFISH 84 model was used to predict the average dimensions of both the greige and finished fabrics produced by Hanes.

Predictions were made using 1) IIC test data, 2) Hanes test data for the inputs of yarn count and stitch length, the outputs being based on 1) measured shrinkages, 2) measured courses and wales.

The average dimensions predicted by STARFISH were then compared with the measurements made in each laboratory where available.

Tables 15-21 show the STARFISH printouts and comparisons with IIC test data, Tables 22-23 show the STARFISH printouts and comparisons with Hanes test data. Tables 24-26 are for the comparisons before compaction, Tables 27-29 are for the comparisons after compaction.

The finishing route chosen from those currently available in STARFISH 84 was single jersey R-95 tubular finish. This had been established in the previous trial as being the most likely to fit the data.

6.1. IIC Test Data Summary

| <u>Greige Reference</u> | Mean | % Difference | $(\text{IIC} - \text{*FISH}) \times 100$ | Table 18 |
|-------------------------|-----------|--------------|--|----------|
| | \bar{x} | σ | IIC | |
| Ne | +0.68 | 1.52 | | |
| Stitch length | +0.23 | 0.38 | | |
| CPI | -2.85 | 0.99 | | |
| WPI | +4.56 | 0.66 | | |
| Weight | -3.76 | 1.18 | | |

Finished Reference Table 19

| | \bar{x} | σ |
|---------------|-----------|----------|
| Ne | +0.89 | 1.91 |
| Stitch length | +0.64 | 0.51 |
| CPI | +1.66 | 1.07 |
| WPI | -1.14 | 1.06 |
| Weight | +0.86 | 1.87 |

For greige reference the agreement between predicted and measured courses, wales and weight is poor. Courses are consistently underestimated (mean difference -2.85%) and wales consistently overestimated (mean difference +4.56%). Weight is also consistently underestimated (mean difference -3.76%) and all 3 parameters have mean differences significantly different from zero.

For finished reference on the other hand the agreement between measured and predicted is excellent, all parameters are well within ± 1 times CV% and none of the mean differences are significantly different from zero.

Finished as delivered (R-95)

1) From measured length and width shrinkages Table 20

| | \bar{x} | σ |
|--------|-----------|----------|
| CPI | +2.06 | 1.29 |
| WPI | -0.78 | 1.09 |
| Weight | +0.93 | 1.30 |
| Width | -0.04 | 1.46 |

2) From measured courses and wales Table 21

| | \bar{x} | σ |
|--------------------|-----------|----------|
| Weight | -0.35 | 1.19 |
| Width | -0.88 | 0.79 |
| % Length Shrinkage | +1.79 | 1.09 |
| % Width Shrinkage | +0.87 | 1.02 |

With the exception of CPI agreement between measured and predicted dimensions is well within ± 1 times CV%. In the case of courses the mean falls just outside ± 1 times CV% or 2%. However, an inspection of the individual data shows that in only one case, sample 1047E-10 do the individual predictions fall outside ± 2 times CV% or 4%, six of the ten samples are within ± 2 %. None of the mean differences are significantly different from zero.

6.2. Hanes Test Data Summary

Finished Reference Table 23

| | \bar{x} | σ |
|--------|-----------|----------|
| CPI | +1.72 | 1.31 |
| WPI | -0.83 | 0.87 |
| Weight | -1.76 | 0.93 |

Agreement between measured and predicted is within ± 1 times CV% and the mean differences are not significantly different from zero.

Finished Before Compaction

1) From measured length and width shrinkages Table 25

| | \bar{x} | σ |
|--------|-----------|----------|
| CPI | +2.00 | 1.62 |
| WPI | -1.65 | 1.12 |
| Weight | -1.34 | 1.40 |
| Width | +1.20 | 1.33 |

2) From measured courses and wales Table 26

| | \bar{x} | σ |
|--------------------|-----------|----------|
| Weight | -1.34 | 1.94 |
| Width | -0.55 | 1.06 |
| % Length Shrinkage | +1.69 | 1.36 |
| % Width Shrinkage | +1.67 | 1.14 |

With the exception of CPI when predicted from measured length shrinkage, all predictions are within ± 1 times CV%, and none of the mean differences are significantly different from zero. In the case of courses, STARFISH is (almost) consistently overestimating the number of courses per inch compared to Hanes measurements, or conversely, STARFISH is overestimating length shrinkage compared to Hanes measurements.

Having said that, however, an inspection of the individual data pairs shows that all samples individually are being predicted within ± 2 times CV% or 4%.

Finished After Compaction

1) From measured length and width shrinkages Table 28

| | \bar{x} | σ |
|--------|-----------|----------|
| CPI | +2.56 | 1.25 |
| WPI | -0.03 | 0.96 |
| Weight | -0.74 | 0.38 |
| Width | -0.21 | 0.93 |

2) From measured courses and wales Table 29

| | \bar{x} | σ |
|--------------------|-----------|----------|
| Weight | -3.22 | 1.73 |
| Width | -0.22 | 1.33 |
| % Length Shrinkage | +2.26 | 1.05 |
| % Width Shrinkage | -0.03 | 0.93 |

Again with the exception of courses all properties are being predicted well within the tolerance of ± 1 times CV% from measured. Courses are however consistently overestimated by STARFISH compared to Hanes measurements and this is probably a significant difference even though individually only one sample 1047E-10 falls outside the outer limit of $\pm 4\%$.

7. CONCLUSIONS

Although overall STARFISH is predicting finished fabric dimensions and properties, whether measured by IIC or Hanes, very well, there are some underlying trends in the data which suggest that the equations currently labelled R-95 tubular finish, do not in fact properly model fabrics processed through Hanes' finishing plant.

In every comparison, even though in some cases the differences between measured and predicted courses are within our stated tolerances, STARFISH is more or less consistently overestimating courses per inch compared to measured. This is apparent in the comparisons of the finished reference state and is emphasised in the predictions of finished before wash dimensions when either courses are overestimated when measured shrinkage is used as an input, or length shrinkage is overestimated when measured courses are used as an input. There is also a tendency for wales to be consistently underestimated, although the differences are much smaller.

This suggests that the finishing route used by Hanes is actually permanently stretching the fabric more in the length direction, thereby producing a fabric longer and slightly narrower than is being predicted by the equations for R-95. This may be due to the influence of the continuous prebleaching unit through which the fabrics are processed prior to dyeing. Having said that, however, the level of agreement generally between measured and predicted dimensions does mean that these equations can be used to give a good guide to the properties of fabrics finished at Hanes - at least for the time being.

The other possible reason for the discrepancies is that Ne 1/20 is actually at the extreme of the yarn range knitted in developing the STARFISH data base consequently there may be some existing skew in the equations. Also variations in twist factor in the yarn can influence the number of courses or wales in a fabric. For example, we have evidence to show that fabrics knitted to the same stitch length from the same count of yarn produce less courses in the reference state if the twist factor is 3.0 than if the twist factor is 4.0. The equations of the STARFISH model are based on yarns with a twist factor of 3.5.

The discrepancies between measured and predicted dimensions in the greige reference state as measured by IIC are not however that easily explained, even taking into account the fact that variations found in greige fabric are usually higher than finished fabric.

In this instance the differences can only be attributed to the possible uncertainty in the measurement of the greige fabrics due to lack of fabric available for testing.

IIC/HANES INTER-LABORATORY TRIAL

IIC GREIGE TEST DATA - AS RECEIVED

| Sample No | Ne | St Lth ins | Crises /in | Wales /in | Weight oz/syd | Width ins |
|-----------|--------|---------------|---------------|--------------|------------------|--------------|
| 1047E-1 | 19.234 | 0.1220 | 52.832 | 24.13 | 5.7593 | 25 |
| 1047E-2 | 19.683 | 0.1249 | 50.461 | 23.876 | 5.8242 | 25.078 |
| 1047E-3 | 19.552 | 0.1251 | 50.630 | 24.892 | 5.4349 | 25.196 |
| 1047E-4 | 20.085 | 0.1273 | 49.022 | 24.13 | 5.7121 | 25.433 |
| 1047E-5 | 19.683 | 0.1265 | 47.498 | 24.299 | 5.4703 | 24.921 |
| 1047E-6 | 20.153 | 0.1291 | 46.99 | 24.13 | 5.5558 | 25 |
| 1047E-7 | 19.424 | 0.1298 | 46.482 | 24.045 | 5.5794 | 24.645 |
| 1047E-8 | 19.815 | 0.1323 | 45.042 | 24.468 | 5.4998 | 24.566 |
| 1047E-9 | 19.949 | 0.1315 | 43.264 | 25.4 | 5.1784 | 24.685 |
| 1047E-10 | 19.749 | 0.1314 | 43.857 | 25.061 | 5.4290 | 24.645 |

\bar{x} = 19.73
 σ = 0.29
 %CV = 1.47

IIC/HANES INTER-LABORATORY TRIAL

IIC GREIGE TEST DATA - REFERENCE STATE

| Sample No | Ne | St ins | Lth /in | Crises /in | Wales /in | Weight oz/syd |
|-----------|--------|-----------|------------|---------------|--------------|------------------|
| 1047E-1 | 19.949 | 0.1200 | 52.07 | 32.512 | 7.0451 | |
| 1047E-2 | 19.749 | 0.1226 | 50.292 | 32.004 | 6.8711 | |
| 1047E-3 | 19.949 | 0.1225 | 50.630 | 32.258 | 6.8947 | |
| 1047E-4 | 20.292 | 0.1257 | 49.53 | 31.580 | 6.7354 | |
| 1047E-5 | 19.882 | 0.1246 | 49.191 | 31.580 | 6.7738 | |
| 1047E-6 | 20.939 | 0.1268 | 47.667 | 31.242 | 6.5850 | |
| 1047E-7 | 20.085 | 0.1269 | 48.090 | 31.157 | 6.5467 | |
| 1047E-8 | 19.749 | 0.1297 | 47.074 | 30.564 | 6.4730 | |
| 1047E-9 | 19.949 | 0.1292 | 46.312 | 30.649 | 6.4700 | |
| 1047E-10 | 20.016 | 0.1292 | 47.159 | 30.649 | 6.4759 | |

\bar{x} = 20.06
 σ = 0.35
 %CV = 1.74

IIC GREIGE TEST DATA - SHRINKAGE

| Sample No | L% 1W+TD | W% 1W+TD | L% 5W+TD | W% 5W+TD |
|-----------|-------------|-------------|-------------|-------------|
| 1047E-1 | +2.3 | 25.1 | +1.5 | 25.7 |
| 1047E-2 | 0.3 | 25.7 | 0.4 | 26.6 |
| 1047E-3 | +0.3 | 24 | +0.1 | 25 |
| 1047E-4 | 0.5 | 25.2 | 1.2 | 26.1 |
| 1047E-5 | 2.2 | 21.9 | 2.7 | 22.8 |
| 1047E-6 | 2.9 | 22.6 | 3.2 | 23.2 |
| 1047E-7 | 4.5 | 21 | 4.6 | 21.8 |
| 1047E-8 | 5.5 | 19.2 | 2.9 | 19.8 |
| 1047E-9 | 6.6 | 18.2 | 7.3 | 19.1 |
| 1047E-10 | 4.3 | 19.4 | 6 | 20.2 |

IIC/HANES INTER-LABORATORY TRIAL

IIC FINISHED TEST DATA - AS RECEIVED

| Sample No | Ne | St Lth ins | Crses /in | Wales /in | Weight oz/syd | Width ins |
|-----------|--------|------------|-----------|-----------|---------------|-----------|
| 1047E-1 | 20.503 | 0.1193 | 42.841 | 32.173 | 5.6473 | 19.251 |
| 1047E-2 | 20.292 | 0.1228 | 44.280 | 30.395 | 5.5175 | 20.748 |
| 1047E-3 | 20.085 | 0.1225 | 41.825 | 32.427 | 5.6679 | 19.370 |
| 1047E-4 | 20.503 | 0.1243 | 40.132 | 32.766 | 5.3288 | 19.212 |
| 1047E-5 | 20.085 | 0.1234 | 43.095 | 30.310 | 5.3641 | 20.984 |
| 1047E-6 | 20.362 | 0.1265 | 39.624 | 32.596 | 5.3966 | 19.330 |
| 1047E-7 | 20.792 | 0.1264 | 38.946 | 32.427 | 5.4585 | 19.133 |
| 1047E-8 | 20.085 | 0.1287 | 38.608 | 31.834 | 5.3700 | 19.566 |
| 1047E-9 | 20.016 | 0.1288 | 38.184 | 32.596 | 5.3848 | 19.370 |
| 1047E-10 | 20.085 | 0.1291 | 37.676 | 32.512 | 5.3347 | 19.291 |

\bar{x} = 20.28
 σ = 0.26
 %CV = 1.28

IIC/HANES INTER-LABORATORY TRIAL

IIC FINISHED TEST DATA - REFERENCE STATE

| Sample No | Ne | St Lth ins | Crises /in | Wales /in | Weight oz/syd |
|-----------|--------|------------|------------|-----------|---------------|
| 1047E-1 | 20.432 | 0.1192 | 47.667 | 33.358 | 6.3255 |
| 1047E-2 | 20.153 | 0.1223 | 47.159 | 32.512 | 6.2017 |
| 1047E-3 | 20.432 | 0.1215 | 45.974 | 32.512 | 6.2105 |
| 1047E-4 | 20.085 | 0.1237 | 45.042 | 33.189 | 6.1043 |
| 1047E-5 | 20.292 | 0.1236 | 45.635 | 32.512 | 6.1279 |
| 1047E-6 | 20.292 | 0.1259 | 44.111 | 32.427 | 6.0601 |
| 1047E-7 | 20.222 | 0.1261 | 44.111 | 32.258 | 6.0395 |
| 1047E-8 | 20.503 | 0.1285 | 43.264 | 31.919 | 5.9245 |
| 1047E-9 | 20.222 | 0.1285 | 43.010 | 32.258 | 5.9746 |
| 1047E-10 | 20.085 | 0.1289 | 42.587 | 32.342 | 5.9569 |

$$\bar{x} = 20.27$$

$$s = 0.15$$

$$\%CV = 0.74$$

IIC FINISHED TEST DATA - SHRINKAGE

| Sample No | L% 1W+TD | W% 1W+TD | L% 5W+TD | W% 5W+TD |
|-----------|----------|----------|----------|----------|
| 1047E-1 | 9 | 3.2 | 9.1 | 3 |
| 1047E-2 | 5.4 | 6.3 | 5.2 | 5.8 |
| 1047E-3 | 8.9 | 1.4 | 9.3 | 1.1 |
| 1047E-4 | 10.4 | 1.2 | 10.7 | +0.03 |
| 1047E-5 | 5.8 | 6.9 | 6.2 | 6.7 |
| 1047E-6 | 9.5 | +0.6 | 10.4 | +1.1 |
| 1047E-7 | 10.3 | 1.1 | 10.9 | +0.02 |
| 1047E-8 | 9.3 | 0.1 | 10.4 | +0.9 |
| 1047E-9 | 9.5 | +0.1 | 10.8 | +1 |
| 1047E-10 | 8 | +0.1 | 10.6 | +1.2 |

