

VARIATION IN STANDARD PRODUCTION QUALITIES

FROM KLYNTON DAVIS

AUTHOR: JILL C. STEVENS
DATE: OCTOBER 1983
CLASSIFICATION: FABRICS/KNITTED/PROPERTIES
KEY WORDS: KLYNTON DAVIS, INTERLOCK, RIB, VARIATION, STARFISH

C O N T E N T S

1. INTRODUCTION

2. RESULTS

3. DISCUSSION

3.1. Variation in Yarn and Fabric

3.1.1. As knitted yarn count and stitch length

a) Yarn count

b) Stitch length

3.1.2. Fabric dimensions grey as knitted

3.1.3. Fabric dimensions finished as delivered

3.1.4. Variation in yarn and fabric after relaxation grey and finished

3.2. Changes During Relaxation

3.2.1. Yarn count

3.2.2. Stitch length

3.2.3. Dimensions

3.3. Changes During Finishing

3.3.1. Yarn count

3.3.2. Stitch length

3.3.3. Dimensions

3.4. Comparisons with the Predictive Model

3.4.1. Prediction of grey relaxed dimensions

a) Interlock

b) Rib

3.4.2. Prediction of Finished Relaxed Dimensions

a) Interlock

b) Rib

3.5. Prediction of Fabric Weight

3.6. Fabric Shrinkage

a) Interlock

b) Rib

3.6.1. Shrinkage calculated from changes in courses and wales

3.7. Prediction of Fabric Width

4. CONCLUSIONS

TABLES 1 - 73

FIGURES 1 - 33

1. INTRODUCTION

During a period of approximately 8 months from October 1981 to May 1982, random samples of yarn, grey and finished fabric from certain standard production qualities were collected from Klynton Davis Limited of Leicester.

The main objective of the project was to discover the scale and influence of normal variations in raw materials, knitting quality and processing conditions on the dimensional properties of standard qualities of knitted cotton fabrics, and consequently how these can affect the accuracy with which we can expect the STARFISH models to predict the dimensions and performance of finished fabrics.

Initially 3 standard qualities were selected for inclusion in the evaluation:-

20 gauge interlock Ne 1/38 combed, Quality No. 1/422

20 gauge interlock Ne 1/38 carded, Quality No. 1/600

14 gauge 1 x 1 rib Ne 1/30 combed, Quality No. 7/514

which at the time were standard production for major customers.

The original plan allowed for at least twelve samples of yarn, grey and finished fabric for each quality to be selected at random over a period of time. Unfortunately during the course of the project production of the combed interlock quality 1/422 was discontinued for commercial reasons and therefore the data set for this quality is incomplete. Full sets for the 1 x 1 rib and carded interlock qualities were however collected.

Selection of the individual samples was left to Klynton Davis on the understanding that all relevant information about them would be provided, and for this purpose, specially designed forms were prepared on which all the details for both yarn and fabric could be recorded. With hindsight, this was perhaps a mistake as discrepancies and inaccuracies were later discovered in the information provided which could have been avoided by closer supervision.

Soon after the test results were available from the laboratory, a report was prepared for Klynton Davis. This presented the "as received" results graphically compared to target dimensions plus tolerances as laid down in the relevant fabric specifications. In at least one area - control of stitch length on the knitting machine - they illustrated that a more stringent quality control system would be advantageous for reducing variability. This point was readily accepted by Klynton Davis who proposed

to implement a more organised system of quality checks and the conversion of their machinery to accept electronic course length monitoring (Welmstar).

2. RESULTS

The full range of standard IIC yarn and fabric tests were carried out on the yarn as received and the grey and finished fabrics, both as received and after standard relaxation. In addition, shrinkage was also measured after one wash and tumble dry cycle to enable information to be gathered regarding the relationship between fabric shrinkage after one cycle, the most usual commercial practice, and our standard five cycle test.

All the yarn and fabric test results are stored on computer disc file and are readily accessible if required. Therefore tables of all the results have not been included in this report. The results which have been included relate specifically to the most important constructional and dimensional properties relevant to the working of the STARFISH predictive models, i.e. yarn count, stitch length, courses, wales, weight, width and shrinkage.

3. DISCUSSION

3.1. Variation in Yarn and Fabric

3.1.1. As knitted yarn count and stitch length

a) Yarn count - Tables 1 - 4, Figures 1 - 3

The three yarn qualities included in this trial were Ne 1/30 (19.68 Tex) combed for 1 x 1 rib and Ne 1/38 (15.54 Tex) carded and combed for the two interlock qualities.

Count was measured both on yarn taken from the package and on yarn extracted from the greige as received fabric samples.

A common commercial tolerance for yarn count in the UK is $\pm 2.5\%$ of specified count.

Ne 1/38 Carded

During the course of the trial four suppliers of carded yarn were monitored both in yarn form and in greige fabric samples.

<u>Supplier</u>	<u>Number of Samples</u>	
	<u>Yarn</u>	<u>Fabric</u>
Blackwater (Ireland)	3	5
Cotland (Switzerland)	2	2
Selected (Greece)	4	3
Majestic (UK)	3	2
TOTAL	<u>12</u>	<u>12</u>

Table 1 gives a breakdown of the individual results for yarn and fabric by supplier. With the exception of one supplier (Blackwater) all the deliveries measured on cone were within target specifications, and, although when the Blackwater results are included the mean tex remains within specification + 0.7%, the overall variation, represented by the coefficient of variation increases to 1.91%.

The results of count measurement made on yarn taken from greige fabric however show much greater variation - having an overall CV% of 2.76, and over 60% of the deliveries falling outside specification, the mean Tex falling + 2.7% from target.

Averaging the measurements made both on the yarn from cone and the yarn taken from the fabric, the mean tex of 15.76 is 1.42% heavier than specified and the overall CV% is 2.67% indicating a potential variation in real terms of approximately $\pm 5.2\%$, double the commercially accepted tolerance.

Ne 1/38 Combed

As previously explained the data set for the 1/38 combed quality is incomplete and only 5 samples of yarn were collected. However all five deliveries were from the same supplier, Houldsworth, and on the evidence of the testing from cone, were delivered within specification with a very low variability, i.e. CV% 0.62%.

The yarn measured from the greige fabrics (six deliveries) was also from the same supplier but the variation was higher - CV% 1.32. The mean tex of 15.97 was also 2.8% heavier than target which meant half the deliveries were outside specification.

Averaging the results from both cone and fabric the overall variation is CV% 1.2 which is within target specifications but because the mean tex of 15.88 is 2.2% heavier than specification, some of the deliveries were outside tolerance.

Ne 1/38 Carded and Combed

As both yarn qualities are expected to conform to the same specification the results for both the carded and combed yarns were combined. The measurements of tex from cone had a CV% of 1.65% and from greige fabric of 2.33%. Averaging cone and fabric measurements the mean tex was 15.83 (+1.83% from target) with an overall CV% of 2.19% - representing in real terms a variation of $\pm 4.38\%$ on specified count.

Ne 1/30 Combed

With the exception of one greige fabric sample all the yarn sampled for the rib quality was supplied by Caleb Wright - the exception came from Mars Mill.

The measurements of tex from the package had a CV% of 1.05%, within specification, and from fabric of 1.37%. Averaging the results from cone and fabric the overall CV% was 1.2% which is within tolerance for variability but the mean tex of 19.23 is -2.29% from target. Consequently half the deliveries were outside specification for tex.

Observations

1. The above results would seem to suggest that although the tolerance for variation in yarn tex of $\pm 2.5\%$ is a strict one, if yarns are obtained from one well controlled source it can be possible to meet it, as long as the mean tex is also correctly adjusted. However when more than one source of yarn is being used (a more normal commercial situation) the chances of meeting the specification are considerably reduced as variability both within and between suppliers is unlikely to be compensatory.
2. In all cases the variation in count measured from greige fabric is higher than measured from cone. This may be a result of the differences in test method. However, it is perhaps more likely to be a feature of within company and between company variation. For example the combined cone and fabric results for the carded quality (4 suppliers) have a CV% of 2.6 over twice as much as for the 1/38 combed (1 supplier) CV 1.2% or the 1/30 combed (mainly 1 supplier) CV 1.2%.

Although perhaps one could argue for a quality effect, i.e. carded yarns are more variable than combed yarns, this cannot be established on the basis of one data set.

Individually for the 3 qualities the mean tex measurements are not statistically significantly different by the two methods, although when the two interlock qualities are combined there is a statistical significance at the 95% level between yarn and fabric tex determinations. It may perhaps be wise to investigate this potential problem further as the accurate determination of tex taken from the fabric is critical to the performance of the STARFISH models.

b) Stitch Length - Tables 5 - 7, Figure 4

Both interlock qualities had the same target stitch length specification, 0.343 cm and the rib quality had a stitch length specification of 0.287 cm. Similarly to yarn, the common commercial tolerance on knitted stitch length is $\pm 2.5\%$.

Interlock 1/600 Carded

The majority of the fabrics were within target specification but the three exceptions caused the CV% to increase to 2.03% although the mean of 0.339 was within tolerance at -1.2% from target.

Interlock 1/422 Combed

The mean stitch length for the combed qualities was 0.340, - 0.9% from target, with a CV% of 1.38%, better than the carded quality but still not as well in control as it should be.

Interlock Carded and Combed

Averaging the results for both interlock qualities the overall mean stitch length of 0.34 is within 1% of target stitch length but the greater variation in the carded quality results in an overall CV% of 1.8% indicating a spread of $\pm 3.6\%$ in reality.

Rib 7/514

The rib quality was much less in control than the interlock qualities. The mean stitch length of 0.281 cm is over 2% from target and the CV% of 2.94% indicates an overall variation of nearly $\pm 6\%$.

Observations

The commercial tolerance of $\pm 2.5\%$ on stitch length is actually quite a realistic one which should be easily attainable with an adequate quality control system in the mill. Therefore more attention needs to be paid to this particular area of production in order to reduce variation.

3.1.2. Fabric dimensions Grey as Knitted - Tables 8 - 11, Figures 5 - 17

The variation in greige as knitted fabric dimensions depends largely on machine settings (take down tension, stretcher board settings etc) and handling of the roll, and are therefore not of direct interest and are usually high. Consequently although the individual measurements and statistics are recorded in the tables, they will not be discussed.

3.1.3. Fabric dimensions Finished as Delivered - Tables 8 - 11, Figures 9 - 17

Finished fabric dimensions and tolerances are normally specified by the customer, depending on the end-use requirements of the fabric.

The specifications for the fabrics included in the trial in existence at that time were:-

Interlock Ne 1/38 carded - Quality 1/600

Finished C/3cm 39

W/3cm 38

Wt. g/m² 168

Interlock Ne 1/38 combed - Quality 1/422

Finished C/3cm 39

W/3cm 38

Wt. g/m² 165

1 x 1 Rib Ne 1/30 combed - Quality 7/514

Finished C/3cm	48
W/3cm	30
Wt. g/m ²	173

Tubular fabric width was in all cases dependent on the diameter of the knitting machine. No tolerances on dimensions were given on the original specifications but a normal commercial tolerance for finished weight is $\pm 5\%$. In addition a tolerance of 1 in wales and 2 in courses is also often specified.

In the figures the dotted lines on either side of the mean represent ± 2 standard deviations unless stated.

Interlock Carded

The mean results for all three properties were almost exactly on target but the variation in the results was without exception much higher than would be commercially specified.

	<u>Mean</u>	<u>σ</u>	<u>%CV</u>
C/3cm	39.38	2.085	5.29
W/3cm	37.84	1.235	3.26
Wt. g/m ²	164.001	7.52	4.59

Interlock Combed

For the interlock combed quality, probably because the yarn and stitch length were more closely under control, the variation in dimensions is lower than for the carded qualities but probably still too high overall.

	<u>Mean</u>	<u>σ</u>	<u>%CV</u>
C/3cm	39.771	1.909	4.80
W/3cm	38.181	0.956	2.50
Wt. g/m ²	164.023	3.529	2.15

Interlock Carded and Combed

If the results from both qualities are combined as they are both supposed to meet virtually the same specification, the overall variability can be seen.

	<u>Mean</u>	<u>σ</u>	<u>CV%</u>
C/3cm	39.526	1.976	5.00
W/3cm	37.963	1.125	2.96
Wt. g/m ²	164.009	6.222	3.79

On average the finisher is meeting the specifications very well but presumably the inherent variations in the grey cloth, i.e. yarn and stitch length, are not helping the consistency with which he can achieve the finished dimensions. In fact, although the variation in stitch length is somewhat lower in the finished fabric, the variation in tex is higher which probably accounts for the higher variation in courses as adjusting the length of the fabric is the only means of achieving the correct weight when width is set.

Rib Combed

	<u>Mean</u>	<u>σ</u>	<u>CV%</u>
C/3cm	47.583	1.688	3.55
W/3cm	31.336	1.523	4.86
Wt. g/m ²	169.99	10.444	6.14

The rib qualities are both more variable than the interlock qualities and with respect to wales were finished on average over 4% from target, i.e. 4% narrower than specified, and almost 2% lighter.

3.1.4. Variation in yarn and fabric After Relaxation Grey and Finished - Tables 2 - 12, Figures 5 - 17

On average the variations in yarn, stitch length and fabric dimensions are reduced after relaxation, in particular from greige to greige relaxed - although yarn count appears to be more variable in the grey relaxed state.

There is less variation in finished relaxed dimensions overall but finished relaxed stitch length and weight tend to be more variable than finished as received.

Table 12 lists the %CV for each property for comparison.

3.2. Changes During Relaxation - Tables 13 - 16, Figures 18 - 31

The accuracy of the predictive models and their ability to predict dimensions in the finished as delivered state relies on the fact that there are no

significant changes in tex and stitch length from the finished as delivered to finished relaxed states. If indeed there is a significant change in tex and l brought about specifically by the relaxation procedure after finishing then a correction or adjustment would need to be made in the models before finished as delivered dimensions could be calculated.

3.2.1. Yarn Count - Tables 13, Figures 18 - 20

Table 13 summarises the results obtained from all the fabrics included in the trials. In all cases the change in tex from FBW to FAW is insignificantly small, although there is a large change on average from greige as knitted to greige relaxed. Interestingly, the change recorded in tex in the combined interlock fabrics is approximately double that recorded in the rib fabric. I - 2.7%, R - 1.3%.

3.2.2. Stitch Length - Table 14, Figures 21 - 23

Table 14 summarises the results for stitch length. Similarly to yarn count there is a large change in stitch length during relaxation of the greige material - 1% to - 1.7% but in the finished fabric the situation is not clear. On average the results of the combined interlock data indicate a very small mean change of -0.05% but individually the interlock carded qualities record a mean loss of $\approx -0.4\%$ and the combed qualities a mean gain of + 0.5%. The rib qualities show a mean loss of $\approx -0.6\%$.

Although judging from the standard deviations of the differences this is probably not a significant difference it should perhaps be checked in other data sets.

3.2.3. Dimensions - Tables 15 - 16, Figures 24 - 31

The changes in fabric dimensions during relaxation are summarised in Tables 15 and 16. The largest effects are apparent in the greige materials - changes due to relaxation in finished fabric are much reduced.

3.3. Changes During Finishing - Tables 17 - 20, Figures 18 - 31

3.3.1. Yarn Count

Table 17 summarises the results for yarn count. Approximately half the total change in tex is due to relaxation and half to the effect of finishing. For both the

averaged interlock results and the rib results there is a change of approximately 1.4% from greige relaxed to finished relaxed which can be directly attributed to finishing effect. The larger overall change of 4% for the combined interlock qualities is the result of a greater apparent change during relaxation of the greige yarn. Although if the individual results for the carded and combed Ne 1/38 are examined there would appear to be a much larger finishing effect on the combed yarn than the carded yarn which appears to resemble more closely the behaviour of the Ne 1/30 in rib.

3.3.2. Stitch Length - Table 18, Figures 21 - 23

Table 18 summarises the results for stitch length. Practically all the changes in stitch length appear to be due to relaxation with only a relatively small additional influence of finishing although again the results of the rib and interlock are dissimilar. For the combined interlock results there is a change of -0.35% from grey relaxed to finished relaxed although for the rib there is apparently a +0.4% gain in stitch length. However once again examination of the standard deviation of the differences suggests that in fact there is no significant difference. On average the total change in stitch length is slightly greater for interlock than rib.

3.3.3. Dimensions - Tables 19 - 20, Figures 24 - 31

Tables 19 and 20 summarise the change in fabric dimensions for the three qualities. The effect of finishing on fabric dimensions is apparent in the differences between the greige and finished relaxed dimensions, which on average are similar for both interlock and rib.

In both cases the finished relaxed structure is larger and lighter than the greige relaxed. The biggest influence appears to be on courses which are reduced by approximately 6%. The effect on wales is to reduce them by 3% on average for interlock and 1.4% for rib. The change in relaxed weight which in both cases is greater than the changes in stitch density is presumably explained by the additional change in tex $\approx 4\%$ for interlock $\approx 2.7\%$ for rib.

There is also apparently a difference in behaviour of the two structures if total change from grey BW to finished relaxed are compared. Although the changes in weight and stitch density are of a similar order the proportional effect on courses

and wales is dissimilar. For rib, the changes in wales are twice the change in courses, whereas for interlock on average, although there is more equality, the change in courses is approximately 25% greater than the change in wales. Individually there are apparently greater changes in the interlock combed qualities than the carded.

3.4. Comparison with the Predictive Models - Tables 21 - 51

The predictive model (K3) is built on equations developed by regression analysis of the CP78 20 gauge interlock and 14 gauge 1 x 1 rib data. It works in 3 steps. First the changes in tex and stitch length from grey as knitted to finished relaxed are calculated according to finish. Secondly, the two new values for tex and l are combined according to the relevant equations and coefficients to calculate finished relaxed dimensions for the fabric; courses, wales, weight and stitch density. Finally, these dimensions are reportioned according to the level of shrinkage which is desired in the as delivered finished fabric.

Since the original equations were developed, additional trials have added more data on which new coefficients have been calculated and the results from this case study provide an ideal opportunity to check not only the accuracy of each step of the original model equations but also whether significant improvements have been made with the additional data.

NB: The original information from Klynton Davis regarding the finishing of these fabrics indicated that all had been processed through a winch dye route. Subsequent discussion with the finishers however seemed to indicate that at least one or two of the individual fabrics may have in fact been jet dyed. However, as there was a certain amount of confusion it was decided to treat all the fabrics as if they had been winch dyed for the purposes of this analysis.

The BW grey tex measurements used in the calculations are those obtained from yarn extracted from the fabric.

3.4.1. Prediction of Grey Relaxed Dimensions

a) Interlock

For grey fabric we have two sets of equations, *20G developed from the original CP78 data and *20+28G which was developed using combined data from both the 20 gauge and 28 gauge trials.

For tex and stitch length the comparisons are between values calculated via the appropriate equation from measured greige before wash, and measured grey relaxed values. For dimensional properties the predicted values are arrived at in two ways:

1. From the measured values of tex and stitch length found in the grey relaxed fabric via the appropriate equations, and
2. Using the predicted values of tex and stitch length grey relaxed and the appropriate equations.

Tables 21 and 22 summarise the results for both interlock qualities individually and table 23 for the combined results.

On average the *20+28G combined equations are probably better than the 20G equations but only marginally. Both sets of equations get closer to predicting relaxed dimensions when predicted values of tex and stitch length are used as opposed to measured values.

Stitch length and courses are predicted very well, within 1%, tex, wales and stitch density fairly well, better than 3%. Weight however is very badly predicted over 5% away from measured by the fully predicted method, although the combined 20+28G equation is marginally better.

Interestingly, as the equations were developed using data obtained from fabrics made from combed yarn, they actually predict the dimensions of the carded yarn qualities generally more closely than the combed qualities.

Predicted values are always within ± 2 standard deviations of measured values and generally, with the exception of weight, within ± 1 standard deviation.

b) 1 x 1 Rib

At present there is only one set of equations for 14G rib, developed from the original CP78 data. Table 24 summarises the results.

Tex and stitch length are both accurately predicted better than $\pm 0.5\%$, although the differences are in the opposite direction to interlock, i.e. for rib, tex is underestimated and stitch length is overestimated, for interlock the reverse is true.

Dimensions are predicted equally well (or badly) whether measured values for tex and 1 are used or the predicted values. By the fully predicted method, courses are very well predicted, better than 1%, stitch density better than 2%, and wales better than 3%. Again weight is badly predicted at over 4%.

However, in all cases, predicted values are within ± 1 standard deviation of the measured values. For both the combined interlock and 1 x 1 rib dimensional predictions the direction of the % differences are similar, i.e. overestimate for courses and underestimate for wales, weight and stitch density.

3.4.2. Prediction of Finished Relaxed Dimensions

For both interlock and rib there are two sets of equations for winch dyeing; WD1 which was developed from the original part set of fabrics included in CP78, and WD2 which was developed later from a supplementary trial which included all the yarn/stitch length variants from the full CP78 plan.

Similarly to the comparison with grey relaxed dimensions, tex and stitch length are predicted using both equations and the results compared with the finished relaxed measured values.

Fabric dimensions are calculated using either measured values of tex and stitch length or predicted values by both sets of equations.

a)_ Interlock

Tables 25 and 26 summarise the results for the carded and combed qualities individually - Table 27 for the combined results.

Looking at the combined results - Table 27. For stitch length and tex the WD2 equations predict the fully relaxed values very closely, better than 1%.

For dimensions the best results overall are actually achieved using the measured values of tex and stitch length with the WD2 equations. But, of the two fully predicted routes, on balance the WD2 set is probably better because it predicts both wales and weight to better than 1%, although courses and stitch density at better than 3% are similar to the WD1 route.

All predicted values are again within ± 1 standard deviation of measured.

Considering the WD1 equations were developed on a limited data set they are performing almost as well as the WD2 equations. The main improvement with WD2 is in the prediction of stitch length and fabric weight, although wales are slightly worse.

Individually the equations predict the finished relaxed dimensions of the carded quality better than the combed quality.

b) 1 x 1 Rib

Table 28 summarises the results. For rib, the prediction of tex and stitch length by the WD2 equations is almost perfect. WD1 works equally well for stitch length but underestimates the tex by over 3.5%.

For dimensions also WD2 is on balance better than WD1. Stitch density is almost exactly predicted, courses and wales are both better than 2% and weight is just over 2% from measured. Only in weight do the WD1 equations prove to be better - within 2%.

In all cases, the predicted values by WD2 are well within ± 1 standard deviation of measured values. For WD1 all predicted values are within ± 2 standard deviations and with the exception of tex and wales, within ± 1 standard deviation.

3.5. Prediction of Fabric Weight - Tables 52 - 61

Fabric weight can be calculated in a variety of ways:

1. By using the measured values for courses, wales, tex and stitch length,
2. Via the existing STARFISH equation $y = a + b \text{ tex}/l$,
3. By using the predicted values of courses, wales, tex and stitch length,
4. By using the predicted value for stitch density, tex and stitch length.

When the original analysis was carried out on the CP78 data it was decided that the regression using tex/l gave sufficiently good results to be used until a more thorough analysis could be carried out. Also it was assumed that if either option 3 or 4 were discovered to be more accurate, the equation's existed and could easily be substituted in the model if required. Table 52 summarises the relaxed fabric results for the combined interlock data - Table 53 the rib.

Certainly as far as grey relaxed weight predictions are concerned, either option 3 or 4 gives much better agreement with measured weight than the existing STARFISH equations. However, for finished relaxed weights there is really no significant degree of improvement over the tex/l regression, especially if in the case of interlock the WD2 equation is used.

For both interlock and rib the 3 methods of predicting finished relaxed weights are at least as good, if not better, than calculating weight from the measured values for courses, wales, tex and l. For grey relaxed weight there is probably a good argument for using either option 3 or 4 unless further analysis discovers why the weight predictions for grey relaxed fabric are apparently so bad.

3.6. Fabric Shrinkage - Tables 62 - 65

The standard IIC relaxation test for knitted fabrics is based on a 5-cycle test of washing, rinsing and tumble drying. However, commercially, shrinkage in fabrics is more usually assessed using a 1-cycle wash and tumble dry test.

Tables 62 - 65 compare the results obtained for shrinkage after one and five cycles for both grey and finished fabrics. Figures 32 - 33 show the results graphically.

a) Interlock

Levels of shrinkage recorded after the five cycle test are always greater than after the one cycle test for both length and on average for width, although the differences are not large.

For grey fabrics		<u>1 W&T</u>	<u>5 W&T</u>	<u>Mean Difference</u>
Interlock carded	L	18.9	20.5	+ 1.6
	W	15.7	16.0	+ 0.3
Interlock combed	L	22.9	24.4	+ 1.5
	W	17.8	18.7	+ 0.9
Interlock carded + combed	L	20.2	21.8	+ 1.6
	W	16.4	16.9	+ 0.5

For finished fabrics		<u>1 W&T</u>	<u>5W&T</u>	<u>Mean Difference</u>
Interlock carded	L	13.3	16.4	+ 3.1
	W	13.2	13.6	+ 0.4
Interlock combed	L	13.5	16.8	+ 3.3
	W	14.3	14.8	+ 0.5
Interlock carded + combed	L	13.4	16.6	+ 3.2
	W	13.6	14.0	+ 0.4

On average, increasing the number of cycles from 1 to 5 increases shrinkage in grey fabric by 1.5% in length and 0.5% in width and for finished fabric by 3% in length and 0.5% in width. Although the variability in shrinkage in finished fabrics is lower than for grey fabrics, as indicated by the standard deviations, they also show that shrinkage is unlikely to be assessed more accurately than $\pm 3\%$ in either direction.

b) Rib

For grey fabric		<u>1W&T</u>	<u>5W&T</u>	<u>Mean Difference</u>
	L	15.7	17.0	+ 1.3
	W	19.1	20.3	+ 1.2
For finished fabric	L	9.4	11.5	+ 2.1
	W	10.3	10.2	- 0.1

Similarly to interlock, levels of shrinkage recorded after 5 cycles for grey fabric are always greater than for 1 cycle, by approximately 1% in both directions. For finished fabrics also length shrinkage is increased on average by 2% from 1 to 5, however, for width shrinkage there is apparently no difference.

The standard deviations again indicate a reduction in variability between grey and finished fabrics and a slight improvement on interlock on the accuracy of determination - approximately $\pm 2\%$ for length and $\pm 2.5\%$ for width.

3.6.1. Shrinkage calculated from changes in Courses and Wales - Table 66 - 71

Apart from actually measuring the changes in length and width of a fabric before and after relaxation, another method of estimating the amount a fabric has shrunk is by calculation from changes in courses and wales.

Tables 68 - 71 give the results for the individual fabrics. Tables 66 and 67 summarise the comparisons between measured shrinkage after 5 cycles and shrinkage calculated from changes in courses and wales. In all cases calculated shrinkages are well within ± 1 standard deviation from measured.

For interlock, calculated shrinkage is always less than measured between $\approx 0.8\%$ and 1.8% . For rib the range is $\approx 0.6\%$ to 1.1% with the exception of grey width where a 0.6% larger shrinkage is recorded.

Although statistically the differences are significant for finished fabric, at the 95% level for the individual interlock qualities, and at the 99% level for the combined interlock and 1×1 rib fabrics, whether they are in reality significant is debatable. The main problem is that the model calculates finished as received courses and wales by proportioning the predicted fully relaxed courses and wales according to the levels of length and width shrinkage that are required. In this instance, the fact that shrinkage from courses and wales consistently underestimates shrinkage as measured may potentially be a source of error in the outputs of the model.

3.7. Prediction of Fabric Width - Tables 72 - 73

One of the outputs of the model is the finished width of the fabric which is calculated from the number of needles in the machine and the number of wales in the fabric. Obviously the accuracy of this prediction depends on the correct number of needles being entered in the first place and also making an accurate prediction of the number of wales in the finished as received fabric.

Previous sections have shown that wales per unit length in the finished relaxed fabric can on average be predicted to within 1% for interlock and 2% for rib compared to measured values. However when calculating finished as delivered dimensions by reportioning courses and wales to take shrinkage into account, there is a possibility of building in a small yet possibly significant error because of the differences between calculated and measured shrinkages. Similarly, there may also be a difference between measured width and calculated width. To check if this is also the case, fabric widths calculated from measured wales and number of needles (where known) were compared against measured widths for the fabrics included in this investigation.

Tables 72 and 73 show the results for the interlock and rib fabrics respectively. For both the interlock and rib grey fabrics there is no difference between measured and calculated widths. This is also true for the finished rib fabrics, but for interlock the calculated width is consistently underestimating measured width by on average 1.6%, which is statistically significant at the 99% level. This would appear to suggest that for some reason during the testing of the finished interlock fabrics, the number of wales in the fabric were being overestimated and should be investigated to see if it is a feature of finished interlock fabrics as it could form an additional source of error in the models.

4. CONCLUSIONS

1. Variations in yarn tex are unlikely to be maintained within the commercial tolerance of $\pm 2.5\%$ unless one well controlled source is used. When yarn from several sources are used the variation both between and within companies is more likely to rise to $\pm 4.5\%$.
2. There is a possibility that the two methods of determining yarn tex, i.e. from cone and from yarn extracted from grey fabric, may be returning different results and should be further investigated.
3. Stitch length can be controlled within commercial tolerances with an adequate quality control system but on the evidence of this trial, Klynton Davis are not performing as well as they should be. On average the variation in knitted stitch length for interlock is $\pm 3.6\%$ and for rib, almost $\pm 6\%$.
4. Mean finished fabric dimensions are in the main conforming to specification very well but the variation is higher than would normally be commercially specified. This is presumably reflecting the variation in knitted tex and stitch length which is adding to the normal variations found in finishing.
5. Variation in yarn, stitch length and fabric dimensions are on average reduced after relaxation.
6. There does not appear to be an additional change in yarn tex during relaxation of the finished fabrics, any changes can be accounted for by relaxation from the grey to finished state and the effect of finishing route.

7. For stitch length the majority of the change that takes place is due to relaxation from grey to finished, with a small effect attributable to finishing route. Although on average there is a small effect of relaxation of the finished fabrics on stitch length it is probably not significant.
8. The effect of finishing route on fabric dimensions is to increase the size and reduce the weight of the finished relaxed fabric. For interlock, courses are reduced by 6%, wales by 3% and weight by 12%. For rib, courses by 6.5%, wales by 1.4% and weight by 9.5%. The differences between changes in stitch density and weight are presumably accounted for by the additional loss of yarn tex.
9. All the predictive models perform reasonably well although the latest equations for grey interlock, i.e. 20+28G combined and finish WD2 for both interlock and rib are on average the best. Finished relaxed dimensions are more accurately predicted than grey relaxed dimensions.