I I C / H A N E S I N T E R - L A B O R A T O R Y T R I A L

H A N E S G R E I G E T E S T D A T A - A S K N I T T E D

| Sample No | Ne | Draw ins | St Lth ins | Crses /in | Wales /in | Weight oz/syd |
|--------------|-------|-------------|---------------|--------------|--------------|------------------|
| 1047E-1 | 19.98 | 152 | 0.1222 | 54 | 24 | 5.425 |
| 1047E-2 | 19.98 | 156 | 0.1254 | 51 | 24 | 5.292 |
| 1047E-3 | 19.98 | 156 | 0.1254 | 51 | 24 | 5.292 |
| 1047E-4 | 19.98 | 158 | 0.127 | 48 | 24 | 4.83 |
| 1047E-5 | 19.98 | 158 | 0.127 | 48 | 24 | 4.83 |
| 1047E-6 | 19.98 | 161 | 0.1294 | 46 | 23.5 | 4.695 |
| 1047E-7 | 19.98 | 161 | 0.1294 | 46 | 23.5 | 4.695 |
| 1047E-8 | 19.98 | 164 | 0.1318 | 42 | 25 | 4.628 |
| 1047E-9 | 19.98 | 164 | 0.1318 | 42 | 25 | 4.628 |
| 1047E-10 | 19.98 | 164 | 0.1318 | 42 | 25 | 4.628 |

I I C / H A N E S I N T E R - L A B O R A T O R Y T R I A L

H A N E S F I N I S H E D T E S T D A T A - B E F O R E C O M P A C T I O N

| Sample No | Crses /in | Wales /in | Weight oz/syd | Width ins |
|-----------|-----------|-----------|---------------|-----------|
| 1047E-1 | 41 | 33.5 | 5.6298 | 18.625 |
| 1047E-2 | 41 | 33 | 5.5261 | 19 |
| 1047E-3 | 41 | 34 | 5.5158 | 18.5 |
| 1047E-4 | 38 | 33.5 | 5.3706 | 18.5 |
| 1047E-5 | 41 | 33 | 5.5158 | 19.25 |
| 1047E-6 | 37 | 33.5 | 5.2669 | 18.75 |
| 1047E-7 | 38 | 33.5 | 5.3603 | 18.75 |
| 1047E-8 | 36 | 33 | 5.2566 | 19 |
| 1047E-9 | 37 | 33 | 5.2566 | 18.875 |
| 1047E-10 | 36 | 33 | 5.1633 | 18.5 |

H A N E S F I N I S H E D T E S T D A T A - B E F O R E C O M P A C T I O N - S H R I N K A G E

| Sample No | L% 1W+TD | W% 1W+TD | L% 5W+TD | W% 5W+TD |
|-----------|----------|----------|----------|----------|
| 1047E-1 | 10.5 | +0.7 | 12.5 | +1.4 |
| 1047E-2 | 10 | 0 | 11 | 0 |
| 1047E-3 | 11.5 | +1.3 | 13 | +1.3 |
| 1047E-4 | 12.5 | +2 | 15 | +2 |
| 1047E-5 | 9 | 0 | 10 | 0 |
| 1047E-6 | 13.5 | +1.3 | 14.5 | +2 |
| 1047E-7 | 11.5 | +2 | 13 | +2 |
| 1047E-8 | 13 | +2.6 | 15 | +2.6 |
| 1047E-9 | 13 | +2 | 15 | +2 |
| 1047E-10 | 13.5 | +2.7 | 15 | +3.3 |

I IC/HANES INTER-LABORATORY TRIAL

HANES FINISHED TEST DATA - AFTER COMPACTION

| Sample No | Crses /in | Wales /in | Weight oz/syd | Width ins |
|--------------|--------------|--------------|------------------|--------------|
| 1047E-1 | 43 | 33 | 5.6609 | 19.375 |
| 1047E-2 | 43.5 | 29.25 | 5.4536 | 21.125 |
| 1047E-3 | 41 | 32.5 | 5.5158 | 19.375 |
| 1047E-4 | 39.5 | 32.25 | 5.4017 | 19.375 |
| 1047E-5 | 43 | 29.75 | 5.3292 | 21.125 |
| 1047E-6 | 39 | 32 | 5.4432 | 19.3 |
| 1047E-7 | 39.5 | 32.25 | 5.4432 | 19.375 |
| 1047E-8 | 38 | 31.75 | 5.3499 | 19.5 |
| 1047E-9 | 38.5 | 31.75 | 5.3914 | 19.375 |
| 1047E-10 | 37.5 | 31.75 | 5.3654 | 19.375 |

=====

I IC/HANES INTER-LABORATORY TRIAL

HANES FINISHED TEST DATA - REFERENCE STATE

| Sample No | Crses /in | Wales /in | Weight oz/syd |
|--------------|--------------|--------------|------------------|
| 1047E-1 | 48 | 33.5 | 6.5318 |
| 1047E-2 | 46 | 32.5 | 6.3245 |
| 1047E-3 | 46 | 33.5 | 6.3245 |
| 1047E-4 | 45 | 32.5 | 6.1171 |
| 1047E-5 | 46 | 32.5 | 6.169 |
| 1047E-6 | 44 | 32 | 6.1171 |
| 1047E-7 | 44 | 32.5 | 6.1171 |
| 1047E-8 | 43 | 32 | 6.0653 |
| 1047E-9 | 42 | 32 | 5.9098 |
| 1047E-10 | 43 | 32 | 6.0134 |

HANES FINISHED TEST DATA - SHRINKAGE

| Sample No | L% 1W+TD | W% 1W+TD | L% 5W+TD | W% 5W+TD |
|--------------|-------------|-------------|-------------|-------------|
| 1047E-1 | 8 | 1.6 | 9.5 | 2 |
| 1047E-2 | 3.25 | 7.75 | 5.25 | 8.5 |
| 1047E-3 | 7.75 | 1.5 | 10 | 1.5 |
| 1047E-4 | 8.5 | 0.9 | 10.75 | 1.1 |
| 1047E-5 | 3.5 | 7.6 | 5.25 | 8.6 |
| 1047E-6 | 7.75 | +0.3 | 10 | +0.3 |
| 1047E-7 | 7.75 | 0.3 | 9.75 | 0 |
| 1047E-8 | 8.75 | +0.6 | 10.5 | +0.6 |
| 1047E-9 | 8.25 | +1 | 10.5 | +1.2 |
| 1047E-10 | 8.25 | +0.6 | 10.5 | +1 |

I I C / H A N E S I N T E R - L A B O R A T O R Y T R I A L

I I C G R E I G E T E S T D A T A - B E F O R E R E L A X A T I O N (A S K N I T T E D)

| Sample No | Ne | St Lth ins | Crses /in | Wales /in | Weight oz/syd |
|-----------|--------|------------|-----------|-----------|---------------|
| 1047E-1 | 19.234 | 0.1220 | 52.832 | 24.13 | 5.7593 |
| 1047E-2 | 19.683 | 0.1249 | 50.461 | 23.876 | 5.8242 |
| 1047E-3 | 19.552 | 0.1251 | 50.630 | 24.892 | 5.4349 |
| 1047E-4 | 20.085 | 0.1273 | 49.022 | 24.13 | 5.7121 |
| 1047E-5 | 19.683 | 0.1265 | 47.498 | 24.299 | 5.4703 |
| 1047E-6 | 20.153 | 0.1291 | 46.99 | 24.13 | 5.5558 |
| 1047E-7 | 19.424 | 0.1298 | 46.482 | 24.045 | 5.5794 |
| 1047E-8 | 19.815 | 0.1323 | 45.042 | 24.468 | 5.4998 |
| 1047E-9 | 19.949 | 0.1315 | 43.264 | 25.4 | 5.1784 |
| 1047E-10 | 19.749 | 0.1314 | 43.857 | 25.061 | 5.4290 |

1) Ne and Stitch Length measured in Greige fabric

I I C / H A N E S I N T E R - L A B O R A T O R Y T R I A L

H A N E S G R E I G E T E S T D A T A - B E F O R E R E L A X A T I O N (A S K N I T T E D)

| Sample No | Ne | St Lth ins | Crses /in | Wales /in | Weight oz/syd |
|-----------|-------|------------|-----------|-----------|---------------|
| 1047E-1 | 19.98 | 0.1222 | 54 | 24 | 5.425 |
| 1047E-2 | 19.98 | 0.1254 | 51 | 24 | 5.292 |
| 1047E-3 | 19.98 | 0.1254 | 51 | 24 | 5.292 |
| 1047E-4 | 19.98 | 0.127 | 48 | 24 | 4.83 |
| 1047E-5 | 19.98 | 0.127 | 48 | 24 | 4.83 |
| 1047E-6 | 19.98 | 0.1294 | 46 | 23.5 | 4.695 |
| 1047E-7 | 19.98 | 0.1294 | 46 | 23.5 | 4.695 |
| 1047E-8 | 19.98 | 0.1318 | 42 | 25 | 4.628 |
| 1047E-9 | 19.98 | 0.1318 | 42 | 25 | 4.628 |
| 1047E-10 | 19.98 | 0.1318 | 42 | 25 | 4.628 |

- 1) Ne measured on cone prior to knitting
 2) Stitch Length calculated from Run-In (Draw)
 3) Courses, Wales, Weight measured after conditioning

I I C / H A N E S I N T E R - L A B O R A T O R Y T R I A L

I I C F I N I S H E D T E S T D A T A - B E F O R E R E L A X A T I O N

| Sample No | Crses /in | Wales /in | Weight oz/syd | Width ins |
|--------------|--------------|--------------|------------------|--------------|
| 1047E-1 | 42.841 | 32.173 | 5.6473 | 19.251 |
| 1047E-2 | 44.280 | 30.395 | 5.5175 | 20.748 |
| 1047E-3 | 41.825 | 32.427 | 5.6679 | 19.370 |
| 1047E-4 | 40.132 | 32.766 | 5.3288 | 19.212 |
| 1047E-5 | 43.095 | 30.310 | 5.3641 | 20.984 |
| 1047E-6 | 39.624 | 32.596 | 5.3966 | 19.330 |
| 1047E-7 | 38.946 | 32.427 | 5.4585 | 19.133 |
| 1047E-8 | 38.608 | 31.834 | 5.3700 | 19.566 |
| 1047E-9 | 38.184 | 32.596 | 5.3848 | 19.370 |
| 1047E-10 | 37.676 | 32.512 | 5.3347 | 19.291 |

I I C / H A N E S I N T E R - L A B O R A T O R Y T R I A L

H A N E S F I N I S H E D T E S T D A T A - B E F O R E R E L A X A T I O N (A F T E R C O M P A C T I O N)

| Sample No | Crses /in | Wales /in | Weight oz/syd | Width ins |
|--------------|--------------|--------------|------------------|--------------|
| 1047E-1 | 43 | 33 | 5.6609 | 19.375 |
| 1047E-2 | 43.5 | 29.25 | 5.4536 | 21.125 |
| 1047E-3 | 41 | 32.5 | 5.5158 | 19.375 |
| 1047E-4 | 39.5 | 32.25 | 5.4017 | 19.375 |
| 1047E-5 | 43 | 29.75 | 5.3292 | 21.125 |
| 1047E-6 | 39 | 32 | 5.4432 | 19.3 |
| 1047E-7 | 39.5 | 32.25 | 5.4432 | 19.375 |
| 1047E-8 | 38 | 31.75 | 5.3499 | 19.5 |
| 1047E-9 | 38.5 | 31.75 | 5.3914 | 19.375 |
| 1047E-10 | 37.5 | 31.75 | 5.3654 | 19.375 |

I I C / H A N E S I N T E R - L A B O R A T O R Y T R I A L

I I C F I N I S H E D T E S T D A T A - A F T E R R E L A X A T I O N

| Sample No | Crses /in | Wales /in | Weight oz/syd | L% 1W+TD | W% 1W+TD | L% 5W+TD | W% 5W+TD |
|-----------|-----------|-----------|---------------|----------|----------|----------|----------|
| 1047E-1 | 47.667 | 33.358 | 6.3255 | 9 | 3.2 | 9.1 | 3 |
| 1047E-2 | 47.159 | 32.512 | 6.2017 | 5.4 | 6.3 | 5.2 | 5.8 |
| 1047E-3 | 45.974 | 32.512 | 6.2105 | 8.9 | 1.4 | 9.3 | 1.1 |
| 1047E-4 | 45.042 | 33.189 | 6.1043 | 10.4 | 1.2 | 10.7 | +0.03 |
| 1047E-5 | 45.635 | 32.512 | 6.1279 | 5.8 | 6.9 | 6.2 | 6.7 |
| 1047E-6 | 44.111 | 32.427 | 6.0601 | 9.5 | +0.6 | 10.4 | +1.1 |
| 1047E-7 | 44.111 | 32.258 | 6.0395 | 10.3 | 1.1 | 10.9 | +0.02 |
| 1047E-8 | 43.264 | 31.919 | 5.9245 | 9.3 | 0.1 | 10.4 | +0.9 |
| 1047E-9 | 43.010 | 32.258 | 5.9746 | 9.5 | +0.1 | 10.8 | +1 |
| 1047E-10 | 42.587 | 32.342 | 5.9569 | 8 | +0.1 | 10.6 | +1.2 |

I I C / H A N E S I N T E R - L A B O R A T O R Y T R I A L

H A N E S F I N I S H E D T E S T D A T A - A F T E R R E L A X A T I O N

| Sample No | Crses /in | Wales /in | Weight oz/syd | L% 1W+TD | W% 1W+TD | L% 5W+TD | W% 5W+TD |
|-----------|-----------|-----------|---------------|----------|----------|----------|----------|
| 1047E-1 | 48 | 33.5 | 6.5318 | 8 | 1.6 | 9.5 | 2 |
| 1047E-2 | 46 | 32.5 | 6.3245 | 3.25 | 7.75 | 5.25 | 8.5 |
| 1047E-3 | 46 | 33.5 | 6.3245 | 7.75 | 1.5 | 10 | 1.5 |
| 1047E-4 | 45 | 32.5 | 6.1171 | 8.5 | 0.9 | 10.75 | 1.1 |
| 1047E-5 | 46 | 32.5 | 6.169 | 3.5 | 7.6 | 5.25 | 8.6 |
| 1047E-6 | 44 | 32 | 6.1171 | 7.75 | +0.3 | 10 | +0.3 |
| 1047E-7 | 44 | 32.5 | 6.1171 | 7.75 | 0.3 | 9.75 | 0 |
| 1047E-8 | 43 | 32 | 6.0653 | 8.75 | +0.6 | 10.5 | +0.6 |
| 1047E-9 | 42 | 32 | 5.9098 | 8.25 | +1 | 10.5 | +1.2 |
| 1047E-10 | 43 | 32 | 6.0134 | 8.25 | +0.6 | 10.5 | +1 |

Students t statistic Degrees of Freedom 9

Significance level: 95% 2.262*
 99% 3.250**
 99.9 4.781***

Comparison: Greige fabric before Relaxation (as knitted)

| | IIC/HANES | | |
|----------------------|-----------|-----------|----------------|
| | Mean Diff | t | r ⁺ |
| Ne | 0.2469 | 2.5005* | |
| St. Length Inches | 0.0001 | 0.6153 | 0.9891 |
| CPI | -0.6081 | 1.4173 | 0.9654 |
| WPI | -0.2433 | 1.7978 | 0.5377 |
| Weight oz/yd | -0.6501 | 7.5159*** | 0.3262 |

Weight: IIC/Hanes highly significantly different.
 IIC consistently measures heavier greige fabric than Hanes.
 This is probably due to relaxation of greige fabric during transit.

NE: Difference statistically significant at 95% level but this is due to the arrangement of the data - Hanes made 1 determination of Ne prior to knitting - IIC measures Ne on each greige fabric. No practical difference can be determined from this data set.

Students t statistic Degrees of Freedom 9

Significance level: 95% 2.262*
 99% 3.250**
 99.9% 4.781***

Comparison: Finished fabric before relaxation

| | IIC/HANES | | |
|--------|-----------|---------|----------------|
| | Mean Diff | t | r ² |
| CPI | -0.2715 | 1.6535 | 0.9553 |
| WPI | -0.3790 | 2.0252 | 0.7950 |
| Weight | -0.0116 | 0.5489 | 0.7473 |
| Width | 0.1040 | 2.2987* | 0.9729 |

Width: Statistically significant (just) at 95% but mean difference of 0.1 in has no practical significance.

Students t statistic Degrees of Freedom 9

Significance level: 95% 2.262*
 99% 3.250**
 99.9% 4.781***

Comparison: Finished Fabric reference state

| | IIC/HANES | | |
|---------------------|------------|-----------|----------------|
| | Mean Diff. | t | r ² |
| CPI | -0.1564 | 0.8676 | 0.9126 |
| WPI | -0.0289 | 0.1892 | 0.3852 |
| Weight | 0.0764 | 3.0552* | 0.8775 |
| %L shrink 1 W+TD | -1.4350 | 4.9727*** | 0.8213 |
| %W shrink 1W+TD | -0.2250 | 0.7639 | 0.9499 |
| %L shrink 5W+TD | -0.1600 | 0.8465 | 0.9283 |
| %W shrink 5W+TD | 0.6250 | 1.7577 | 0.9460 |

Weight: Hanes consistently measures heavier fabric than IIC but a Mean difference of 0.08 oz/sq.yd probably means this is not significant in practice.

Shrinkage: IIC consistently measured higher length shrinkage after 1 W+TD than Hanes. However, the differences after 5 W+TD cycles are not significant.

IIC -STARFISH 84- MODEL PREDICTIONS

Plain Single Jersey - singles,combed ring yarns
 18g 22in 1244 needles
 Greige

Greige Reference State Dimensions

04-MAR-85 15:25

| Average as knitted | | | | Average Reference dimensions | | | | | | | |
|--------------------|----------|----------|------------|------------------------------|----------|------------|-------------|-----------|--------------|-------------|---|
| Yarn Ne | StLen in | C.Len in | Tness Fctr | Yarn Ne | StLen in | Tness Fctr | courses /in | wales /in | weight oz/sy | width in(T) | |
| 19.2 | 0.1220 | 151.8 | 17.9 | 19.7 | 0.120 | 17.9 | 50.1 | 33.8 | 6.89 | 18.4 | * |
| 19.7 | 0.1249 | 155.4 | 17.3 | 20.1 | 0.123 | 17.3 | 48.7 | 33.4 | 6.59 | 18.6 | * |
| 19.6 | 0.1251 | 155.6 | 17.3 | 20.0 | 0.123 | 17.3 | 48.6 | 33.3 | 6.63 | 18.7 | * |
| 20.1 | 0.1273 | 158.4 | 16.8 | 20.6 | 0.126 | 16.8 | 47.6 | 33.1 | 6.36 | 18.8 | * |
| 19.7 | 0.1265 | 157.4 | 17.0 | 20.1 | 0.125 | 17.1 | 48.0 | 33.1 | 6.52 | 18.8 | * |
| 20.2 | 0.1291 | 160.6 | 16.5 | 20.6 | 0.127 | 16.5 | 46.8 | 32.8 | 6.25 | 19.0 | * |
| 19.4 | 0.1298 | 161.5 | 16.7 | 19.9 | 0.128 | 16.8 | 46.7 | 32.4 | 6.44 | 19.2 | * |
| 19.8 | 0.1323 | 164.6 | 16.2 | 20.3 | 0.130 | 16.3 | 45.6 | 32.1 | 6.21 | 19.4 | * |
| 19.9 | 0.1315 | 163.6 | 16.3 | 20.4 | 0.130 | 16.3 | 45.9 | 32.3 | 6.21 | 19.3 | * |
| 19.7 | 0.1314 | 163.5 | 16.4 | 20.2 | 0.130 | 16.4 | 46.0 | 32.2 | 6.27 | 19.3 | * |

- NB : Shrinkage convention is + for growth, - for contraction
- : Qualities marked with * have unreasonable finishing targets
- : Estimates are given in good faith but without liability
- : Yarn counts are given as Resultant for folded yarns
- : Tightness Factor is $\text{Root}(\text{Tex})/\text{St.Len}$ in cm

I I C -STARFISH 84- MODEL PREDICTIONS

Plain Single Jersey - singles,combed ring yarns

18g 22in 1244 needles

R-Jet95 (medium) + Tubular finish

Finished Reference State Dimensions

04-MAR-85 15:21

| Average as knitted | | | | Average Reference dimensions | | | | | | | |
|--------------------|--------|-------|-------|------------------------------|-------|-------|---------|-------|--------|-------|---|
| Yarn | StLen | C.Len | Tness | Yarn | StLen | Tness | courses | wales | weight | width | |
| Ne | in | in | Fctr | Ne | in | Fctr | /in | /in | oz/sy | in(T) | |
| 19.2 | 0.1220 | 151.8 | 17.9 | 19.9 | 0.120 | 17.9 | 48.4 | 33.1 | 6.62 | 18.8 | * |
| 19.7 | 0.1249 | 155.4 | 17.3 | 20.4 | 0.123 | 17.3 | 46.9 | 32.7 | 6.31 | 19.0 | * |
| 19.6 | 0.1251 | 155.6 | 17.3 | 20.3 | 0.123 | 17.3 | 46.9 | 32.6 | 6.34 | 19.1 | * |
| 20.1 | 0.1273 | 158.4 | 16.8 | 20.8 | 0.125 | 16.8 | 45.7 | 32.4 | 6.06 | 19.2 | * |
| 19.7 | 0.1265 | 157.4 | 17.0 | 20.4 | 0.124 | 17.0 | 46.2 | 32.4 | 6.23 | 19.2 | * |
| 20.2 | 0.1291 | 160.6 | 16.5 | 20.9 | 0.127 | 16.5 | 44.9 | 32.1 | 5.96 | 19.4 | * |
| 19.4 | 0.1298 | 161.5 | 16.7 | 20.1 | 0.128 | 16.7 | 44.9 | 31.7 | 6.15 | 19.6 | * |
| 19.8 | 0.1323 | 164.6 | 16.2 | 20.5 | 0.130 | 16.2 | 43.8 | 31.4 | 5.91 | 19.8 | * |
| 19.9 | 0.1315 | 163.6 | 16.3 | 20.7 | 0.129 | 16.3 | 44.0 | 31.6 | 5.91 | 19.7 | * |
| 19.7 | 0.1314 | 163.5 | 16.4 | 20.5 | 0.129 | 16.4 | 44.2 | 31.6 | 5.97 | 19.7 | * |

NB : Shrinkage convention is + for growth, - for contraction
: Qualities marked with * have unreasonable finishing targets
: Estimates are given in good faith but without liability
: Yarn counts are given as Resultant for folded yarns
: Tightness Factor is $\text{Root}(\text{Tex})/\text{St.Len}$ in cm

IIC -STARFISH 84- MODEL PREDICTIONS

Plain Single Jersey - singles,combed ring yarns

18g 22in 1244 needles

R-Jet95 (medium) + Tubular finish

Targets are Finished Length & Width Shrinkages

04-MAR-85 15:21

| Yarn Ne | Average as knitted | | | Average as delivered | | | Shrinkage (5 W&T) | | |
|---------|--------------------|----------|------------|----------------------|-----------|--------------|-------------------|----------|---------|
| | StLen in | C.Len in | Tness Fctr | courses /in | wales /in | weight oz/sy | width in(T) | Length % | Width % |
| 19.2 | 0.1220 | 151.8 | 17.9 | 44.0 | 32.1 | 5.83 | 19.4 | -9.1 | -3.0 |
| 19.7 | 0.1249 | 155.4 | 17.3 | 44.5 | 30.8 | 5.64 | 20.2 | -5.2 | -5.8 |
| 19.6 | 0.1251 | 155.6 | 17.3 | 42.5 | 32.3 | 5.69 | 19.3 | -9.3 | -1.1 |
| 20.1 | 0.1273 | 158.4 | 16.8 | 40.8 | 32.4 | 5.42 | 19.2 | -10.7 | 0.0 |
| 19.7 | 0.1265 | 157.4 | 17.0 | 43.3 | 30.2 | 5.45 | 20.6 | -6.2 | -6.7 |
| 20.2 | 0.1291 | 160.6 | 16.5 | 40.3 | 32.5 | 5.40 | 19.2 | -10.4 | +1.1 |
| 19.4 | 0.1298 | 161.5 | 16.7 | 40.0 | 31.7 | 5.48 | 19.6 | -10.9 | 0.0 |
| 19.8 | 0.1323 | 164.6 | 16.2 | 39.2 | 31.7 | 5.35 | 19.6 | -10.4 | +0.9 |
| 19.9 | 0.1315 | 163.6 | 16.3 | 39.3 | 31.9 | 5.32 | 19.5 | -10.8 | +1.0 |
| 19.7 | 0.1314 | 163.5 | 16.4 | 39.5 | 31.9 | 5.40 | 19.5 | -10.6 | +1.2 |

NB : Shrinkage convention is + for growth, - for contraction

: Estimates are given in good faith but without liability

: Yarn counts are given as Resultant for folded yarns

: Tightness Factor is Root(Tex)/St.Len in cm

IIC -STARFISH 84- MODEL PREDICTIONS

Plain Single Jersey - singles,combed ring yarns

18g 22in 1244 needles

R-Jet95 (medium) + Tubular finish

Targets are Finished Courses & Wales

04-MAR-85 15:23

| Yarn Ne | Average as knitted | | | Average as delivered | | | Shrinkage (5 W&T) | | |
|---------|--------------------|----------|------------|----------------------|-----------|--------------|-------------------|----------|---------|
| | StLen in | C.Len in | Tness Fctr | courses /in | wales /in | weight oz/sy | width in(T) | Length % | Width % |
| 19.2 | 0.1220 | 151.8 | 17.9 | 42.8 | 32.2 | 5.69 | 19.3 | -11.4 | -2.8 |
| 19.7 | 0.1249 | 155.4 | 17.3 | 44.3 | 30.4 | 5.54 | 20.5 | -5.6 | -7.1 |
| 19.6 | 0.1251 | 155.6 | 17.3 | 41.8 | 32.4 | 5.63 | 19.2 | -10.7 | -0.6 |
| 20.1 | 0.1273 | 158.4 | 16.8 | 40.1 | 32.8 | 5.38 | 19.0 | -12.2 | +1.1 |
| 19.7 | 0.1265 | 157.4 | 17.0 | 43.1 | 30.3 | 5.44 | 20.5 | -6.7 | -6.5 |
| 20.2 | 0.1291 | 160.6 | 16.5 | 39.6 | 32.6 | 5.34 | 19.1 | -11.8 | +1.6 |
| 19.4 | 0.1298 | 161.5 | 16.7 | 39.0 | 32.4 | 5.45 | 19.2 | -13.3 | +2.3 |
| 19.8 | 0.1323 | 164.6 | 16.2 | 38.6 | 31.8 | 5.28 | 19.5 | -11.8 | +1.3 |
| 19.9 | 0.1315 | 163.6 | 16.3 | 38.2 | 32.6 | 5.28 | 19.1 | -13.3 | +3.2 |
| 19.7 | 0.1314 | 163.5 | 16.4 | 37.7 | 32.5 | 5.25 | 19.1 | -14.7 | +3.0 |

NB : Shrinkage convention is + for growth, - for contraction

: Estimates are given in good faith but without liability

: Yarn counts are given as Resultant for folded yarns

: Tightness Factor is Root(Tex)/St.Len in cm

STARFISH 84 COMPARISON : HANES FABRICS

IIC TEST DATA
GREIGE REFERENCE STATE

| Sample No | IIC | | *FISH | | IIC | | *FISH | | D | %D |
|-----------|-------|------|-------|--------|--------|--------|--------|--------|---|----|
| | Ne | Ne | D | %D | St Lth | St Lth | D | %D | | |
| 1047E-1 | 19.95 | 19.7 | -0.25 | -1.253 | 0.12 | 0.12 | 0 | 0 | | |
| 1047E-2 | 19.75 | 20.1 | 0.35 | 1.7721 | 0.123 | 0.123 | 0 | 0 | | |
| 1047E-3 | 19.95 | 20 | 0.05 | 0.2506 | 0.123 | 0.123 | 0 | 0 | | |
| 1047E-4 | 20.29 | 20.6 | 0.31 | 1.5278 | 0.126 | 0.126 | 0 | 0 | | |
| 1047E-5 | 19.88 | 20.1 | 0.22 | 1.1066 | 0.125 | 0.125 | 0 | 0 | | |
| 1047E-6 | 20.94 | 20.6 | -0.34 | -1.623 | 0.127 | 0.127 | 0 | 0 | | |
| 1047E-7 | 20.09 | 19.9 | -0.19 | -0.945 | 0.127 | 0.128 | 0.0010 | 0.7874 | | |
| 1047E-8 | 19.75 | 20.3 | 0.55 | 2.7848 | 0.13 | 0.13 | 0 | 0 | | |
| 1047E-9 | 19.95 | 20.4 | 0.45 | 2.2556 | 0.129 | 0.13 | 0.0010 | 0.7751 | | |
| 1047E-10 | 20.02 | 20.2 | 0.18 | 0.8991 | 0.129 | 0.13 | 0.0010 | 0.7751 | | |
| \bar{x} | | | | +0.68 | | | | +0.23 | | |
| σ | | | | 1.52 | | | | 0.38 | | |

| Sample No | IIC | | *FISH | | IIC | | *FISH | | IIC | | *FISH | |
|-----------|-------|------|-------|--------|-------|------|-------|--------|-------|-------|-------|--------|
| | CPI | CPI | D | %D | WPI | WPI | D | %D | Wtosy | Wtosy | D | %D |
| 1047E-1 | 52.07 | 50.1 | -1.97 | -3.783 | 32.51 | 33.8 | 1.29 | 3.9688 | 7.05 | 6.89 | -0.16 | -2.269 |
| 1047E-2 | 50.29 | 48.7 | -1.59 | -3.161 | 32 | 33.4 | 1.4 | 4.375 | 6.87 | 6.59 | -0.28 | -4.075 |
| 1047E-3 | 50.63 | 48.6 | -2.03 | -4.009 | 32.26 | 33.3 | 1.04 | 3.2238 | 6.89 | 6.63 | -0.26 | -3.773 |
| 1047E-4 | 49.53 | 47.6 | -1.93 | -3.896 | 31.58 | 33.1 | 1.52 | 4.8131 | 6.74 | 6.36 | -0.38 | -5.637 |
| 1047E-5 | 49.19 | 48 | -1.19 | -2.419 | 31.58 | 33.1 | 1.52 | 4.8131 | 6.77 | 6.52 | -0.25 | -3.692 |
| 1047E-6 | 47.67 | 46.8 | -0.87 | -1.825 | 31.24 | 32.8 | 1.56 | 4.9936 | 6.59 | 6.25 | -0.34 | -5.159 |
| 1047E-7 | 48.09 | 46.7 | -1.39 | -2.890 | 31.16 | 32.4 | 1.24 | 3.9794 | 6.55 | 6.44 | -0.11 | -1.679 |
| 1047E-8 | 47.07 | 45.6 | -1.47 | -3.123 | 30.56 | 32.1 | 1.54 | 5.0392 | 6.47 | 6.21 | -0.26 | -4.018 |
| 1047E-9 | 46.31 | 45.9 | -0.41 | -0.885 | 30.65 | 32.3 | 1.65 | 5.3833 | 6.47 | 6.21 | -0.26 | -4.018 |
| 1047E-10 | 47.16 | 46 | -1.16 | -2.459 | 30.65 | 32.2 | 1.55 | 5.0571 | 6.48 | 6.27 | -0.21 | -3.240 |
| \bar{x} | | | | -2.85 | | | | +4.56 | | | | -3.76 |
| σ | | | | 0.99 | | | | 0.66 | | | | 1.18 |