Grey Interlock

Within 1% stitch length and courses

Between 2-3% tex, wales and stitch density

Over 5% weight

Grey Rib

Within 1% tex, stitch length and courses

Between 1-2% stitch density

Between 2-3% wales

Over 4% weight

Finished Interlock WD2

Within 1% tex, stitch length, wales and weight

Between 2-3% courses and stitch density

Finished Rib WD2

Within 1% tex, stitch length, stitch density

Between 1-2% courses and wales

Between 2-2.5% weight

In the majority of cases predicted values fall within ± 1 standard deviation of measured values.

10. Grey relaxed fabric weights can be more accurately predicted by calculation from predicted values of tex, l, courses and wales or tex, l, stitch density than the original STARFISH regression tex/l . However, there is nothing to choose between all three methods for finished relaxed weights. All three methods are at least as good as calculating weight from measured values of tex, l, courses and wales.
11. Fabric shrinkage measured after one cycle of washing and tumble drying is less than after the standard IIC relaxation test but only by a relatively small amount. For interlock, grey fabric shrinkage increases from 1-5 cycles by 1.5% in length and 0.5% in width, and in finished fabrics by 3% in length and 0.5% in width. For rib, the differences are smaller - for grey fabrics by approximately 1% in both length and width directions, for finished fabric by 2% in length and no difference in width.
12. Shrinkage can be calculated from changes in courses and wales and the calculated results are within ± 1 standard deviation from measured values after 5 cycles. However, in the majority of cases, calculated shrinkage underestimates measured shrinkage by up to 2% and the mean differences are often significant at the 95% level.
13. The calculation of fabric width from wales and number of needles in the machine depends on the accuracy with which wales are either measured or predicted. The results of this trial have shown that finished relaxed wales can be predicted within 1% for interlock and 2% for rib compared with measured, but there is probably a significant difference between shrinkage calculated from changes in courses and wales compared to measured. This could add a source of error in the prediction of finished as delivered wales, and consequently the calculation of finished width.

Calculated widths compared to measured widths for grey interlock and grey and finished rib fabrics included in the trials were found to be the same. The calculated widths from measured wales and needles for finished interlock fabrics were however consistently 1.6% narrower than measured widths.

These differences are statistically significant at the 99% level.

VARIATION IN YARN COUNT BY SUPPLIER

INTERLOCK QUALITY 1/600 Ne 1/38 CARDED

	<u>Tex on Cone</u>	<u>Tex GBW</u>		
Blackwater (Ireland)	16.005 16.044 <u>16.154</u> \bar{x} 16.068 r 0.0773 %CV 0.48	16.234 16.243 15.603 <u>16.506</u> \bar{x} 16.1226 r 0.3365 %CV 2.09	Average \bar{x} r %CV	16.102 0.2593 1.61
Cotland (Switzerland)	15.213 <u>15.703</u> \bar{x} 15.458 r 0.3465 %CV 2.24	15.257 <u>16.044</u> \bar{x} 15.6505 r 0.5565 %CV 3.56	Average \bar{x} r %CV	15.5543 0.3945 2.54
Selected (Greece)	15.699 15.678 15.554 <u>15.416</u> \bar{x} 15.5868 r 0.1306 %CV 0.84	16.529 16.221 <u>15.296</u> \bar{x} 16.0153 r 0.6417 %CV 4.01	Average \bar{x} r %CV	15.7704 0.4453 2.82
Majestic (UK)	15.416 15.296 <u>15.579</u> \bar{x} 15.4303 r 0.1420 %CV 0.92	15.497 <u>16.001</u> \bar{x} 15.749 r 0.3564 %CV 2.26	Average \bar{x} r %CV	15.5578 0.2689 1.73
Average	<u>Tex on Cone</u>	<u>Target</u>	<u>% Difference</u>	
Cotland, Selected & Majestic	\bar{x} 15.506 r 0.1801 %CV 1.16	15.54	- 0.22%	
Average				
Blackwater, Cotland, Selected & Majestic	\bar{x} 15.647 r 0.299 %CV 1.91	15.54	+ 0.69%	
Average	<u>Tex GBW</u>	<u>Target</u>	<u>% Difference</u>	
Cotland, Selected & Majestic	\bar{x} 15.835 r 0.49 %CV 3.09	15.54	+ 1.9%	
Average				
Blackwater, Cotland Selected & Majestic	\bar{x} 15.955 r 0.441 %CV 2.76	15.54	+ 2.67%	

FACTORY VARIATIONS CASE STUDY : MILL No 2
 QUALITY :- INTERLOCK Ne 1-38 (Carded) # 1/600
 GREY & FINISHED FABRIC DATA : MEASURED YARN TEX

Sample No	Yarn MeasTx	Fabric TexGBW	Fabric TexGAW	Fabric TexFBW	Fabric TexFAW
1	16.005	16.234	15.408	15.093	15.089
2	15.213	15.257	15.348	15.320	15.368
3	15.703	16.044	15.481	15.550	15.509
4	16.044	16.243	15.753	15.595	15.804
5	15.699	15.603	16.066	15.762	15.229
6	15.678	16.027	15.460	15.493	15.440
7	16.154	16.506	15.686	15.562	16.221
8	15.554	16.529	15.783	15.534	15.186
9	15.416	16.221	15.703	15.915	15.497
10	15.416	15.296	14.872	14.872	15.257
11	15.296	15.497	15.178	15.257	14.948
12	15.579	16.001	15.296	15.416	15.456

*** COLUMNS STATISTICS ***

		Mean	SD	CV%	Max	Min
1.	Yarn MeasTx	15.647	0.299	1.91	16.155	15.214
2.	Fabric TexGBW	15.955	0.441	2.76	16.530	15.257
3.	Fabric TexGAW	15.503	0.318	2.05	16.067	14.873
4.	Fabric TexFBW	15.448	0.283	1.83	15.915	14.873
5.	Fabric TexFAW	15.417	0.338	2.19	16.221	14.948

N = 24 Av. Cols 1 & 2 15.76 0.41 2.60
 Tex GBW

FACTORY VARIATIONS CASE STUDY : MILL No 2
 QUALITY :- INTERLOCK Ne 1-38 (Combed) # 1/422
 GREY & FINISHED FABRIC DATA : MEASURED YARN TEX

Sample No	Yarn MeasTx	Fabric TexGBW	Fabric TexGAW	Fabric TexFBW	Fabric TexFAW
1	15.690	16.310	15.468	14.676	14.790
2	15.778	15.997	15.249	15.170	15.440
3	15.829	16.027	16.401	15.440	15.159
4	15.661	15.670	15.182	14.669	14.951
5	15.897	15.876	15.657	15.360	15.190
6	n. a.	15.923	15.505	14.593	14.869
7	n. a.	n. a.	n. a.	15.050	14.724

*** COLUMNS STATISTICS ***

		Mean	SD	CV%	Max	Min
1.	Yarn MeasTx	15.772	0.097	0.62	15.898	15.662
2.	Fabric TexGBW	15.968	0.210	1.32	16.311	15.670
3.	Fabric TexGAW	15.578	0.440	2.82	16.401	15.183
4.	Fabric TexFBW	14.995	0.350	2.33	15.441	14.593
5.	Fabric TexFAW	15.018	0.256	1.70	15.441	14.724

N = 11 Av. Cols 1 & 2 15.878 0.101 1.20
 Tex GBW

FACTORY VARIATIONS CASE STUDY : MILL No 2
 QUALITY :- INTERLOCK Ne 1-38 (Carded) # 1/600
 QUALITY :- INTERLOCK Ne 1-38 (Combed) # 1/422
 GREY & FINISHED FABRIC DATA : MEASURED YARN TEX

Sample No	Yarn MeasTx	Fabric TexGBW	Fabric TexGAW	Fabric TexFBW	Fabric TexFAW

Interlock :- Quality # 1/600 Ne 1-38 Carded					
1	16.085	16.234	15.488	15.093	15.089
2	15.213	15.257	15.348	15.320	15.368
3	15.703	16.044	15.481	15.550	15.589
4	16.044	16.243	15.753	15.595	15.804
5	15.699	15.603	16.066	15.762	15.229
6	15.678	16.027	15.460	15.493	15.440
7	16.154	16.506	15.686	15.562	16.221
8	15.554	16.529	15.783	15.534	15.186
9	15.416	16.221	15.703	15.915	15.497
10	15.416	15.296	14.872	14.872	15.257
11	15.296	15.497	15.178	15.257	14.948
12	15.579	16.001	15.296	15.416	15.456
Interlock :- Quality # 1/422 Ne 1-38 Combed					
1	15.690	16.310	15.468	14.676	14.790
2	15.778	15.997	15.249	15.170	15.440
3	15.829	16.027	16.401	15.440	15.159
4	15.661	15.670	15.182	14.669	14.951
5	15.897	15.876	15.657	15.360	15.190
6	n. a.	15.923	15.505	14.593	14.869
7	n. a.	n. a.	n. a.	15.050	14.724

*** COLUMNS STATISTICS

		Mean	SD	CV%	Max	Min
1.	Yarn MeasTx	15.684	0.259	1.65	16.155	15.214
2.	Fabric TexGBW	15.959	0.372	2.33	16.520	15.257
3.	Fabric TexGAW	15.528	0.352	2.26	16.401	14.873
4.	Fabric TexFBW	15.281	0.374	2.45	15.915	14.593
5.	Fabric TexFAW	15.270	0.362	2.37	16.221	14.724

N = 35 Average of Columns 2, 3 & 4
 Tex (GBW) 15.825 0.347 2.19

FACTORY VARIATIONS CASE STUDY : MILL No 2
 QUALITY :- 1x1 RIB Ne 1-30 (Combed) # 7/514
 GREY & FINISHED FABRIC DATA : MEASURED YARN TEX

Sample No	Yarn MeasTx	Fabric TexGBW	Fabric TexGAW	Fabric TexFBW	Fabric TexFAW
1	19.493	19.740	19.120	18.632	18.822
2	19.164	18.882	18.229	18.661	18.786
3	19.108	19.145	19.201	18.428	18.696
4	19.170	19.302	19.034	18.786	18.567
5	19.145	19.096	18.798	18.463	18.702
6	19.441	18.870	18.822	18.497	18.590
7	18.936	19.551	19.422	18.463	18.602
8	19.448	19.077	18.942	18.936	18.876
9	19.551	19.170	19.046	18.744	18.985
10	19.295	19.422	19.170	18.804	18.744
11	19.359	19.170	18.864	19.046	18.223
12	18.985	18.985	18.744	18.685	18.509

*** COLUMNS STATISTICS

		Mean	SD	CV%	Max	Min
1.	Yarn MeasTx	19.258	0.203	1.05	19.551	18.937
2.	Fabric TexGBW	19.201	0.263	1.37	19.741	18.870
3.	Fabric TexGAW	18.950	0.300	1.58	19.423	18.229
4.	Fabric TexFBW	18.679	0.196	1.05	19.047	18.429
5.	Fabric TexFAW	18.676	0.198	1.06	18.986	18.224

NO# 24 Average of Cols. 2 & 3
 TexGBW 19.229 0.252 1.20

FACTORY VARIATIONS CASE STUDY :- MILL No 2
 QUALITY :- INTERLOCK № 1-38 (Carded) # 1/600
 GREY & FINISHED FABRIC DATA
 MEASURED STITCH LENGTH cm

Sample No	SL cm GBN	SL cm GAN	SL cm FBN	SL cm FAN
1	0.331	0.3279	0.3309	0.3295
2	0.3325	0.3291	0.335	0.3336
3	0.338	0.336	0.336	0.337
4	0.346	0.336	0.34	0.339
5	0.352	0.339	0.342	0.339
6	0.336	0.329	0.327	0.322
7	0.3451	0.3374	0.3342	0.3335
8	0.3421	0.3368	0.3366	0.3392
9	0.3411	0.3404	0.3305	0.3255
10	0.3431	0.3429	0.3442	0.3408
11	0.3376	0.3315	0.3261	0.3306
12	0.3281	0.3229	0.3365	0.3333

*** COLUMNS STATISTICS ***

			N	Mean	SD	CV%	Max	Min
1.	SL cm	GBN	12	0.339	0.007	2.03	0.352	0.328
2.	SL cm	GAN	12	0.334	0.006	1.78	0.343	0.323
3.	SL cm	FBN	12	0.335	0.006	1.67	0.344	0.326
4.	SL cm	FAN	12	0.334	0.006	1.76	0.341	0.322

FACTORY VARIATIONS CASE STUDY :- MILL No 2
 QUALITY :- INTERLOCK № 1-38 (Combed) # 1/422
 GREY & FINISHED FABRIC DATA
 MEASURED STITCH LENGTH cm

Sample No	SL cm GBN	SL cm GAN	SL cm FBN	SL cm FAN
1	0.3369	0.3366	0.3344	0.334
2	0.3407	0.3359	0.331	0.3314
3	0.334	0.34	0.329	0.345
4	0.347	0.339	0.335	0.333
5	0.34	0.334	0.33	0.33
6	0.344	0.338	0.334	0.334
7	n. a.	n. a.	0.3345	0.333

*** COLUMNS STATISTICS ***

			N	Mean	SD	CV%	Max	Min
1.	SL cm	GBN	6	0.340	0.005	1.38	0.347	0.334
2.	SL cm	GAN	6	0.337	0.002	0.65	0.340	0.334
3.	SL cm	FBN	7	0.333	0.002	0.75	0.335	0.329
4.	SL cm	FAN	7	0.334	0.005	1.47	0.345	0.330

FACTORY VARIATIONS CASE STUDY :- MILL No 2
 QUALITY :- INTERLOCK Ne 1-38 (Carded) # 1/600
 QUALITY :- INTERLOCK Ne 1-38 (Combed) # 1/422
 GREY & FINISHED FABRIC DATA
 MEASURED STITCH LENGTH cm

Sample No	SL cm GBW	SL cm GAW	SL cm FBW	SL cm FAW

Interlock :- Quality # 1/600 Ne 1-38 Carded				
1	0.331	0.3279	0.3309	0.3295
2	0.3325	0.3291	0.335	0.3336
3	0.338	0.336	0.336	0.337
4	0.346	0.336	0.34	0.339
5	0.352	0.339	0.342	0.339
6	0.336	0.329	0.327	0.322
7	0.3451	0.3374	0.3342	0.3335
8	0.3421	0.3368	0.3366	0.3392
9	0.3411	0.3404	0.3305	0.3255
10	0.3431	0.3429	0.3442	0.3408
11	0.3376	0.3315	0.3261	0.3306
12	0.3281	0.3229	0.3365	0.3333
Interlock :- Quality # 1/422 Ne 1-38 Combed				
1	0.3369	0.3366	0.3344	0.334
2	0.3407	0.3359	0.331	0.3314
3	0.334	0.34	0.329	0.345
4	0.347	0.339	0.335	0.333
5	0.34	0.334	0.33	0.33
6	0.344	0.338	0.334	0.334
7	n. a.	n. a.	0.3345	0.333

=====
 *** COLUMNS STATISTICS ***

			N	Mean	SD	CV%	Max	Min
1.	SL cm	GBW	18	0.340	0.006	1.80	0.352	0.328
2.	SL cm	GAW	18	0.335	0.005	1.54	0.343	0.323
3.	SL cm	FBW	19	0.334	0.005	1.42	0.344	0.326
4.	SL cm	FAW	19	0.334	0.005	1.62	0.345	0.322

FACTORY VARIATIONS CASE STUDY :- MILL No 2
 QUALITY :- 1x1 RIB Ne 1-30 (Combed) # 7/514
 GREY & FINISHED FABRIC DATA
 MEASURED STITCH LENGTH cm

Sample No	SL cm GBW	SL cm GAW	SL cm FBW	SL cm FAW
1	0.2671	0.2637	0.2825	0.2779
2	0.2844	0.2783	0.2739	0.2722
3	0.27	0.262	0.276	0.275
4	0.271	0.266	0.276	0.274
5	0.287	0.282	0.275	0.275
6	0.284	0.279	0.281	0.276
7	0.2764	0.2735	0.2778	0.2737
8	0.2928	0.2885	0.2765	0.2746
9	0.2842	0.2801	0.2827	0.2808
10	0.2811	0.278	0.2856	0.2825
11	0.2878	0.2826	0.2795	0.2851
12	0.2891	0.2842	0.2835	0.2825

=====
 *** COLUMNS STATISTICS ***

			N	Mean	SD	CV%	Max	Min
1.	SL cm	GBW	12	0.281	0.008	2.94	0.293	0.267
2.	SL cm	GAW	12	0.276	0.008	3.06	0.289	0.262
3.	SL cm	FBW	12	0.279	0.004	1.37	0.286	0.274
4.	SL cm	FAW	12	0.277	0.004	1.52	0.285	0.272

FACTORY VARIATIONS CASE STUDY : MILL No 2
 QUALITY :- INTERLOCK No 1-38 (Carded) # 1/600
 GREY & FINISHED FABRIC DATA
 MEASURED BEFORE & AFTER RELAXATION

Sample No	C/3cm	C/3cm	W/3cm	W/3cm	Wtasm	Wtasm	Ss 9cm	Ss 9cm
	GBW	GAW	GBW	GAW	GBW	GAW	GBW	GAW
1	42	50.3	36.1	45.1	178.79	249.8	168.46	252.05
2	37.5	50	37.8	43.7	162.07	236.2	157.5	242.77
3	40.7	49.5	43	45	195.7	259	194.45	247.5
4	41.1	50.4	41.3	45.5	211.6	270	188.60	254.8
5	34.9	47.9	37	45.2	160.9	253.3	143.47	240.56
6	40.6	50.9	36.4	44.9	179.2	259.4	164.20	253.93
7	39.3	49	41.8	45.6	201.96	259.36	182.52	248.26
8	44.5	51	35.64	43	194.02	255.45	176.22	243.66
9	37.5	48.3	35.9	43.3	158.5	246.5	149.58	232.37
10	36.3	47.3	39.9	46.9	170.3	242.6	160.93	246.48
11	40.1	51.4	36	44.3	164.6	246	160.4	253.00
12	46.4	54	33.6	42.1	186.7	250.3	173.22	252.6

Sample No	C/3cm	C/3cm	W/3cm	W/3cm	Wtasm	Wtasm	Ss 9cm	Ss 9cm
	FBW	FAW	FBW	FAW	FBW	FAW	FBW	FAW
1	41.1	46.6	36.9	42.6	163.08	202.57	168.51	220.57
2	41.1	48.8	37.3	44	168.67	226.11	170.33	238.57
3	37.5	44.6	38.4	42.9	164.9	212.5	160	212.59
4	38.1	46.6	37.6	42.1	162.8	188	159.17	217.98
5	40.1	47.9	39.9	41.8	176.21	226.69	177.77	222.46
6	41.4	47.4	37.83	41.5	159	213.1	174.01	218.56
7	43	48	36.8	44.1	178.15	241.87	175.82	235.2
8	36.8	45.9	39.7	43.1	154.2	218.19	162.32	219.81
9	38.6	46.7	38.2	43.6	163	229	163.83	226.23
10	36.1	44.2	35.4	43.7	154.3	220.2	141.99	214.61
11	38.7	47.3	38.4	44.4	158.5	227	165.12	233.34
12	40.1	45.9	37.6	41.1	165.2	215.8	167.52	209.61

*** COLUMNS STATISTICS ***

Mean SD CV% Max Min

1.	C/3cm	GBW	40.075	3.302	8.24	46.400	34.900
2.	C/3cm	GAW	50.000	1.806	3.61	54.000	47.300
3.	W/3cm	GBW	37.870	2.928	7.73	43.000	33.600
4.	W/3cm	GAW	44.550	1.326	2.98	46.900	42.100
5.	Wtasm	GBW	180.362	17.707	9.82	211.600	158.500
6.	Wtasm	GAW	252.326	9.077	3.60	270.000	236.200
7.	Ss 9cm	GBW	168.300	15.381	9.14	194.456	143.478
8.	Ss 9cm	GAW	247.326	6.653	2.69	254.800	232.377
9.	C/3cm	FBW	39.383	2.085	5.29	43.000	36.100
10.	C/3cm	FAW	46.658	1.359	2.91	48.800	44.200
11.	W/3cm	FBW	37.836	1.235	3.26	39.900	35.400
12.	W/3cm	FAW	42.908	1.096	2.55	44.400	41.100
13.	Wtasm	FBW	164.001	7.520	4.59	178.150	154.200
14.	Wtasm	FAW	218.419	13.860	6.35	241.870	188.000
15.	Ss 9cm	FBW	165.537	9.545	5.77	177.777	141.993
16.	Ss 9cm	FAW	222.465	9.168	4.12	238.578	209.610

FACTORY VARIATIONS CASE STUDY : MILL No 2
 QUALITY :- INTERLOCK No 1-38 (Combed) # 1/422
 GREY & FINISHED FABRIC DATA
 MEASURED BEFORE & AFTER RELAXATION

Sample No	C/3cm GBW	C/3cm GAW	W/3cm GBW	W/3cm GAW	Wtasm GBW	Wtasm GAW	Ss 9cm GBW	Ss 9cm GAW
1	39.7	49.1	35	45.7	170.59	252.77	154.38	249.31
2	36.1	49.5	36.3	45.2	159	252.47	145.60	248.6
3	39.3	48.7	37.8	43.25	173.4	248.3	165.06	234.03
4	39	49.7	38.4	45.9	180.3	259.9	166.4	253.47
5	35.8	48.3	36.6	44.9	152.9	250.3	145.58	240.96
6	35.7	48.6	38.6	45.7	170.25	256.59	153.11	246.78
7	n. a.	n. a.	n. a.	n. a.	n. a.	n. a.	n. a.	n. a.

Sample No	C/3cm FBW	C/3cm FAW	W/3cm FBW	W/3cm FAW	Wtasm FBW	Wtasm FAW	Ss 9cm FBW	Ss 9cm FAW
1	38.6	45.7	38.4	44.8	162.99	211.83	164.69	227.48
2	39	47.13	38.67	45.6	169.52	231.56	167.57	238.79
3	36.6	46.5	39.8	43.7	163.4	241.3	161.85	225.78
4	40.3	47.9	37.7	42.7	163.4	224.9	168.81	227.25
5	42.6	46.5	36.7	45.2	168.06	232.06	173.71	233.53
6	40.7	47.1	38.2	42.7	160.5	218.3	172.74	223.46
7	40.6	47.1	37.8	43.5	160.29	213.89	170.52	227.65

*** COLUMNS STATISTICS

Mean

SD

CV%

Max

Min

1.	C/3cm	GBW	37.600	1.916	5.10	39.700	35.700
2.	C/3cm	GAW	48.983	0.546	1.11	49.700	48.300
3.	W/3cm	GBW	37.117	1.395	3.76	38.600	35.000
4.	W/3cm	GAW	45.108	0.983	2.18	45.900	43.250
5.	Wtasm	GBW	167.740	10.008	5.97	180.300	152.900
6.	Wtasm	GAW	253.388	4.226	1.67	259.900	248.300
7.	Ss 9cm	GBW	155.025	9.077	5.86	166.400	145.587
8.	Ss 9cm	GAW	245.527	6.950	2.83	253.470	234.031
9.	C/3cm	FBW	39.771	1.909	4.80	42.600	36.600
10.	C/3cm	FAW	46.847	0.692	1.48	47.900	45.700
11.	W/3cm	FBW	38.181	0.956	2.50	39.800	36.700
12.	W/3cm	FAW	44.029	1.180	2.68	45.600	42.700
13.	Wtasm	FBW	164.023	3.529	2.15	169.520	160.290
14.	Wtasm	FAW	224.834	10.802	4.80	241.300	211.830
15.	Ss 9cm	FBW	168.559	4.261	2.53	173.713	161.853
16.	Ss 9cm	FAW	229.138	5.235	2.28	238.792	223.463

FACTORY VARIATIONS CASE STUDY : MILL No 2
 QUALITY :- INTERLOCK Ne 1-38 (Carded) # 1/600
 QUALITY :- INTERLOCK Ne 1-38 (Combed) # 1/422
 GREY & FINISHED FABRIC DATA
 MEASURED BEFORE & AFTER RELAXATION

Sample No	C/3cm GBW	C/3cm GAW	W/3cm GBW	W/3cm GAW	Wtasm GBW	Wtasm GAW	Ss 9cm GBW	Ss 9cm GAW
Interlock :- Quality # 1/600 Ne 1-38 Carded								
1	42	50.3	36.1	45.1	178.79	249.8	168.46	252.05
2	37.5	50	37.8	43.7	162.07	236.2	157.5	242.77
3	40.7	49.5	43	45	195.7	259	194.45	247.5
4	41.1	50.4	41.3	45.5	211.6	270	188.60	254.8
5	34.9	47.9	37	45.2	160.9	253.3	143.47	240.56
6	40.6	50.9	36.4	44.9	179.2	259.4	164.20	253.93
7	39.3	49	41.8	45.6	201.96	259.36	182.52	248.26
8	44.5	51	35.64	43	194.02	255.45	176.22	243.66
9	37.5	48.3	35.9	43.3	158.5	246.5	149.58	232.37
10	36.3	47.3	39.9	46.9	170.3	242.6	160.93	246.48
11	40.1	51.4	36	44.3	164.6	246	160.4	253.00
12	46.4	54	33.6	42.1	186.7	250.3	173.22	252.6
Interlock :- Quality # 1/422 Ne 1-38 Combed								
1	39.7	49.1	35	45.7	170.59	252.77	154.38	249.31
2	36.1	49.5	36.3	45.2	159	252.47	145.60	248.6
3	39.3	48.7	37.8	43.25	173.4	248.3	165.06	234.03
4	39	49.7	38.4	45.9	180.3	259.9	166.4	253.47
5	35.8	48.3	36.6	44.9	152.9	250.3	145.58	240.96
6	35.7	48.6	38.6	45.7	170.25	256.59	153.11	246.78
7	n. a.	n. a.	n. a.	n. a.	n. a.	n. a.	n. a.	n. a.