1) %D = (IIC-*FISH/IIC)*100

STARFISH 84 COMPARISON : HANES FABRICS

IIC TEST DATA
FINISHED REFERENCE STATE

| Sample No | IIC | | *FISH | | IIC | | *FISH | | D | %D |
|-----------|-------|------|-------|--------|--------|--------|--------|--------|---|----|
| | Ne | Ne | D | %D | St Lth | St Lth | D | %D | | |
| 1047E-1 | 20.43 | 19.9 | -0.53 | -2.594 | 0.119 | 0.12 | 0.0010 | 0.8403 | | |
| 1047E-2 | 20.15 | 20.4 | 0.25 | 1.2406 | 0.122 | 0.123 | 0.0010 | 0.8196 | | |
| 1047E-3 | 20.43 | 20.3 | -0.13 | -0.636 | 0.122 | 0.123 | 0.0010 | 0.8196 | | |
| 1047E-4 | 20.09 | 20.8 | 0.71 | 3.5341 | 0.124 | 0.125 | 0.0010 | 0.8064 | | |
| 1047E-5 | 20.29 | 20.4 | 0.11 | 0.5421 | 0.124 | 0.124 | 0 | 0 | | |
| 1047E-6 | 20.29 | 20.9 | 0.61 | 3.0064 | 0.126 | 0.127 | 0.0010 | 0.7936 | | |
| 1047E-7 | 20.22 | 20.1 | -0.12 | -0.593 | 0.126 | 0.128 | 0.002 | 1.5873 | | |
| 1047E-8 | 20.5 | 20.5 | 0 | 0 | 0.129 | 0.13 | 0.0010 | 0.7751 | | |
| 1047E-9 | 20.22 | 20.7 | 0.48 | 2.3738 | 0.129 | 0.129 | 0 | 0 | | |
| 1047E-10 | 20.09 | 20.5 | 0.41 | 2.0408 | 0.129 | 0.129 | 0 | 0 | | |
| \bar{x} | | | | +0.89 | | | | +0.64 | | |
| σ | | | | 1.91 | | | | 0.51 | | |

| Sample No | IIC | | *FISH | | IIC | | *FISH | | IIC | | *FISH | |
|-----------|-------|------|-------|--------|-------|------|-------|--------|-------|-------|-------|--------|
| | CPI | CPI | D | %D | WPI | WPI | D | %D | Wtosy | Wtosy | D | %D |
| 1047E-1 | 47.67 | 48.4 | 0.73 | 1.5313 | 33.36 | 33.1 | -0.26 | -0.779 | 6.33 | 6.62 | 0.29 | 4.5813 |
| 1047E-2 | 47.16 | 46.9 | -0.26 | -0.551 | 32.51 | 32.7 | 0.19 | 0.5844 | 6.2 | 6.31 | 0.11 | 1.7741 |
| 1047E-3 | 45.97 | 46.9 | 0.93 | 2.0230 | 32.51 | 32.6 | 0.09 | 0.2768 | 6.21 | 6.34 | 0.13 | 2.0934 |
| 1047E-4 | 45.04 | 45.7 | 0.66 | 1.4653 | 33.19 | 32.4 | -0.79 | -2.380 | 6.1 | 6.06 | -0.04 | -0.655 |
| 1047E-5 | 45.64 | 46.2 | 0.56 | 1.2269 | 32.51 | 32.4 | -0.11 | -0.338 | 6.13 | 6.23 | 0.1 | 1.6313 |
| 1047E-6 | 44.11 | 44.9 | 0.79 | 1.7909 | 32.43 | 32.1 | -0.33 | -1.017 | 6.06 | 5.96 | -0.1 | -1.650 |
| 1047E-7 | 44.11 | 44.9 | 0.79 | 1.7909 | 32.26 | 31.7 | -0.56 | -1.735 | 6.04 | 6.15 | 0.11 | 1.8211 |
| 1047E-8 | 43.26 | 43.8 | 0.54 | 1.2482 | 31.92 | 31.4 | -0.52 | -1.629 | 5.92 | 5.91 | -0.01 | -0.168 |
| 1047E-9 | 43.01 | 44 | 0.99 | 2.3017 | 32.26 | 31.6 | -0.66 | -2.045 | 5.97 | 5.91 | -0.06 | -1.005 |
| 1047E-10 | 42.59 | 44.2 | 1.61 | 3.7802 | 32.34 | 31.6 | -0.74 | -2.288 | 5.96 | 5.97 | 0.01 | 0.1677 |
| \bar{x} | | | | +1.66 | | | | -1.14 | | | | +0.86 |
| σ | | | | 1.07 | | | | 1.05 | | | | 1.87 |

1) %D = (IIC-*FISH/IIC)*100

STARFISH 84 COMPARISON : HANES FABRICS

IIC TEST DATA

FINISHED AS DELIVERED : [R-95 Tubular Finish]

From measured length and width shrinkage

| Sample No | IIC CPI | *FISH CPI | D | %D | IIC WPI | *FISH WPI | D | %D |
|-----------|---------|-----------|------|--------|---------|-----------|-------|--------|
| 1047E-1 | 42.84 | 44 | 1.16 | 2.7077 | 32.17 | 32.1 | -0.07 | -0.217 |
| 1047E-2 | 44.28 | 44.5 | 0.22 | 0.4968 | 30.4 | 30.8 | 0.4 | 1.3157 |
| 1047E-3 | 41.83 | 42.5 | 0.67 | 1.6017 | 32.43 | 32.3 | -0.13 | -0.400 |
| 1047E-4 | 40.13 | 40.8 | 0.67 | 1.6695 | 32.77 | 32.4 | -0.37 | -1.129 |
| 1047E-5 | 43.1 | 43.3 | 0.2 | 0.4640 | 30.31 | 30.2 | -0.11 | -0.362 |
| 1047E-6 | 39.62 | 40.3 | 0.68 | 1.7163 | 32.6 | 32.5 | -0.1 | -0.306 |
| 1047E-7 | 38.95 | 40 | 1.05 | 2.6957 | 32.43 | 31.7 | -0.73 | -2.251 |
| 1047E-8 | 38.61 | 39.2 | 0.59 | 1.5281 | 31.83 | 31.7 | -0.13 | -0.408 |
| 1047E-9 | 38.18 | 39.3 | 1.12 | 2.9334 | 32.6 | 31.9 | -0.7 | -2.147 |
| 1047E-10 | 37.68 | 39.5 | 1.82 | 4.8301 | 32.51 | 31.9 | -0.61 | -1.876 |
| \bar{x} | | | | +2.06 | | | | -0.78 |
| σ | | | | 1.29 | | | | 1.09 |

| Sample No | IIC Wtasy | *FISH Wtasy | D | %D | IIC Width | *FISH Width | D | %D |
|-----------|-----------|-------------|-------|--------|-----------|-------------|-------|--------|
| 1047E-1 | 5.65 | 5.83 | 0.18 | 3.1858 | 19.25 | 19.4 | 0.15 | 0.7792 |
| 1047E-2 | 5.52 | 5.64 | 0.12 | 2.1739 | 20.75 | 20.2 | -0.55 | -2.650 |
| 1047E-3 | 5.67 | 5.69 | 0.02 | 0.3527 | 19.37 | 19.3 | -0.07 | -0.361 |
| 1047E-4 | 5.33 | 5.42 | 0.09 | 1.6885 | 19.21 | 19.2 | -0.01 | -0.052 |
| 1047E-5 | 5.36 | 5.45 | 0.09 | 1.6791 | 20.98 | 20.6 | -0.38 | -1.811 |
| 1047E-6 | 5.4 | 5.4 | 0 | 0 | 19.33 | 19.2 | -0.13 | -0.672 |
| 1047E-7 | 5.46 | 5.48 | 0.02 | 0.3663 | 19.13 | 19.6 | 0.47 | 2.4568 |
| 1047E-8 | 5.37 | 5.35 | -0.02 | -0.372 | 19.57 | 19.6 | 0.03 | 0.1533 |
| 1047E-9 | 5.38 | 5.32 | -0.06 | -1.115 | 19.37 | 19.5 | 0.13 | 0.6711 |
| 1047E-10 | 5.33 | 5.4 | 0.07 | 1.3133 | 19.29 | 19.5 | 0.21 | 1.0886 |
| \bar{x} | | | | -0.93 | | | | -0.04 |
| σ | | | | 1.30 | | | | 1.46 |

1) %D = (IIC-*FISH/IIC)*100

STARFISH 84 COMPARISON : HANES FABRICS

IIC TEST DATA

FINISHED AS DELIVERED : (R-95 Tubular Finish)

From measured courses and wales

| Sample No | IIC Wtasy | *FISH Wtasy | D | %D | IIC Width | *FISH Width | D | %D |
|-----------|-----------|-------------|-------|--------|-----------|-------------|-------|--------|
| 1047E-1 | 5.65 | 5.69 | 0.04 | 0.7079 | 19.25 | 19.3 | 0.05 | 0.2597 |
| 1047E-2 | 5.52 | 5.54 | 0.02 | 0.3623 | 20.75 | 20.5 | -0.25 | -1.204 |
| 1047E-3 | 5.67 | 5.63 | -0.04 | -0.705 | 19.37 | 19.2 | -0.17 | -0.877 |
| 1047E-4 | 5.33 | 5.38 | 0.05 | 0.9380 | 19.21 | 19 | -0.21 | -1.093 |
| 1047E-5 | 5.36 | 5.44 | 0.08 | 1.4925 | 20.98 | 20.5 | -0.48 | -2.287 |
| 1047E-6 | 5.4 | 5.34 | -0.06 | -1.111 | 19.33 | 19.1 | -0.23 | -1.189 |
| 1047E-7 | 5.46 | 5.45 | -0.01 | -0.183 | 19.13 | 19.2 | 0.07 | 0.3659 |
| 1047E-8 | 5.37 | 5.28 | -0.09 | -1.675 | 19.57 | 19.5 | -0.07 | -0.357 |
| 1047E-9 | 5.38 | 5.28 | -0.1 | -1.858 | 19.37 | 19.1 | -0.27 | -1.393 |
| 1047E-10 | 5.33 | 5.25 | -0.08 | -1.500 | 19.29 | 19.1 | -0.19 | -0.984 |
| \bar{x} | | | | -0.35 | | | | -0.88 |
| σ | | | | 1.19 | | | | 0.79 |

| Sample No | IIC 5*LS% | *FISH 5*LS% | D | IIC 5*WS% | *FISH 5*WS% | D |
|-----------|-----------|-------------|------|-----------|-------------|-------|
| 1047E-1 | -9.1 | -11.4 | +2.3 | -3 | -2.8 | -0.2 |
| 1047E-2 | -5.2 | -5.6 | +0.4 | -5.8 | -7.1 | +1.3 |
| 1047E-3 | -9.3 | -10.7 | +1.4 | -1.1 | -0.6 | -0.5 |
| 1047E-4 | -10.7 | -12.2 | +1.5 | +0.03 | +1.1 | +1.07 |
| 1047E-5 | -6.2 | -6.7 | +0.5 | -6.7 | -6.5 | -0.2 |
| 1047E-6 | -10.4 | -11.8 | +1.4 | +1.1 | +1.6 | +0.5 |
| 1047E-7 | -10.9 | -13.3 | +2.4 | +0.02 | +2.3 | +2.28 |
| 1047E-8 | -10.4 | -11.8 | +1.4 | +0.9 | +1.3 | +0.4 |
| 1047E-9 | -10.8 | -13.3 | +2.5 | +1 | +3.2 | +2.2 |
| 1047E-10 | -10.6 | -14.7 | +4.1 | +1.2 | +3 | +1.8 |
| \bar{x} | | +1.79 | | | +0.87 | |
| σ | | 1.09 | | | 1.02 | |

1)%D = (IIC-*FISH/IIC)*100

IIC -STARFISH 84- MODEL PREDICTIONS

Plain Single Jersey - singles,combed ring yarns
18g 22in 1244 needles
R-Jet95 (medium) + Tubular finish

Finished Reference State Dimensions

04-MAR-85 15:36

| Average as knitted | | | | Average Reference dimensions | | | | | | | |
|--------------------|----------|----------|------------|------------------------------|----------|------------|-------------|-----------|--------------|-------------|---|
| Yarn Ne | StLen in | C.Len in | Tness Fctr | Yarn Ne | StLen in | Tness Fctr | courses /in | wales /in | weight oz/sy | width in(T) | |
| 20.0 | 0.1222 | 152.0 | 17.5 | 20.7 | 0.120 | 17.5 | 48.0 | 33.3 | 6.36 | 18.7 | * |
| 20.0 | 0.1254 | 156.0 | 17.1 | 20.7 | 0.123 | 17.1 | 46.6 | 32.7 | 6.19 | 19.0 | * |
| 20.0 | 0.1254 | 156.0 | 17.1 | 20.7 | 0.123 | 17.1 | 46.6 | 32.7 | 6.19 | 19.0 | * |
| 20.0 | 0.1270 | 158.0 | 16.9 | 20.7 | 0.125 | 16.8 | 45.9 | 32.4 | 6.11 | 19.2 | * |
| 20.0 | 0.1270 | 158.0 | 16.9 | 20.7 | 0.125 | 16.8 | 45.9 | 32.4 | 6.11 | 19.2 | * |
| 20.0 | 0.1294 | 161.0 | 16.5 | 20.7 | 0.127 | 16.5 | 44.9 | 32.0 | 6.00 | 19.4 | * |
| 20.0 | 0.1294 | 161.0 | 16.5 | 20.7 | 0.127 | 16.5 | 44.9 | 32.0 | 6.00 | 19.4 | * |
| 20.0 | 0.1318 | 164.0 | 16.2 | 20.7 | 0.129 | 16.2 | 43.9 | 31.6 | 5.88 | 19.7 | * |
| 20.0 | 0.1318 | 164.0 | 16.2 | 20.7 | 0.129 | 16.2 | 43.9 | 31.6 | 5.88 | 19.7 | * |
| 20.0 | 0.1318 | 164.0 | 16.2 | 20.7 | 0.129 | 16.2 | 43.9 | 31.6 | 5.88 | 19.7 | * |

NB : Shrinkage convention is + for growth, - for contraction
: Qualities marked with * have unreasonable finishing targets
: Estimates are given in good faith but without liability
: Yarn counts are given as Resultant for folded yarns
: Tightness Factor is $\text{Root}(\text{Tex})/\text{St.Len}$ in cm

STARFISH 84 COMPARISON : HANES FABRICS

HANES TEST DATA

FINISHED REFERENCE STATE : [R-95 Tubular Finish]

| Sample No | *FISH | | | | *FISH | | | | *FISH | | | |
|--------------|--------------|--------------|------|--------|--------------|--------------|------|--------|----------------|----------------|-------|--------|
| | HANES CPI | *FISH CPI | D | %D | HANES WPI | *FISH WPI | D | %D | HANES Wtasy | *FISH Wtasy | D | %D |
| 1047E-1 | 48 | 48 | 0 | 0 | 33.5 | 33.3 | -0.2 | -0.597 | 6.53 | 6.36 | -0.17 | -2.603 |
| 1047E-2 | 46 | 46.6 | 0.6 | 1.3043 | 32.5 | 32.7 | 0.2 | 0.6153 | 6.32 | 6.19 | -0.13 | -2.056 |
| 1047E-3 | 46 | 46.6 | 0.6 | 1.3043 | 33.5 | 32.7 | -0.8 | -2.398 | 6.32 | 6.19 | -0.13 | -2.056 |
| 1047E-4 | 45 | 45.9 | 0.9 | 2 | 32.5 | 32.4 | -0.1 | -0.307 | 6.12 | 6.11 | -0.01 | -0.163 |
| 1047E-5 | 46 | 45.9 | -0.1 | -0.217 | 32.5 | 32.4 | -0.1 | -0.307 | 6.17 | 6.11 | -0.06 | -0.972 |
| 1047E-6 | 44 | 44.9 | 0.9 | 2.0454 | 32 | 32 | 0 | 0 | 6.12 | 6 | -0.12 | -1.960 |
| 1047E-7 | 44 | 44.9 | 0.9 | 2.0454 | 32.5 | 32 | -0.5 | -1.538 | 6.12 | 6 | -0.12 | -1.960 |
| 1047E-8 | 43 | 43.9 | 0.9 | 2.0930 | 32 | 31.6 | -0.4 | -1.25 | 6.07 | 5.88 | -0.19 | -3.130 |
| 1047E-9 | 42 | 43.9 | 1.9 | 4.5238 | 32 | 31.6 | -0.4 | -1.25 | 5.91 | 5.88 | -0.03 | -0.507 |
| 1047E-10 | 43 | 43.9 | 0.9 | 2.0930 | 32 | 31.6 | -0.4 | -1.25 | 6.01 | 5.88 | -0.13 | -2.163 |
| \bar{x} | | | | 1.72 | | | | -0.83 | | | | -1.76 |
| σ | | | | 1.31 | | | | 0.87 | | | | 0.93 |

1) %D = (HANES-*FISH/HANES)*100

I I C -STARFISH 84- MODEL PREDICTIONS

Plain Single Jersey - singles,combed ring yarns

18g 22in 1244 needles

R-Jet95 (medium) + Tubular finish

Targets are Finished Length & Width Shrinkages

20-MAR-85 10:27

| Yarn Ne | StLen in | C.Len in | Tness Fctr | Average as knitted | | Average as delivered | | Shrinkage (5 W&T) | |
|---------|----------|----------|------------|--------------------|-----------|----------------------|-------------|-------------------|---------|
| | | | | courses /in | wales /in | weight oz/sy | width in(T) | Length % | Width % |
| 20.0 | 0.1222 | 152.0 | 17.5 | 42.0 | 33.8 | 5.64 | 18.4 | -12.5 | +1.4 |
| 20.0 | 0.1254 | 156.0 | 17.1 | 41.4 | 32.7 | 5.51 | 19.0 | -11.0 | 0.0 |
| 20.0 | 0.1254 | 156.0 | 17.1 | 40.5 | 33.1 | 5.46 | 18.8 | -13.0 | +1.3 |
| 20.0 | 0.1270 | 158.0 | 16.9 | 39.0 | 33.1 | 5.30 | 18.8 | -15.0 | +2.0 |
| 20.0 | 0.1270 | 158.0 | 16.9 | 41.3 | 32.4 | 5.50 | 19.2 | -10.0 | 0.0 |
| 20.0 | 0.1294 | 161.0 | 16.5 | 38.4 | 32.6 | 5.23 | 19.1 | -14.5 | +2.0 |
| 20.0 | 0.1294 | 161.0 | 16.5 | 39.0 | 32.6 | 5.32 | 19.1 | -13.0 | +2.0 |
| 20.0 | 0.1318 | 164.0 | 16.2 | 37.3 | 32.4 | 5.13 | 19.2 | -15.0 | +2.6 |
| 20.0 | 0.1318 | 164.0 | 16.2 | 37.3 | 32.2 | 5.10 | 19.3 | -15.0 | +2.0 |
| 20.0 | 0.1318 | 164.0 | 16.2 | 37.3 | 32.6 | 5.17 | 19.1 | -15.0 | +3.3 |

NB : Shrinkage convention is + for growth, - for contraction

: Estimates are given in good faith but without liability

: Yarn counts are given as Resultant for folded yarns

: Tightness Factor is Root(Tex)/St.Len in cm

I I C -STARFISH 84- MODEL PREDICTIONS

Plain Single Jersey - singles,combed ring yarns

18g 22in 1244 needles

R-Jet95 (medium) + Tubular finish

Targets are Finished Courses & Wales

20-MAR-85 10:28

| Yarn Ne | StLen in | C.Len in | Tness Fctr | Average as knitted | | Average as delivered | | Shrinkage (5 W&T) | |
|---------|----------|----------|------------|--------------------|-----------|----------------------|-------------|-------------------|---------|
| | | | | courses /in | wales /in | weight oz/sy | width in(T) | Length % | Width % |
| 20.0 | 0.1222 | 152.0 | 17.5 | 41.0 | 33.5 | 5.46 | 18.6 | -14.6 | +0.5 |
| 20.0 | 0.1254 | 156.0 | 17.1 | 41.0 | 33.0 | 5.50 | 18.8 | -11.9 | +0.9 |
| 20.0 | 0.1254 | 156.0 | 17.1 | 41.0 | 34.0 | 5.66 | 18.3 | -11.9 | +3.9 |
| 20.0 | 0.1270 | 158.0 | 16.9 | 38.0 | 33.5 | 5.23 | 18.6 | -17.2 | +3.3 |
| 20.0 | 0.1270 | 158.0 | 16.9 | 41.0 | 33.0 | 5.56 | 18.8 | -10.6 | +1.8 |
| 20.0 | 0.1294 | 161.0 | 16.5 | 37.0 | 33.5 | 5.18 | 18.6 | -17.6 | +4.7 |
| 20.0 | 0.1294 | 161.0 | 16.5 | 38.0 | 33.5 | 5.32 | 18.6 | -15.3 | +4.7 |
| 20.0 | 0.1318 | 164.0 | 16.2 | 36.0 | 33.0 | 5.04 | 18.8 | -18.0 | +4.6 |
| 20.0 | 0.1318 | 164.0 | 16.2 | 37.0 | 33.0 | 5.18 | 18.8 | -15.8 | +4.6 |
| 20.0 | 0.1318 | 164.0 | 16.2 | 36.0 | 33.0 | 5.04 | 18.8 | -18.0 | +4.6 |

NB : Shrinkage convention is + for growth, - for contraction

: Estimates are given in good faith but without liability

: Yarn counts are given as Resultant for folded yarns

: Tightness Factor is Root(Tex)/St.Len in cm

STARFISH 84 COMPARISON : HANES FABRICS

HANES TEST DATA

FINISHED BEFORE COMPACTING : (R-95 Tubular Finish)

From measured length and width shrinkage

| Sample No | HANES | | | | *FISH | | | |
|-----------|-------|------|------|--------|-------|------|------|--------|
| | CPI | CPI | D | %D | WPI | WPI | D | %D |
| 1047E-1 | 41 | 42 | 1 | 2.4390 | 33.5 | 33.8 | 0.3 | 0.8955 |
| 1047E-2 | 41 | 41.4 | 0.4 | 0.9756 | 33 | 32.7 | -0.3 | -0.909 |
| 1047E-3 | 41 | 40.5 | -0.5 | -1.219 | 34 | 33.1 | -0.9 | -2.647 |
| 1047E-4 | 38 | 39 | 1 | 2.6315 | 33.5 | 33.1 | -0.4 | -1.194 |
| 1047E-5 | 41 | 41.3 | 0.3 | 0.7317 | 33 | 32.4 | -0.6 | -1.818 |
| 1047E-6 | 37 | 38.4 | 1.4 | 3.7837 | 33.5 | 32.6 | -0.9 | -2.686 |
| 1047E-7 | 38 | 39 | 1 | 2.6315 | 33.5 | 32.6 | -0.9 | -2.686 |
| 1047E-8 | 36 | 37.3 | 1.3 | 3.6111 | 33 | 32.4 | -0.6 | -1.818 |
| 1047E-9 | 37 | 37.3 | 0.3 | 0.8108 | 33 | 32.2 | -0.8 | -2.424 |
| 1047E-10 | 36 | 37.3 | 1.3 | 3.6111 | 33 | 32.6 | -0.4 | -1.212 |
| \bar{x} | | | | 2.00 | | | | -1.65 |
| σ | | | | 1.62 | | | | 1.12 |

| Sample No | HANES | | | | *FISH | | | |
|-----------|-------|-------|-------|--------|-------|-------|-------|--------|
| | Wtasy | Wtasy | D | %D | Width | Width | D | %D |
| 1047E-1 | 5.63 | 5.64 | 0.01 | 0.1776 | 18.63 | 18.4 | -0.23 | -1.234 |
| 1047E-2 | 5.53 | 5.51 | -0.02 | -0.361 | 19 | 19 | 0 | 0 |
| 1047E-3 | 5.52 | 5.46 | -0.06 | -1.086 | 18.5 | 18.8 | 0.3 | 1.6216 |
| 1047E-4 | 5.37 | 5.3 | -0.07 | -1.303 | 18.5 | 18.8 | 0.3 | 1.6216 |
| 1047E-5 | 5.52 | 5.3 | -0.22 | -3.985 | 19.25 | 19.2 | -0.05 | -0.259 |
| 1047E-6 | 5.27 | 5.23 | -0.04 | -0.759 | 18.75 | 19.1 | 0.35 | 1.8666 |
| 1047E-7 | 5.36 | 5.32 | -0.04 | -0.746 | 18.75 | 19.1 | 0.35 | 1.8666 |
| 1047E-8 | 5.26 | 5.13 | -0.13 | -2.471 | 19 | 19.2 | 0.2 | 1.0526 |
| 1047E-9 | 5.26 | 5.1 | -0.16 | -3.041 | 18.88 | 19.3 | 0.42 | 2.2245 |
| 1047E-10 | 5.16 | 5.17 | 0.01 | 0.1938 | 18.5 | 19.1 | 0.6 | 3.2432 |
| \bar{x} | | | | -1.34 | | | | 1.20 |
| σ | | | | 1.40 | | | | 1.33 |

1) %D = (HANES-*FISH/HANES)*100

STARFISH 84 COMPARISON : HANES FABRICS

HANES TEST DATA

FINISHED BEFORE COMPACTING : [R-95 Tubular Finish]

From measured courses and wales

| Sample No | HANES Wtasy | *FISH Wtasy | D | %D | HANES Width | *FISH Width | D | %D |
|-----------|-------------|-------------|-------|--------|-------------|-------------|-------|--------|
| 1047E-1 | 5.63 | 5.46 | -0.17 | -3.019 | 18.63 | 18.6 | -0.03 | -0.161 |
| 1047E-2 | 5.53 | 5.5 | -0.03 | -0.542 | 19 | 18.8 | -0.2 | -1.052 |
| 1047E-3 | 5.52 | 5.66 | 0.14 | 2.5362 | 18.5 | 18.3 | -0.2 | -1.081 |
| 1047E-4 | 5.37 | 5.23 | -0.14 | -2.607 | 18.5 | 18.6 | 0.1 | 0.5405 |
| 1047E-5 | 5.52 | 5.56 | 0.04 | 0.7246 | 19.25 | 18.8 | -0.45 | -2.337 |
| 1047E-6 | 5.27 | 5.18 | -0.09 | -1.707 | 18.75 | 18.6 | -0.15 | -0.8 |
| 1047E-7 | 5.36 | 5.32 | -0.04 | -0.746 | 18.75 | 18.6 | -0.15 | -0.8 |
| 1047E-8 | 5.26 | 5.04 | -0.22 | -4.182 | 19 | 18.8 | -0.2 | -1.052 |
| 1047E-9 | 5.26 | 5.18 | -0.08 | -1.520 | 18.88 | 18.8 | -0.08 | -0.423 |
| 1047E-10 | 5.16 | 5.04 | -0.12 | -2.325 | 18.5 | 18.8 | 0.3 | 1.6216 |
| \bar{x} | | | | -1.34 | | | | -0.55 |
| σ | | | | 1.94 | | | | 1.06 |

| Sample No | HANES S*LS% | *FISH S*LS% | D | HANES S*WS% | *FISH S*WS% | D |
|-----------|-------------|-------------|------|-------------|-------------|------|
| 1047E-1 | -12.5 | -14.6 | +2.1 | +1.4 | +0.5 | -0.9 |
| 1047E-2 | -11 | -11.9 | +0.9 | 0 | +0.9 | +0.9 |
| 1047E-3 | -13 | -11.9 | -1.1 | +1.3 | +3.9 | +2.6 |
| 1047E-4 | -15 | -17.2 | +2.2 | +2 | +3.3 | +1.3 |
| 1047E-5 | -10 | -10.6 | +0.6 | 0 | +1.8 | +1.8 |
| 1047E-6 | -14.5 | -17.6 | +3.1 | +2 | +4.7 | +2.7 |
| 1047E-7 | -13 | -15.3 | +2.3 | +2 | +4.7 | +2.7 |
| 1047E-8 | -15 | -18 | +3 | +2.6 | +4.6 | +2 |
| 1047E-9 | -15 | -15.8 | +0.8 | +2 | +4.6 | +2.6 |
| 1047E-10 | -15 | -18 | +3 | +3.6 | +4.6 | +1 |
| \bar{x} | | +1.69 | | +1.67 | | |
| σ | | 1.36 | | 1.14 | | |