Sample No	C/3cm FBW	C/3cm FAW	W/3cm FBW	W/3cm FAW	Wtasm FBW	Wtasm FAW	Ss 9cm FBW	Ss 9cm FAW
Interlock :- Quality # 1/600 Ne 1-38 Carded								
1	41.1	46.6	36.9	42.6	163.08	202.57	168.51	220.57
2	41.1	48.8	37.3	44	168.67	226.11	170.33	238.57
3	37.5	44.6	38.4	42.9	164.9	212.5	160	212.59
4	38.1	46.6	37.6	42.1	162.8	188	159.17	217.98
5	40.1	47.9	39.9	41.8	176.21	226.69	177.77	222.46
6	41.4	47.4	37.83	41.5	159	213.1	174.01	218.56
7	43	48	36.8	44.1	178.15	241.87	175.82	235.2
8	36.8	45.9	39.7	43.1	154.2	218.19	162.32	219.81
9	38.6	46.7	38.2	43.6	163	229	163.83	226.23
10	36.1	44.2	35.4	43.7	154.3	220.2	141.99	214.61
11	38.7	47.3	38.4	44.4	158.5	227	165.12	233.34
12	40.1	45.9	37.6	41.1	165.2	215.8	167.52	209.61
Interlock :- Quality # 1/422 Ne 1-38 Combed								
1	38.6	45.7	38.4	44.8	162.99	211.83	164.69	227.48
2	39	47.13	38.67	45.6	169.52	231.56	167.57	238.79
3	36.6	46.5	39.8	43.7	163.4	241.3	161.85	225.78
4	40.3	47.9	37.7	42.7	163.4	224.9	168.81	227.25
5	42.6	46.5	36.7	45.2	168.06	232.06	173.71	233.53
6	40.7	47.1	38.2	42.7	160.5	218.3	172.74	223.46
7	40.6	47.1	37.8	43.5	160.29	213.89	170.52	227.65

*** COLUMNS STATISTICS ***

			Mean	SD	CV%	Max	Min
1.	C/3cm	GBW	39.250	2.094	7.88	46.400	34.900
2.	C/3cm	GAW	49.661	1.562	2.15	54.000	47.300
3.	W/3cm	GBW	37.619	2.500	6.65	43.000	32.600
4.	W/3cm	GAW	44.736	1.223	2.73	46.900	42.100
5.	Wtasm	GBW	176.154	16.427	9.33	211.600	152.900
6.	Wtasm	GAW	252.680	7.670	3.04	270.000	236.200
7.	Ss 9cm	GBW	163.875	14.791	9.03	194.456	143.478
8.	Ss 9cm	GAW	246.733	6.604	2.68	254.800	232.377
9.	C/3cm	FBW	39.526	1.976	5.00	43.000	36.100
10.	C/3cm	FAW	46.728	1.139	2.44	48.900	44.200
11.	W/3cm	FBW	37.963	1.125	2.96	39.900	35.400
12.	W/3cm	FAW	43.321	1.227	2.83	45.600	41.100
13.	Wtasm	FBW	164.009	6.222	3.79	178.150	154.200
14.	Wtasm	FAW	220.783	12.899	5.84	241.870	188.000
15.	Ss 9cm	FBW	166.650	7.998	4.80	177.777	141.993
16.	Ss 9cm	FAW	224.924	8.452	3.76	238.792	209.610

FACTORY VARIATIONS CASE STUDY : MILL No 2
 QUALITY :- 1x1 RIB Ne 1-30 (Combed) # 7/514
 GREY & FINISHED FABRIC DATA
 MEASURED BEFORE & AFTER RELAXATION

Sample No	C/3cm GBW	C/3cm GAW	W/3cm GBW	W/3cm GAW	Wtasm GBW	Wtasm GAW	Ss 9cm GBW	Ss 9cm GAW
1	56.2	60.9	25.73	35.7	171.76	238.29	160.66	241.57
2	43.3	56.8	27.36	35.5	144.62	227.88	131.63	224.04
3	53.6	59.9	27.9	35.7	172.7	239.8	166.16	237.60
4	51.1	60.9	27.6	36.4	163.6	244.9	156.70	246.30
5	47.2	55.9	27.1	34.6	153.4	224	142.12	214.90
6	45.4	56	27	34.8	155.31	225.8	136.2	216.53
7	48.2	57.3	28.1	35.6	160.09	233.9	150.49	226.65
8	42.6	53.8	29	33.5	154.2	211.26	137.26	200.25
9	45.6	55.7	27.6	35	156.2	228.3	139.84	216.61
10	46.1	56.2	30.2	36.2	156.8	224.2	154.69	226.04
11	47	55.7	26.7	34.3	153.8	218.9	139.43	212.27
12	45.8	54.6	29.4	34.8	163	219	149.61	211.12

Sample No	C/3cm FBW	C/3cm FAW	W/3cm FBW	W/3cm FAW	Wtasm FBW	Wtasm FAW	Ss 9cm FBW	Ss 9cm FAW
1	46.1	51.9	30.8	34.2	160.96	195.81	157.76	197.22
2	49.9	56.2	31.73	35.5	180.77	215.7	175.92	221.67
3	47	52.9	32.1	35.9	171.8	211.9	167.63	211.01
4	51	54.8	33.4	35.8	188.07	213.28	189.26	217.98
5	48.7	55.8	34.3	35.4	188	216	185.60	219.48
6	46.5	52.6	32.4	34.7	169.6	205.8	167.4	202.80
7	47.4	54.2	31.2	35.5	162.46	210.8	164.84	213.78
8	48.5	53.5	30.6	33.6	167.62	204.72	164.9	199.73
9	45.8	50.6	30.6	34.6	165.2	205.4	155.72	194.52
10	47.4	51.6	29.2	33.5	163.6	196	154.31	192.06
11	47.4	52.4	29.9	32.9	166.2	193.1	157.47	191.55
12	45.3	51.4	29.6	34.4	155.6	204	148.98	196.46

*** COLUMNS STATISTICS

Mean

SD

CV%

Max

Min

1.	C/3cm	GBW	47.675	4.055	8.50	56.200	42.600
2.	C/3cm	GAW	56.975	2.358	4.14	60.900	53.800
3.	W/3cm	GBW	27.808	1.234	4.44	30.200	25.730
4.	W/3cm	GAW	35.175	0.831	2.36	36.400	33.500
5.	Wtasm	GBW	158.790	7.993	5.03	172.700	144.620
6.	Wtasm	GAW	228.019	9.747	4.27	244.900	211.260
7.	Ss 9cm	GBW	147.069	10.897	7.41	166.160	131.632
8.	Ss 9cm	GAW	222.828	13.639	6.12	246.307	200.256
9.	C/3cm	FBW	47.583	1.688	3.55	51.000	45.300
10.	C/3cm	FAW	53.158	1.777	3.34	56.200	50.600
11.	W/3cm	FBW	31.336	1.523	4.86	34.300	29.300
12.	W/3cm	FAW	34.667	0.984	2.84	35.900	32.900
13.	Wtasm	FBW	169.990	10.444	6.14	188.070	155.600
14.	Wtasm	FAW	206.043	7.869	3.82	216.000	193.100
15.	Ss 9cm	FBW	165.819	12.443	7.50	189.267	148.987
16.	Ss 9cm	FAW	204.859	11.254	5.49	221.678	191.551

TABLE 12

COMPARISON OF CV% GREY AND FINISHED

	GBW	GAW		FBW	FAW	
Tex I38 Carded	2.6	2.05	-	1.83	2.19	+
Combed	1.2	2.82	+	2.33	1.70	-
Carded&Combed	2.19	2.26	+	2.45	2.37	-
R30 Combed	1.2	1.58	+	1.05	1.06	+
\bar{x}	1.8	2.18	+	1.92	1.83	-
Length I38 Carded	2.03	1.78	-	1.67	1.76	+
Combed	1.38	0.65	-	0.75	1.47	+
Carded&Combed	1.8	1.54	-	1.42	1.62	+
R30 Combed	2.94	3.06	+	1.37	1.52	+
\bar{x}	2.04	1.76	-	1.30	1.59	+
I Carded C/3cm	8.24	3.61	-	5.29	2.91	-
W/3cm	7.73	2.98	-	3.26	2.55	-
Wt gm ²	9.82	3.6	-	4.59	6.35	+
I Combed C/3cm	5.10	1.11	-	4.8	1.48	-
W/3cm	3.76	2.18	-	2.5	1.68	-
Wt gm ²	5.97	1.67	-	2.15	4.80	+
I Carded & Combed C/3cm	7.88	3.15	-	5.0	2.44	-
W/3cm	6.65	2.73	-	2.96	2.83	-
Wt gm ²	9.33	3.04	-	3.79	5.84	+
Rib C/3cm	8.5	4.14	-	3.55	3.34	-
W/3cm	4.4	2.36	-	4.86	2.84	-
Wt gm ²	5.03	4.27	-	6.14	3.82	-
\bar{x}	6.87	2.90	-	4.07	3.49	-

NB: CV% for tex GBW from fabric testing

CHANGE IN YARN TEX DURING RELAXATION (5 W+T)INTERLOCK Ne 1/38 CARDED 1/600

	TEX GBW	TEX GAW	MEAN % DIFF	TEX FBW	TEX FAW	MEAN % DIFF
\bar{x}	15.955	15.503	- 2.7909	15.448	15.417	- 0.1803
σ	0.441	0.318	2.375	0.283	0.338	2.2101
% CV	2.76	2.05		1.83	2.19	

INTERLOCK Ne 1/38 COMBED 1/422

	TEX GBW	TEX GAW	MEAN % DIFF	TEX FBW	TEX FAW	MEAN % DIFF
\bar{x}	15.968	15.578	- 2.4361	14.995	15.018	0.1815
σ	0.210	0.44	2.7126	0.350	0.256	1.8281
% CV	1.32	2.82		2.33	1.70	

INTERLOCK Ne 1/38 CARDED AND COMBED 1/600 + 1/422

	TEX GBW	TEX GAW	MEAN % DIFF	TEX FBW	TEX FAW	MEAN % DIFF
\bar{x}	15.9595	15.5281	- 2.6731	15.2808	15.2703	- 0.0473
σ	0.3724	0.3516	2.4175	0.3745	0.3617	2.0328
% CV	2.33	2.26		2.45	2.37	

1 X 1 RIB Ne 1/30 COMBED 7/514

	TEX GBW	TEX GAW	MEAN % DIFF	TEX FBW	TEX FAW	MEAN % DIFF
\bar{x}	19.2013	18.9498	- 1.3069	18.6791	18.6757	- 0.006
σ	0.2632	0.2999	1.0885	0.1964	0.1981	1.6205
% CV	1.37	1.58		1.05	1.06	

TABLE 14

CHANGE IN STITCH LENGTH DURING RELAXATION (5 W+T)

INTERLOCK Ne 1/38 CARDED 1/600

	SL GBW	SL GAW	MEAN % DIFF	SL FBW	SL FAW	MEAN % DIFF
\bar{x}	0.3394	0.3341	- 1.5544	0.3349	0.3336	- 0.3960
σ	0.0069	0.0059	1.0792	0.0056	0.0059	0.8774
% CV	2.03	1.78		1.67	1.76	

INTERLOCK Ne 1/38 COMBED 1/422

	SL GBW	SL GAW	MEAN % DIFF	SL FBW	SL FAW	MEAN % DIFF
\bar{x}	0.3404	0.3373	- 0.9193	0.3326	0.3343	+ 0.5456
σ	0.0047	0.0022	1.5245	0.0025	0.0049	1.9215
% CV	1.38	0.65		0.75	1.47	

INTERLOCK Ne 1/38 CARDED AND COMBED 1/600 + 1/422

	SL GBW	SL GAW	MEAN % DIFF	SL FBW	SL FAW	MEAN % DIFF
\bar{x}	0.3397	0.3351	- 1.3427	0.3340	0.3339	- 0.0491
σ	0.0061	0.0052	1.2378	0.0048	0.0054	1.3853
% CV	1.80	1.54		1.42	1.62	

1 X 1 RIB Ne 1/30 COMBED 7/514

	SL GBW	SL GAW	MEAN % DIFF	SL FBW	SL FAW	MEAN % DIFF
\bar{x}	0.2812	0.2765	- 1.6911	0.2792	0.2774	- 0.6154
σ	0.0083	0.0085	0.5145	0.0038	0.0042	0.9878
% CV	2.94	3.06		1.37	1.52	

TABLE 15

CHANGE IN FABRIC DIMENSIONS DURING RELAXATION (5 W+T)

INTERLOCK Ne 1/38 CARDED 1/600

	GBW	GAW	MEAN % DIFF	FBW	FAW	MEAN % DIFF
C/3cm \bar{x}	40.075	50.00	+ 25.2428	39.3833	46.6583	+ 18.6474
σ	3.3015	1.8055	6.7319	2.0845	1.3595	4.2157
% CV	8.24	3.61		5.29	2.91	
W/3cm \bar{x}	37.87	44.55	+ 18.0938	37.8358	42.9083	+ 13.5397
σ	2.9277	1.3256	6.8182	1.2353	1.0958	5.2737
% CV	7.73	2.98		3.26	2.55	
Wt g/m ² \bar{x}	180.3617	252.3258	+ 40.7633	164.0008	218.4192	+ 33.30
σ	17.7074	9.0766	10.1793	7.5199	13.8597	8.3205
% CV	9.82	3.60		4.59	6.35	
'S'sqcm \bar{x}	168.2995	247.3361	+ 47.9007	165.5370	222.4652	+ 34.6974
σ	15.3811	6.6529	11.6204	9.5450	9.1683	7.6558
% CV	9.14	2.69		5.77	4.12	

INTERLOCK Ne 1/38 COMBED 1/422

	GBW	GAW	MEAN % DIFF	FBW	FAW	MEAN % DIFF
C/3cm \bar{x}	37.6000	48.9833	+ 30.5336	39.7714	46.8471	+ 18.0053
σ	1.9162	0.5456	6.2339	1.9085	0.6920	5.4506
% CV	5.10	1.11		4.8	1.48	
W/3cm \bar{x}	37.1167	45.1083	+ 21.6850	38.1814	44.0286	+ 15.3813
σ	1.3949	0.9831	5.5903	0.9556	1.1800	4.4221
% CV	3.76	2.18		2.50	2.68	
Wt g/m ² \bar{x}	167.74	253.3883	+ 51.4532	164.0229	224.8343	+ 37.0583
σ	10.0082	4.2263	8.2056	3.5286	10.8024	5.4590
% CV	5.97	1.67		2.15	4.80	
'S'sqcm \bar{x}	155.0254	245.5271	+ 58.8372	168.5587	229.1379	+ 36.0067
σ	9.0775	6.9495	10.3135	4.2607	5.2354	4.3541
% CV	5.86	2.83		2.53	2.28	

TABLE 16

CHANGE IN FABRIC DIMENSIONS DURING RELAXATION (5 W+T)

INTERLOCK Ne 1/38 CARDED + COMBED 1/600 AND 1/422

	GBW	GAW	MEAN % DIFF	FBW	FAW	MEAN % DIFF
C/3cm \bar{x}	39.25	49.6611	27.0064	39.5263	46.7279	18.4108
σ	3.0943	1.5621	6.8804	1.9765	1.1392	4.5678
% CV	7.88	3.15		5.0	2.44	
W/3cm \bar{x}	37.6189	44.7361	19.2909	37.9632	43.3211	14.2182
σ	2.5004	1.2226	6.5044	1.1253	1.2273	4.9343
% CV	6.65	2.73		2.96	2.83	
Wt g/m ² \bar{x}	176.1544	252.68	44.3266	164.0089	220.7826	34.6847
σ	16.4265	7.6698	10.6648	6.2216	12.8994	7.4640
% CV	9.33	3.04		3.79	5.84	
'S'sqcm \bar{x}	163.8748	246.7331	51.5462	166.6502	224.9236	35.1798
σ	14.7910	6.6041	12.1162	7.9982	8.4523	6.5237
% CV	9.03	2.68		4.80	3.76	
1 X 1 RIB Ne 1/30 COMBED 7/514						
	GBW	GBW	MEAN % DIFF	FBW	FAW	MEAN % DIFF
C/3cm \bar{x}	47.6750	56.9750	19.9339	47.5833	53.1583	11.7432
σ	4.0547	2.3584	5.9893	1.6878	1.7769	2.2079
% CV	8.50	4.14		3.55	3.34	
W/3cm \bar{x}	27.8075	35.1750	26.7186	31.3358	34.6667	10.7607
σ	1.2343	0.8313	6.2738	1.5228	0.9838	3.5945
% CV	4.44	2.36		4.86	2.84	
Wt g/m ² \bar{x}	158.79	228.0192	43.7667	169.99	206.0425	21.4396
σ	7.9934	9.7466	6.2600	10.4445	7.8694	5.3706
% CV	5.03	4.27		6.14	3.82	
'S'sqcm \bar{x}	147.0690	222.8275	51.8168	165.8192	204.8588	23.7645
σ	10.8968	13.6390	7.9303	12.4428	11.2544	4.6333
% CV	7.41	6.12		7.5	5.49	

TABLE 17

CHANGE IN YARN TEX DURING FINISHING (WINCH DYE)INTERLOCK Ne 1/38 CARDED 1/600

	TEX GBW	TEX FBW	MEAN % DIFF	TEX GAW	TEX FAW	MEAN % DIFF	TOT CHANGE GBW-FAW
\bar{x}	15.955	15.448	- 3.1337	15.503	15.417	- 0.529	- 3.3287
σ	0.441	0.283	2.3319	0.318	0.338	2.3440	2.3812
% CV	2.76	1.83		2.05	2.19		

INTERLOCK Ne 1/38 COMBED 1/422

	TEX GBW	TEX FBW	MEAN % DIFF	TEX GAW	TEX FAW	MEAN % DIFF	TOT CHANGE GBW-FAW
\bar{x}	15.968	14.995	- 6.1373	15.578	15.018	- 3.218	- 5.6235
σ	0.210	0.350	2.4283	0.44	0.256	2.7098	1.9179
% CV	1.32	2.33		2.82	1.70		

INTERLOCK Ne 1/38 CARDED AND COMBED 1/600 AND 1/422

	TEX GBW	TEX FBW	MEAN % DIFF	TEX GAW	TEX FAW	MEAN % DIFF	TOT CHANGE GBW-FAW
\bar{x}	15.9595	15.2808	- 4.1358	15.5281	15.2703	- 1.4256	- 4.0940
σ	0.3724	0.3745	2.8369	0.3516	0.3617	2.8589	2.5574
% CV	2.33	2.45		2.26	2.37		

1 X 1 RIB Ne 1/30 COMBED 7/514

	TEX GBW	TEX FBW	MEAN % DIFF	TEX GAW	TEX FAW	MEAN % DIFF	TOT CHANGE GBW-FAW
\bar{x}	19.2013	18.6791	- 2.7025	18.9498	18.6757	- 1.4241	- 2.7217
σ	0.2632	0.1964	1.6747	0.2999	0.1981	1.8637	1.5921
% CV	1.37	1.05		1.58	1.06		

CHANGE IN STITCH LENGTH DURING FINISHING (WINCH DYE)INTERLOCK Ne 1/38 CARDED 1/600

	SL GBW	SL FBW	MEAN % DIFF	SL GAW	SL FAW	MEAN % DIFF	TOT CHANGE GBW-FAW
\bar{x}	0.3394	0.3349	- 1.2936	0.3341	0.3336	- 0.1305	- 1.6869
σ	0.0069	0.0056	1.8966	0.0059	0.0059	1.8864	1.9434
% CV	2.03	1.67		1.78	1.76		

INTERLOCK Ne 1/38 COMBED 1/422

	SL GBW	SL FBW	MEAN % DIFF	SL GAW	SL FAW	MEAN % DIFF	TOT CHANGE GBW-FAW
\bar{x}	0.3404	0.3326	- 2.3988	0.3373	0.3343	- 0.7987	- 1.6966
σ	0.0047	0.0025	1.0425	0.0022	0.0049	1.1570	2.6513
% CV	1.38	0.75		0.65	1.47		

INTERLOCK Ne 1/38 CARDED AND COMBED 1/600 AND 1/422

	SL GBW	SL FBW	MEAN % DIFF	SL GAW	SL FAW	MEAN % DIFF	TOT CHANGE GBW-FAW
\bar{x}	0.3397	0.3340	- 1.6620	0.3351	0.3339	- 0.3532	- 1.6901
σ	0.0061	0.0048	1.7130	0.0052	0.0054	1.6737	2.1240
% CV	1.80	1.42		1.54	1.62		

1 X 1 RI8 Ne 1/30 COMBED 7/514

	SL GBW	SL FBW	MEAN % DIFF	SL GAW	SL FAW	MEAN % DIFF	TOT CHANGE GBW-FAW
\bar{x}	0.2812	0.2792	- 0.6587	0.2765	0.2774	+ 0.4179	- 1.2831
σ	0.0083	0.0038	3.23	0.0085	0.0042	3.0110	2.8987
% CV	2.94	1.37		3.06	1.52		

TABLE 19

CHANGE IN FABRIC DIMENSIONS DURING FINISHING (WINCH DYE)

INTERLOCK № 1/38 CARDED 1/600

	GBW	FBW	MEAN % DIFF	GAW	FAW	MEAN % DIFF	% DIFF GBW - FAW
C/3cm \bar{x}	40.0750	39.3833	- 1.1175	50.00	46.6583	- 6.5796	17.2088
σ	3.3015	2.0845	9.6117	1.8055	1.3595	4.1475	10.9221
% CV	8.25	5.29		3.61	2.91		
W/3cm \bar{x}	37.8700	37.8358	0.5111	44.55	42.9083	- 3.6189	13.8464
σ	2.9277	1.2353	9.0572	1.3256	1.0958	3.4269	8.1061
% CV	7.73	3.26		2.98	2.55		
Wt g/m ² \bar{x}	180.3617	164.0008	- 8.2803	252.3258	218.4192	-13.2522	22.4623
σ	17.7074	7.5199	9.8678	9.0766	13.8597	7.2953	16.4433
% CV	9.82	4.59		3.6	6.35		
'S'sqcm \bar{x}	168.2995	165.537	- 0.7839	247.3361	222.4652	- 9.9698	33.3461
σ	15.3811	9.545	11.8630	6.6529	9.1683	4.9747	14.8098
% CV	9.14	5.77		2.69	4.12		

INTERLOCK № 1/38 COMBED 1/422

	GBW	FBW	MEAN % DIFF	GAW	FAW	MEAN % DIFF	% DIFF GBW - FAW
C/3cm \bar{x}	37.6000	39.7714	+ 5.7876	48.9833	46.8471	- 4.4441	24.7716
σ	1.9162	1.9085	9.8640	0.5456	0.6920	1.3646	7.0654
% CV	5.10	4.80		1.11	1.48		
W/3cm \bar{x}	37.1167	38.1814	+ 3.1580	45.1083	44.0286	- 2.1520	19.0909
σ	1.3949	0.9556	4.6823	0.9831	1.18	3.7444	7.5838
% CV	3.76	2.50		2.18	2.68		
Wt g/m ² \bar{x}	167.740	164.0229	- 1.4652	253.3883	224.8343	-10.4957	35.6167
σ	10.0082	3.5286	7.7841	4.2263	10.8024	5.1971	11.6437
% CV	5.97	2.15		1.67	4.80		
'S'sqcm \bar{x}	155.0254	168.5587	+ 8.9019	245.5271	229.1379	- 6.5166	48.5107
σ	9.0775	4.2607	8.2494	6.9495	5.2354	3.3346	11.5703
% CV	5.86	2.53		2.83	2.28		

TABLE 20.

CHANGE IN FABRIC DIMENSIONS DURING FINISHING (WINCH DYE)

INTERLOCK Ne 1/38 CARDED AND COMBED 1/600 AND 1/422

	GBW	FBW	MEAN % DIFF	GAW	FAW	MEAN % DIFF	% DIFF GBW - FAW
C/3cm \bar{x}	39.25	39.5263	1.1842	49.6611	46.7279	- 5.8678	19.7297
σ	3.0943	1.9765	9.9807	1.5621	1.1392	3.5709	10.2630
% CV	7.88	5.00		3.15	2.44		
W/3cm \bar{x}	37.6189	37.9632	1.3934	44.7361	43.3211	- 3.130	15.5946
σ	2.5004	1.1253	7.8216	1.2226	1.2273	3.4970	8.1182
% CV	6.65	2.96		2.73	2.83		
Wt g/m ² \bar{x}	176.1544	164.0089	- 6.0086	252.680	220.7826	-12.3334	26.8471
σ	16.4265	6.2216	9.5789	7.6698	12.8994	6.6460	15.9857
% CV	9.33	3.79		3.04	5.84		
'S'sqcm \bar{x}	163.8748	166.6502	2.4447	246.7331	224.9236	- 8.8188	38.4010
σ	14.7910	7.9982	11.5391	6.6041	8.4523	4.70	15.3429
% CV	9.03	4.80		2.68	3.76		

1 X 1 RIB Ne 1/30 COMBED 7/514

	GBW	FBW	MEAN % DIFF	GAW	FAW	MEAN % DIFF	% DIFF GBW - FAW
C/3cm \bar{x}	47.6750	47.5833	0.4642	56.9750	53.1583	- 6.5735	12.2334
σ	4.0547	1.6878	9.1700	2.3584	1.7769	4.5190	9.753
% CV	8.50	3.55		4.14	3.34		
W/3cm \bar{x}	27.8075	31.3358	12.9811	35.1750	34.6667	- 1.4233	24.9095
σ	1.2343	1.5228	8.6688	0.8313	0.9838	2.6438	6.8452
% CV	4.44	4.86		2.36	2.84		
Wt g/m ² \bar{x}	158.790	169.990	7.3921	228.0192	206.0425	- 9.5302	30.0981
σ	7.9934	10.4445	9.7309	9.7466	7.8694	4.2801	8.9445
% CV	5.03	6.14		4.27	3.82		
'S'sqcm \bar{x}	147.0690	165.8192	13.3587	222.8275	204.8588	- 7.8492	40.0091
σ	10.8968	12.4428	12.3581	13.6390	11.2544	6.0816	13.2476
% CV	7.41	7.50		6.12	5.49		

INTERLOCK 20G Ne 1/38 CARDED QUALITY NO. 1/600

PREDICTION OF GREY RELAXED YARN TEX FROM TEX MEASURED IN GREY FABRIC (G8W)

	Tex 1	Tex 2	% Diff	Tex 3	% Diff
\bar{x}	15.503	15.950	+2.883	15.903	+2.580
σ	0.318	0.467		0.452	
% CV	2.05	2.93		2.84	

PREDICTION OF GREY RELAXED STITCH LENGTH FROM STITCH LENGTH MEASURED IN GREY FABRIC (G8W)

	SL cm 1	SL cm 2	% Diff	SL cm 3	% Diff
\bar{x}	0.334	0.332	-0.599	0.332	-0.599
σ	0.006	0.006		0.007	
% CV	1.78	1.93		1.97	

1. Measured Relaxed
2. Predicted using 20G Step 1 equations
3. Predicted using 20+28G Step 1 equations

PREDICTION OF GREY RELAXED DIMENSIONS FROM TEX AND STITCH LENGTH

	C/cm 1	C/cm 2	% Diff	C/cm 3	% Diff	C/cm 4	% Diff	C/cm 5	% Diff
\bar{x}	16.667	16.450	- 1.302	16.455	- 1.272	16.595	- 0.432	16.638	- 0.174
σ	0.602	0.316		0.339		0.347		0.385	
% CV	3.61	1.92		2.06		2.09		2.32	
	W/cm 1	W/cm 2	% Diff	W/cm 3	% Diff	W/cm 4	% Diff	W/cm 5	% Diff
\bar{x}	14.850	14.667	- 1.232	14.703	- 0.99	14.579	- 1.825	14.568	- 1.899
σ	0.442	0.163		0.190		0.189		0.231	
% CV	2.98	1.11		1.29		1.30		1.58	
	Wt gsm 1	Wt gsm 2	% Diff	Wt gsm 3	% Diff	Wt gsm 4	% Diff	Wt gsm 5	% Diff
\bar{x}	252.326	231.506	- 8.251	232.714	- 7.772	238.589	- 5.444	239.00	- 5.281
σ	9.077	4.678		4.540		6.985		6.662	
% CV	3.60	2.02		1.95		2.93		2.79	
	S sqcm 1	S sqcm 2	% Diff	S sqcm 3	% Diff	S sqcm 4	% Diff	S sqcm 5	% Diff
\bar{x}	247.336	241.051	- 2.541	241.775	- 2.248	241.780	- 2.246	241.765	- 2.252
σ	6.653	6.996		7.535		7.524		8.254	
% CV	2.69	2.90		3.12		3.11		3.41	

1. Measured relaxed
2. Predicted using measured relaxed tex + 1 and 20G Step 2 equations
3. Predicted using measured relaxed tex + 1 and 20 + 28G Step 2 equations
4. Predicted using Step 1 and 2 20G equations
5. Predicted using Step 1 and 2 20 + 28G equations

INTERLOCK 20G Ne 1/38 COMBED QUALITY NO. 1/422

PREDICTION OF GREY RELAXED YARN TEX FROM TEX MEASURED IN GREY FABRIC (GBW)

	Tex 1	Tex 2	% Diff	Tex 3	% Diff
\bar{x}	15.578	15.963	+2.471	15.915	+2.163
σ	0.440	0.223		0.216	
% CV	2.82	1.39		1.35	

PREDICTION OF GREY RELAXED STITCH LENGTH FROM STITCH LENGTH MEASURED IN GREY FABRIC (GBW)

	SL cm 1	SL cm 2	% Diff	SL cm 3	% Diff
\bar{x}	0.337	0.333	-1.187	0.333	-1.187
σ	0.002	0.004		0.004	
% CV	0.65	1.31		1.34	

1. Measured relaxed
2. Predicted using 20G Step 1 equations
3. Predicted using 20 + 28G Step 1 equations

PREDICTION OF GREY RELAXED DIMENSIONS FROM TEX AND STITCH LENGTH

	C/cm 1	C/cm 2	% Diff	C/cm 3	% Diff	C/cm 4	% Diff	C/cm 5	% Diff
\bar{x}	16.328	16.282	-0.282	16.278	-0.306	16.540	+1.317	16.578	+1.531
σ	0.182	0.108		0.119		0.248		0.286	
% CV	1.11	0.66		0.73		1.50		1.72	
	W/cm 1	W/cm 2	% Diff	W/cm 3	% Diff	W/cm 4	% Diff	W/cm 5	% Diff
\bar{x}	15.036	14.584	-3.006	14.617	-2.787	14.555	-3.199	14.543	-3.279
σ	0.328	0.145		0.204		0.057		0.062	
% CV	2.18	1.000		1.40		0.39		0.43	
	Wt gsm 1	Wt gsm 2	% Diff	Wt gsm 3	% Diff	Wt gsm 4	% Diff	Wt gsm 5	% Diff
\bar{x}	253.388	230.522	-9.024	231.759	-8.536	238.139	-6.018	238.546	-5.238
σ	4.226	5.273		5.117		5.222		5.028	
% CV	1.67	2.29		2.21		2.19		2.11	
	S sqcm 1	S sqcm 2	% Diff	S sqcm 3	% Diff	S sqcm 4	% Diff	S sqcm 5	% Diff
\bar{x}	245.527	237.189	-3.396	237.624	-3.219	240.529	-2.036	240.421	-2.080
σ	6.95	3.261		4.199		4.314		4.236	
% CV	2.83	1.37		1.77		1.79		1.76	

1. Measured relaxed
2. Predicted using measured relaxed tex + 1 and 20G Step 2 equations.
3. Predicted using measured relaxed tex + 1 and 20 + 28G Step 2 equations
4. Predicted using Step 1 and 2 20G equations
5. Predicted using Step 1 and 2 20 + 28G equations

INTERLOCK 20G Ne 1/38 CARDED QUALITY NO. 1/600
 INTERLOCK 20G Ne 1/38 COMBED QUALITY NO. 1/422

PREDICTION OF GREY RELAXED YARN TEX FROM TEX MEASURED IN GREY FABRIC (GBW)

	Tex 1	Tex 2	% Diff	Tex 3	% Diff
\bar{x}	15.528	15.955	+2.75	15.907	+2.441
σ	0.352	0.394		0.382	
% CV	2.26	2.47		2.40	

PREDICTION OF GREY RELAXED STITCH LENGTH FROM STITCH LENGTH MEASURED IN GREY FABRIC (GBW)

	SL cm 1	SL cm 2	% Diff	SL cm 3	% Diff
\bar{x}	0.335	0.332	-0.896	0.332	-0.896
σ	0.005	0.006		0.006	
% CV	1.54	1.71		1.75	

1. Measured relaxed
2. Predicted using 20G Step 1 equations
3. Predicted using 20 + 28G Step 1 equations

	C/cm 1	C/cm 2	% Diff	C/cm 3	% Diff	C/cm 4	% Diff	C/cm 5	% Diff
\bar{x}	16.554	16.394	-0.967	16.396	-0.954	16.577	+0.018	16.618	+0.387
σ	0.521	0.274		0.293		0.311		0.348	
% CV	3.15	1.67		1.79		1.88		2.09	
	W/cm 1	W/cm 2	% Diff	W/cm 3	% Diff	W/cm 4	% Diff	W/cm 5	% Diff
\bar{x}	14.912	14.639	-1.831	14.675	1.589	14.571	-2.287	14.560	-2.361
σ	0.408	0.158		0.193		0.156		0.189	
% CV	2.73	1.08		1.31		1.07		1.3	
	Wt qsm 1	Wt qsm 2	% Diff	Wt qsm 3	% Diff	Wt qsm 4	% Diff	Wt qsm 5	% Diff
\bar{x}	252.68	231.178	-8.510	232.396	-8.028	238.439	-5.636	238.849	-5.474
σ	7.670	4.750		4.610		6.296		6.017	
% CV	3.04	2.05		1.98		2.64		2.52	
	S sqcm 1	S sqcm 2	% Diff	S sqcm 3	% Diff	S sqcm 4	% Diff	S sqcm 5	% Diff
\bar{x}	246.733	239.764	-2.825	240.391	-2.570	241.363	-2.176	241.317	-2.195
σ	6.604	6.189		6.781		6.517		7.056	
% CV	2.68	2.58		2.82		2.70		2.92	

1. Measured relaxed
2. Predicted using measured relaxed tex + 1 and 20G Step 2 equations
3. Predicted using measured relaxed tex + 1 and 20 + 28G Step 2 equations
4. Predicted using Step 1 and 2 20G equations
5. Predicted using Step 1 and 2 20 + 28G equations

1 x 1 RIB 14G Ne 1/30 COMBED QUALITY NO. 7/514

PREDICTION OF GREY RELAXED YARN TEX FROM TEX MEASURED IN GREY FABRIC (GBW)

	TEX 1	TEX 2	% DIFF
\bar{x}	18.950	18.877	-0.385
σ	0.300	0.275	
% CV	1.58	1.46	

PREDICTION OF GREY RELAXED STITCH LENGTH FROM STITCH LENGTH MEASURED IN GREY FABRIC (GBW)

	SL cm 1	SL cm 2	% DIFF
\bar{x}	0.276	0.277	+0.362
σ	0.008	0.008	
% CV	3.06	2.89	

1. Measured relaxed
2. Predicted using Step 1 equations

PREDICTION OF GREY RELAXED DIMENSIONS FROM TEX AND STITCH LENGTH

	C/cm 1	C/cm 2	% DIFF	C/cm 3	% DIFF
\bar{x}	18.992	19.211	+1.153	19.159	+0.879
σ	0.786	0.673		0.634	
% CV	4.14	3.50		3.31	
	W/cm 1	W/cm 2	% DIFF	W/cm 3	% DIFF
\bar{x}	11.725	11.438	-2.448	11.415	-2.644
σ	0.277	0.298		0.281	
% CV	2.36	2.60		2.46	
	Wt qsm 1	Wt qsm 2	% DIFF	Wt qsm 3	% DIFF
\bar{x}	228.019	220.245	-3.409	218.760	-4.061
σ	9.747	10.072		9.985	
% CV	4.27	4.57		4.56	
	S sqcm 1	S sqcm 2	% DIFF	S sqcm 3	% DIFF
\bar{x}	228.828	219.95	-1.292	218.894	-1.765
σ	13.639	13.639		12.796	
% CV	6.12	6.20		5.85	

1. Measured relaxed
2. Predicted using measured relaxed Tex + 1 and Step 2 equations
3. Predicted using Step 1 and 2 equations

INTERLOCK 20G Ne 1/38 CARDED QUALITY NO. 1/600

PREDICTION OF FINISHED RELAXED YARN TEX FROM TEX MEASURED IN GREY FABRIC (GBW)

	Tex 1	Tex 2	% Diff	Tex 3	% Diff
\bar{x}	15.417	15.332	-0.551	15.334	-0.538
σ	0.338	0.378		0.416	
% CV	2.19	2.47		2.71	

PREDICTION OF FINISHED RELAXED STITCH LENGTH FROM STITCH LENGTH MEASURED IN GREY FABRIC (GBW)

	SL cm 1	SL cm 2	% Diff	SL cm 3	% Diff
\bar{x}	0.334	0.330	-1.198	0.336	+0.599
σ	0.006	0.007		0.007	
% CV	1.76	1.99		1.99	

1. Measured Relaxed
2. Predicted using 20G WD1 Step 1 equations
3. Predicted using 20G WD2 Step 1 equations

PREDICTION OF FINISHED RELAXED DIMENSIONS FROM TEX AND STITCH LENGTH

	C/cm 1	C/cm 2	% Diff	C/cm 3	% Diff	C/cm 4	% Diff	C/cm 5	% Diff
\bar{x}	15.553	15.058	-3.183	15.315	-1.530	15.222	-2.128	15.170	-2.463
σ	0.453	0.270		0.341		0.305		0.378	
% CV	2.91	1.80		2.23		2.0		2.49	
	W/cm 1	W/cm 2	% Diff	W/cm 3	% Diff	W/cm 4	% Diff	W/cm 5	% Diff
\bar{x}	14.303	14.272	-0.217	14.468	+1.154	14.373	+0.489	14.445	0.993
σ	0.365	0.154		0.150		0.178		0.179	
% CV	2.55	1.08		1.03		1.24		1.24	
	Wt qsm 1	Wt qsm 2	% Diff	Wt qsm 3	% Diff	Wt qsm 4	% Diff	Wt qsm 5	% Diff
\bar{x}	218.419	222.773	+1.993	224.170	+2.633	224.127	+2.613	221.732	+1.517
σ	13.860	6.5		5.359		7.148		6.144	
% CV	6.35	2.92		2.39		3.19		2.77	
	S sqcm 1	S sqcm 2	% Diff	S sqcm 3	% Diff	S sqcm 4	% Diff	S sqcm 5	% Diff
\bar{x}	222.465	214.880	-3.41	221.306	-0.521	218.847	-1.626	218.854	-1.623
σ	9.168	5.899		6.875		6.776		7.638	
% CV	4.12	2.75		3.11		3.10		3.49	

1. Measured relaxed
2. Predicted using measured relaxed tex + 1 and 20G WD1 Step 2 equations
3. Predicted using measured relaxed tex + 1 and 20G WD2 Step 2 equations
4. Predicted using Step 1 and 2 20G WD1 equations
5. Predicted using Step 1 and 2 20G WD2 equations

INTERLOCK 20G Ne 1/38 COMBED QUALITY NO 1/422PREDICTION OF FINISHED RELAXED YARN TEX FROM TEX MEASURED IN GREY FABRIC (GBW)

	Tex 1	Tex 2	% Diff	Tex 3	% Diff
\bar{x}	15.018	15.343	+2.164	15.346	+2.184
σ	0.256	0.180		0.198	
% CV	1.70	1.18		1.29	

PREDICTION OF FINISHED RELAXED STITCH LENGTH FROM STITCH LENGTH MEASURED IN GREY FABRIC (GBW)

	SL cm 1	SL cm 2	% Diff	SL cm 3	% Diff
\bar{x}	0.334	0.331	-0.898	0.337	+0.898
σ	0.005	0.004		0.005	
% CV	1.47	1.35		1.35	

1. Measured relaxed
2. Predicted using 20G WD1 Step 1 equations
3. Predicted using 20G WD2 Step 1 equations

PREDICTION OF FINISHED RELAXED DIMENSIONS FROM TEX AND STITCH LENGTH

	C/cm 1	C/cm 2	% Diff	C/cm 3	% Diff	C/cm 4	% Diff	C/cm 5	% Diff
\bar{x}	15.616	14.980	-4.073	15.238	-2.421	15.173	-4.073	15.109	-3.247
σ	0.231	0.219		0.275		0.221		0.268	
% CV	1.48	1.46		1.81		1.46		1.77	
	W/cm 1	W/cm 2	% Diff	W/cm 3	% Diff	W/cm 4	% Diff	W/cm 5	% Diff
\bar{x}	14.676	14.368	-2.099	14.564	-0.763	14.347	-2.242	14.420	-1.744
σ	0.393	0.121		0.117		0.064		0.058	
% CV	2.68	0.84		0.80		0.45		0.41	
	Wt gsm 1	Wt gsm 2	% Diff	Wt gsm 3	% Diff	Wt gsm 4	% Diff	Wt gsm 5	% Diff
\bar{x}	224.834	216.165	-3.856	218.722	-2.718	223.556	-0.568	221.286	-1.578
σ	10.802	5.088		4.196		5.538		4.686	
% CV	4.80	2.35		1.92		2.48		2.12	
	S sqcm 1	S sqcm 2	% Diff	S sqcm 3	% Diff	S sqcm 4	% Diff	S sqcm 5	% Diff
\bar{x}	229.138	215.208	-6.079	221.630	-3.277	217.710	-4.987	217.573	-5.047
σ	5.235	4.642		5.411		4.099		4.570	
% CV	2.28	2.16		2.44		1.88		2.10	

1. Measured relaxed
2. Predicted using measured relaxed tex and 1 and 20G WD1 Step 2 equations
3. Predicted using measured relaxed tex and 1 and 20G WD2 Step 2 equations
4. Predicted using Step 1 and 2 20G WD1 equations
5. Predicted using Step 1 and 2 20G WD2 equations

INTERLOCK 20G Ne 1/38 CARDED QUALITY NO. 1/600

INTERLOCK 20G Ne 1/38 COMBED QUALITY NO. 1/422

PREDICTION OF FINISHED RELAXED YARN TEX FROM TEX MEASURED IN GREY FABRIC (GBW)

	Tex 1	Tex 2	% Diff	Tex 3	% Diff
\bar{x}	15.270	15.336	+0.432	15.338	+0.445
σ	0.362	0.320		0.351	
% CV	2.37	2.08		2.29	

PREDICTION OF FINISHED RELAXED STITCH LENGTH FROM STITCH LENGTH MEASURED IN GREY FABRIC (GBW)

	SL cm 1	SL cm 2	% Diff	SL cm 3	% Diff
\bar{x}	0.334	0.330	-1.198	0.336	+0.599
σ	0.005	0.006		0.006	
% CV	1.62	1.77		1.77	

1. Measured relaxed
2. Predicted using 20G WD1 Step 1 equations
3. Predicted using 20G WD2 Step 1 equations

	C/cm 1	C/cm 2	% Diff	C/cm 3	% Diff	C/cm 4	% Diff	C/cm 5	% Diff
\bar{x}	15.576	15.029	-3.512	15.287	-1.855	15.206	-2.375	15.150	-2.735
σ	0.380	0.249		0.313		0.274		0.338	
% CV	2.44	1.66		2.04		1.80		2.23	
	W/cm 1	W/cm 2	% Diff	W/cm 3	% Diff	W/cm 4	% Diff	W/cm 5	% Diff
\bar{x}	14.440	14.307	-0.921	14.503	+0.436	14.364	-0.526	14.437	-0.021
σ	0.409	0.147		0.143		0.148		0.148	
% CV	2.83	1.03		0.99		1.03		1.02	
	Wt gsm 1	Wt gsm 2	% Diff	Wt gsm 3	% Diff	Wt gsm 4	% Diff	Wt gsm 5	% Diff
\bar{x}	220.782	220.338	-0.202	222.163	+0.625	223.937	+1.429	221.583	+0.362
σ	12.899	6.721		5.542		6.493		5.561	
% CV	5.84	3.05		2.49		2.90		2.51	
	S sqcm 1	S sqcm 2	% Diff	S sqcm 3	% Diff	S sqcm 4	% Diff	S sqcm 5	% Diff
\bar{x}	224.924	215.001	-4.412	221.426	-1.555	218.468	-2.870	218.427	-2.889
σ	8.452	5.336		6.218		5.912		6.654	
% CV	3.76	2.48		2.81		2.71		3.05	

1. Measured relaxed
2. Predicted using measured relaxed tex + 1 and 20G WD1 Step 2 equations
3. Predicted using measured relaxed tex + 1 and 20G WD2 Step 2 equations
4. Predicted using Step 1 and 2 20G WD1 equations
5. Predicted using Step 1 and 2 20G WD2 equations

1 X 1 RIB 14G Ne 1/30 COMBED QUALITY NO. 7/514

PREDICTION OF FINISHED RELAXED YARN TEX FROM TEX MEASURED IN GREY FABRIC (GBW)

	Tex 1	Tex 2	% Diff	Tex 3	% Diff
\bar{x}	18.676	17.998	-3.630	18.652	-0.129
σ	0.198	0.257		0.274	
% CV	1.06	1.43		1.47	

PREDICTION OF FINISHED RELAXED STITCH LENGTH FROM STITCH LENGTH MEASURED IN GREY FABRIC (GBW)

	SL cm 1	SL cm 2	% Diff	SL cm 3	% Diff
\bar{x}	0.277	0.277	0	0.277	0
σ	0.004	0.008		0.008	
% CV	1.52	3.04		2.91	

1. Measured relaxed
2. Predicted using WD1 Step 1 equations
3. Predicted using WD2 Step 1 equations

	C/cm 1	C/cm 2	% Diff	C/cm 3	% Diff	C/cm 4	% Diff	C/cm 5	% Diff
\bar{x}	17.719	18.043	+1.829	17.982	+1.484	18.052	+1.879	18.011	+1.648
σ	0.592	0.307		0.323		0.629		0.635	
% CV	3.34	1.70		1.79		3.49		3.53	
	W/cm 1	W/cm 2	% Diff	W/cm 3	% Diff	W/cm 4	% Diff	W/cm 5	% Diff
\bar{x}	11.556	11.131	-3.678	11.373	-1.584	11.169	-3.349	11.385	-1.4
σ	0.328	0.136		0.107		0.277		0.209	
% CV	2.84	1.22		0.94		2.48		1.83	
	Wt qsm 1	Wt qsm 2	% Diff	Wt qsm 3	% Diff	Wt qsm 4	% Diff	Wt qsm 5	% Diff
\bar{x}	206.043	210.641	+2.232	210.463	+2.145	202.712	-1.617	210.566	+2.195
σ	7.869	5.031		4.598		9.603		8.885	
% CV	3.82	2.39		2.18		4.74		4.22	
	S sqcm 1	S sqcm 2	% Diff	S sqcm 3	% Diff	S sqcm 4	% Diff	S sqcm 5	% Diff
\bar{x}	204.859	200.688	-2.036	204.215	-0.314	201.595	-1.593	204.878	+0.009
σ	11.254	5.838		5.625		12.134		11.188	
% CV	5.49	2.91		2.75		6.02		5.46	

1. Measured relaxed
2. Predicted using measured relaxed tex + 1 and WD1 Step 2 equations
3. Predicted using measured relaxed tex + 1 and WD2 Step 2 equations
4. Predicted using Step 1 and 2 WD1 equations
5. Predicted using Step 1 and 2 WD2 equations

FACTORY VARIATIONS CASE STUDY : MILL No 2
 QUALITY :- INTERLOCK Ne 1-38 (Carded) # 1/600
 GREY FABRIC DATA : MEASURED & PREDICTED YARN COUNT

Sample No	Yarn MeasTx	Fabric TexGBW	Fabric TexGAW	YCalcTx 20G	YCalcTx 20+28G	FCalcTx 20G	FCalcTx 20+28G
1	16.005	16.235	15.408	16.003	15.954	16.246	16.189
2	15.213	15.257	15.348	15.165	15.142	15.210	15.186
3	15.703	16.045	15.481	15.683	15.644	16.045	15.994
4	16.044	16.243	15.753	16.045	15.994	16.254	16.197
5	15.699	15.604	16.066	15.679	15.640	15.578	15.542
6	15.678	16.027	15.460	15.657	15.618	16.026	15.976
7	16.154	16.507	15.686	16.161	16.106	16.534	16.468
8	15.554	16.53	15.783	15.525	15.491	16.558	16.491
9	15.416	16.221	15.703	15.379	15.350	16.231	16.175
10	15.416	15.297	14.872	15.379	15.350	15.253	15.227
11	15.296	15.497	15.178	15.252	15.227	15.465	15.432
12	15.579	16.001	15.296	15.552	15.517	15.998	15.949

*** COLUMNS STATISTICS

		Mean	SD	CV%	Max	Min
1.	Yarn MeasTx	15.647	0.299	1.91	16.155	15.214
2.	Fabric TexGBW	15.955	0.441	2.76	16.530	15.257
3.	Fabric TexGAW	15.503	0.318	2.05	16.067	14.873
4.	YCalcTx 20G	15.624	0.316	2.02	16.161	15.165
5.	YCalcTx 20+28G	15.587	0.306	1.96	16.107	15.142
6.	FCalcTx 20G	15.950	0.467	2.93	16.559	15.211
7.	FCalcTx 20+28G	15.903	0.452	2.84	16.492	15.187

FACTORY VARIATIONS CASE STUDY : MILL No 2
 QUALITY :- INTERLOCK Ne 1-38 (Carded) # 1/600
 GREY & FINISHED FABRIC DATA : MEASURED & PREDICTED YARN COUNT

Sample No	Yarn MeasTx	Fabric TexGBW	Fabric TexFAW	YCalTx WD1FAW	YCalTx WD2FAW	FCalTx WD1FAW	FCalTx WD2FAW
1	16.005	16.235	15.089	15.375	15.381	15.572	15.598
2	15.213	15.257	15.368	14.695	14.634	14.732	14.675
3	15.703	16.045	15.51	15.115	15.096	15.409	15.419
4	16.044	16.243	15.804	15.408	15.418	15.579	15.606
5	15.699	15.604	15.23	15.112	15.092	15.030	15.003
6	15.678	16.027	15.441	15.094	15.072	15.393	15.402
7	16.154	16.507	16.221	15.503	15.522	15.805	15.855
8	15.554	16.53	15.186	14.987	14.955	15.825	15.877
9	15.416	16.221	15.497	14.869	14.825	15.560	15.585
10	15.416	15.297	15.257	14.869	14.825	14.766	14.713
11	15.296	15.497	14.948	14.766	14.712	14.938	14.902
12	15.579	16.001	15.457	15.009	14.979	15.371	15.377

*** COLUMNS STATISTICS

		Mean	SD	CV%	Max	Min
1.	Yarn MeasTx	15.647	0.299	1.91	16.155	15.214
2.	Fabric TexGBW	15.955	0.441	2.76	16.530	15.257
3.	Fabric TexFAW	15.417	0.338	2.19	16.221	14.948
4.	YCalTx WD1FAW	15.067	0.256	1.70	15.503	14.695
5.	YCalTx WD2FAW	15.043	0.282	1.87	15.522	14.634
6.	FCalTx WD1FAW	15.332	0.378	2.47	15.825	14.733
7.	FCalTx WD2FAW	15.334	0.416	2.71	15.877	14.675

FACTORY VARIATIONS CASE STUDY : MILL No 2
 QUALITY :- INTERLOCK Ne 1-38 (Combed) # 1/422
 GREY FABRIC DATA : MEASURED & PREDICTED YARN COUNT

Sample No	Yarn MeasTx	Fabric TexGBW	Fabric TexGAW	YCalTx 20G	YCalTx 20+28G	FCalTx 20G	FCalTx 20+28G
1	15.690	16.311	15.468	15.670	15.631	16.326	16.267
2	15.778	15.997	15.249	15.763	15.721	15.994	15.945
3	15.829	16.027	16.401	15.817	15.773	16.026	15.976
4	15.661	15.67	15.182	15.639	15.601	15.648	15.610
5	15.897	15.877	15.657	15.889	15.843	15.867	15.822
6	n. a.	15.924	15.505	n. a.	n. a.	15.917	15.870
7	n. a.	n. a.	n. a.	n. a.	n. a.	n. a.	n. a.

=====
 ** COLUMNS STATISTICS ***

		Mean	SD	CV%	Max	Min
1.	Yarn MeasTx	15.772	0.097	0.62	15.898	15.662
2.	Fabric TexGBW	15.968	0.210	1.32	16.311	15.670
3.	Fabric TexGAW	15.578	0.440	2.82	16.401	15.183
4.	YCalTx 20G	15.756	0.103	0.65	15.890	15.640
5.	YCalTx 20+28G	15.715	0.100	0.64	15.844	15.602
6.	FCalTx 20G	15.963	0.223	1.39	16.327	15.648
7.	FCalTx 20+28G	15.915	0.216	1.35	16.267	15.610

FACTORY VARIATIONS CASE STUDY : MILL No 2
 QUALITY :- INTERLOCK Ne 1-38 (Combed) # 1/422
 GREY & FINISHED FABRIC DATA : MEASURED & PREDICTED YARN COUNT

Sample No	Yarn MeasTx	Fabric TexGBW	Fabric TexFAW	YcalTx WD1FAW	YcalTx WD2FAW	FCalTx WD1FAW	FCalTx WD2FAW
1	15.690	16.311	14.791	15.105	15.084	15.637	15.67
2	15.778	15.997	15.441	15.190	15.167	15.367	15.373
3	15.829	16.027	15.159	15.224	15.215	15.393	15.402
4	15.661	15.67	14.952	15.080	15.057	15.087	15.065
5	15.897	15.877	15.19	15.282	15.279	15.264	15.26
6	n. a.	15.924	14.869	n. a.	n. a.	15.305	15.305
7	n. a.	n. a.	14.724	n. a.	n. a.	n. a.	n. a.

=====
) COLUMNS STATISTICS *

		Mean	SD	CV%	Max	Min
1.	Yarn MeasTx	15.772	0.097	0.62	15.898	15.662
2.	Fabric TexGBW	15.968	0.210	1.32	16.311	15.670
3.	Fabric TexFAW	15.018	0.256	1.70	15.441	14.724
4.	YcalTx WD1FAW	15.175	0.084	0.55	15.283	15.080
5.	YcalTx WD2FAW	15.161	0.092	0.61	15.280	15.057
6.	FCalTx WD1FAW	15.343	0.180	1.18	15.637	15.087
7.	FCalTx WD2FAW	15.346	0.198	1.29	15.670	15.065

FACTORY VARIATIONS CASE STUDY : MILL No 2
 FABRIC :- INTERLOCK 20G
 QUALITY :- Ne 1-38 (Carded) # 1/600
 QUALITY :- Ne 1-38 (Combed) # 1/422
 GREY FABRIC DATA : MEASURED & PREDICTED YARN COUNT

Sample No	Yarn MeasTx	Fabric TexGBW	Fabric TexGAW	YCalTx 20G	YCalTx 20+28G	FCalTx 20G	FCalTx 20+28G

Interlock :- Quality # 1/600 Ne 1-38 Carded							
1	16.005	16.235	15.408	16.003	15.954	16.246	16.189
2	15.213	15.257	15.348	15.165	15.142	15.210	15.186
3	15.703	16.045	15.481	15.683	15.644	16.045	15.994
4	16.044	16.243	15.753	16.045	15.994	16.254	16.197
5	15.699	15.604	16.066	15.679	15.640	15.578	15.542
6	15.678	16.027	15.460	15.657	15.618	16.026	15.976
7	16.154	16.507	15.686	16.161	16.106	16.534	16.468
8	15.554	16.53	15.783	15.525	15.491	16.558	16.491
9	15.416	16.221	15.703	15.379	15.350	16.231	16.175
10	15.416	15.297	14.872	15.379	15.350	15.253	15.227
11	15.296	15.497	15.178	15.252	15.227	15.465	15.432
12	15.579	16.001	15.296	15.552	15.517	15.998	15.949

Interlock :- Quality # 1/422 Ne 1-38 Combed							
1	15.690	16.311	15.468	15.670	15.631	16.326	16.267
2	15.778	15.997	15.249	15.763	15.721	15.994	15.945
3	15.829	16.027	16.401	15.817	15.773	16.026	15.976
4	15.661	15.67	15.182	15.639	15.601	15.648	15.610
5	15.897	15.877	15.657	15.889	15.843	15.867	15.822
6	n. a.	15.924	15.505	n. a.	n. a.	15.917	15.870
7	n. a.	n. a.	n. a.	n. a.	n. a.	n. a.	n. a.
=====							

*** COLUMNS STATISTICS		***	Mean	SD	CV%	Max	Min
1.	Yarn MeasTx		15.684	0.259	1.65	16.155	15.214
2.	Fabric TexGBW		15.959	0.372	2.33	16.530	15.257
3.	Fabric TexGAW		15.528	0.352	2.26	16.401	14.873
4.	YCalTx 20G		15.663	0.274	1.75	16.161	15.165
5.	YCalTx 20+28G		15.624	0.266	1.70	16.107	15.142
6.	FCalTx 20G		15.955	0.394	2.47	16.559	15.211
7.	FCalTx 20+28G		15.907	0.382	2.40	16.492	15.187

FACTORY VARIATIONS CASE STUDY : MILL No 2

FABRIC :- INTERLOCK 20G

QUALITY :- Ne 1-38 (Carded) # 1/600

QUALITY :- Ne 1-38 (Combed) # 1/422

GREY & FINISHED FABRIC DATA : MEASURED & PREDICTED YARN COUNT

Sample No	Yarn MeasTx	Fabric TexGBW	Fabric TexFAW	YCalTx WD1FAW	YCalTx WD2FAW	FCalTx WD1FAW	FCalTx WD2FAW

Interlock :- Quality # 1/600 Ne 1-38 Carded							
1	16.005	16.235	15.089	15.375	15.381	15.572	15.598
2	15.213	15.257	15.368	14.695	14.634	14.732	14.675
3	15.703	16.045	15.51	15.115	15.096	15.409	15.419
4	16.044	16.243	15.804	15.408	15.418	15.579	15.606
5	15.699	15.604	15.23	15.112	15.092	15.030	15.003
6	15.678	16.027	15.441	15.094	15.072	15.393	15.402
7	16.154	16.507	16.221	15.503	15.522	15.805	15.855
8	15.554	16.53	15.186	14.987	14.955	15.825	15.877
9	15.416	16.221	15.497	14.869	14.825	15.560	15.585
10	15.416	15.297	15.257	14.869	14.825	14.766	14.713
11	15.296	15.497	14.948	14.766	14.712	14.938	14.902
12	15.579	16.001	15.457	15.009	14.979	15.371	15.377

Interlock :- Quality # 1/422 Ne 1-38 Combed							
1	15.690	16.311	14.791	15.105	15.084	15.637	15.67
2	15.778	15.997	15.441	15.180	15.167	15.367	15.373
3	15.829	16.027	15.159	15.224	15.215	15.393	15.402
4	15.661	15.67	14.952	15.080	15.057	15.087	15.065
5	15.897	15.877	15.19	15.282	15.279	15.264	15.26
6	n. a.	15.924	14.869	n. a.	n. a.	15.305	15.305
7	n. a.	n. a.	14.724	n. a.	n. a.	n. a.	n. a.
=====							

*** COLUMNS STATISTICS

Mean SD CV% Max Min

1.	Yarn MeasTx	15.684	0.259	1.65	16.155	15.214
2.	Fabric TexGBW	15.959	0.372	2.33	16.530	15.257
3.	Fabric TexFAW	15.270	0.362	2.37	16.221	14.724
4.	YCalTx WD1FAW	15.099	0.222	1.47	15.503	14.696
5.	YCalTx WD2FAW	15.078	0.245	1.62	15.522	14.634
6.	FCalTx WD1FAW	15.336	0.320	2.08	15.825	14.733
7.	FCalTx WD2FAW	15.338	0.351	2.29	15.877	14.675

FACTORY VARIATIONS CASE STUDY : MILL No 2

QUALITY :- 1x1 RIB Ne 1-30 (Combed) # 7/514

GREY FABRIC DATA : MEASURED & PREDICTED YARN COUNT

Sample No	Yarn MeasTx	Fabric TexGBW	Fabric TexGAW	YCalTx 14G	FCalTx 14G
1	19.493	19.740	19.120	19.182	19.441
2	19.164	18.882	18.229	18.838	18.543
3	19.108	19.145	19.201	18.780	18.819
4	19.170	19.302	19.034	18.845	18.982
5	19.145	19.096	18.798	18.819	18.767
6	19.441	18.870	18.822	19.129	18.531
7	18.936	19.551	19.422	18.600	19.243
8	19.448	19.077	18.942	19.135	18.748
9	19.551	19.170	19.046	19.243	18.845
10	19.295	19.422	19.170	18.976	19.108
11	19.359	19.170	18.864	19.042	18.845
12	18.985	18.985	18.744	18.651	18.651

*** COLUMNS STATISTICS

Mean

SD

CV%

Max

Min

1.	Yarn MeasTx	19.258	0.203	1.05	19.551	18.937
2.	Fabric TexGBW	19.201	0.263	1.37	19.741	18.870
3.	Fabric TexGAW	18.950	0.300	1.58	19.423	18.229
4.	YCalTx 14G	18.937	0.212	1.12	19.244	18.601
5.	FCalTx 14G	18.877	0.275	1.46	19.442	18.531

FACTORY VARIATIONS CASE STUDY : MILL No 2
 QUALITY :- 1x1 RIB Ne 1-30 (Combed) # 7/514
 GREY & FINISHED FABRIC DATA : MEASURED & PREDICTED YARN COUNT

Sample No	Yarn MeasTx	Fabric TexGBW	Fabric TexFAW	YCalcTx WD1FAW	YCalcTx WD2FAW	FCalcTx WD1FAW	FCalcTx WD2FAW
1	19.493	19.740	18.822	18.369	18.673	18.524	19.212
2	19.164	18.882	18.786	18.086	18.363	17.687	18.320
3	19.108	19.145	18.696	18.038	18.310	17.944	18.594
4	19.170	19.302	18.567	18.092	18.368	18.096	18.756
5	19.145	19.096	18.702	18.070	18.345	17.895	18.542
6	19.441	18.870	18.590	18.325	18.625	17.675	18.307
7	18.936	19.551	18.602	17.891	18.148	18.339	19.015
8	19.448	19.077	18.876	18.330	18.631	17.877	18.523
9	19.551	19.170	18.985	18.419	18.728	17.968	18.619
10	19.295	19.422	18.744	18.199	18.487	18.214	18.882
11	19.359	19.170	18.223	18.254	18.546	17.968	18.619
12	18.985	18.985	18.509	17.932	18.194	17.787	18.427

=====
 *** COLUMNS STATISTICS ***

		N	Mean	SD	CV%	Max	Min
1.	Yarn MeasTx	12	19.258	0.203	1.05	19.551	18.937
2.	Fabric TexGBW	12	19.201	0.263	1.37	19.741	18.870
3.	Fabric TexFAW	12	18.676	0.198	1.06	18.986	18.224
4.	YCalcTx WD1FAW	12	18.168	0.174	0.96	18.419	17.892
5.	YCalcTx WD2FAW	12	18.452	0.191	1.04	18.728	18.148
6.	FCalcTx WD1FAW	12	17.998	0.257	1.43	18.525	17.675
7.	FCalcTx WD2FAW	12	18.652	0.274	1.47	19.213	18.308

FACTORY VARIATIONS CASE STUDY : MILL No 2
 QUALITY :- INTERLOCK No 1-38 (Carded) # 1/600
 GREY & FINISHED FABRIC DATA
 MEASURED & PREDICTED STITCH LENGTH cm

Sample No	SL cm GBW	SL cm GAW	SL cm 20G	SL cm 20+28G	SL cm FBW	SL cm FAW	SL cm WD1FAW	SL cm WD2FAW
1	0.331	0.3279	0.3242	0.3240	0.3309	0.3295	0.3218	0.3278
2	0.3325	0.3291	0.3256	0.3254	0.335	0.3336	0.3232	0.3293
3	0.338	0.336	0.3307	0.3306	0.336	0.337	0.3285	0.3346
4	0.346	0.336	0.3381	0.3382	0.34	0.339	0.3361	0.3424
5	0.352	0.339	0.3437	0.3439	0.342	0.339	0.3419	0.3483
6	0.336	0.329	0.3288	0.3287	0.327	0.322	0.3266	0.3327
7	0.3451	0.3374	0.3373	0.3374	0.3342	0.3335	0.3353	0.3415
8	0.3421	0.3368	0.3345	0.3345	0.3366	0.3392	0.3324	0.3386
9	0.3411	0.3404	0.3336	0.3336	0.3305	0.3255	0.3314	0.3377
10	0.3431	0.3429	0.3354	0.3355	0.3442	0.3408	0.3333	0.3396
11	0.3376	0.3315	0.3303	0.3303	0.3261	0.3306	0.3281	0.3343
12	0.3281	0.3229	0.3215	0.3212	0.3365	0.3333	0.3190	0.3250

*** COLUMNS STATISTICS

		Mean	SD	CV%	Max	Min
1.	SL cm GBW	0.339	0.007	2.03	0.352	0.328
2.	SL cm GAW	0.334	0.006	1.78	0.343	0.323
3.	SL cm 20G	0.332	0.006	1.93	0.344	0.322
4.	SL cm 20+28G	0.332	0.007	1.97	0.344	0.321
5.	SL cm FBW	0.335	0.006	1.67	0.344	0.326
6.	SL cm FAW	0.334	0.006	1.76	0.341	0.322
7.	SL cm WD1FAW	0.330	0.007	1.99	0.342	0.319
8.	SL cm WD2FAW	0.336	0.007	1.99	0.348	0.325

FACTORY VARIATIONS CASE STUDY : MILL No 2
 QUALITY :- INTERLOCK Ne 1-38 (Combed) # 1/422
 GREY & FINISHED FABRIC DATA
 MEASURED & PREDICTED STITCH LENGTH cm

Sample No	SL cm GBW	SL cm GAW	SL cm 20G	SL cm 20+28G	SL cm FBW	SL cm FAW	SL cm WD1FAW	SL cm WD2FAW
1	0.3369	0.3366	0.3297	0.3296	0.3344	0.334	0.3274	0.3336
2	0.3407	0.3359	0.3332	0.3332	0.331	0.3314	0.3311	0.3373
3	0.334	0.34	0.3270	0.3268	0.329	0.345	0.3247	0.3308
4	0.347	0.339	0.3391	0.3392	0.335	0.333	0.3371	0.3434
5	0.34	0.334	0.3326	0.3325	0.33	0.33	0.3304	0.3366
6	0.344	0.338	0.3363	0.3363	0.334	0.334	0.3342	0.3405
7	n. a.	n. a.	n. a.	n. a.	0.3345	0.333	n. a.	n. a.