1) %D = (HANES-*FISH/HANES)*100

IIC -STARFISH 84- MODEL PREDICTIONS

Plain Single Jersey - singles,combed ring yarns

18g 22in 1244 needles

R-Jet95 (medium) + Tubular finish

Targets are Finished Length & Width Shrinkages

04-MAR-85 15:38

| Average as knitted | | | | Average as delivered | | | | Shrinkage (5 W&T) | |
|--------------------|----------|----------|------------|----------------------|-----------|--------------|-------------|-------------------|---------|
| Yarn Ne | StLen in | C.Len in | Tness Fctr | courses /in | wales /in | weight oz/sy | width in(T) | Length % | Width % |
| 20.0 | 0.1222 | 152.0 | 17.5 | 43.4 | 32.7 | 5.64 | 19.0 | -9.5 | -2.0 |
| 20.0 | 0.1254 | 156.0 | 17.1 | 44.1 | 29.9 | 5.37 | 20.8 | -5.3 | -8.5 |
| 20.0 | 0.1254 | 156.0 | 17.1 | 41.9 | 32.2 | 5.49 | 19.3 | -10.0 | -1.5 |
| 20.0 | 0.1270 | 158.0 | 16.9 | 40.9 | 32.1 | 5.39 | 19.4 | -10.8 | -1.1 |
| 20.0 | 0.1270 | 158.0 | 16.9 | 43.5 | 29.6 | 5.29 | 21.0 | -5.3 | -8.6 |
| 20.0 | 0.1294 | 161.0 | 16.5 | 40.4 | 32.1 | 5.41 | 19.4 | -10.0 | +0.3 |
| 20.0 | 0.1294 | 161.0 | 16.5 | 40.5 | 32.0 | 5.41 | 19.4 | -9.8 | 0.0 |
| 20.0 | 0.1318 | 164.0 | 16.2 | 39.3 | 31.7 | 5.30 | 19.6 | -10.5 | +0.6 |
| 20.0 | 0.1318 | 164.0 | 16.2 | 39.3 | 31.9 | 5.33 | 19.5 | -10.5 | +1.2 |
| 20.0 | 0.1318 | 164.0 | 16.2 | 39.3 | 31.9 | 5.32 | 19.5 | -10.5 | +1.0 |

NB : Shrinkage convention is + for growth, - for contraction

: Estimates are given in good faith but without liability

: Yarn counts are given as Resultant for folded yarns

: Tightness Factor is Root(Tex)/St.Len in cm

IIC -STARFISH 84- MODEL PREDICTIONS

Plain Single Jersey - singles,combed ring yarns

18g 22in 1244 needles

R-Jet95 (medium) + Tubular finish

Targets are Finished Courses & Wales

04-MAR-85 15:39

| Average as knitted | | | | Average as delivered | | | | Shrinkage (5 W&T) | |
|--------------------|----------|----------|------------|----------------------|-----------|--------------|-------------|-------------------|---------|
| Yarn Ne | StLen in | C.Len in | Tness Fctr | courses /in | wales /in | weight oz/sy | width in(T) | Length % | Width % |
| 20.0 | 0.1222 | 152.0 | 17.5 | 43.0 | 33.0 | 5.64 | 18.8 | -10.4 | -1.0 |
| 20.0 | 0.1254 | 156.0 | 17.1 | 43.5 | 29.3 | 5.17 | 21.3 | -6.6 | -10.6 |
| 20.0 | 0.1254 | 156.0 | 17.1 | 41.0 | 32.5 | 5.41 | 19.1 | -11.9 | -0.7 |
| 20.0 | 0.1270 | 158.0 | 16.9 | 39.5 | 32.3 | 5.23 | 19.3 | -13.9 | -0.5 |
| 20.0 | 0.1270 | 158.0 | 16.9 | 43.0 | 29.8 | 5.26 | 20.9 | -6.3 | -8.2 |
| 20.0 | 0.1294 | 161.0 | 16.5 | 39.0 | 32.0 | 5.21 | 19.4 | -13.1 | +0.1 |
| 20.0 | 0.1294 | 161.0 | 16.5 | 39.5 | 32.3 | 5.32 | 19.3 | -12.0 | +0.8 |
| 20.0 | 0.1318 | 164.0 | 16.2 | 38.0 | 31.8 | 5.12 | 19.6 | -13.5 | +0.6 |
| 20.0 | 0.1318 | 164.0 | 16.2 | 38.5 | 31.8 | 5.19 | 19.6 | -12.3 | +0.6 |
| 20.0 | 0.1318 | 164.0 | 16.2 | 37.5 | 31.8 | 5.06 | 19.6 | -14.6 | +0.6 |

NB : Shrinkage convention is + for growth, - for contraction

: Estimates are given in good faith but without liability

: Yarn counts are given as Resultant for folded yarns

: Tightness Factor is Root(Tex)/St.Len in cm

STARFISH 84 COMPARISON : HANES FABRICS

HANES TEST DATA

FINISHED AFTER COMPACTING : [R-95 Tubular Finish]

From measured length and width shrinkage

| Sample No | HANES | | | | *FISH | | | |
|-----------|-------|------|-----|--------|-------|------|-------|--------|
| | CPI | CPI | D | %D | WPI | WPI | D | %D |
| 1047E-1 | 43 | 43.4 | 0.4 | 0.9302 | 33 | 32.7 | -0.3 | -0.909 |
| 1047E-2 | 43.5 | 44.1 | 0.6 | 1.3793 | 29.25 | 29.9 | 0.65 | 2.2222 |
| 1047E-3 | 41 | 41.9 | 0.9 | 2.1951 | 32.5 | 32.2 | -0.3 | -0.923 |
| 1047E-4 | 39.5 | 40.9 | 1.4 | 3.5443 | 32.25 | 32.1 | -0.15 | -0.465 |
| 1047E-5 | 43 | 43.5 | 0.5 | 1.1627 | 29.75 | 29.6 | -0.15 | -0.504 |
| 1047E-6 | 39 | 40.4 | 1.4 | 3.5897 | 32 | 32.1 | 0.1 | 0.3125 |
| 1047E-7 | 39.5 | 40.5 | 1 | 2.5316 | 32.25 | 32 | -0.25 | -0.775 |
| 1047E-8 | 38 | 39.3 | 1.3 | 3.4210 | 31.75 | 31.7 | -0.05 | -0.157 |
| 1047E-9 | 38.5 | 39.3 | 0.8 | 2.0779 | 31.75 | 31.9 | 0.15 | 0.4724 |
| 1047E-10 | 37.5 | 39.3 | 1.8 | 4.8 | 31.75 | 31.9 | 0.15 | 0.4724 |
| \bar{x} | | | | 2.56 | | | | -0.03 |
| σ | | | | 1.25 | | | | 0.96 |

| Sample No | HANES | | | | *FISH | | | |
|-----------|-------|-------|-------|--------|-------|-------|-------|--------|
| | Wtasy | Wtasy | D | %D | Width | Width | D | %D |
| 1047E-1 | 5.66 | 5.64 | -0.02 | -0.353 | 19.38 | 19 | -0.38 | -1.960 |
| 1047E-2 | 5.45 | 5.37 | -0.08 | -1.467 | 21.13 | 20.8 | -0.33 | -1.561 |
| 1047E-3 | 5.52 | 5.49 | -0.03 | -0.543 | 19.38 | 19.3 | -0.08 | -0.412 |
| 1047E-4 | 5.4 | 5.39 | -0.01 | -0.185 | 19.38 | 19.4 | 0.02 | 0.1032 |
| 1047E-5 | 5.33 | 5.29 | -0.04 | -0.750 | 21.13 | 21 | -0.13 | -0.615 |
| 1047E-6 | 5.44 | 5.41 | -0.03 | -0.551 | 19.3 | 19.4 | 0.1 | 0.5181 |
| 1047E-7 | 5.44 | 5.41 | -0.03 | -0.551 | 19.38 | 19.4 | 0.02 | 0.1032 |
| 1047E-8 | 5.35 | 5.3 | -0.05 | -0.934 | 19.5 | 19.6 | 0.1 | 0.5128 |
| 1047E-9 | 5.39 | 5.33 | -0.06 | -1.113 | 19.38 | 19.5 | 0.12 | 0.6192 |
| 1047E-10 | 5.37 | 5.32 | -0.05 | -0.931 | 19.38 | 19.5 | 0.12 | 0.6192 |
| \bar{x} | | | | -0.74 | | | | -0.21 |
| σ | | | | 0.38 | | | | 0.93 |

1) %D = (HANES-*FISH/HANES)*100

STARFISH 84 COMPARISON : HANES FABRICS

HANES TEST DATA

FINISHED AFTER COMPACTING : [R-95 Tubular Finish]

From measured courses and wales

| Sample No | *FISH | | | | HANES | | | |
|-----------|-------|-------|-------|--------|-------|-------|-------|--------|
| | Wtosy | Wtosy | D | %D | Wtosy | Wtosy | D | %D |
| 1047E-1 | 5.66 | 5.64 | -0.02 | -0.353 | 19.38 | 18.8 | -0.58 | -2.992 |
| 1047E-2 | 5.45 | 5.17 | -0.28 | -5.137 | 21.13 | 21.3 | 0.17 | 0.8045 |
| 1047E-3 | 5.52 | 5.41 | -0.11 | -1.992 | 19.38 | 19.1 | -0.28 | -1.444 |
| 1047E-4 | 5.4 | 5.23 | -0.17 | -3.148 | 19.38 | 19.3 | -0.08 | -0.412 |
| 1047E-5 | 5.33 | 5.26 | -0.07 | -1.313 | 21.13 | 20.9 | -0.23 | -1.088 |
| 1047E-6 | 5.44 | 5.21 | -0.23 | -4.227 | 19.3 | 19.4 | 0.1 | 0.5181 |
| 1047E-7 | 5.44 | 5.32 | -0.12 | -2.205 | 19.38 | 19.3 | -0.08 | -0.412 |
| 1047E-8 | 5.35 | 5.12 | -0.23 | -4.299 | 19.5 | 19.6 | 0.1 | 0.5128 |
| 1047E-9 | 5.39 | 5.19 | -0.2 | -3.710 | 19.38 | 19.6 | 0.22 | 1.1351 |
| 1047E-10 | 5.37 | 5.06 | -0.31 | -5.772 | 19.38 | 19.6 | 0.22 | 1.1351 |
| \bar{x} | | | | -3.22 | | | | -0.22 |
| σ | | | | 1.73 | | | | 1.33 |

| Sample No | *FISH | | | HANES | | |
|-----------|--------|-------|-------|-------|-------|-------|
| | 5*LS% | 5*LS% | D | 5*WS% | 5*WS% | D |
| 1047E-1 | -9.5 | -10.4 | +0.9 | -2 | -1 | -1 |
| 1047E-2 | -5.25 | -6.6 | +1.35 | -8.5 | -10.6 | +2.1 |
| 1047E-3 | -10 | -11.9 | +1.9 | -1.5 | -0.7 | -0.8 |
| 1047E-4 | -10.75 | -13.9 | +3.15 | -1.1 | -0.5 | -0.6 |
| 1047E-5 | -5.25 | -6.3 | +1.05 | -8.6 | -8.2 | -0.4 |
| 1047E-6 | -10 | -13.1 | +3.1 | +0.3 | +0.1 | -0.2 |
| 1047E-7 | -9.75 | -12 | +2.25 | 0 | +0.8 | +0.8 |
| 1047E-8 | -10.5 | -13.5 | +3 | +0.6 | +0.6 | 0 |
| 1047E-9 | -10.5 | -12.3 | +1.8 | +1.2 | +0.6 | -0.6 |
| 1047E-10 | -10.5 | -14.6 | +4.1 | +1 | +0.6 | -0.4 |
| \bar{x} | | | +2.26 | | | -0.03 |
| σ | | | 1.05 | | | 0.93 |