) *** COLUMNS STATISTICS

			*** Mean	SD	CV%	Max	Min
1.	SL cm	GBW	0.340	0.005	1.38	0.347	0.334
2.	SL cm	GAW	0.337	0.002	0.65	0.340	0.334
3.	SL cm	20G	0.333	0.004	1.31	0.339	0.327
4.	SL cm	20+28G	0.333	0.004	1.34	0.339	0.327
5.	SL cm	FBW	0.333	0.002	0.75	0.335	0.329
6.	SL cm	FAW	0.334	0.005	1.47	0.345	0.330
7.	SL cm	WD1FAW	0.331	0.004	1.35	0.337	0.325
8.	SL cm	WD2FAW	0.337	0.005	1.35	0.343	0.331

FACTORY VARIATIONS CASE STUDY : MILL No 2

FABRIC :- INTERLOCK 20G

QUALITY :- Ne 1-38 (Carded) # 1/600

QUALITY :- Ne 1-38 (Combed) # 1/422

KEY & FINISHED FABRIC DATA : MEASURED & PREDICTED STITCH LENGTH

Sample No	SL cm GBW	SL cm GAW	SL cm 20G	SL cm 20+28G	SL cm FBW	SL cm FAW	SL cm WD1FAW	SL cm WD2FAW
-----------	--------------	--------------	--------------	-----------------	--------------	--------------	-----------------	-----------------

Interlock :- Quality # 1/600 Ne 1-38 Carded

1	0.331	0.3279	0.3242	0.3240	0.3309	0.3295	0.3218	0.3278
2	0.3325	0.3291	0.3256	0.3254	0.335	0.3336	0.3232	0.3293
3	0.338	0.336	0.3307	0.3306	0.336	0.337	0.3285	0.3346
4	0.346	0.336	0.3381	0.3382	0.34	0.339	0.3361	0.3424
5	0.352	0.339	0.3437	0.3439	0.342	0.339	0.3419	0.3483
6	0.336	0.329	0.3288	0.3287	0.327	0.322	0.3266	0.3327
7	0.3451	0.3374	0.3373	0.3374	0.3342	0.3335	0.3353	0.3415
8	0.3421	0.3368	0.3345	0.3345	0.3366	0.3392	0.3324	0.3386
9	0.3411	0.3404	0.3336	0.3336	0.3305	0.3255	0.3314	0.3377
10	0.3431	0.3429	0.3354	0.3355	0.3442	0.3408	0.3333	0.3396
11	0.3376	0.3315	0.3303	0.3303	0.3261	0.3306	0.3281	0.3343
12	0.3281	0.3229	0.3215	0.3212	0.3365	0.3333	0.3190	0.3250

Interlock :- Quality # 1/422 Ne 1-38 Combed

1	0.3369	0.3366	0.3297	0.3296	0.3344	0.334	0.3274	0.3336
2	0.3407	0.3359	0.3332	0.3332	0.331	0.3314	0.3311	0.3373
3	0.334	0.34	0.3270	0.3268	0.329	0.345	0.3247	0.3308
4	0.347	0.339	0.3391	0.3392	0.335	0.333	0.3371	0.3434
5	0.34	0.334	0.3326	0.3325	0.33	0.33	0.3304	0.3366
6	0.344	0.338	0.3363	0.3363	0.334	0.334	0.3342	0.3405
7	n. a.	n. a.	n. a.	n. a.	0.3345	0.333	n. a.	n. a.

*** COLUMNS STATISTICS ***

			N	Mean	SD	CV%	Max	Min
1.	SL cm	GBW	18	0.340	0.006	1.80	0.352	0.328
2.	SL cm	GAW	18	0.335	0.005	1.54	0.343	0.323
3.	SL cm	20G	18	0.332	0.006	1.71	0.344	0.322
4.	SL cm	20+28G	18	0.332	0.006	1.75	0.344	0.321
5.	SL cm	FBW	19	0.334	0.005	1.42	0.344	0.326
6.	SL cm	FAW	19	0.334	0.005	1.62	0.345	0.322
7.	SL cm	WD1FAW	18	0.330	0.006	1.77	0.342	0.319
8.	SL cm	WD2FAW	18	0.336	0.006	1.77	0.348	0.325

FACTORY VARIATIONS CASE STUDY : MILL No 2
 QUALITY :- 1x1 RIB Ne 1-30 (Combed) # 7/514
 GREY & FINISHED FABRIC DATA
 MEASURED & PREDICTED STITCH LENGTH cm

Sample No	SL cm GBW	SL cm GAW	SL cm *GAW	SL cm FBW	SL cm FAW	SL cm WD1FAW	SL cm WD2FAW
1	0.2671	0.2637	0.2633	0.2825	0.2779	0.2624	0.2633
2	0.2844	0.2783	0.2801	0.2739	0.2722	0.2800	0.2802
3	0.27	0.262	0.2662	0.276	0.275	0.2654	0.2661
4	0.271	0.266	0.2671	0.276	0.274	0.2664	0.2671
5	0.287	0.282	0.2826	0.275	0.275	0.2827	0.2827
6	0.284	0.279	0.2797	0.281	0.276	0.2796	0.2798
7	0.2764	0.2735	0.2724	0.2778	0.2737	0.2719	0.2724
8	0.2928	0.2885	0.2882	0.2765	0.2746	0.2886	0.2884
9	0.2842	0.2801	0.2799	0.2827	0.2808	0.2798	0.2800
10	0.2811	0.278	0.2769	0.2856	0.2825	0.2767	0.2770
11	0.2878	0.2826	0.2834	0.2795	0.2851	0.2835	0.2835
12	0.2891	0.2842	0.2847	0.2835	0.2825	0.2848	0.2848

=====
 *** COLUMNS STATISTICS ***

			N	Mean	SD	CV%	Max	Min
1.	SL cm	GBW	12	0.281	0.008	2.94	0.293	0.267
2.	SL cm	GAW	12	0.276	0.008	3.06	0.289	0.262
3.	SL cm	*GAW	12	0.277	0.008	2.89	0.288	0.263
4.	SL cm	FBW	12	0.279	0.004	1.37	0.286	0.274
5.	SL cm	FAW	12	0.277	0.004	1.52	0.285	0.272
6.	SL cm	WD1FAW	12	0.277	0.008	3.04	0.289	0.262
7.	SL cm	WD2FAW	12	0.277	0.008	2.91	0.288	0.263

FACTORY VARIATIONS CASE STUDY : MILL No 2
 QUALITY :- INTERLOCK Ne 1-38 (Carded) # 1/600
 QUALITY :- INTERLOCK Ne 1-38 (Combed) # 1/422
 PREDICTION OF GREY RELAXED DIMENSIONS
 FROM MEASURED RELAXED TEX & STITCH LENGTH
 USING 1) STARFISH 20G ; 2) STARFISH 20+28G

Sample No	Sl cm GAW	Tex GAW	C/cm GAW	W/cm GAW	Wtasm GAW	\S' GAW	C/cm *20G	W/cm *20G	Wtasm *20G	\S' *20G	C/cm *20+28	W/cm *20+28	Wtasm *20+28	\S' *20+28
Interlock :- Quality # 1/600 Ne 1-38 Carded														
1	0.3279	15.408	16.766	15.033	249.8	252.05	16.776	14.812	233.99	248.23	16.799	14.848	235.12	249.39
2	0.3291	15.348	16.666	14.566	236.2	242.77	16.705	14.805	232.46	247.05	16.718	14.853	233.64	248.32
3	0.336	15.481	16.5	15	259	247.5	16.340	14.634	230.02	238.86	16.334	14.678	231.27	239.57
4	0.336	15.753	16.8	15.166	270	254.8	16.361	14.555	233.53	237.89	16.376	14.560	234.68	237.92
5	0.339	16.066	15.966	15.066	253.3	240.56	16.226	14.410	235.73	233.57	16.253	14.377	236.81	232.72
6	0.329	15.460	16.966	14.966	259.4	253.93	16.719	14.775	234.00	246.77	16.742	14.806	235.13	247.76
7	0.3374	15.686	16.333	15.2	259.36	248.26	16.282	14.548	231.83	236.62	16.286	14.566	233.03	236.77
8	0.3368	15.783	17	14.333	255.45	243.66	16.321	14.532	233.43	236.92	16.335	14.534	234.58	236.85
9	0.3404	15.703	16.1	14.433	246.5	232.37	16.126	14.487	230.27	233.39	16.119	14.509	231.52	233.41
10	0.3429	14.872	15.766	15.633	242.6	246.48	15.935	14.683	218.34	233.75	15.850	14.831	219.93	235.78
11	0.3315	15.178	17.133	14.766	246	253.00	16.560	14.808	228.78	244.91	16.549	14.885	230.07	246.53
12	0.3229	15.296	18	14.033	250.3	252.6	17.051	14.945	235.64	254.60	17.088	14.985	236.72	256.21
Interlock :- Quality # 1/422 Ne 1-38 Combed														
1	0.3366	15.468	16.366	15.233	252.77	249.31	16.308	14.626	229.51	238.25	16.298	14.673	230.78	238.98
2	0.3359	15.249	16.5	15.066	252.47	248.6	16.328	14.703	227.10	239.79	16.304	14.780	228.43	241.09
3	0.34	16.401	16.233	14.416	248.3	234.03	16.198	14.297	239.39	231.33	16.248	14.220	240.36	229.61
4	0.339	15.182	16.566	15.3	259.9	253.47	16.160	14.664	224.45	236.70	16.117	14.758	225.86	238.07
5	0.334	15.657	16.1	14.966	250.3	240.96	16.460	14.621	233.50	240.42	16.477	14.635	234.65	240.75
6	0.338	15.505	16.2	15.233	256.59	246.78	16.237	14.589	229.16	236.62	16.224	14.634	230.43	237.21
7	n. a.	n. a.	n. a.	n. a.	n. a.	n. a.	n. a.	n. a.	n. a.	n. a.	n. a.	n. a.	n. a.	n. a.

*** COLUMNS STATISTICS ***

	Mean	SD	CY%	Max	Min
1. Sl cm GAW	0.335	0.005	1.54	0.343	0.323
2. Tex GAW	15.528	0.352	2.26	16.401	14.873
3. C/cm GAW	16.554	0.521	3.15	18.000	15.767
4. W/cm GAW	14.912	0.408	2.73	15.633	14.033
5. Wtasm GAW	252.680	7.670	3.04	270.000	236.200
6. \S' GAW	246.733	6.604	2.68	254.800	232.377
7. C/cm *20G	16.394	0.274	1.67	17.051	15.936
8. W/cm *20G	14.639	0.158	1.08	14.946	14.298
9. Wtasm *20G	231.178	4.750	2.05	239.393	218.341
10. \S' *20G	239.764	6.189	2.58	254.607	231.338
11. C/cm *20+28	16.396	0.293	1.79	17.089	15.851
12. W/cm *20+28	14.675	0.193	1.31	14.986	14.220
13. Wtasm *20+28	232.396	4.610	1.98	240.368	219.937
14. \S' *20+28	240.391	6.781	2.82	256.218	229.619

FACTORY VARIATIONS CASE STUDY : MILL No 2
 QUALITY :- INTERLOCK Ne 1-38 (Carded) # 1/600
 QUALITY :- INTERLOCK Ne 1-38 (Combed) # 1/422
 PREDICTION OF GREY RELAXED DIMENSIONS USING STARFISH 20G
 FROM PREDICTED GREY RELAXED TEX & STITCH LENGTH

Sample No	SL cm GBW	Tex GBW	C/cm GAW	W/cm GAW	Wt _{esm} GAW	'S' GAW	SL cm *20G	Tex *20G	C/cm *20G	W/cm *20G	Wt _{esm} *20G	'S' *20G
Interlock :- Quality #1/600 Ne 1-38 Carded												
1	0.331	16.235	16.766	15.033	249.8	252.05	0.3242	16.246	17.045	14.647	247.47	249.62
2	0.3325	15.257	16.666	14.566	236.2	242.77	0.3256	15.210	16.889	14.915	232.78	251.62
3	0.338	16.045	16.5	15	259	247.5	0.3307	16.045	16.666	14.574	240.57	242.70
4	0.346	16.243	16.8	15.166	270	254.8	0.3381	16.254	16.283	14.372	238.64	233.77
5	0.352	15.604	15.966	15.066	253.3	240.56	0.3437	15.578	15.945	14.462	226.75	230.37
6	0.336	16.027	16.966	14.966	259.4	253.93	0.3288	16.026	16.767	14.616	241.51	244.91
7	0.3451	16.507	16.333	15.2	259.36	248.26	0.3373	16.534	16.347	14.310	242.74	233.68
8	0.3421	16.53	17	14.333	255.45	243.66	0.3345	16.558	16.497	14.356	244.82	236.62
9	0.3411	16.221	16.1	14.433	246.5	232.37	0.3336	16.231	16.523	14.465	241.18	238.81
10	0.3431	15.297	15.766	15.633	242.6	246.48	0.3354	15.253	16.351	14.709	227.39	240.22
11	0.3376	15.497	17.133	14.766	246	253.00	0.3303	15.465	16.643	14.747	233.21	245.18
12	0.3281	16.001	18	14.033	250.3	252.6	0.3215	15.998	17.182	14.772	245.96	253.80
Interlock :- Quality #1/422 Ne 1-38 Combed												
1	0.3369	16.310	16.366	15.233	252.77	249.31	0.3297	16.326	16.743	14.514	244.92	242.88
2	0.3407	15.997	16.5	15.066	252.47	248.6	0.3332	15.994	16.526	14.539	238.33	240.06
3	0.334	16.027	16.233	14.416	248.3	234.03	0.3270	16.026	16.871	14.653	242.71	247.07
4	0.347	15.670	16.566	15.3	259.9	253.47	0.3391	15.648	16.189	14.527	230.33	234.93
5	0.34	15.876	16.1	14.966	250.3	240.96	0.3326	15.866	16.552	14.588	237.08	241.24
6	0.344	15.923	16.2	15.233	256.59	246.78	0.3363	15.916	16.356	14.503	235.44	236.97
7	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.

*** COLUMNS STATISTICS ***

	Mean	SD	CV%	Max	Min
1. SL cm GBW	0.340	0.006	1.80	0.352	0.328
2. Tex GBW	15.959	0.372	2.33	16.530	15.257
3. C/cm GAW	16.554	0.521	3.15	18.000	15.767
4. W/cm GAW	14.912	0.408	2.73	15.633	14.033
5. Wt _{esm} GAW	252.680	7.670	3.04	270.000	236.200
6. 'S' GAW	246.733	6.604	2.68	254.800	232.377
7. SL cm *20G	0.332	0.006	1.71	0.344	0.322
8. Tex *20G	15.955	0.394	2.47	16.559	15.211
9. C/cm *20G	16.577	0.311	1.88	17.182	15.945
10. W/cm *20G	14.571	0.156	1.07	14.915	14.310
11. Wt _{esm} *20G	238.439	6.296	2.64	247.476	226.751
12. 'S' *20G	241.363	6.517	2.70	253.804	230.378

FACTORY VARIATIONS CASE STUDY : MILL No 2
 QUALITY :- INTERLOCK Ne 1-38 (Carded) # 1/600
 QUALITY :- INTERLOCK Ne 1-38 (Combed) # 1/422
 PREDICTION OF GREY RELAXED DIMENSIONS USING STARFISH 20+28G
 FROM PREDICTED GREY RELAXED TEX & STITCH LENGTH

Sample No	SL cm GBW	Tex GBW	C/cm GAW	W/cm GAW	Wt _{esm} GAW	'S' GAW	SL cm *20+28	Tex *20+28	C/cm *20+28	W/cm *20+28	Wt _{esm} *20+28	'S' *20+28
Interlock :- Quality #1/600 Ne 1-38 Carded												
1	0.331	16.235	16.766	15.033	249.8	252.05	0.3240	16.189	17.154	14.582	247.59	249.37
2	0.3325	15.257	16.666	14.566	236.2	242.77	0.3254	15.186	16.912	14.987	233.73	253.68
3	0.338	16.045	16.5	15	259	247.5	0.3306	15.994	16.723	14.547	240.90	242.53
4	0.346	16.243	16.8	15.166	270	254.8	0.3382	16.197	16.313	14.333	238.86	232.70
5	0.352	15.604	15.966	15.066	253.3	240.56	0.3439	15.542	15.896	14.521	227.53	230.59
6	0.336	16.027	16.966	14.966	259.4	253.93	0.3287	15.976	16.833	14.588	241.83	244.88
7	0.3451	16.507	16.333	15.2	259.36	248.26	0.3374	16.468	16.403	14.234	242.74	232.00
8	0.3421	16.53	17	14.333	255.45	243.66	0.3345	16.491	16.570	14.271	244.78	235.04
9	0.3411	16.221	16.1	14.433	246.5	232.37	0.3336	16.175	16.577	14.421	241.38	238.04
10	0.3431	15.297	15.766	15.633	242.6	246.48	0.3355	15.227	16.321	14.796	228.37	241.62
11	0.3376	15.497	17.133	14.766	246	253.00	0.3303	15.432	16.659	14.795	233.99	246.37
12	0.3281	16.001	18	14.033	250.3	252.6	0.3212	15.949	17.289	14.733	246.25	254.29
Interlock :- Quality #1/422 Ne 1-38 Combed												
1	0.3369	16.310	16.366	15.233	252.77	249.31	0.3296	16.267	16.826	14.450	245.01	242.11
2	0.3407	15.997	16.5	15.066	252.47	248.6	0.3332	15.945	16.564	14.525	238.72	239.86
3	0.334	16.027	16.233	14.416	248.3	234.03	0.3268	15.976	16.948	14.621	243.02	247.16
4	0.347	15.670	16.566	15.3	259.9	253.47	0.3392	15.610	16.170	14.569	231.03	235.23
5	0.34	15.876	16.1	14.966	250.3	240.96	0.3325	15.821	16.584	14.589	237.56	241.37
6	0.344	15.923	16.2	15.233	256.59	246.78	0.3363	15.870	16.372	14.504	235.91	236.78
7	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.

*** COLUMNS STATISTICS ***

		Mean	SD	CV%	Max	Min
1.	SL cm GBW	0.340	0.006	1.80	0.352	0.328
2.	Tex GBW	15.959	0.372	2.33	16.530	15.257
3.	C/cm GAW	16.554	0.521	3.15	18.000	15.767
4.	W/cm GAW	14.912	0.408	2.73	15.633	14.033
5.	Wt _{esm} GAW	252.680	7.670	3.04	270.000	236.200
6.	'S' GAW	246.733	6.604	2.68	254.800	232.377
7.	SL cm *20+28	0.332	0.006	1.75	0.344	0.321
8.	Tex *20+28	15.907	0.382	2.40	16.492	15.187
9.	C/cm *20+28	16.618	0.348	2.09	17.290	15.896
10.	W/cm *20+28	14.560	0.189	1.30	14.988	14.234
11.	Wt _{esm} *20+28	238.849	6.017	2.52	247.591	227.538
12.	'S' *20+28	241.317	7.056	2.92	254.294	230.600

FACTORY VARIATIONS CASE STUDY : MILL No 2

QUALITY :- INTERLOCK Ne 1-38 (Carded) # 1/600

QUALITY :- INTERLOCK Ne 1-38 (Combed) # 1/422

PREDICTION OF FINISHED RELAXED DIMENSIONS

FROM MEASURED FINISHED RELAXED TEX & STITCH LENGTH

USING 1) STARFISH 20G;WD1 ; 2) STARFISH 20G;WD2

Sample No	SL cm	Tex	C/cm	W/cm	Wtasm	'S'	C/cm	W/cm	Wtasm	'S'	C/cm	W/cm	Wtasm	'S'
	FAW	FAW	FAW	FAW	FAW	FAW	*WD1	*WD1	*WD1	*WD1	*WD2	*WD2	*WD2	*WD2
Interlock :- Quality # 1/600 Ne 1-38 Carded														
1	0.3295	15.089	15.533	14.2	202.57	220.57	15.206	14.444	220.56	219.69	15.521	14.636	222.35	226.87
2	0.3336	15.368	16.266	14.666	226.11	238.57	15.047	14.283	221.95	214.86	15.384	14.478	223.49	221.27
3	0.337	15.509	14.866	14.3	212.5	212.59	14.910	14.176	221.71	211.21	15.122	14.374	223.30	217.04
4	0.339	15.804	15.533	14.833	188	217.98	14.852	14.055	224.74	208.52	15.033	14.256	225.79	213.95
5	0.339	15.229	15.966	13.933	226.69	222.46	14.792	14.214	216.15	210.13	14.989	14.415	218.71	215.74
6	0.322	15.440	15.8	13.833	213.1	218.56	15.600	14.505	231.49	226.52	16.000	14.690	231.36	234.90
7	0.3335	16.221	16	14.7	241.87	235.2	15.140	14.051	234.97	212.57	15.376	14.247	234.23	218.73
8	0.3392	15.186	15.3	14.366	218.19	219.81	14.778	14.222	215.38	210.06	14.974	14.423	218.07	215.65
9	0.3255	15.497	15.566	14.533	229	226.23	15.437	14.414	229.76	222.65	15.791	14.602	229.93	230.39
10	0.3408	15.257	14.733	14.566	220.2	214.61	14.716	14.172	215.36	208.40	14.891	14.374	218.06	213.72
11	0.3306	14.948	15.766	14.8	227	233.34	15.140	14.461	217.62	218.98	15.445	14.654	219.92	226.02
12	0.3333	15.456	15.3	13.7	215.8	209.61	15.070	14.264	223.50	214.90	15.329	14.460	224.77	221.34
Interlock :- Quality # 1/422 Ne 1-38 Combed														
1	0.334	14.790	15.233	14.933	211.83	227.48	14.968	14.437	212.91	216.08	15.236	14.632	216.03	222.62
2	0.3314	15.440	15.71	15.2	231.56	238.79	15.155	14.307	224.60	216.81	15.437	14.501	225.68	223.56
3	0.345	15.159	15.5	14.566	241.3	225.78	14.525	14.119	211.16	204.92	14.655	14.324	214.60	209.65
4	0.333	14.951	15.966	14.233	224.9	227.25	15.031	14.411	216.03	216.60	15.306	14.606	218.61	223.25
5	0.33	15.190	15.5	15.066	232.06	233.53	15.194	14.406	221.76	218.90	15.499	14.598	223.33	225.97
6	0.334	14.869	15.7	14.233	218.3	223.46	14.977	14.414	214.09	215.86	15.242	14.610	217.01	222.37
7	0.333	14.724	15.7	14.5	213.89	227.65	15.006	14.476	212.57	217.24	15.288	14.670	215.76	223.96

*** COLUMNS STATISTICS ***

			Mean	SD	CV%	Max	Min
1	SL cm	FAW	0.334	0.005	1.62	0.345	0.322
2	Tex	FAW	15.270	0.362	2.37	16.221	14.724
3	C/cm	FAW	15.576	0.380	2.44	16.267	14.733
4	W/cm	FAW	14.440	0.409	2.83	15.200	13.700
5	Wtasm	FAW	220.783	12.899	5.84	241.870	188.000
6	'S'	FAW	224.924	8.452	3.76	238.792	209.610
7	C/cm	*WD1	15.029	0.249	1.66	15.601	14.526
8	W/cm	*WD1	14.307	0.147	1.03	14.505	14.051
9	Wtasm	*WD1	220.338	6.721	3.05	234.977	211.167
10	'S'	*WD1	215.001	5.336	2.48	226.529	204.927
11	C/cm	*WD2	15.287	0.313	2.04	16.000	14.656
12	W/cm	*WD2	14.503	0.143	0.99	14.690	14.247
13	Wtasm	*WD2	222.163	5.542	2.49	234.233	214.601
14	'S'	*WD2	221.426	6.218	2.81	234.903	209.654

FACTORY VARIATIONS CASE STUDY : MILL No 2

QUALITY :- INTERLOCK Ne 1-38 (Carded) # 1/600

QUALITY :- INTERLOCK Ne 1-38 (Combed) # 1/422

PREDICTION OF FINISHED RELAXED DIMENSIONS USING STARFISH 20G; WD1
FROM PREDICTED FINISHED RELAXED TEX & STITCH LENGTH

Sample No	SL cm	Tex	C/cm	W/cm	Wt _{esm}	'S'	SL cm	Tex	C/cm	W/cm	Wt _{esm}	'S'
	GBW	GBW	FAW	FAW	FAW	FAW	*WD1	*WD1	*WD1	*WD1	*WD1	*WD1
Interlock :- Quality #1/600 Ne 1-38 Carded												
1	0.331	16.235	15.533	14.2	202.57	220.57	0.3218	15.572	15.622	14.472	233.69	226.33
2	0.3325	15.257	16.266	14.666	226.11	238.57	0.3232	14.732	15.464	14.676	219.44	227.14
3	0.338	16.045	14.866	14.3	212.5	212.59	0.3285	15.409	15.285	14.375	226.18	219.78
4	0.346	16.243	15.533	14.033	188	217.98	0.3361	15.579	14.954	14.173	223.34	211.80
5	0.352	15.604	15.966	13.933	226.69	222.46	0.3419	15.030	14.644	14.214	211.27	208.04
6	0.336	16.027	15.8	13.833	213.1	218.56	0.3266	15.393	15.374	14.419	227.33	221.78
7	0.3451	16.507	16	14.7	241.87	235.2	0.3353	15.805	15.016	14.128	227.36	211.99
8	0.3421	16.53	15.3	14.366	218.19	219.81	0.3324	15.825	15.148	14.180	229.72	214.71
9	0.3411	16.221	15.566	14.533	229	226.23	0.3314	15.560	15.164	14.272	226.37	216.39
10	0.3431	15.297	14.733	14.566	220.2	214.61	0.3333	14.766	14.993	14.456	212.95	216.73
11	0.3376	15.497	15.766	14.8	227	233.34	0.3281	14.938	15.254	14.515	219.19	221.48
12	0.3281	16.001	15.3	13.7	215.8	209.61	0.3190	15.371	15.737	14.588	232.62	229.93
Interlock :- Quality #1/422 Ne 1-38 Combed												
1	0.3369	16.310	15.233	14.933	211.83	227.48	0.3274	15.637	15.359	14.334	230.47	220.22
2	0.3407	15.997	15.71	15.2	231.56	238.79	0.3311	15.367	15.161	14.333	223.70	217.31
3	0.334	16.027	15.5	14.566	241.3	225.78	0.3247	15.393	15.465	14.460	228.74	223.77
4	0.347	15.670	15.966	14.233	224.9	227.25	0.3371	15.087	14.860	14.291	215.28	212.28
5	0.34	15.876	15.5	15.066	232.06	233.53	0.3304	15.264	15.181	14.376	222.59	218.26
6	0.344	15.923	15.7	14.233	218.3	223.46	0.3342	15.304	15.011	14.287	220.53	214.40
7	n.a.	n.a.	15.7	14.5	213.89	227.65	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.

*** COLUMNS STATISTICS ***

			Mean	SD	CV%	Max	Min
1	SL cm	GBW	0.340	0.006	1.80	0.352	0.328
2	Tex	GBW	15.959	0.372	2.33	16.530	15.257
3	C/cm	FAW	15.576	0.380	2.44	16.267	14.733
4	W/cm	FAW	14.440	0.409	2.83	15.200	13.700
5	Wt _{esm}	FAW	220.783	12.899	5.84	241.870	188.000
6	'S'	FAW	224.924	8.452	3.76	238.792	209.610
7	SL cm	*WD1	0.330	0.006	1.77	0.342	0.319
8	Tex	*WD1	15.336	0.320	2.08	15.825	14.733
9	C/cm	*WD1	15.206	0.274	1.80	15.738	14.645
10	W/cm	*WD1	14.364	0.148	1.03	14.676	14.128
11	Wt _{esm}	*WD1	223.937	6.493	2.90	233.690	211.277
12	'S'	*WD1	218.468	5.912	2.71	229.931	208.042

FACTORY VARIATIONS CASE STUDY : MILL No 2

QUALITY :- INTERLOCK Ne 1-38 (Carded) # 1/600

QUALITY :- INTERLOCK Ne 1-38 (Combed) # 1/422

PREDICTION OF FINISHED RELAXED DIMENSIONS USING STARFISH 20G; WD2
FROM PREDICTED FINISHED RELAXED TEX & STITCH LENGTH

Sample No	SL cm GBW	Tex GBW	C/cm FAW	W/cm FAW	Wt _{gsm} FAW	'S' FAW	SL cm *WD2	Tex *WD2	C/cm *WD2	W/cm *WD2	Wt _{gsm} *WD2	'S' *WD2
Interlock :- Quality #1/600 Ne 1-38 Carded												
1	0.331	16.235	15.533	14.2	202.57	220.57	0.3278	15.598	15.656	14.527	229.77	227.19
2	0.3325	15.257	16.266	14.666	226.11	238.57	0.3293	14.674	15.497	14.756	217.18	228.34
3	0.338	16.045	14.866	14.3	212.5	212.59	0.3346	15.418	15.246	14.443	223.49	219.88
4	0.346	16.243	15.533	14.033	188	217.98	0.3424	15.605	14.827	14.246	221.40	210.87
5	0.352	15.604	15.966	13.933	226.69	222.46	0.3483	15.002	14.467	14.309	210.97	206.80
6	0.336	16.027	15.8	13.833	213.1	218.56	0.3327	15.401	15.356	14.485	224.40	222.13
7	0.3451	16.507	16	14.7	241.87	235.2	0.3415	15.854	14.894	14.194	224.93	211.02
8	0.3421	16.53	15.3	14.366	218.19	219.81	0.3386	15.876	15.057	14.242	226.87	214.07
9	0.3411	16.221	15.566	14.533	229	226.23	0.3377	15.584	15.088	14.340	223.82	216.03
10	0.3431	15.297	14.733	14.566	220.2	214.61	0.3396	14.712	14.911	14.548	211.99	216.64
11	0.3376	15.497	15.766	14.8	227	233.34	0.3343	14.901	15.227	14.595	217.25	221.93
12	0.3281	16.001	15.3	13.7	215.8	209.61	0.3250	15.377	15.808	14.644	228.65	231.29
Interlock :- Quality #1/422 Ne 1-38 Combed												
1	0.3369	16.310	15.233	14.933	211.83	227.48	0.3336	15.669	15.326	14.395	227.25	220.31
2	0.3407	15.997	15.71	15.2	231.56	238.79	0.3373	15.373	15.094	14.406	221.43	217.11
3	0.334	16.027	15.5	14.566	241.3	225.78	0.3308	15.402	15.469	14.523	225.54	224.37
4	0.347	15.670	15.966	14.233	224.9	227.25	0.3434	15.064	14.732	14.379	214.28	211.54
5	0.34	15.876	15.5	15.066	232.06	233.53	0.3366	15.259	15.123	14.451	220.40	218.21
6	0.344	15.923	15.7	14.233	218.3	223.46	0.3405	15.304	14.910	14.365	218.79	213.86
7	n.a.	n.a.	15.7	14.5	213.89	227.65	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.

*** COLUMNS STATISTICS ***

	Mean	SD	CY%	Max	Nin
1. SL cm GBW	0.340	0.006	1.80	0.352	0.328
2. Tex GBW	15.959	0.372	2.33	16.530	15.257
3. C/cm FAW	15.576	0.380	2.44	16.267	14.733
4. W/cm FAW	14.440	0.409	2.83	15.200	13.700
5. Wt _{gsm} FAW	220.783	12.899	5.84	241.870	188.000
6. 'S' FAW	224.924	8.452	3.76	238.792	209.610
7. SL cm *WD2	0.336	0.006	1.77	0.348	0.325
8. Tex *WD2	15.338	0.352	2.29	15.877	14.675
9. C/cm *WD2	15.150	0.338	2.23	15.808	14.468
10. W/cm *WD2	14.437	0.148	1.02	14.756	14.195
11. Wt _{gsm} *WD2	221.583	5.561	2.51	229.773	210.978
12. 'S' *WD2	218.427	6.654	3.05	231.293	206.802

FACTORY VARIATIONS CASE STUDY : MILL No 2
 QUALITY :- 1x1 RIB Ne 1-30 (Combed) # 7/514
 PREDICTION OF GREY RELAXED DIMENSIONS USING STARFISH 14G
 FROM MEASURED TEX & STITCH LENGTH

Sample No	SL cm GAW	Tex GAW	C/cm GAW	W/cm GAW	Wtasm GAW	'S' GAW	C/cm *14G	W/cm *14G	Wtasm *14G	'S' *14G
1	0.2637	19.120	20.3	11.9	238.29	241.57	20.236	11.892	234.28	240.83
2	0.2783	18.229	18.933	11.833	227.88	224.04	19.022	11.354	209.05	215.97
3	0.262	19.201	19.966	11.9	239.8	237.60	20.385	11.957	237.09	243.97
4	0.266	19.034	20.3	12.133	244.9	246.30	20.039	11.804	230.86	236.70
5	0.282	18.798	18.633	11.533	224	214.90	18.767	11.242	213.22	210.95
6	0.279	18.822	18.666	11.6	225.8	216.53	18.994	11.342	216.11	215.43
7	0.2735	19.422	19.1	11.866	233.9	226.65	19.445	11.542	228.90	224.51
8	0.2885	18.942	17.933	11.166	211.26	200.25	18.301	11.035	209.62	201.90
9	0.2801	19.046	18.566	11.666	228.3	216.61	18.920	11.309	218.04	213.98
10	0.278	19.170	18.733	12.066	224.2	226.04	19.084	11.382	221.49	217.25
11	0.2826	18.864	18.566	11.433	218.9	212.27	18.725	11.223	213.55	210.14
12	0.2842	18.744	18.2	11.6	219	211.12	18.603	11.169	210.68	207.73

*** COLUMNS STATISTICS

			Mean	SD	CV%	Max	Min
1.	SL cm	GAW	0.276	0.008	3.06	0.289	0.262
2.	Tex	GAW	18.950	0.300	1.58	19.422	18.229
3.	C/cm	GAW	18.992	0.786	4.14	20.300	17.933
4.	W/cm	GAW	11.725	0.277	2.36	12.133	11.167
5.	Wtasm	GAW	228.019	9.747	4.27	244.900	211.260
6.	'S'	GAW	222.828	13.639	6.12	246.307	200.256
7.	C/cm	*14G	19.211	0.673	3.50	20.386	18.301
8.	W/cm	*14G	11.438	0.298	2.60	11.958	11.036
9.	Wtasm	*14G	220.245	10.072	4.57	237.093	209.055
10.	'S'	*14G	219.950	13.639	6.20	243.976	201.901

FACTORY VARIATIONS CASE STUDY : MILL No 2

QUALITY :- 1x1 RIB Ne 1-30 (Combed) # 7/514

PREDICTION OF GREY RELAXED DIMENSIONS USING STARFISH 14G
FROM PREDICTED GREY RELAXED TEX & STITCH LENGTH

Sample No	SL cm	Tex	C/cm	W/cm	Wtasm	\S'	SL cm	Tex	C/cm	W/cm	Wtasm	\S'
	GBW	GBW	GAW	GAW	GAW	GAW	*14G	*14G	*14G	*14G	*14G	*14G
1	0.2671	19.740	20.3	11.9	238.29	241.57	0.2633	19.441	20.276	11.909	238.98	241.66
2	0.2844	18.882	18.933	11.833	227.88	224.04	0.2801	18.543	18.895	11.298	211.53	213.46
3	0.27	19.145	19.966	11.9	239.8	237.60	0.2662	18.819	20.013	11.792	227.75	236.16
4	0.271	19.302	20.3	12.133	244.9	246.30	0.2671	18.982	19.939	11.760	229.03	234.63
5	0.287	19.096	18.633	11.533	224	214.90	0.2826	18.767	18.716	11.219	212.26	209.95
6	0.284	18.870	18.666	11.6	225.8	216.53	0.2797	18.531	18.924	11.311	211.70	214.03
7	0.2764	19.551	19.1	11.866	233.9	226.65	0.2724	19.243	19.525	11.577	227.56	226.12
8	0.2928	19.077	17.933	11.166	211.26	200.25	0.2882	18.748	18.308	11.038	207.36	202.02
9	0.2842	19.170	18.566	11.666	228.3	216.61	0.2799	18.845	18.922	11.310	215.58	214.01
10	0.2811	19.422	18.733	12.066	224.2	226.04	0.2769	19.108	19.162	11.417	221.63	218.80
11	0.2878	19.170	18.566	11.433	218.9	212.27	0.2834	18.845	18.662	11.195	212.59	208.90
12	0.2891	18.985	18.2	11.6	219	211.12	0.2847	18.651	18.562	11.151	209.09	206.93

*** COLUMNS STATISTICS

			Mean	SD	CV%	Max	Min
1.	SL cm	GBW	0.281	0.008	2.94	0.293	0.267
2.	Tex	GBW	19.201	0.263	1.37	19.741	18.870
3.	C/cm	GAW	18.992	0.786	4.14	20.300	17.933
4.	W/cm	GAW	11.725	0.277	2.36	12.133	11.167
5.	Wtasm	GAW	228.019	9.747	4.27	244.900	211.260
6.	\S'	GAW	222.828	13.639	6.12	246.307	200.256
7.	SL cm	*14G	0.277	0.008	2.89	0.288	0.263
8.	Tex	*14G	18.877	0.275	1.46	19.442	18.531
9.	C/cm	*14G	19.159	0.624	3.31	20.276	18.308
10.	W/cm	*14G	11.415	0.281	2.46	11.910	11.039
11.	Wtasm	*14G	218.760	9.985	4.56	238.981	207.362
12.	\S'	*14G	218.894	12.796	5.85	241.668	202.023

FACTORY VARIATIONS CASE STUDY : MILL No 2
 QUALITY :- 1x1 RIB Ne 1-30 (Combed) # 7/514
 PREDICTION OF FINISHED RELAXED DIMENSIONS
 FROM MEASURED FINISHED TEX & STITCH LENGTH
 USING 1) STARFISH 14G;WD1 ; 2) STARFISH 14G;WD2

Sample No	SL cm	Tex	C/cm	W/cm	Wtasm	'S'	C/cm	W/cm	Wtasm	'S'	C/cm	W/cm	Wtasm	'S'
	FAW	FAW	FAW	FAW	FAW	FAW	*WD1	*WD1	*WD1	*WD1	*WD2	*WD2	*WD2	*WD2
1	0.2779	18.822	17.3	11.4	195.81	197.22	18.015	11.111	212.04	199.99	17.959	11.355	211.74	203.59
2	0.2722	18.786	18.733	11.833	215.7	221.67	18.430	11.301	216.57	208.10	18.389	11.507	215.88	211.36
3	0.275	18.696	17.633	11.966	211.9	211.01	18.217	11.209	212.95	204.01	18.163	11.435	212.57	207.41
4	0.274	18.567	18.266	11.933	213.28	217.98	18.282	11.245	212.16	205.39	18.225	11.465	211.85	208.68
5	0.275	18.702	18.6	11.8	216	219.48	18.218	11.209	213.03	204.01	18.164	11.434	212.64	207.41
6	0.276	18.590	17.533	11.566	205.8	202.80	18.137	11.178	210.73	202.54	18.076	11.411	210.54	205.97
7	0.2737	18.602	18.066	11.833	210.8	213.78	18.307	11.254	212.88	205.84	18.252	11.472	212.50	209.13
8	0.2746	18.876	17.833	11.2	204.72	199.73	18.259	11.219	215.60	204.66	18.214	11.440	215.00	208.09
9	0.2808	18.985	16.866	11.533	205.4	194.52	17.820	11.015	211.62	196.11	17.764	11.276	211.36	199.93
10	0.2825	18.744	17.2	11.166	196	192.06	17.686	10.966	207.18	193.75	17.613	11.240	207.30	197.58
11	0.2851	18.223	17.466	10.966	193.1	191.55	17.472	10.895	198.62	190.16	17.368	11.190	199.47	193.95
12	0.2825	18.509	17.133	11.466	204	196.46	17.670	10.970	204.25	193.65	17.586	11.247	204.62	197.41

*** COLUMNS STATISTICS

			Mean	SD	CV%	Max	Min
1.	SL cm	FAW	0.277	0.004	1.52	0.285	0.272
2.	Tex	FAW	18.676	0.198	1.06	18.986	18.224
3.	C/cm	FAW	17.719	0.592	3.34	18.733	16.867
4.	W/cm	FAW	11.556	0.328	2.84	11.967	10.967
5.	Wtasm	FAW	206.043	7.869	3.82	216.000	193.100
6.	'S'	FAW	204.859	11.254	5.49	221.678	191.551
7.	C/cm	*WD1	18.043	0.307	1.70	18.431	17.472
8.	W/cm	*WD1	11.131	0.136	1.22	11.302	10.895
9.	Wtasm	*WD1	210.641	5.031	2.39	216.575	198.622
10.	'S'	*WD1	200.688	5.838	2.91	208.107	190.162
11.	C/cm	*WD2	17.982	0.323	1.79	18.389	17.368
12.	W/cm	*WD2	11.373	0.107	0.94	11.507	11.191
13.	Wtasm	*WD2	210.463	4.598	2.18	215.886	199.478
14.	'S'	*WD2	204.215	5.625	2.75	211.370	193.960

FACTORY VARIATION CASE STUDY : MILL No 2

QUALITY :- 1x1 RIB Ne 1-30 (Combed) # 7/514

PREDICTION OF FINISHED RELAXED DIMENSIONS USING STARFISH 14G; WD1
FROM PREDICTED FINISHED RELAXED TEX & STITCH LENGTH

Sample No	SL cm	Tex	C/cm	W/cm	Wtasm	'S'	SL cm	Tex	C/cm	W/cm	Wtasm	'S'
	GBW	GBW	FAW	FAW	FAW	FAW	*WD1	*WD1	*WD1	*WD1	*WD1	*WD1
1	0.2671	19.740	17.3	11.4	195.81	197.22	0.2624	18.524	19.167	11.648	222.07	223.11
2	0.2844	18.882	18.733	11.833	215.7	221.67	0.2800	17.687	17.784	11.063	195.91	196.54
3	0.27	19.145	17.633	11.966	211.9	211.01	0.2654	17.944	18.893	11.553	211.60	218.11
4	0.271	19.302	18.266	11.933	213.28	217.98	0.2664	18.096	18.824	11.514	212.71	216.57
5	0.287	19.096	18.6	11.8	216	219.48	0.2827	17.895	17.613	10.975	196.42	193.10
6	0.284	18.870	17.533	11.566	205.8	202.80	0.2796	17.675	17.812	11.076	196.08	197.09
7	0.2764	19.551	18.066	11.833	210.8	213.78	0.2719	18.339	18.420	11.319	211.02	208.31
8	0.2928	19.077	17.833	11.2	204.72	199.73	0.2886	17.877	17.211	10.794	191.64	185.58
9	0.2842	19.170	16.866	11.533	205.4	194.52	0.2798	17.968	17.817	11.064	199.61	196.93
10	0.2811	19.422	17.2	11.166	196	192.06	0.2767	18.214	18.060	11.162	205.32	201.38
11	0.2878	19.170	17.466	10.966	193.1	191.55	0.2835	17.968	17.562	10.948	196.68	192.07
12	0.2891	18.985	17.133	11.466	204	196.46	0.2848	17.787	17.459	10.911	193.42	190.28

*** COLUMNS STATISTICS

			Mean	SD	CV%	Max	Min
1.	SL cm	GBW	0.281	0.008	2.94	0.293	0.267
2.	Tex	GBW	19.201	0.263	1.37	19.741	18.870
3.	C/cm	FAW	17.719	0.592	3.34	18.733	16.867
4.	W/cm	FAW	11.556	0.328	2.84	11.967	10.967
5.	Wtasm	FAW	206.043	7.869	3.82	216.000	193.100
6.	'S'	FAW	204.859	11.254	5.49	221.678	191.551
7.	SL cm	*WD1	0.277	0.008	3.04	0.289	0.262
8.	Tex	*WD1	17.998	0.257	1.43	18.525	17.675
9.	C/cm	*WD1	18.052	0.629	3.49	19.168	17.212
10.	W/cm	*WD1	11.169	0.277	2.48	11.649	10.794
11.	Wtasm	*WD1	202.712	9.603	4.74	222.078	191.647
12.	'S'	*WD1	201.595	12.134	6.02	223.117	185.588

FACTORY VARIATION CASE STUDY : MILL No 2

QUALITY :- 1x1 RIB Ne 1-30 (Combed) # 7/514

PREDICTION OF FINISHED RELAXED DIMENSIONS USING STARFISH 14G; WD;
FROM PREDICTED FINISHED RELAXED TEX & STITCH LENGTH.

Sample No	SL cm GBW	Tex GBW	C/cm FAW	W/cm FAW	Wtasm FAW	'S' FAW	SL cm *WD2	Tex *WD2	C/cm *WD2	W/cm *WD2	Wtasm *WD2	'S' *WD2
1	0.2671	19.740	17.3	11.4	195.81	197.22	0.2633	19.212	19.146	11.742	228.55	224.79
2	0.2844	18.882	18.733	11.833	215.7	221.67	0.2802	18.320	17.728	11.309	204.14	200.13
3	0.27	19.145	17.633	11.966	211.9	211.01	0.2661	18.594	18.844	11.678	218.57	219.98
4	0.271	19.302	18.266	11.933	213.28	217.98	0.2671	18.756	18.733	11.646	219.71	218.64
5	0.287	19.096	18.6	11.8	216	219.48	0.2827	18.542	17.569	11.238	204.78	197.06
6	0.284	18.870	17.533	11.566	205.8	202.80	0.2798	18.307	17.755	11.319	204.29	200.63
7	0.2764	19.551	18.066	11.833	210.8	213.78	0.2724	19.015	18.396	11.494	218.39	211.19
8	0.2928	19.077	17.833	11.2	204.72	199.73	0.2884	18.523	17.167	11.100	200.42	190.13
9	0.2842	19.170	16.866	11.533	205.4	194.52	0.2800	18.619	17.776	11.305	207.73	200.61
10	0.2811	19.422	17.2	11.166	196	192.06	0.2770	18.882	18.031	11.376	213.12	204.79
11	0.2878	19.170	17.466	10.966	193.1	191.55	0.2835	18.619	17.521	11.217	205.08	196.14
12	0.2891	18.985	17.133	11.466	204	196.46	0.2848	18.427	17.409	11.191	201.96	194.42

*** COLUMNS STATISTICS ***

			Mean	SD	DV%	Max	Min
1.	SL cm	GBW	0.281	0.008	2.94	0.293	0.267
2.	Tex	GBW	19.201	0.263	1.37	19.741	18.870
3.	C/cm	FAW	17.719	0.592	3.34	18.733	16.867
4.	W/cm	FAW	11.556	0.328	2.84	11.967	10.967
5.	Wtasm	FAW	206.043	7.869	3.82	216.000	193.100
6.	'S'	FAW	204.859	11.254	5.49	221.678	191.551
7.	SL cm	*WD2	0.277	0.008	2.91	0.288	0.263
8.	Tex	*WD2	18.652	0.274	1.47	19.213	18.308
9.	C/cm	*WD2	18.011	0.635	3.53	19.147	17.167
10.	W/cm	*WD2	11.385	0.209	1.83	11.742	11.101
11.	Wtasm	*WD2	210.566	8.885	4.22	228.558	200.425
12.	'S'	*WD2	204.878	11.188	5.46	224.790	190.131

INTERLOCK CARDED AND COMBED COMBINED No. 1/600 + No. 1/422

GREY RELAXED FABRIC WEIGHTS

	Mean Wt. Measured	Calc from Meas. cwtl	Mean % Diff
\bar{x}	252.68	256.68	+1.62
σ	7.67	5.97	1.71
% CV	3.04	2.33	

Key: C = courses
W = wales
S = stitch density
t = tex
l = stitch length

PREDICTIONS USING STARFISH *20G

	Mean Wt Measured	*20G	Mean % Diff	Calc*20G *c.w.t.l	Mean % Diff	Calc 20G *t.l.s.	Mean % Diff
\bar{x}	252.68	238.439	-5.569	256.043	+1.399	255.826	+1.313
σ	7.67	6.296	3.353	5.396	3.113	5.446	3.126
% CV	3.04	2.64		2.11		2.13	

PREDICTIONS USING STARFISH 20 + 28G

	Mean Wt Measured	*20+28G	Mean % Diff	20+28G x.w.+ l	Mean % Diff	Ca120+28G t.l.s.	Mean % Diff
\bar{x}	252.68	238.849	-5.405	255.682	+1.261	254.975	+0.985
σ	7.67	6.017	3.329	4.939	3.165	4.571	3.195
% CV	3.04	2.52		1.93		1.79	

FINISHED RELAXED FABRIC WEIGHTS

	Mean Wt. Measured	Calc from Meas cwtl	Mean % Diff
\bar{x}	220.783	229.30	+4.07
σ	12.899	10.07	5.66
% CV	5.84	4.39	

PREDICTION USING STARFISH *20G WD1

	Mean Wt Measured	WD2	Mean % Diff	WD2 c.w.t.l.	Mean % Diff	WD2 t.l.s.	Mean % Diff
\bar{x}	220.783	223.937	+1.646	221.106	+0.35	221.128	+0.36
σ	12.899	6.493	7.602	4.212	7.004	4.251	7.013
% CV	5.84	2.9		1.90		1.92	

PREDICTIONS USING STARFISH *20G WD2

	Mean Wt. Measured	WD2	Mean % Diff	WD2 c.w.t.l	Mean % Diff	WD2 t.l.s.	Mean % Diff
\bar{x}	220.783	221.583	+0.573	225.582	+2.385	225.255	+2.236
σ	12.899	5.561	7.311	4.964	7.283	4.954	7.274
% CV	5.84	2.51		2.20		2.20	

1 x 1 RIB COMBED No. 7/514

GREY RELAXED FABRIC WEIGHTS

	Mean Wt. Measured	Calc from c.w.t.l.	% DIFF
\bar{x}	228.019	23.14	+2.28
σ	9.747	9.27	2.08
% CV	4.27	3.98	

PREDICTIONS USING STARFISH *14G

	Mean Wt. Measured	*14G	% DIFF	Calc from c.w.t.l.	% DIFF	Calc from t.l.s.	% DIFF
\bar{x}	228.019	218.76	-4.044	228.679	+0.327	228.701	+0.336
σ	9.747	9.985	2.348	9.133	2.392	9.221	2.392
% CV	4.27	4.56		3.99		4.03	

FINISHED RELAXED FABRIC WEIGHTS

	Mean Wt. Measured	Calc from c.w.t.l.	% DIFF
\bar{x}	206.043	212.15	+2.958
σ	7.869	9.23	1.67
% CV	3.82	4.35	

	Mean Wt. Measured	WD1	% DIFF	Calc WD1 c.w.t.l.	% DIFF	Calc WD1 t.l.s.	% DIFF
\bar{x}	206.043	202.713	-1.467	200.824	-2.386	200.625	-2.483
σ	7.869	9.603	6.357	8.027	5.761	8.044	5.764
% CV	3.82	4.74		4.0		4.01	

	Mean Wt. Measured	WD2	% DIFF	WD2 c.w.t.l.	% DIFF	WD2 t.l.s.	% DIFF
\bar{x}	206.043	210.566	+2.35	211.886	+2.99	211.577	+2.843
σ	7.869	8.885	6.202	7.593	5.836	7.726	5.871
% CV	3.82	4.22		3.58		3.65	

FACTORY VARIATIONS CASE STUDY : MILL No 2

QUALITY :- INTERLOCK Ne 1-38 (Carded) # 1/600

FABRIC WEIGHT gsm IN GREY and FINISHED FABRIC

MEASURED Vs CALCULATED from COURSES, WALES, TEX, STITCH LENGTH

Sample No	MeasWt	CalcWt	%Diff	MeasWt	CalcWt	%Diff	MeasWt	CalcWt	%Diff	MeasWt	CalcWt	%Diff
	GBW	GBW		GAW	GAW		FBW	FBW		FAW	FAW	
1	178.79	181.05	1.2671	249.8	254.70	1.9620	163.08	168.32	3.2133	202.57	219.33	8.2770
2	162.07	159.79	-1.401	236.2	245.26	3.8359	168.67	174.84	3.6612	226.11	244.63	8.1912
3	195.7	210.91	7.7733	259	257.48	-0.586	164.9	167.19	1.3937	212.5	222.23	4.5885
4	211.6	211.99	0.1886	270	269.74	-0.094	162.8	168.80	3.6877	188	233.57	24.243
5	160.9	157.61	-2.043	253.3	262.05	3.4550	176.21	191.66	8.7716	226.69	229.71	1.3337
6	179.2	176.85	-1.308	259.4	258.33	-0.411	159	176.32	10.896	213.1	217.33	1.9885
7	201.96	207.95	2.9674	259.36	262.80	1.3267	178.15	182.89	2.6621	241.87	254.47	5.2114
8	194.02	199.30	2.7219	255.45	259.05	1.4116	154.2	169.75	10.888	218.19	226.45	3.7899
9	158.5	165.52	4.4353	246.5	248.43	0.7837	163	172.35	5.7380	229	228.24	-0.329
10	170.3	168.92	-0.809	242.6	251.40	3.6312	154.3	145.37	-5.781	220.2	223.18	1.3551
11	164.6	167.83	1.9682	246	254.60	3.4990	158.5	164.30	3.6629	227	230.63	1.6002
12	186.7	181.88	-2.576	250.3	249.53	-0.306	165.2	173.81	5.2153	215.8	215.97	0.0796

*** COLUMN STATISTICS ***

		N	Mean	SD	CV%
1.	MeasWt GBW	12	180.3617	17.7074	9.82
2.	CalcWt GBW	12	182.4723	20.1449	11.04
3.	%Diff	12	1.0986	3.0525	277.86
4.	MeasWt GAW	12	252.3258	9.0766	3.60
5.	CalcWt GAW	12	256.1177	6.9265	2.70
6.	%Diff	12	1.5422	1.7155	111.23
7.	MeasWt FBW	12	164.0008	7.5199	4.59
8.	CalcWt FBW	12	171.3052	11.0766	6.47
9.	%Diff	12	4.4341	4.4194	99.67
10.	MeasWt FAW	12	218.4192	13.8597	6.35
11.	CalcWt FAW	12	228.8164	11.2927	4.94
12.	%Diff	12	5.0267	6.6939	133.16

FACTORY VARIATIONS CASE STUDY : MILL No 2

QUALITY :- INTERLOCK Ne 1-38 (Combed) # 1/422

FABRIC WEIGHT gsm IN GREY and FINISHED FABRIC

MEASURED Vs CALCULATED from COURSES, WALES, TEX, STITCH LENGTH

Sample No	MeasWt	CalcWt	%Diff	MeasWt	CalcWt	%Diff	MeasWt	CalcWt	%Diff	MeasWt	CalcWt	%Diff
	GBW	GBW		GAW	GAW		FBW	FBW		FAW	FAW	
1	170.59	169.67	-0.535	252.77	259.63	2.7152	162.99	161.66	-0.815	211.83	224.76	6.1043
2	159	158.71	-0.180	252.47	254.67	0.8739	169.52	168.29	-0.724	231.56	244.38	5.5368
3	173.4	176.71	1.9137	248.3	261.01	5.1200	163.4	164.44	0.6377	241.3	236.16	-2.127
4	180.3	180.96	0.3666	259.9	260.91	0.3910	163.4	165.91	1.5415	224.9	226.30	0.6240
5	152.9	157.17	2.7968	250.3	252.03	0.6915	168.06	176.10	4.7882	232.06	234.13	0.8930
6	170.25	167.74	-1.472	256.59	258.66	0.8098	160.5	168.40	4.9237	218.3	221.95	1.6745
7	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	160.29	171.69	7.1173	213.89	223.24	4.3734

*** COLUMN STATISTICS ***

		N	Mean	SD	CV%
1.	MeasWt GBW	6	167.7400	10.0082	5.97
2.	CalcWt GBW	6	168.4981	9.4740	5.62
3.	%Diff	6	0.4815	1.5947	331.23
4.	MeasWt GAW	6	253.3883	4.2263	1.67
5.	CalcWt GAW	6	257.8230	3.6656	1.42
6.	%Diff	6	1.7670	1.8387	104.06
7.	MeasWt FBW	7	164.0229	3.5286	2.15
8.	CalcWt FBW	7	168.0747	4.7747	2.84
9.	%Diff	7	2.4956	3.1146	124.80
10.	MeasWt FAW	7	224.8343	10.8024	4.80
11.	CalcWt FAW	7	230.1348	8.2990	3.61
12.	%Diff	7	2.4398	2.9972	122.85

FACTORY VARIATIONS CASE STUDY : MILL No 2

QUALITY :- INTERLOCK Ne 1-38 (Carded) # 1/600

QUALITY :- INTERLOCK Ne 1-38 (Combed) # 1/422

FABRIC WEIGHT gsm IN GREY and FINISHED FABRIC

MEASURED Vs CALCULATED from COURSES, WALES, TEX, STITCH LENGTH

Sample No	MeasWt	CalcWt	%Diff	MeasWt	CalcWt	%Diff	MeasWt	CalcWt	%Diff	MeasWt	CalcWt	%Diff
	GBW	GBW		GAW	GAW		FBW	FBW		FAW	FAW	
Interlock :- Quality 1/600 Ne 1-38 Carded												
1	178.79	181.05	1.2671	249.8	254.70	1.9620	163.00	168.32	3.2133	202.57	219.33	8.2770
2	162.07	159.79	-1.401	236.2	245.26	3.8359	168.67	174.04	3.6612	226.11	244.63	8.1912
3	195.7	210.91	7.7733	259	257.48	-0.586	164.9	167.19	1.3937	212.5	222.23	4.5805
4	211.6	211.99	0.1886	270	269.74	-0.094	162.8	168.00	3.6877	188	233.57	24.243
5	160.9	157.61	-2.043	253.3	262.05	3.4550	176.21	191.66	8.7716	226.69	229.71	1.3337
6	179.2	176.85	-1.308	259.4	258.33	-0.411	159	176.32	10.896	213.1	217.33	1.9885
7	201.96	207.95	2.9674	259.36	262.80	1.3267	178.15	182.89	2.6621	241.87	254.47	5.2114
8	194.02	199.30	2.7219	255.45	259.05	1.4116	154.2	169.75	10.088	218.19	226.45	3.7899
9	158.5	165.52	4.4353	246.5	248.43	0.7837	163	172.35	5.7300	229	228.24	-0.329
10	170.3	168.92	-0.809	242.6	251.40	3.6312	154.3	145.37	-5.781	220.2	223.18	1.3551
11	164.6	167.83	1.9682	246	254.60	3.4990	158.5	164.30	3.6629	227	230.63	1.6002
12	186.7	181.88	-2.576	250.3	249.53	-0.306	165.2	173.81	5.2153	215.8	215.97	0.0796
Interlock :- Quality 1/422 Ne 1-38 Combed												
13	170.59	169.67	-0.535	252.77	259.63	2.7152	162.99	161.66	-0.815	211.83	224.76	6.1043
14	159	158.71	-0.180	252.47	254.67	0.8739	169.52	168.29	-0.724	231.56	244.38	5.5368
15	173.4	176.71	1.9137	248.3	261.01	5.1200	163.4	164.44	0.6377	241.3	236.16	-2.127
16	180.3	180.96	0.3666	259.9	260.91	0.3910	163.4	165.91	1.5415	224.9	226.30	0.6240
17	152.9	157.17	2.7968	250.3	252.03	0.6915	168.06	176.10	4.7882	232.06	234.13	0.8930
18	170.25	167.74	-1.472	256.59	258.66	0.8098	160.5	168.40	4.9237	218.3	221.95	1.6745
19	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	160.29	171.69	7.1173	213.89	223.24	4.3734