1) %D = (HANES-*FISH/HANES)*100

A P P E N D I X

I I C T E S T R E S U L T S

H A N E S T E S T R E S U L T S

| TESTS REQUIRED | 1 | 95%CL | 2 | 95%CL | 3 | 95%CL | 4 | 95%CL | 5 | 95%CL | 6 | 95%CL | 7 | 95%CL | 8 | 95%CL |
|----------------------|--------|-------|--------|-------|--------|-------|--------|-------|--------|-------|--------|-------|--------|-------|--------|-------|
| FABRIC WEIGHT BW | 195.3 | 4.1 | 197.5 | 5.5 | 184.3 | 3.8 | 193.7 | 3.1 | 185.5 | 4.5 | 188.4 | 3.7 | 189.2 | 4.5 | 186.5 | 2.0 |
| G.S.M. AW | 238.9 | 1.5 | 233.0 | 3.3 | 233.8 | 1.3 | 228.4 | 2.9 | 229.7 | 3.7 | 223.3 | 3.1 | 222.0 | 2.8 | 219.5 | 1.7 |
| 1/3 CM BW | 62.4 | 0.4 | 59.6 | 0.4 | 59.8 | 0.3 | 57.9 | 0.4 | 56.1 | 0.2 | 55.5 | 0.4 | 54.9 | 0.5 | 53.2 | 0.6 |
| AW | 61.5 | 0.4 | 59.4 | 0.4 | 59.8 | 0.3 | 58.5 | 0.4 | 58.1 | 0.2 | 56.3 | 0.4 | 56.8 | 0.5 | 55.6 | 0.4 |
| 1/3 CM BW | 285 | 0.4 | 282 | 0.3 | 29.4 | 0.4 | 28.5 | 0.5 | 28.7 | 0.5 | 28.5 | 0.5 | 28.4 | 0.4 | 28.9 | 0.5 |
| AW | 38.4 | 0.4 | 37.8 | 0.3 | 38.1 | 0.2 | 37.3 | 0.4 | 37.3 | 0.4 | 36.9 | 0.2 | 36.8 | 0.3 | 36.1 | 0.2 |
| SWITCH LENGTH BW | 3.100 | 0.004 | 3.173 | 0.003 | 3.178 | 0.01 | 3.235 | 0.003 | 3.215 | 0.01 | 3.281 | 0.002 | 3.297 | 0.01 | 3.362 | 0.003 |
| MM AW | 3.050 | 0.004 | 3.115 | 0.004 | 3.114 | 0.003 | 3.193 | 0.003 | 3.165 | 0.003 | 3.223 | 0.003 | 3.225 | 0.003 | 3.295 | 0.004 |
| FIRST STRENGTH BW | 721.0 | 233 | 672.0 | 21.7 | 704.9 | 19.0 | 679.6 | 18.4 | 673.9 | 19.4 | 663.5 | 18.2 | 664.1 | 18.1 | 607.1 | 16.7 |
| KN/m ² AW | 680.8 | 15.9 | 630 | 18.3 | 616.8 | 24.9 | 604.3 | 17.9 | 665.5 | 10.7 | 618.9 | 15.7 | 653.6 | 18.0 | 632.3 | 21.0 |
| EXTENSION BW | 18.6 | 0.9 | 18.9 | 0.4 | 18.6 | 0.8 | 19.1 | 0.7 | 18.1 | 0.7 | 19.6 | 0.7 | 19.0 | 1.0 | 19.9 | 0.9 |
| AW | 21.7 | 0.4 | 22.0 | 0.5 | 21.2 | 0.5 | 21.2 | 1.0 | 21.2 | 0.7 | 21.9 | 1.0 | 21.6 | 0.8 | 21.5 | 0.5 |
| PIRICALITY ANGLES BW | 8.3 | 1.8 | 8.1 | 2.5 | 7.4 | 2.2 | 7.9 | 2.6 | 6.9 | 2.7 | 9.9 | 2.9 | 9.9 | 2.4 | 10.2 | 3.4 |
| AW | 11.7 | 0.4 | 12.5 | 0.6 | 12.6 | 0.5 | 12.8 | 0.5 | 13.7 | 0.6 | 13.3 | 0.6 | 14.0 | 0.6 | 13.5 | 0.5 |
| WIDTH BW | 63.5 | 2.1 | 63.7 | 1.2 | 64.0 | 0.8 | 64.6 | 2.5 | 63.3 | 0.5 | 63.5 | 1.0 | 62.6 | 1.3 | 62.4 | 2.4 |
| BW | 82.3 | 15.5 | 77.7 | 17.3 | 83.32 | 20.3 | 814.9 | 10.6 | 826.3 | 19.1 | 830.4 | 23.0 | 819.6 | 19.4 | 808.9 | 16.0 |
| THICKNESS AW | 1068.4 | 14.9 | 1063.8 | 22.6 | 1061.8 | 23.4 | 1064.8 | 17.3 | 1069.9 | 20.6 | 1065.0 | 16.4 | 1089.4 | 27.1 | 1067.3 | 12.0 |
| WARP COUNT BW | 30.7 | 30.0 | 30.0 | 30.2 | 30.2 | 29.4 | 29.4 | 30.0 | 30.0 | 29.3 | 29.3 | 30.4 | 30.4 | 29.8 | 29.8 | 29.8 |
| AW | 29.6 | 29.9 | 29.9 | 29.6 | 29.6 | 29.1 | 29.1 | 29.7 | 29.7 | 28.2 | 28.2 | 29.4 | 29.4 | 29.9 | 29.9 | 29.9 |
| P.E.S. g BW | 367.5 | 16.0 | 359.0 | 18.3 | 360.2 | 22.5 | 354.2 | 17.6 | 348.6 | 15.9 | 353.3 | 12.6 | 344.4 | 14.6 | 344.8 | 15.9 |
| AW | 378.4 | 14.2 | 380.4 | 11.2 | 385.2 | 12.1 | 387.1 | 13.2 | 341.4 | 11.1 | 358.1 | 13.0 | 351.7 | 13.9 | 356.1 | 13.6 |
| EXT BW | 7.7 | 0.4 | 7.2 | 0.3 | 7.1 | 0.5 | 7.1 | 0.3 | 7.2 | 0.3 | 7.1 | 0.4 | 6.5 | 0.3 | 7.2 | 0.3 |
| AW | 6.8 | 0.3 | 6.8 | 0.3 | 6.8 | 0.3 | 6.8 | 0.2 | 7.0 | 0.2 | 7.1 | 0.3 | 7.1 | 0.2 | 7.2 | 0.3 |

COMMENTS:

FABRIC KNITTED at HANES PRINTABLES

Single Jersey 18G, 22" 1244 Needles.

Ne 1/20. cotton

FABRIC DETAILS:

Cotton

Incorporated. 1047 1-10 Greige

| TESTS REQUIRED | 9 | 95%CL | 10 | 95%CL | 95%CL | 95%CL | 95%CL | 95%CL | 95%CL | 95%CL | 95%CL |
|---------------------|--------|-------|--------|-------|-------|-------|-------|-------|-------|-------|-------|
| FABRIC WEIGHT BW | 175.6 | 3.7 | 184.1 | 3.3 | | | | | | | |
| G.S.M. AW | 219.4 | 4.3 | 219.6 | 2.3 | | | | | | | |
| C/3 CM BW | 51.1 | 0.4 | 51.8 | 0.5 | | | | | | | |
| AW | 54.7 | 0.4 | 55.7 | 0.4 | | | | | | | |
| W/3 CM BW | 30.0 | 0.5 | 29.6 | 0.4 | | | | | | | |
| AW | 36.2 | 0.3 | 36.2 | 0.3 | | | | | | | |
| STITCH LENGTH BW | 3.342 | 0.01 | 3.340 | 0.003 | | | | | | | |
| AW | 3.284 | 0.003 | 3.284 | 0.003 | | | | | | | |
| B*RT STRENGTH BW | 6490 | 18.6 | 6638 | 13.1 | | | | | | | |
| AW | 6188 | 16.8 | 6130 | 25.3 | | | | | | | |
| DISTENSION BW | 18.7 | 0.7 | 19.6 | 0.7 | | | | | | | |
| AW | 21.7 | 0.6 | 21.8 | 0.5 | | | | | | | |
| SPIRALITY ANGLES BW | 11.7 | 2.8 | 9.7 | 1.9 | | | | | | | |
| AW | 14.3 | 0.6 | 13.7 | 0.6 | | | | | | | |
| WIDTH BW | 62.7 | 1.2 | 62.6 | 0.7 | | | | | | | |
| THICKNESS BW | 821.5 | 24.3 | 857.1 | 15.7 | | | | | | | |
| AW | 1063.2 | 17.4 | 1047.1 | 23.9 | | | | | | | |
| YARN COUNT BW | 29.6 | | 29.9 | | | | | | | | |
| AW | 29.6 | | 29.5 | | | | | | | | |
| S.E.S. 9 BW | 361.4 | 18.0 | 351.3 | 13.3 | | | | | | | |
| AW | 346.8 | 16.1 | 344.6 | 14.3 | | | | | | | |
| \$ EXT BW | 7.7 | 0.3 | 7.2 | 0.3 | | | | | | | |
| AW | 7.4 | 0.3 | 6.9 | 0.3 | | | | | | | |

FABRIC DETAILS:

COMMENTS:

Σ 29.95 √ 0.4347

% SHRINKAGE

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 95% | | | | | |
|--------------------------------|--------------------------|--------------------|-------------|------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| WASH + TUMBLE DRY | LENGTH ✓ 2.3 ext | 0.3 | 2.8 | 0.3 ext | 1.9 | 0.5 | 3.4 | 2.2 | 0.4 | 2.9 | 4.5 | 3.0 | 5.5 | 4.1 |
| | WIDTH ✓ 25.1 | 25.7 | 2.6 | 24.0 | 6.4 | 25.2 | 4.6 | 21.9 | 9.8 | 22.6 | 21.0 | 3.5 | 19.2 | 5.1 |
| 1 WASH + 4 RINSES + TUMBLE DRY | LENGTH ✓ 1.5 ext | 0.4 | 2.4 | 0.1 ext | 2.3 | 1.2 | 3.8 | 2.7 | 3.5 | 3.2 | 4.6 | 2.3 | 2.9 | 14.1 |
| | WIDTH ✓ 25.7 | 26.6 | 2.5 | 25.0 | 8.3 | 26.1 | 4.4 | 22.8 | 9.8 | 23.2 | 21.8 | 4.1 | 19.8 | 6.1 |
| WASH + Tumble | COUSES LEADER 61.1 | 58.8 | 0.7 | 59.5 | 0.5 | 57.9 | 0.5 | 57.8 | 0.5 | 56.9 | 55.8 | 0.3 | 56.0 | 0.1 |
| WASH DRY | WASH WALS 37.8 | 38.8 | 0.3 | 38.9 | 0.2 | 38.3 | 0.4 | 38.4 | 0.4 | 37.3 | 36.0 | 0 | 37.2 | 0.1 |
| 1 WASH + 4 RINSES + LINE DRY | LENGTH | | | | | | | | | | | | | |
| | WIDTH | | | | | | | | | | | | | |
| SIZE TESTED | 50CM | NO. REPS TUMBLE 50 | NO. REPS CL | NO. REPS LINE 50 | NO. REPS CL | NO. REPS CL | NO. REPS CL | NO. REPS CL | NO. REPS CL | NO. REPS CL | NO. REPS CL | NO. REPS CL | NO. REPS CL | NO. REPS CL |
| | 25CM ✓ | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 |

Samples 1, 9 - 2 replications
 " 3, 4, 5, 6, 7, 8, 10 - 3 replications.
 " 2 - 4 replications.

| TESTS REQUIRED | 1 | 95%CL | 3σ | 95%CL | 4 | 95%CL | 5 | 95%CL | 6 | 95%CL | 7 | 95%CL | 8 | 95%CL |
|---------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| FABRIC WEIGHT BW | 191.5 | 0.3 | 187.1 | 4.2 | 192.2 | 2.6 | 181.9 | 1.3 | 183.0 | 3.7 | 185.1 | 1.7 | 182.1 | 2.3 |
| G.S.M. AW | 214.5 | 2.1 | 210.3 | 0.8 | 210.6 | 0.7 | 207.8 | 3.1 | 205.5 | 2.7 | 204.8 | 1.7 | 200.9 | 2.2 |
| 1/3 CM BW | 50.6 | 0.7 | 52.3 | 0.5 | 49.4 | 0.7 | 50.9 | 0.5 | 46.8 | 0.3 | 46.0 | 0.5 | 45.6 | 0.5 |
| 1/3 CM AW | 56.3 | 0.5 | 55.7 | 0.8 | 54.3 | 0.5 | 53.9 | 0.4 | 52.1 | 0.4 | 52.1 | 0.4 | 51.1 | 0.5 |
| 1/3 CM BW | 38.0 | 0.3 | 35.9 | 0.4 | 38.3 | 0.5 | 35.8 | 0.3 | 38.3 | 0.4 | 38.3 | 0.4 | 37.6 | 0.6 |
| 1/3 CM AW | 39.4 | 0.4 | 38.4 | 0.4 | 38.4 | 0.4 | 38.4 | 0.4 | 38.3 | 0.4 | 38.1 | 0.5 | 37.7 | 0.4 |
| STITCH LENGTH BW | 3.032 | 0.01 | 3.120 | 0.01 | 3.113 | 0.01 | 3.135 | 0.01 | 3.214 | 0.01 | 3.213 | 0.01 | 3.271 | 0.01 |
| MM AW | 3.029 | 0.01 | 3.107 | 0.01 | 3.087 | 0.01 | 3.140 | 0.01 | 3.199 | 0.01 | 3.203 | 0.01 | 3.264 | 0.01 |
| FIRST STRENGTH BW | 624.7 | 46.8 | 621.5 | 21.4 | 640.7 | 27.2 | 597.8 | 87.0 | 610.0 | 25.3 | 630.2 | 30.8 | 596.0 | 25.7 |
| KN/m² AW | 628.5 | 31.4 | 621.4 | 18.0 | 630.1 | 22.1 | 618.0 | 18.4 | 610.0 | 23.3 | 625.1 | 25.9 | 614.5 | 24.6 |
| DISENSION BW | 16.6 | 0.7 | 17.0 | 0.8 | 17.3 | 0.5 | 17.6 | 1.0 | 16.9 | 0.7 | 16.8 | 0.7 | 18.0 | 0.9 |
| MM AW | 16.0 | 0.6 | 18.2 | 0.3 | 18.3 | 0.5 | 18.7 | 0.7 | 18.8 | 0.5 | 18.5 | 0.7 | 18.9 | 0.4 |
| SPIRALITY ANGLES BW | 9.8 | 1.0 | 8.7 | 1.1 | 8.9 | 1.0 | 8.0 | 1.7 | 9.0 | 1.0 | 7.6 | 1.6 | 7.9 | 1.7 |
| MM AW | 11.0 | 0.6 | 12.2 | 0.7 | 11.9 | 0.7 | 12.9 | 0.8 | 12.3 | 0.9 | 12.4 | 0.5 | 14.7 | 0.7 |
| WIDTH BW | 46.9 | 0.1 | 52.7 | 0.6 | 49.2 | 0.2 | 48.8 | 0.6 | 49.1 | 0.4 | 48.6 | 0.3 | 49.7 | 0.5 |
| THICKNESS BW | 578.9 | 11.5 | 604.3 | 10.0 | 588.4 | 13.4 | 594.4 | 9.7 | 594.5 | 7.1 | 582.2 | 6.6 | 593.7 | 10.8 |
| MM AW | 881.7 | 15.1 | 889.4 | 12.3 | 896.2 | 19.9 | 919.9 | 19.1 | 901.4 | 16.3 | 904.2 | 8.0 | 919.7 | 18.4 |
| WARN COUNT BW | 28.8 | | 29.1 | | 29.4 | | 28.8 | | 29.0 | | 28.4 | | 29.4 | |
| TEX AW | 28.9 | | 29.3 | | 28.9 | | 29.1 | | 29.1 | | 29.2 | | 28.8 | |
| S.E.S. g BW | 418.8 | 15.2 | 384.8 | 16.8 | 373.5 | 18.2 | 380.9 | 16.7 | 373.9 | 18.7 | 391.3 | 19.2 | 378.0 | 18.8 |
| EXT AW | 435.0 | 21.6 | 415.4 | 21.5 | 406.6 | 16.3 | 391.3 | 17.9 | 408.1 | 19.0 | 404.2 | 14.5 | 403.3 | 23.1 |
| AW | 6.8 | 0.2 | 7.0 | 0.4 | 6.8 | 0.3 | 6.9 | 0.2 | 7.3 | 0.4 | 7.2 | 0.2 | 6.8 | 0.3 |
| AW | 7.1 | 0.3 | 7.2 | 0.3 | 7.4 | 0.2 | 7.7 | 0.5 | 7.6 | 0.4 | 7.2 | 0.3 | 7.7 | 0.3 |

FABRIC DETAILS:

COMMENTS: FABRIC KNITTED AT HANES PRINTABLES
 Finished fabric from Cotton Inc.
 1047 ⇒ gave number ②
 1047/3 1047/3 x 2 - gave numbers 30, 36
 1047/4 ⇒ 10

| TESTS REQUIRED | 9 | 95%CL | 10 | 95%CL | 95%CL | 95%CL | 95%CL | 95%CL | 95%CL | 95%CL | 95%CL |
|---------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| FABRIC WEIGHT BW | 182.6 | 1.2 | 1809 | 3.3 | | | | | | | |
| G.S.M. AW | 202.6 | 1.6 | 202.0 | 2.4 | | | | | | | |
| C/3 CM BW | 45.1 | 0.4 | 44.5 | 0.6 | | | | | | | |
| AW | 50.8 | 0.7 | 50.3 | 0.4 | | | | | | | |
| w/3 CM BW | 38.5 | 0.4 | 38.4 | 0.4 | | | | | | | |
| AW | 38.1 | 0.4 | 38.2 | 0.5 | | | | | | | |
| STITCH LENGTH BW | 3.272 | 0.01 | 3.281 | 0.01 | | | | | | | |
| AW | 3.266 | 0.01 | 3.276 | 0.01 | | | | | | | |
| BURST STRENGTH BW | 614.1 | 14.7 | 640.8 | 33.4 | | | | | | | |
| AW | 590.5 | 34.5 | 598.3 | 39.4 | | | | | | | |
| W/STENSION BW | 17.0 | 0.6 | 17.1 | 0.7 | | | | | | | |
| AW | 18.7 | 0.6 | 18.6 | 0.7 | | | | | | | |
| SPIRALITY ANGLES BW | 11.1 | 1.1 | 10.5 | 1.0 | | | | | | | |
| AW | 13.0 | 0.6 | 13.0 | 0.8 | | | | | | | |
| WIDTH BW | 49.2 | 0.2 | 49.0 | 0.4 | | | | | | | |
| THICKNESS BW | 569.8 | 8.5 | 587.2 | 14.9 | | | | | | | |
| AW | 921.6 | 13.5 | 901.5 | 17.1 | | | | | | | |
| YARN COUNT BW | 29.5 | | 29.4 | | | | | | | | |
| AW | 29.2 | | 29.4 | | | | | | | | |
| S.E.S. q BW | 408.3 | 16.7 | 570.5 | 21.7 | | | | | | | |
| AW | 412.4 | 17.0 | 430.0 | 22.9 | | | | | | | |
| % EXT BW | 7.7 | 0.2 | 7.0 | 0.3 | | | | | | | |
| AW | 7.3 | 0.3 | 7.0 | 0.3 | | | | | | | |

COMMENTS: FABRIC DETAILS:

% SHRINKAGE

| | | 9 | 95%CL | 10 | 95%CL | | 95%CL | | 95%CL | | 95%CL | | 95%CL | | 95%CL | | 95%CL | 95 |
|-----------------------------------|----------------|-----------------|-------|----------|---------------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|----|
| WASH + TUMBLE DRY | LENGTH | 9.5 | 0.8 | 8.0 | 4.8 | | | | | | | | | | | | | |
| | WIDTH | 0.1 each | 0.4 | 0.1 each | 0.4 | | | | | | | | | | | | | |
| 1 WASH + 4 RINSES + TUMBLE DRY | LENGTH | 10.8 | 0.7 | 10 each | 0.6 | | | | | | | | | | | | | |
| | WIDTH | 10.6 | 1.0 | 1.2 each | 0.5 | | | | | | | | | | | | | |
| WASH + Tumble WASH DRY | WASH COARSE | 56.7 | 0.4 | 50.2 | 0.5 | | | | | | | | | | | | | |
| | WASH FINE | 38.4 | 0.4 | 38.5 | 0.4 | | | | | | | | | | | | | |
| 1 WASH + 4 RINSES + LINE DRY | LENGTH | | | | | | | | | | | | | | | | | |
| | WIDTH | | | | | | | | | | | | | | | | | |
| SIZE TESTED | 50CM | NO. REPS TUMBLE | | 50 | NO. REPS LINE | | 50 | | | | | | | | | | | |
| | 25CM | | | 25 | | | 25 | | | | | | | | | | | |

Hanes Printables, Inc.

Post Office Box 15901
Winston-Salem, NC 27103
Telephone 919/744-2950

October 15, 1984

Mr. Brian Jones
Cotton, Inc.
4505 Creedmoor Rd.
Raleigh, NC 27612

Dear Brian:

I have recently concluded the 10 cell trial discussed in my last correspondence and have attached results along with fabric samples. It is unfortunate that I do not have any yarn left to send but our testing results are attached and all roll weights reflected these results.

The data shows some interesting points. The objective was to knit and finish the cloth differently and achieve $1\text{b}/\text{in}^2$ figures within 2% (see actual targets under Proj.% Δ column) at the same finished dimensions (excepting for 2 samples where the finished dimension was altered). Admittedly, the shadowgraph scale is not the most precise measuring tool but we did insure it was properly calibrated.

The most interesting observation is the 8% yield difference between 1047E and 1047E-10. Theoretically the difference should only be .9% and for 1047E-9 there should be no difference. Three samples were taken from each roll and these yields are the averages of the three, with very little variation in the actual measures between them. If we now look at length shrinkage we find despite the yield differences shrinkage was almost constant. Does this say that the process for 1047E-10 will result in lighter yield and equal shrinkage compared to the 1047E process? It seems contrary that loose knitting and high compaction gives better results than tight knitting and less compaction. To sort this out I am running 10 rolls of a present fabric with looser knitting and higher compaction. I will keep you appraised.




Mr. Brian Jones
October 15, 1984
-2-

Another observation is that actual yield is furthest from prediction (based off K1047E) on those fabrics with the highest dryer shrinkages. Whether this indicates high variation of shrinkage due to varying levels of input moisture or some other variable it at least indicates this is the least favorable method to control yield. This is further proven out by the measured 5% shrinkage on K1047E-2 which actually yielded the same as K1047E-3, after drying, which had 0% shrinkage. The method of measuring shrinkage is to make a 25" mark along the length and measure at the flat fold truck at the exit end.

I hope STARFISH is progressing well and I look forward to your response.

Sincerely,



Geoff Krasnov
Sr Fabric Development Engineer

mjc

YARN NO. 20/1

BLEND 100%

VENDOR H & H

K1041
E-1 thru 10

SHIPMENT DATE

9-13-84

CASE NUMBER

TEST DATE

9-17-84

A. TEST DATA

- 1. Yarn Count 20'
- 2. Yarn Count & C.V. 4.0%
- 3. Break C.V. % No
- 4. Break Factor 2235
- 5. S.E. - Average Break 444
- & C.V. NO
- 6. Skein Break NO
- 7. CLASSIMAT - OBJ. FAULTS 8
- Top 6* 8.8
- Total* NO
- Elongation %** No
- E.+100% - 3" & Longer NO
- F.+45%-100% 3" to 13" NO
- G.+45%-100% 13" & Longer NO
- H-1 30%-45% 3" to 13" NO
- H-2 45%-75% 3" to 13" NO
- I-1 30%-45% 13" & Longer NO
- I-2 45%-75% 13" & Longer NO
- 8. Twist 3.5
- 9. % Polyester Blend
- 10. Uster Evenness - % C.V.

STD.

TOL.

20'

+ .5

19.98

4.0%

MAX.

3.25

No

STD.

3.58

2235

444

NO

STD.

8.4

NO

STD.

112

8

12

2.7

8.8

13.1

3

NO

STD.

547

No

STD

5.7

NO

STD.

0

NO

STD.

0

NO

STD.

1

NO

STD.

66

NO

STD.

1

NO

STD.

0

NO

STD.

0

3.5

3.8

3.4

17.7

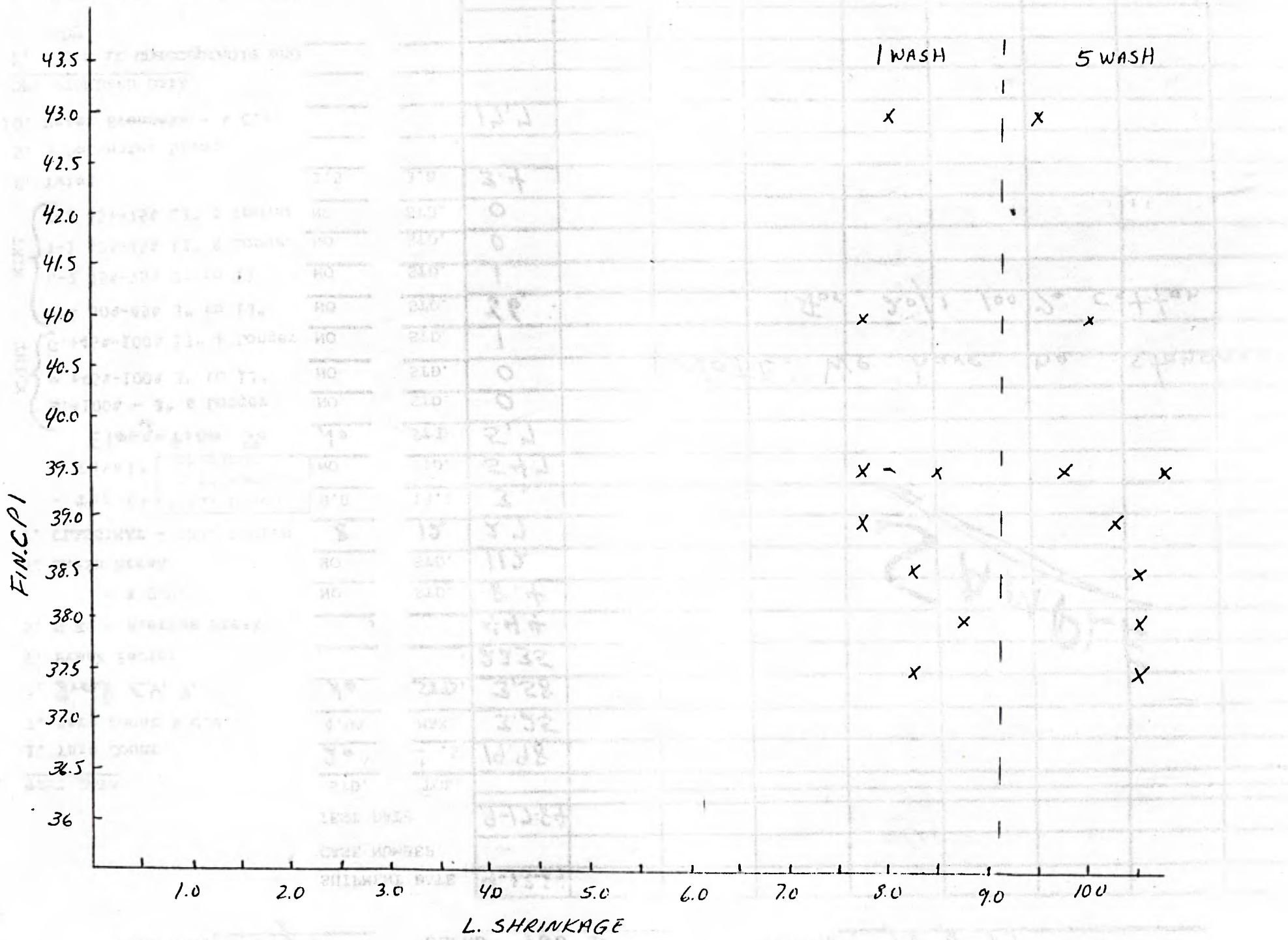
~~SAMPLE~~

NOTE: We have no standards
for 20/1 100% cotton

B. OFF STANDARD DATA

- 1. Note if unacceptable and why
- 2. Note action taken - run/

FINISHED WIDTH 19.375"



| K# | INCH DRAW | 02/42 | CONDITIONED | | DRY % | LB/IN ² | BEFORE COMPARISON | | FIN | X10 ⁻³ | L6/2N | CPI X WPI | L X W | 5 WASH | L X W | Proj % Δ | lb/in ² | AFTER 5 WASH |
|----------|-----------|-------|-----------------|-----------|-------|--------------------|-------------------|--|-----|-------------------|-------|------------------------------|---------------|--------------|-------|----------|--------------------|--------------|
| | | | CPI X WPI | L X W | | | SHAPING % | COMP. | | | | | | | | | | |
| 1047E-1 | 152 | 5.425 | 51 1/2 x 23 1/4 | 54 x 24 | 0 | 18 3/8 | 543 | 41 x 33 S 10.5 x 17 5 12.5 x 14 | 5 | 19.375 | .546 | 43 x 33 | 8.0 x 16 | 9.5 x 2.0 | | | .63 | 48 x 3 |
| 1047E-2 | 156 | 5.292 | 50 x 23 1/4 | 51 x 24 | +5 | 19 | 533 | 41 x 33 10.0 x 0 5 11.0 x 0 | 10 | 21.125 | .526 | 43 1/2 x 24 3 1/4 x 7 1/4 | 5 1/4 x 8 1/2 | | -3.2 | -3.7 | .61 | 46 x 3 |
| 1047E-3 | 156 | 5.292 | 50 x 23 1/4 | 51 x 24 | 0 | 18 1/2 | 532 | 41 x 34 11.5 x 13 5 13.0 x 13 | 7 | 19.375 | .532 | 41 x 32 1/2 | 7 1/4 x 11 | 10 x 1 1/2 | -.6 | -2.6 | .61 | 46 x 3 |
| 1047E-4 | 158 | 4.830 | 48 x 22 1/2 | 48 x 24 | 0 | 18 1/2 | 518 | 38 x 33 S 12.5 x 20 5 15.0 x 20 | 7 | 19.375 | .521 | 39 1/2 x 32 1/4 | 8 1/2 x 9 | 10 3/4 x 1.1 | -1.9 | -3.6 | .59 | 45 x 3 |
| 1047E-5 | 158 | 4.830 | 48 x 22 1/2 | 48 x 24 | +7 | 19 1/4 | 532 | 41 x 33 9.0 x 0 5 10.0 x 0 | 10 | 21.125 | .514 | 43 x 29 1/4 | 3 1/2 x 7.6 | 5 1/4 x 8.6 | -2.4 | -5.9 | .595 | 46 x 3 |
| 1047E-6 | 161 | 4.695 | 45 1/2 x 23 1/4 | 46 x 23 S | +3 | 18 3/4 | 508 | 39 x 33 S 13.5 x 13 5 14.5 x 20 | 7 | 19.3 | .525 | 39 x 32 | 7 1/4 x 3 | 10 x 1.3 | -.2 | -3.8 | .59 | 44 x 3 |
| 1047E-7 | 161 | 4.695 | 45 1/2 x 23 1/4 | 46 x 23 S | 0 | 18 3/4 | 517 | 38 x 33 S 11.5 x 20 5 13.0 x 20 | 10 | 19.375 | .525 | 39 1/2 x 32 1/4 | 7 1/4 x 3 | 9 3/4 x 0 | -.9 | -3.8 | .59 | 44 x 3 |
| 1047E-8 | 164 | 4.628 | 44 x 23 | 42 x 25 | +5 | 19 | 507 | 36 x 33 13.0 x 2.6 5 15.0 x 2.6 | 7 | 19.5 | .516 | 38 x 31 1/4 | 8 3/4 x 5.6 | 10 1/2 x 1.6 | -.9 | -5.5 | .585 | 43 x 3 |
| 1047E-9 | 164 | 4.628 | 44 x 23 | 42 x 25 | +3 | 18 1/8 | 507 | 39 x 33 13.0 x 2.0 5 15.0 x 2.0 | 10 | 19.375 | .520 | 38 1/2 x 31 1/4 | 8 1/4 x 1.0 | 10 1/2 x 1.2 | +1 | -4.8 | .57 | 42 x 3 |
| 1047E-10 | 164 | 4.628 | 44 x 23 | 42 x 25 | 0 | 18 1/2 | 498 | 36 x 33 13.5 x 2.7 5 | 12 | 19.375 | .5175 | 31 1/2 x 31 1/4 | 6 1/4 x 1.6 | 10 1/2 x 1.0 | -.9 | -5.2 | .58 | 43 x 3 |