*** COLUMN STATISTICS ***

		N	Mean	SD	CV%
1.	MeasWt GBW	18	176.1544	16.4265	9.33
2.	CalcWt GBW	18	177.8143	18.3012	10.29
3.	%Diff	18	0.8929	2.6204	293.48
4.	MeasWt GAW	18	252.6800	7.6698	3.04
5.	CalcWt GAW	18	256.6861	5.9732	2.33
6.	%Diff	18	1.6172	1.7060	105.50
7.	MeasWt FBW	19	164.0089	6.2216	3.79
8.	CalcWt FBW	19	170.1150	9.2271	5.42
9.	%Diff	19	3.7199	4.0115	107.84
10.	MeasWt FAW	19	220.7826	12.8994	5.84
11.	CalcWt FAW	19	229.3021	10.0656	4.39
12.	%Diff	19	4.0737	5.6587	138.91

FACTORY VARIATIONS CASE STUDY : MILL No 2

QUALITY :- INTERLOCK Ne 1-38 (Carded) # 1/600

QUALITY :- INTERLOCK Ne 1-38 (Combed) # 1/422

CALCULATION OF GREY RELAXED FABRIC WEIGHT gsm

Sample No	MeasWt GAW	*20G Tex/l	%Diff fromGAW	*20G *LTCW	%Diff fromGAW	*20G *LTS	%Diff fromGAW	*20+28 Tex/l	%Diff fromGAW	*20+28 *LTCW	%Diff fromGAW	*20+28 *LTS	%Diff fromGAW
Interlock :- Quality #1/600 Ne 1-38 Carded													
1	249.8	247.47	-0.930	263.02	5.2957	262.98	5.2789	247.59	-0.884	262.47	5.0736	261.65	4.7451
2	236.2	232.78	-1.444	249.53	5.6471	249.25	5.5282	233.73	-1.042	250.58	6.0905	250.78	6.1748
3	259	240.57	-7.112	257.80	-0.460	257.60	-0.540	240.90	-6.987	257.36	-0.630	256.56	-0.939
4	270	238.64	-11.61	257.29	-4.703	257.01	-4.807	238.86	-11.53	256.26	-5.086	255.02	-5.546
5	253.3	226.75	-10.48	246.99	-2.491	246.74	-2.588	227.53	-10.17	246.82	-2.555	246.57	-2.655
6	259.4	241.51	-6.895	258.34	-0.405	258.16	-0.474	241.83	-6.769	258.00	-0.538	257.27	-0.819
7	259.36	242.74	-6.407	260.96	0.6195	260.68	0.5189	242.74	-6.407	259.49	0.0524	257.85	-0.588
8	255.45	244.82	-4.158	262.41	2.7246	262.17	2.6309	244.78	-4.176	260.98	2.1679	259.39	1.5442
9	246.5	241.18	-2.159	258.87	5.0205	258.64	4.9261	241.38	-2.075	258.03	4.6789	256.92	4.2282
10	242.6	227.39	-6.266	246.16	1.4683	245.86	1.3442	228.37	-5.863	246.78	1.7244	246.91	1.7795
11	246	233.21	-5.197	250.80	1.9552	250.53	1.8451	233.99	-4.880	251.29	2.1543	251.19	2.1104
12	250.3	245.96	-1.733	261.14	4.3314	261.11	4.3220	246.25	-1.617	261.09	4.3113	260.63	4.1271
Interlock :- Quality #1/422 Ne 1-38 Combed													
13	252.77	244.92	-3.105	261.65	3.5149	261.49	3.4515	245.01	-3.067	260.78	3.1702	259.66	2.7272
14	252.47	238.33	-5.598	256.15	1.4600	255.91	1.3646	238.72	-5.445	255.71	1.2847	254.92	0.9723
15	248.3	242.71	-2.247	259.13	4.3637	258.99	4.3053	243.02	-2.122	258.85	4.2499	258.17	3.9770
16	259.9	230.33	-11.37	249.61	-3.956	249.34	-4.062	231.03	-11.10	249.51	-3.996	249.13	-4.141
17	250.3	237.08	-5.280	254.86	1.8241	254.62	1.7267	237.56	-5.088	254.64	1.7379	254.03	1.4923
18	256.59	235.44	-8.241	253.97	-1.018	253.70	-1.123	235.91	-8.058	253.55	-1.184	252.82	-1.469
19	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.

*20G Tex/l = Wt calculated via STARFISH

*20+28 Tex/l = Wt calculated via STARFISH combined equation

LTCW = Wt calculated from predicted Stitch Length, Tex, Courses, Wales

LTS = Wt calculated from predicted Stitch Length, Tex & Stitch Density

*** COLUMN STATISTICS ***

	N	Mean	SD	CV%
1. MeasWt GAW	18	252.6800	7.6698	3.04
2. *20G Tex/l	18	238.4392	6.2956	2.64
3. %Diff fromGAW	18	-5.5694	3.3525	60.19
4. *20G *LTCW	18	256.0434	5.3957	2.11
5. %Diff fromGAW	18	1.3994	3.1126	222.43
6. *20G *LTS	18	255.0259	5.4458	2.13
7. %Diff fromGAW	18	1.3133	3.1259	238.03
8. *20+28 Tex/l	18	238.8486	6.0168	2.52
9. %Diff fromGAW	18	-5.4054	3.3291	61.59
10. *20+28 *LTCW	18	255.6823	4.9390	1.93
11. %Diff fromGAW	18	1.2614	3.1645	250.87
12. *20+28 *LTS	18	254.9748	4.5712	1.79
13. %Diff fromGAW	18	0.9849	3.1950	324.42

FACTORY VARIATIONS CASE STUDY : MILL No 2

QUALITY :- INTERLOCK Ne 1-38 (Carded) # 1/600

QUALITY :- INTERLOCK Ne 1-38 (Combed) # 1/422

CALCULATION OF FINISHED RELAXED FABRIC WEIGHT gsm

Sample No	MeasWt FAW	*WD1 Tex/l fromFAW	%Diff fromFAW	*WD1 *LTCW fromFAW	%Diff fromFAW	*WD1 *LTS fromFAW	%Diff fromFAW	*WD2 Tex/l fromFAW	%Diff fromFAW	*WD2 *LTCW fromFAW	%Diff fromFAW	*WD2 *LTS fromFAW	%Diff fromFAW
Interlock :- Quality #1/600 Ne 1-38 Carded													
1	202.57	233.67	15.362	226.62	11.872	226.86	11.994	229.77	13.428	232.64	14.848	232.39	14.725
2	226.11	219.44	-2.947	216.18	-4.390	216.35	-4.312	217.18	-3.947	221.05	-2.236	220.72	-2.381
3	212.5	226.18	6.4396	222.48	4.6971	222.52	4.7164	223.49	5.1730	227.28	6.9580	226.94	6.7992
4	188	223.34	18.799	222.00	18.089	221.85	18.008	221.40	17.766	225.00	20.106	225.40	19.898
5	226.69	211.27	-6.799	213.95	-5.619	213.82	-5.676	210.97	-6.931	216.36	-4.553	216.12	-4.658
6	213.1	227.33	6.6798	222.92	4.6107	223.01	4.6544	224.40	5.3046	228.01	6.9977	227.68	6.8464
7	241.87	227.36	-5.995	224.87	-7.027	224.70	-7.096	224.93	-7.001	229.01	-5.316	228.57	-5.495
8	218.19	229.72	5.2888	226.02	3.5896	225.92	3.5445	226.87	3.9798	230.62	5.7885	230.21	5.5115
9	229	226.37	-1.148	223.27	-2.498	223.23	-2.518	223.82	-2.257	227.77	-0.534	227.40	-0.696
10	220.2	212.95	-3.291	213.41	-3.079	213.40	-3.083	211.99	-3.724	216.82	-1.534	216.52	-1.668
11	227	219.19	-3.437	217.07	-4.371	217.14	-4.340	217.25	-4.293	221.44	-2.446	221.11	-2.590
12	215.8	232.62	7.7984	225.19	4.3555	225.53	4.5122	228.65	5.9586	231.44	7.2502	231.23	7.1503
Interlock :- Quality #1/422 Ne 1-38 Combed													
13	211.83	230.47	8.8027	225.48	6.4448	225.54	6.4727	227.25	7.2798	230.68	8.9014	230.34	8.7416
14	231.56	223.70	-3.393	221.17	-4.486	221.15	-4.494	221.43	-4.373	225.53	-2.601	225.18	-2.752
15	241.3	228.74	-5.202	223.56	-7.351	223.71	-7.289	225.54	-6.528	228.94	-5.119	228.64	-5.244
16	224.9	215.28	-4.274	216.03	-3.941	215.94	-3.982	214.28	-4.720	219.21	-2.529	218.90	-2.663
17	232.06	222.59	-4.079	220.17	-5.119	220.18	-5.118	220.40	-5.021	224.54	-3.239	224.20	-3.386
18	218.3	220.53	1.0215	219.44	0.5238	219.36	0.4886	218.79	0.2245	223.26	2.2743	222.91	2.1152
19	213.89	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.

*WD1 Tex/l = Wt calculated via STARFISH 20G original Winch
 *WD2 Tex/l = Wt calculated via STARFISH supplementary Winch
 *LTCW = Wt calculated from predicted Stitch Length, Tex, Courses, Wales
 *LTS = Wt calculated from predicted Stitch Length, Tex & Stitch Density

*** COLUMN STATISTICS ***

	N	Mean	SD	CV%
1. MeasWt FAW	19	220.7826	12.8994	5.84
2. *WD1 Tex/l	18	223.9366	6.4928	2.90
3. %Diff fromFAW	18	1.6458	7.6019	461.90
4. *WD1 *LTCW	18	221.1060	4.2116	1.90
5. %Diff fromFAW	18	0.3498	7.0040	2002.14
6. *WD1 *LTS	18	221.1276	4.2512	1.92
7. %Diff fromFAW	18	0.3599	7.8130	1948.52
8. *WD2 Tex/l	18	221.5830	5.5613	2.51
9. %Diff fromFAW	18	0.5731	7.3189	1275.61
10. *WD2 *LTCW	18	225.5825	4.9640	2.20
11. %Diff fromFAW	18	2.3848	7.2831	305.40
12. *WD2 *LTS	18	225.2545	4.9540	2.20
13. %Diff fromFAW	18	2.2361	7.2740	325.30

FACTORY VARIATIONS CASE STUDY : MILL No 2

QUALITY :- 1x1 RIB Ne 1-30 (Combed) # 7/514

FABRIC WEIGHT gsm IN GREY and FINISHED FABRIC

MEASURED Vs CALCULATED from COURSES, WALES, TEX, STITCH LENGTH

Sample No	GBW			GAW			FBW			FAW		
	MeasWt	CalcWt	%Diff	MeasWt	CalcWt	%Diff	MeasWt	CalcWt	%Diff	MeasWt	CalcWt	%Diff
1	171.76	169.43	-1.353	238.29	243.60	2.2311	160.96	166.00	3.1811	195.01	206.31	5.3666
2	144.62	141.37	-2.242	227.88	227.32	-0.243	180.77	179.84	-0.512	215.7	226.71	5.1863
3	172.7	171.78	-0.528	239.8	239.06	-0.305	171.8	170.52	-0.741	211.9	216.99	2.4024
4	163.6	163.94	0.2090	244.9	249.41	1.8451	188.07	196.26	4.3596	213.28	221.79	3.9938
5	153.4	155.78	1.5544	224	227.84	1.7165	188	188.47	0.2513	216	225.76	4.5231
6	155.31	145.98	-6.005	225.8	227.41	0.7171	169.6	174.02	2.6091	205.8	208.12	1.1274
7	160.09	162.65	1.5993	233.9	240.00	2.9505	162.46	169.10	4.0879	210.8	217.70	3.2750
8	154.2	153.35	-0.550	211.26	218.08	3.6870	167.62	172.68	3.0212	204.72	207.06	1.1433
9	156.2	152.37	-2.447	228.3	231.12	1.2370	165.2	165.03	-0.100	205.4	207.41	0.9795
10	156.8	160.91	7.7257	224.2	240.94	7.4667	163.6	165.74	1.3122	196	203.41	3.7807
11	153.8	153.85	0.0376	218.9	226.33	3.3955	166.2	167.66	0.8809	193.1	199.04	3.0784
12	163	164.23	0.7589	219	224.93	2.7898	155.6	157.84	1.4417	204	205.45	0.7139

*** COLUMN STATISTICS ***

		N	Mean	SD	CV%	
1.	MeasWt	GBW	12	158.7900	7.9934	5.03
2.	CalcWt	GBW	12	158.6413	9.6620	6.09
3.	%Diff		12	-0.1036	3.2285	3116.00
4.	MeasWt	GAW	12	228.0192	9.7466	4.27
5.	CalcWt	GAW	12	233.1415	9.2680	3.98
6.	%Diff		12	2.2774	2.0809	91.37
7.	MeasWt	FBW	12	169.9900	10.4445	6.14
8.	CalcWt	FBW	12	172.7743	10.7522	6.22
9.	%Diff		12	1.6493	1.7734	107.53
10.	MeasWt	FAW	12	206.0425	7.8694	3.82
11.	CalcWt	FAW	12	212.1500	9.2271	4.35
12.	%Diff		12	2.9576	1.6688	56.42

FACTORY VARIATIONS CASE STUDY : MILL No 2

QUALITY :- 1x1 RIB Ne 1-30 (Combed) # 7/514

CALCULATION OF GREY RELAXED FABRIC WEIGHT gsm

Sample No	MeasWt GAW	*14G Tex/l	%Diff fromGAW	*14G *LTCW	%Diff fromGAW	*14G *LTS	%Diff fromGAW
1	238.29	238.98	0.2897	247.31	3.7893	247.50	3.8684
2	227.88	211.53	-7.170	221.81	-2.659	221.79	-2.671
3	239.8	227.75	-5.023	236.47	-1.385	236.62	-1.325
4	244.9	229.03	-6.477	237.86	-2.873	237.99	-2.819
5	224	212.26	-5.239	222.80	-0.534	222.76	-0.553
6	225.8	211.70	-6.241	221.94	-1.706	221.92	-1.717
7	233.9	227.56	-2.706	236.99	1.3229	237.07	1.3555
8	211.26	207.36	-1.845	218.46	3.4096	218.37	3.3692
9	228.3	215.58	-5.571	225.83	-1.078	225.82	-1.084
10	224.2	221.63	-1.142	231.57	3.2891	231.59	3.3006
11	218.9	212.59	-2.878	223.21	1.9724	223.17	1.9525
12	219	209.09	-4.523	219.83	0.3818	219.77	0.3526

*14G Tex/l = Wt calculated via STARFISH

*LTCW = Wt calculated from predicted Stitch Length, Tex, Courses, Wales

*LTS = Wt calculated from predicted Stitch Length, Tex & Stitch Density

*** COLUMN STATISTICS ***

	N	Mean	SD	CV%
1. MeasWt GAW	12	228.0192	9.7466	4.27
2. *14G Tex/l	12	218.7599	9.9854	4.56
3. %Diff fromGAW	12	-4.0444	2.3484	58.07
4. *14G *LTCW	12	228.6792	9.1330	3.99
5. %Diff fromGAW	12	0.3272	2.3917	730.98
6. *14G *LTS	12	228.7014	9.2212	4.03
7. %Diff fromGAW	12	0.3355	2.3915	712.74

FACTORY VARIATIONS CASE STUDY : MILL No 2

QUALITY :- 1x1 RIB Ne 1-30 (Combed) # 7/514

CALCULATION OF FINISHED RELAXED FABRIC WEIGHT gsm

Sample No	MeasWt FAW	*WD1 Tex/l	%Diff fromFAW	*WD1 *LTCW	%Diff fromFAW	*WD1 *LTS	%Diff fromFAW	*WD2 Tex/l	%Diff fromFAW	*WD2 *LTCW	%Diff fromFAW	*WD2 *LTS	%Diff fromFAW
1	195.81	222.07	13.415	217.12	10.885	216.96	10.805	228.55	16.724	227.52	16.197	227.48	16.178
2	215.7	195.91	-9.173	194.94	-9.624	194.72	-9.722	204.14	-5.357	205.87	-4.552	205.51	-4.722
3	211.9	211.60	-0.138	207.93	-1.872	207.76	-1.952	218.57	3.1491	217.85	2.8122	217.76	2.7698
4	213.28	212.71	-0.265	209.02	-1.996	208.84	-2.078	219.71	3.0155	219.26	2.8042	219.13	2.7451
5	216	196.42	-9.061	195.62	-9.434	195.40	-9.533	204.78	-5.192	207.08	-4.127	206.67	-4.318
6	205.8	196.08	-4.719	195.06	-5.215	194.85	-5.318	204.29	-0.732	205.95	0.8753	205.59	-0.899
7	210.8	211.02	0.1083	207.97	-1.338	207.77	-1.433	218.39	3.6050	219.10	3.9377	218.83	3.8103
8	204.72	191.64	-6.385	191.73	-6.344	191.52	-6.446	200.42	-2.098	203.64	-0.523	203.18	-0.750
9	205.4	199.61	-2.817	198.28	-3.463	198.07	-3.567	207.73	1.1367	209.61	2.8500	209.22	1.8638
10	196	205.32	4.7570	203.21	3.6799	203.00	3.5733	213.12	8.7357	214.60	9.4945	214.25	9.3156
11	193.1	196.68	1.8589	195.92	1.4623	195.71	1.3520	205.08	6.2047	207.56	7.4891	207.13	7.2679
12	204	193.42	-5.185	193.05	-5.365	192.84	-5.470	201.96	-0.997	204.53	0.2634	204.10	0.0535

*WD1 Tex/l = Wt calculated via STARFISH 146 original Winch

*WD2 Tex/l = Wt calculated via STARFISH supplementary Winch

*LTCW = Wt calculated from predicted Stitch Length, Tex, Courses, Wales

*LTS = Wt calculated from predicted Stitch Length, Tex & Stitch Density

*** COLUMN STATISTICS ***

	N	Mean	SD	CV%
1. MeasWt FAW	12	206.0425	7.8694	3.82
2. *WD1 Tex/l	12	202.7125	9.6030	4.74
3. %Diff fromFAW	12	-1.4673	6.3565	433.21
4. *WD1 *LTCW	12	200.8243	8.0265	4.00
5. %Diff fromFAW	12	-2.3857	5.7607	241.46
6. *WD1 *LTS	12	200.6247	8.0444	4.01
7. %Diff fromFAW	12	-2.4827	5.7642	232.17
8. *WD2 Tex/l	12	210.5661	8.8845	4.22
9. %Diff fromFAW	12	2.3495	6.2024	263.99
10. *WD2 *LTCW	12	211.8861	7.5930	3.58
11. %Diff fromFAW	12	2.9933	5.8361	194.97
12. *WD2 *LTS	12	211.5768	7.7258	3.65
13. %Diff fromFAW	12	2.8429	5.8706	206.50

FACTORY VARIATIONS CASE STUDY : MILL No 2
 QUALITY :- INTERLOCK Ne 1-38 (Carded) # 1/600
 MEASURED SHRINKAGE IN GREY & FINISHED FABRIC
 AFTER 1 WASH+TUMBLE and 5 WASH+TUMBLE CYCLES

Sample No	%LS G		Diff	%WS G		Diff	%LS F		Diff	%WS F		Diff
	1W+T	5W+T		1W+T	5W+T		1W+T	5W+T		1W+T	5W+T	
1	16.19	18.33	2.14	19.41	20.18	0.77	11.55	15.49	3.94	13.74	12.97	-0.77
2	24.35	25.34	0.99	13.24	13.59	0.35	12.29	15.03	2.74	16.61	16.82	0.21
3	18.6	20.68	2.08	11.13	11.09	-0.040	10.45	15.36	4.91	15.36	15.97	0.61
4	17	18.41	1.41	10.93	10.24	-0.69	17.38	19.67	2.29	13.43	13.55	0.12
5	23.05	24.49	1.44	18.2	18.12	-0.08	14.05	16.97	2.92	9.31	10.48	1.17
6	21.63	22.26	0.63	19.49	20.11	0.62	10.15	12.09	1.94	12.96	12.05	-0.91
7	17.4	19.5	2.1	9.46	8.98	-0.48	9.04	11.18	2.14	15.24	15.54	0.3
8	11.87	13.68	1.81	17.77	18.45	0.68	18.16	21.22	3.06	5.63	6.04	0.41
9	21.9	24.3	2.4	17.2	18.9	1.7	14	17.2	3.2	13.5	15.5	2
10	21.9	24.1	2.2	13.4	13.7	0.3	15.8	19.7	3.9	16.3	17.8	1.5
11	20.4	21.56	1.16	17.9	17.7	-0.2	15.9	18.7	2.8	14.3	13.8	-0.5
12	12.2	13.6	1.4	20	20.6	0.6	11.4	14.5	3.1	12	12.2	0.2

*** COLUMN STATISTICS ***

		N	Mean	SD	CV%	
1.	%LS G	1W+T	12	18.8742	4.0701	21.56
2.	%LS G	5W+T	12	20.5208	3.9908	19.45
3.	Diff		12	1.6467	0.5558	33.75
4.	%WS G	1W+T	12	15.6775	3.7918	24.19
5.	%WS G	5W+T	12	15.9717	4.2101	26.36
6.	Diff		12	0.2942	0.6480	220.27
7.	%LS F	1W+T	12	13.3475	2.9877	22.38
8.	%LS F	5W+T	12	16.4258	3.0790	18.74
9.	Diff		12	3.0783	0.8422	27.36
10.	%WS F	1W+T	12	13.1983	3.0990	23.48
11.	%WS F	5W+T	12	13.5600	3.2004	23.60
12.	Diff		12	0.3617	0.8764	242.32

FACTORY VARIATIONS CASE STUDY : MILL No 2
 QUALITY :- INTERLOCK Ne 1-38 (Combed) # 1/422
 MEASURED SHRINKAGE IN GREY & FINISHED FABRIC
 AFTER 1 WASH+TUMBLE and 5 WASH+TUMBLE CYCLES

Sample No	%LS G 1W+T	%LS G 5W+T	Diff	%WS G 1W+T	%WS G 5W+T	Diff	%LS F 1W+T	%LS F 5W+T	Diff	%WS F 1W+T	%WS F 5W+T	Diff
1	19.05	20.56	1.51	21.79	23.09	1.3	12.5	16.64	4.14	13.72	13.71	-0.009
2	27.97	29.17	1.2	18.16	18.6	0.44	14.28	17.14	2.86	16.43	16.69	0.26
3	19.01	21.26	2.25	17.38	18.91	1.53	18.89	22.6	3.71	11.67	12.74	1.07
4	19.63	20.6	0.97	16.31	16.69	0.38	14.44	16.9	2.46	13.55	13.69	0.14
5	26.21	27.72	1.51	15.83	16.55	0.72	10.1	13.41	3.31	17.49	18.45	0.96
6	25.24	27.04	1.8	17.32	18.23	0.91	11.72	13.92	2.2	12.87	13.31	0.44
7	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	12.83	16.8	3.97	14.23	14.96	0.73

*** COLUMN STATISTICS ***

	N	Mean	SD	CV%
1. %LS G 1W+T	6	22.8517	4.0687	17.80
2. %LS G 5W+T	6	24.3917	3.9947	16.38
3. Diff	6	1.5400	0.4503	29.24
4. %WS G 1W+T	6	17.7983	2.1240	11.93
5. %WS G 5W+T	6	18.6783	2.3752	12.72
6. Diff	6	0.8800	0.4624	52.54
7. %LS F 1W+T	7	13.5371	2.7902	20.61
8. %LS F 5W+T	7	16.7729	2.9881	17.92
9. Diff	7	3.2357	0.7531	23.27
10. %WS F 1W+T	7	14.2800	2.0238	14.17
11. %WS F 5W+T	7	14.7929	2.0738	14.02
12. Diff	7	0.5129	0.4162	81.15

FACTORY VARIATIONS CASE STUDY : MILL No 2

QUALITY :- INTERLOCK Ne 1-38 (Carded) # 1/600

QUALITY :- INTERLOCK Ne 1-38 (Combed) # 1/422

MEASURED SHRINKAGE IN GREY & FINISHED FABRIC

AFTER 1 WASH+TUMBLE and 5 WASH+TUMBLE CYCLES

Sample No	%LS G 1W+T	%LS G 5W+T	Diff	%WS G 1W+T	%WS G 5W+T	Diff	%LS F 1W+T	%LS F 5W+T	Diff	%WS F 1W+T	%WS F 5W+T	Diff
Interlock :- Quality #1/600 Ne 1-38 Carded												
1	16.19	18.33	2.14	19.41	20.18	0.77	11.55	15.49	3.94	13.74	12.97	-0.77
2	24.35	25.34	0.99	13.24	13.59	0.35	12.29	15.03	2.74	16.61	16.82	0.21
3	18.6	20.68	2.08	11.13	11.09	-0.040	10.45	15.36	4.91	15.36	15.97	0.61
4	17	18.41	1.41	10.93	10.24	-0.69	17.38	19.67	2.29	13.43	13.55	0.12
5	23.05	24.49	1.44	18.2	18.12	-0.08	14.05	16.97	2.92	9.31	10.48	1.17
6	21.63	22.26	0.63	19.49	20.11	0.62	10.15	12.09	1.94	12.96	12.05	-0.91
7	17.4	19.5	2.1	9.46	8.98	-0.48	9.04	11.18	2.14	15.24	15.54	0.3
8	11.87	13.68	1.81	17.77	18.45	0.68	18.16	21.22	3.06	5.63	6.04	0.41
9	21.9	24.3	2.4	17.2	18.9	1.7	14	17.2	3.2	13.5	15.5	2
10	21.9	24.1	2.2	13.4	13.7	0.3	15.8	19.7	3.9	16.3	17.8	1.5
11	20.4	21.56	1.16	17.9	17.7	-0.2	15.9	18.7	2.8	14.3	13.8	-0.5
12	12.2	13.6	1.4	20	20.6	0.6	11.4	14.5	3.1	12	12.2	0.2
Interlock :- Quality #1/422 Ne 1-38 Combed												
13	19.05	20.56	1.51	21.79	23.09	1.3	12.5	16.64	4.14	13.72	13.71	-0.009
14	27.97	29.17	1.2	18.16	18.6	0.44	14.28	17.14	2.86	16.43	16.69	0.26
15	19.01	21.26	2.25	17.38	18.91	1.53	18.89	22.6	3.71	11.67	12.74	1.07
16	19.63	20.6	0.97	16.31	16.69	0.38	14.44	16.9	2.46	13.55	13.69	0.14
17	26.21	27.72	1.51	15.83	16.55	0.72	10.1	13.41	3.31	17.49	18.45	0.96
18	25.24	27.04	1.8	17.32	18.23	0.91	11.72	13.92	2.2	12.97	13.31	0.44
19	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	12.83	16.8	3.97	14.23	14.96	0.73

*** COLUMN STATISTICS ***

	N	Mean	SD	CV%
1. %LS G 1W+T	18	20.2000	4.3944	21.75
2. %LS G 5W+T	18	21.8111	4.3040	19.73
3. Diff	18	1.6111	0.5121	31.78
4. %WS G 1W+T	18	16.3844	3.4188	20.87
5. %WS G 5W+T	18	16.8739	3.8539	22.84
6. Diff	18	0.4894	0.6444	131.67
7. %LS F 1W+T	19	13.4174	2.8388	21.16
8. %LS F 5W+T	19	16.5537	2.9664	17.92
9. Diff	19	3.1363	0.7929	25.28
10. %WS F 1W+T	19	13.5968	2.7426	20.17
11. %WS F 5W+T	19	14.0142	2.8401	20.27
12. Diff	19	0.4174	0.7299	174.88

FACTORY VARIATIONS CASE STUDY : MILL No 2
 QUALITY :- 1x1 RIB Ne 1-30 (Combed) # 7/514
 MEASURED SHRINKAGE IN GREY & FINISHED FABRIC
 AFTER 1 WASH+TUMBLE and 5 WASH+TUMBLE CYCLES

Sample No	%LS G		Diff	%WS G		Diff	%LS F		Diff	%WS F		Diff
	1W+T	5W+T		1W+T	5W+T		1W+T	5W+T		1W+T	5W+T	
1	8.5	9.72	1.22	24.34	26.64	2.3	9.64	11.9	2.26	10.95	10.23	-0.72
2	23.67	24.7	1.03	19.82	20.51	0.69	9.43	11.38	1.95	10.37	9.69	-0.68
3	13.4	15.08	1.68	22.37	23.28	0.91	9.93	13.09	3.16	9.81	9.81	0
4	13.02	14.03	1.01	26.3	27	0.7	7.43	9.77	2.34	8.64	9.38	0.74
5	14.1	13.92	-0.18	11.72	13.31	1.59	11	12.48	1.48	7.05	6.59	-0.46
6	18.83	20.7	1.87	20.25	21.39	1.14	10.56	11.85	1.29	9.06	8.01	-1.05
7	15.69	17.27	1.58	19.15	20.77	1.62	11.56	14.48	2.92	11.8	11.73	-0.070
8	18.21	20.22	2.01	11.93	14.07	2.14	9.76	11.64	1.88	8.03	9.21	1.18
9	17.4	19.3	1.9	19.5	20.4	0.9	8.6	11.2	2.6	10.7	11.3	0.6
10	16.6	18.2	1.6	16.7	18.1	1.4	6.3	8.5	2.2	12.2	12.6	0.4
11	15.42	16.22	0.8	18.16	18.37	0.21	8.6	9.3	0.7	8.3	8	-0.3
12	13.6	15.2	1.6	18.9	20.3	1.4	10.3	12.6	2.3	16.1	15.7	-0.4

*** COLUMN STATISTICS ***

	N	Mean	SD	CV%
1. %LS G 1W+T	12	15.7033	3.7499	23.88
2. %LS G 5W+T	12	17.0467	3.9192	22.99
3. Diff	12	1.3433	0.6159	45.85
4. %WS G 1W+T	12	19.0950	4.3122	22.58
5. %WS G 5W+T	12	20.3450	4.1740	20.52
6. Diff	12	1.2500	0.6135	49.08
7. %LS F 1W+T	12	9.4258	1.4958	15.87
8. %LS F 5W+T	12	11.5158	1.6737	14.53
9. Diff	12	2.0900	0.6908	33.05
10. %WS F 1W+T	12	10.2508	2.4179	23.59
11. %WS F 5W+T	12	10.1875	2.4176	23.73
12. Diff	12	-0.0633	0.6716	1060.44

MEASURED VS CALCULATED SHRINKAGEINTERLOCK CARDED 1/600GREY

	LS% MEAS	LS% CALC	MEAN DIFF	WS% MEAS	WS% CALC	MEAN DIFF
\bar{x}	20.52	19.94	-0.58	15.97	15.05	-0.92
σ	3.99	4.30	1.50	4.21	5.14	2.01
% CV	19.45	21.57		26.36	34.18	

FINISHED

	LS% MEAS	LS% CALC	MEAN DIFF	WS% MEAS	WS% CALC	MEAN DIFF
\bar{x}	16.43	15.62	-0.81	13.56	11.75	-1.81
σ	3.08	3.03	1.27	3.20	4.07	2.63
% CV	18.74	19.43	*	23.60	34.63	*

INTERLOCK COMBEDGREY

	LS% MEAS	LS% CALC	MEAN DIFF	WS% MEAS	WS% CALC	MEAN DIFF
\bar{x}	24.39	23.25	-1.15	18.68	17.68	-1.00
σ	3.99	3.68	1.17	2.38	3.74	3.04
% CV	16.38	15.84		12.72	21.13	

FINISHED

	LS% MEAS	LS% CALC	MEAN DIFF	WS% MEAS	WS% CALC	MEAN DIFF
\bar{x}	16.77	15.10	-1.67	14.79	13.22	-1.57
σ	2.99	3.93	1.77	2.07	3.27	1.58
% CV	17.82	26.03	*	14.02	24.73	*

* 95% significant

FACTORY VARIATIONS CASE STUDY :- MILL No 2

QUALITY :- INTERLOCK Ne 1-38 (Carded) # 1/600

SHRINKAGE IN GREY and FINISHED FABRIC

MEASURED Vs CALCULATED from changes in COURSES and WALES

Sample No	%LS G 5W+T	CalcLX fromC	Diff	%WS G 5W+T	CalcWZ fromW	Diff	%LS F 5W+T	CalcLX fromC	Diff	%WS F 5W+T	CalcWZ fromW	Diff
1	18.33	16.500	-1.829	20.18	19.955	-0.224	15.49	11.802	-3.687	12.97	13.380	0.4102
2	25.34	25	-0.34	13.59	13.501	-0.088	15.03	15.778	0.7486	16.82	15.227	-1.592
3	20.68	17.777	-2.902	11.09	4.4444	-6.645	15.36	15.919	0.5592	15.97	10.489	-5.480
4	18.41	18.452	0.0423	10.24	9.2307	-1.009	19.67	18.240	-1.429	13.55	10.688	-2.861
5	24.49	27.139	2.6498	18.12	18.141	0.0215	16.97	16.283	-0.686	10.48	4.5454	-5.934
6	22.26	20.235	-2.024	20.11	18.930	-1.179	12.09	12.658	0.5682	12.05	8.8433	-3.206
7	19.5	19.795	0.2959	8.98	8.3333	-0.646	11.18	10.416	-0.763	15.54	16.553	1.0132
8	13.68	12.745	-0.934	18.45	17.116	-1.333	21.22	19.825	-1.394	6.04	7.8886	1.8486
9	24.3	22.360	-1.939	18.9	17.090	-1.809	17.2	17.344	0.1447	15.5	12.385	-3.114
10	24.1	23.255	-0.844	13.7	14.925	1.2253	19.7	18.325	-1.374	17.8	18.993	1.1931
11	21.56	21.984	0.4244	17.7	18.735	1.0358	18.7	18.181	-0.518	13.8	13.513	-0.286
12	13.6	14.074	0.4740	20.6	20.190	-0.409	14.5	12.636	-1.863	12.2	8.5158	-3.684

*** COLUMN STATISTICS ***

	N	Mean	SD	CV%
1. %LS G 5W+T	12	20.5208	3.9908	19.45
2. CalcLX fromC	12	19.9435	4.3009	21.57
3. Diff	12	-0.5773	1.5029	260.34
4. %WS G 5W+T	12	15.9717	4.2101	26.36
5. CalcWZ fromW	12	15.0496	5.1433	34.18
6. Diff	12	-0.9220	2.0146	218.49
7. %LS F 5W+T	12	16.4258	3.0790	18.74
8. CalcLX fromC	12	15.6178	3.0345	19.43
9. Diff	12	-0.8080	1.2668	156.78
10. %WS F 5W+T	12	13.5600	3.2004	23.60
11. CalcWZ fromW	12	11.7520	4.0703	34.63
12. Diff	12	-1.8080	2.6359	145.79

FACTORY VARIATIONS CASE STUDY :- MILL No 2

QUALITY :- INTERLOCK Ne 1-38 (Combed) # 1/422

SHRINKAGE IN GREY and FINISHED FABRIC

MEASURED Vs CALCULATED from changes in COURSES and WALES

Sample No	%LS G 5W+T	CalcL% fromC	Diff	%WS G 5W+T	CalcW% fromW	Diff	%LS F 5W+T	CalcL% fromC	Diff	%WS F 5W+T	CalcW% fromW	Diff
1	20.56	19.144	-1.415	23.09	23.413	0.3235	16.64	15.536	-1.103	13.71	14.285	0.5757
2	29.17	27.070	-2.099	18.6	19.690	1.0902	17.14	17.250	0.1101	16.69	15.197	-1.492
3	21.26	19.301	-1.958	18.91	12.601	-6.308	22.6	21.290	-1.309	12.74	8.9244	-3.815
4	20.6	21.529	0.9291	16.69	16.339	-0.350	16.9	15.866	-1.033	13.69	11.709	-1.980
5	27.72	25.879	-1.840	16.55	18.485	1.9355	13.41	8.3870	-5.022	18.45	18.805	0.3553
6	27.04	26.543	-0.496	18.23	15.536	-2.693	13.92	13.588	-0.331	13.31	10.538	-2.771
7	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	16.8	13.800	-2.999	14.96	13.103	-1.856

*** COLUMN STATISTICS ***

	N	Mean	SD	CV%
1. %LS G 5W+T	6	24.3917	3.9947	16.38
2. CalcL% fromC	6	23.2449	3.6814	15.84
3. Diff	6	-1.1468	1.1705	102.07
4. %WS G 5W+T	6	18.6783	2.3752	12.72
5. CalcW% fromW	6	17.6777	3.7350	21.13
6. Diff	6	-1.0006	3.0402	303.84
7. %LS F 5W+T	7	16.7729	2.9881	17.82
8. CalcL% fromC	7	15.1027	3.9319	26.03
9. Diff	7	-1.6702	1.7713	106.05
10. %WS F 5W+T	7	14.7929	2.0738	14.02
11. CalcW% fromW	7	13.2235	3.2705	24.73
12. Diff	7	-1.5693	1.5839	100.93

FACTORY VARIATIONS CASE STUDY :- MILL No 2

QUALITY :- INTERLOCK Ne 1-38 (Carded) # 1/600

QUALITY :- INTERLOCK Ne 1-38 (Combed) # 1/422

SHRINKAGE IN GREY and FINISHED FABRIC

MEASURED Vs CALCULATED from changes in COURSES and WALES

Sample No	%LS G 5W+T	CalcLX fromC	Diff	%WS G 5W+T	CalcWZ fromW	Diff	%LS F 5W+T	CalcLX fromC	Diff	%WS F 5W+T	CalcWZ fromW	Diff
Interlock :- Quality #1/600 Ne 1-38 Carded												
1	18.33	16.500	-1.829	20.18	19.955	-0.224	15.49	11.802	-3.687	12.97	13.380	0.4102
2	25.34	25	-0.34	13.59	13.501	-0.088	15.03	15.778	0.7486	16.82	15.227	-1.592
3	20.68	17.777	-2.902	11.09	4.4444	-6.645	15.36	15.919	0.5592	15.97	10.489	-5.480
4	18.41	18.452	0.0423	10.24	9.2307	-1.009	19.67	18.240	-1.429	13.55	10.688	-2.861
5	24.49	27.139	2.6498	18.12	18.141	0.0215	16.97	16.283	-0.686	10.48	4.5454	-5.934
6	22.26	20.235	-2.024	20.11	18.930	-1.179	12.09	12.658	0.5682	12.05	8.8433	-3.206
7	19.5	19.795	0.2959	8.98	8.3333	-0.646	11.18	10.416	-0.763	15.54	16.553	1.0132
8	13.68	12.745	-0.934	18.45	17.116	-1.333	21.22	19.825	-1.394	6.04	7.8886	1.8486
9	24.3	22.360	-1.939	18.9	17.090	-1.809	17.2	17.344	0.1447	15.5	12.385	-3.114
10	24.1	23.255	-0.844	13.7	14.925	1.2253	19.7	18.325	-1.374	17.8	18.993	1.1931
11	21.56	21.984	0.4244	17.7	18.735	1.0358	18.7	18.181	-0.518	13.8	13.513	-0.286
12	13.6	14.074	0.4740	20.6	20.190	-0.409	14.5	12.636	-1.863	12.2	8.5158	-3.684
Interlock :- Quality #1/422 Ne 1-38 Combed												
13	20.56	19.144	-1.415	23.09	23.413	0.3235	16.64	15.536	-1.103	13.71	14.285	0.5757
14	29.17	27.070	-2.099	18.6	19.690	1.0902	17.14	17.250	0.1101	16.69	15.197	-1.492
15	21.26	19.301	-1.958	18.91	12.601	-6.308	22.6	21.290	-1.309	12.74	8.9244	-3.815
16	20.6	21.529	0.9291	16.69	16.339	-0.350	16.9	15.866	-1.033	13.69	11.709	-1.980
17	27.72	25.879	-1.840	16.55	18.485	1.9355	13.41	8.3870	-5.022	18.45	18.805	0.3553
18	27.04	26.543	-0.496	18.23	15.536	-2.693	13.92	13.588	-0.331	13.31	10.538	-2.771
19	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	16.8	13.800	-2.999	14.96	13.103	-1.856

*** COLUMN STATISTICS ***

	N	Mean	SD	CV%
1. %LS G 5W+T	18	21.8111	4.3040	19.73
2. CalcLX fromC	18	21.0440	4.3034	20.45
3. Diff	18	-0.7671	1.3932	181.61
4. %WS G 5W+T	18	16.8739	3.8539	22.84
5. CalcWZ fromW	18	15.9257	4.7797	30.01
6. Diff	18	-0.9482	2.3122	243.84
7. %LS F 5W+T	19	16.5537	2.9664	17.92
8. CalcLX fromC	19	15.4280	3.2933	21.35
9. Diff	19	-1.1257	1.4863	132.04
10. %WS F 5W+T	19	14.0142	2.8401	20.27
11. CalcWZ fromW	19	12.2942	3.7711	30.67
12. Diff	19	-1.7201	2.2575	131.25

FACTORY VARIATIONS CASE STUDY :- MILL No 2

QUALITY :- 1x1 RIB Ne 1-30 (Combed) # 7/514

SHRINKAGE IN GREY and FINISHED FABRIC

MEASURED Vs CALCULATED from changes in COURSES and WALES

Sample No	%LS G 5W+T	CalcLX fromC	Diff	%WS G 5W+T	CalcWZ fromW	Diff	%LS F 5W+T	CalcLX fromC	Diff	%WS F 5W+T	CalcWZ fromW	Diff
1	9.72	7.7175	-2.002	26.64	27.927	1.2871	11.9	11.175	-0.724	10.23	9.9415	-0.288
2	24.7	23.767	-0.932	20.51	22.929	2.4195	11.30	11.209	-0.170	9.69	10.619	0.9297
3	15.00	10.517	-4.562	23.28	21.840	-1.431	13.09	11.153	-1.936	9.81	10.584	0.7749
4	14.03	16.091	2.0619	27	24.175	-2.824	9.77	6.9343	-2.835	9.30	6.7039	-2.676
5	13.92	15.563	1.6435	13.31	21.676	8.3663	12.40	12.724	0.2440	6.59	3.1073	-3.482
6	20.7	18.928	-1.771	21.39	22.413	1.0237	11.85	11.596	-0.253	8.01	6.6282	-1.381
7	17.27	15.881	-1.388	20.77	21.067	0.2974	14.40	12.546	-1.933	11.73	11.830	0.1009
8	20.22	20.817	0.5978	14.07	13.432	-0.637	11.64	9.3457	-2.294	9.21	8.9285	-0.281
9	19.3	18.132	-1.167	20.4	21.142	0.7428	11.2	9.4061	-1.713	11.3	11.560	0.2606
10	18.2	17.971	-0.228	18.1	16.574	-1.525	8.5	8.1395	-0.360	12.6	12.537	-0.062
11	16.22	15.619	-0.600	18.37	22.157	3.7874	9.3	9.5419	0.2419	8	9.1185	1.1185
12	15.2	16.117	0.9172	20.3	15.517	-4.782	12.6	11.867	-0.732	15.7	13.953	-1.746

*** COLUMN STATISTICS ***

	N	Mean	SD	CV%
1. %LS G 5W+T	12	17.0467	3.9192	22.99
2. CalcLX fromC	12	16.4272	4.2362	25.79
3. Diff	12	-0.6194	1.8112	292.40
4. %WS G 5W+T	12	20.3450	4.1740	20.52
5. CalcWZ fromW	12	20.9053	3.9673	18.98
6. Diff	12	0.5603	3.3764	602.60
7. %LS F 5W+T	12	11.5158	1.6737	14.53
8. CalcLX fromC	12	10.4768	1.7876	17.06
9. Diff	12	-1.0391	1.0522	101.27
10. %WS F 5W+T	12	10.1875	2.4176	23.73
11. CalcWZ fromW	12	9.6263	2.9936	31.10
12. Diff	12	-0.5612	1.4595	260.05

FACTORY VARIATIONS CASE STUDY : MILL No 2
 QUALITY :- INTERLOCK Ne 1-38 (Carded) # 1/600
 QUALITY :- INTERLOCK Ne 1-38 (Combed) # 1/422
 CALCULATION OF FABRIC WIDTH TUBULAR : GREY & FINISHED
 FROM MEASURED WALES/cm & MACHINE NEEDLES

Sample No	Ndles inM/c	W/cm GBW	Width GBW	CalcWd GBW	Actual Diff	% Diff	Ndles inM/c	W/cm FBW	Width FBW	CalcWd FBW	Actual Diff	% Diff
Interlock :- Quality # 1/600 Ne 1-38 Carded												
1	1896	12.033	77.9	78.781	0.8811	1.1311	1488	12.3	61.02	60.487	-0.532	-0.872
2	1488	12.6	58.98	59.047	0.0676	0.1146	1680	12.433	68.97	67.560	-1.409	-2.043
3	1896	14.333	69.63	66.139	-3.490	-5.012	1236	12.8	49.17	48.281	-0.888	-1.807
4	1260	13.766	45.67	45.762	0.0927	0.2030	1488	12.533	59.4	59.361	-0.038	-0.064
5	984	12.333	39.17	39.891	0.7218	1.8429	1680	13.3	66.38	62.157	-3.222	-4.854
6	1488	12.133	61.05	61.318	0.2686	0.4401	1344	12.61	55.98	53.291	-2.688	-4.803
7	1260	13.933	45	45.215	0.2153	0.4784	n.a.	12.266	n.a.	n.a.	n.a.	n.a.
8	1680	11.88	70.27	70.707	0.4370	0.6219	1236	13.233	46.67	46.700	0.0302	0.0648
9	1488	11.966	63.7	62.172	-1.527	-2.397	1680	12.733	68.3	65.968	-2.331	-3.413
10	1368	13.3	53.1	51.428	-1.671	-3.147	984	11.8	41.2	41.694	0.4949	1.2012
11	984	12	40.3	41	0.7	1.7369	1896	12.8	74.3	74.062	-0.237	-0.319
12	1872	11.2	83.9	83.571	-0.328	-0.391	1236	12.533	58.8	49.308	-1.491	-2.936
Interlock :- Quality # 1/422 Ne 1-38 Combed												
1	1872	11.666	79.67	80.228	0.5585	0.7011	n.a.	12.8	n.a.	n.a.	n.a.	n.a.
2	1896	12.1	76.53	78.347	1.8171	2.3743	984	12.89	38.85	38.169	-0.680	-1.752
3	984	12.6	39.83	39.047	-0.782	-1.964	984	13.266	37.07	37.065	0.0154	0.0416
4	984	12.8	38.53	38.437	-0.092	-0.240	1680	12.566	67.1	66.843	-0.256	-0.382
5	1896	12.2	75.38	77.704	2.3249	3.0842	n.a.	12.233	n.a.	n.a.	n.a.	n.a.
6	984	12.866	38.95	38.239	-0.711	-1.827	1680	12.733	67.6	65.968	-1.631	-2.413
7	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	12.6	n.a.	n.a.	n.a.	n.a.

*** COLUMNS STATISTICS ***

			N	Mean	SD	CV%
1.	Ndles	inM/c	18	1460.0000	373.5338	25.58
2.	W/cm	GBW	18	12.5396	0.8335	6.65
3.	Width	GBW	18	58.7533	16.4234	27.95
4.	CalcWd	GBW	18	58.7245	16.6903	28.42
5.	Actual	Diff	18	-0.0288	1.3209	4578.74
6.	%	Diff	18	-0.1251	2.0596	1645.98
7.	Ndles	inM/c	15	1418.4000	298.9765	21.08
8.	W/cm	FBW	19	12.6544	0.3751	2.96
9.	Width	FBW	15	56.8540	12.1831	21.43
10.	CalcWd	FBW	15	55.8628	11.7629	21.06
11.	Actual	Diff	15	-0.9912	1.1048	111.46
12.	%	Diff	15	-1.6237	1.8159	111.84

FACTORY VARIATIONS CASE STUDY : MILL No 2
 QUALITY :- 1x1 RIB Ne 1-30 (Combed) # 7/514
 CALCULATION OF FABRIC WIDTH TUBULAR ; GREY & FINISHED
 FROM MEASURED WALES/cm & MACHINE NEEDLES

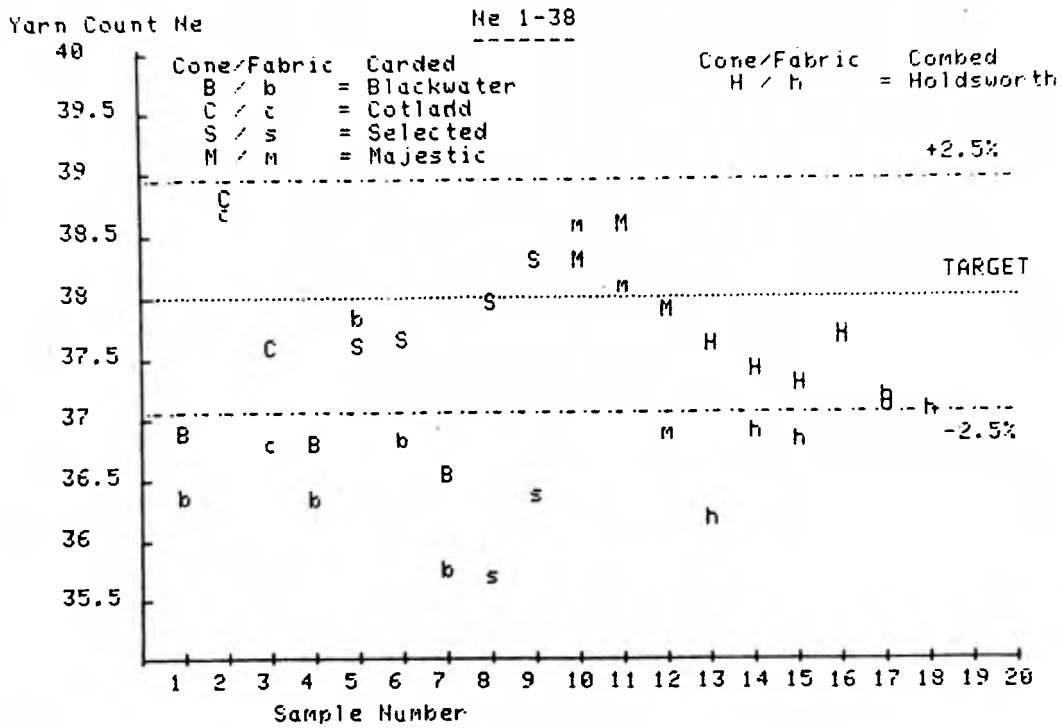
Sample No	Ndles inM/c	W/cm GBW	Width GBW	CalcWd GBW	Actual Diff	% Diff	Ndles inM/c	W/cm FBW	Width FBW	CalcWd FBW	Actual Diff	% Diff
1	792	8.5766	45.02	46.171	1.1517	2.5583	792	10.266	38.37	38.571	0.2014	0.5249
2	912	9.12	48.8	50	1.2	2.4590	792	10.576	36.85	37.440	0.5909	1.6035
3	792	9.3	42.6	42.580	-0.019	-0.045	972	10.7	45.57	45.420	-0.149	-0.327
4	792	9.2	42.38	43.043	0.6634	1.5655	912	11.133	41.45	40.958	-0.491	-1.186
5	1320	9.0333	74.2	73.062	-1.137	-1.532	692	11.433	31.33	30.262	-1.067	-3.407
6	692	9	37.93	38.444	0.5144	1.3562	1320	10.8	61.83	61.111	-0.718	-1.162
7	756	9.3666	43.5	40.355	-3.144	-7.227	912	10.433	43.03	43.706	0.6760	1.5711
8	n.a.	9.6666	35.67	n.a.	n.a.	n.a.	792	10.2	38.7	38.823	0.1235	0.3191
9	692	9.2	39	37.608	-1.391	-3.567	792	10.2	37.5	38.823	1.3235	3.5294
10	876	10.0666	44.7	43.509	-1.190	-2.662	792	9.7666	40.1	40.546	0.4460	1.1124
11	792	8.9	42.1	44.494	2.3943	5.6873	792	9.9666	39.6	39.732	0.1324	0.3344
12	792	9.8	41.8	40.408	-1.391	-3.329	660	9.8666	32.7	33.445	0.7459	2.2811

*** COLUMNS STATISTICS ***

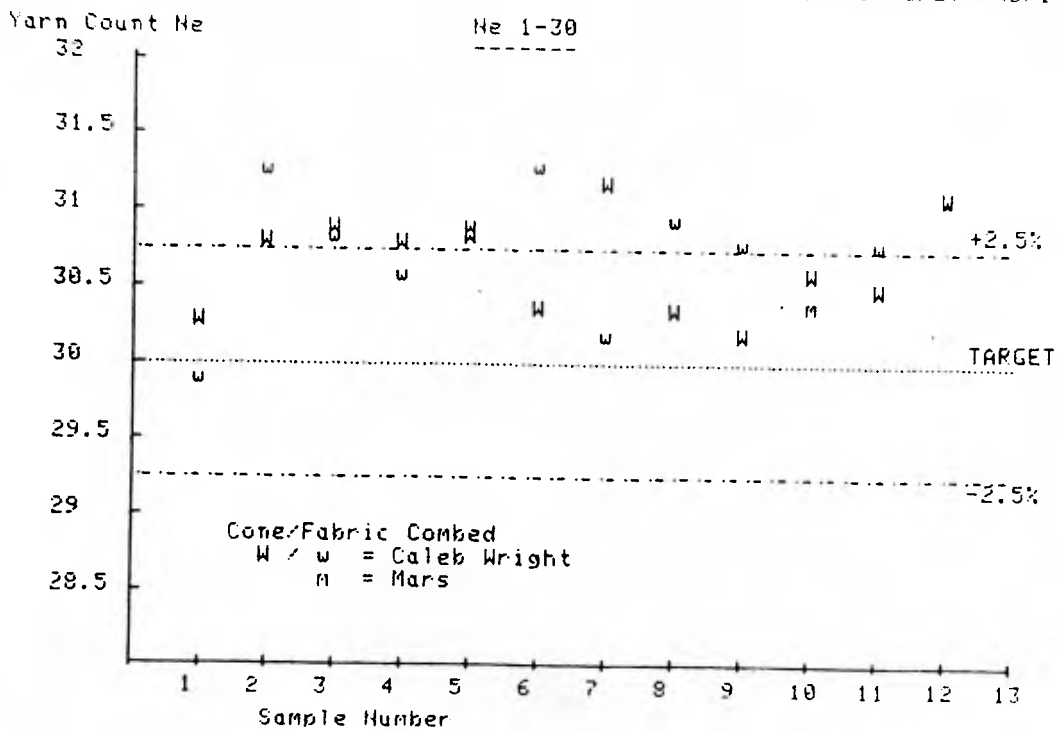
			N	Mean	SD	CV%	Max	Min
1.	Ndles	inM/c	11	837.091	172.966	20.66	1320.000	692.000
2.	W/cm	GBW	12	9.269	0.411	4.44	10.067	8.577
3.	Width	GBW	12	44.808	9.878	22.04	74.200	35.670
4.	CalcWd	GBW	11	45.425	9.820	21.62	73.063	37.609
5.	Actual	Diff	11	-0.214	1.587	-742.68	2.394	-3.144
6.	%	Diff	11	-0.431	3.643	-845.51	5.687	-7.228
7.	Ndles	inM/c	12	851.667	171.805	20.17	1320.000	660.000
8.	W/cm	FBW	12	10.445	0.508	4.86	11.433	9.767
9.	Width	FBW	12	40.586	7.769	19.14	61.830	31.330
10.	CalcWd	FBW	12	40.737	7.584	18.62	61.111	30.262
11.	Actual	Diff	12	0.151	0.676	447.99	1.324	-1.068
12.	%	Diff	12	0.433	1.826	422.00	3.529	-3.408

FIGURE 1

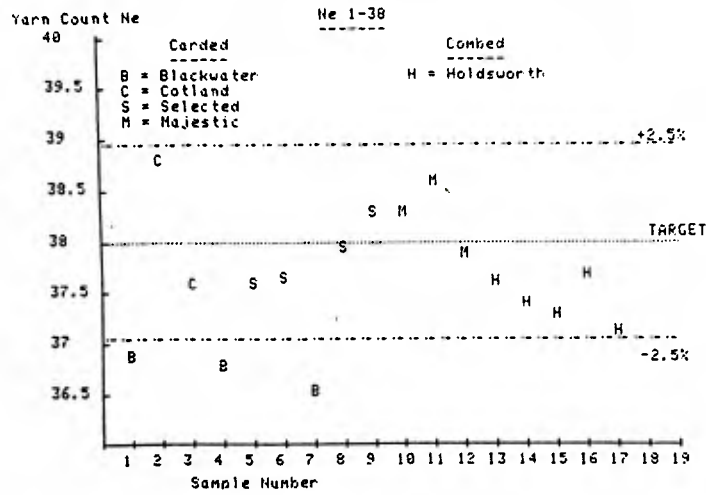
MILL No 2 :- VARIATION IN Ne MEASURED ON CONE & IN GREY FABRIC



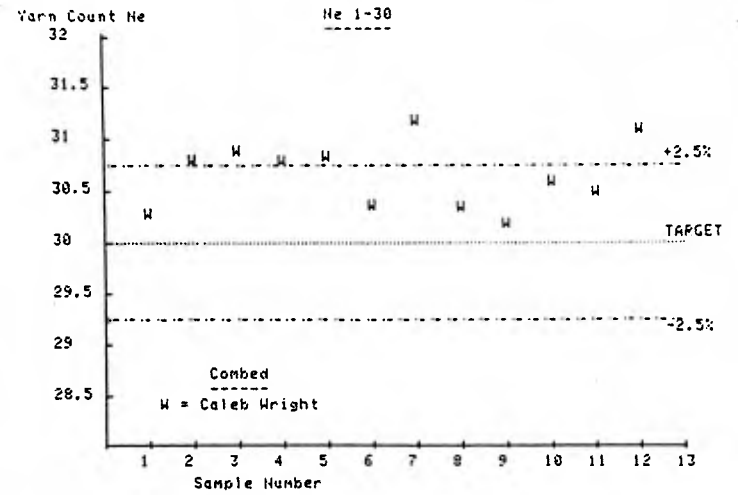
MILL No 2 :- VARIATION IN Ne MEASURED ON CONE & IN GREY FABRIC



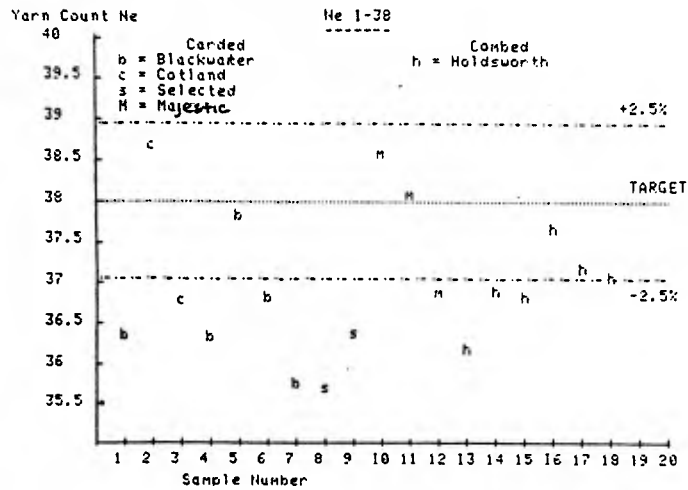
MILL No 2 :- VARIATION IN Ne MEASURED ON CONE BY SUPPLIER



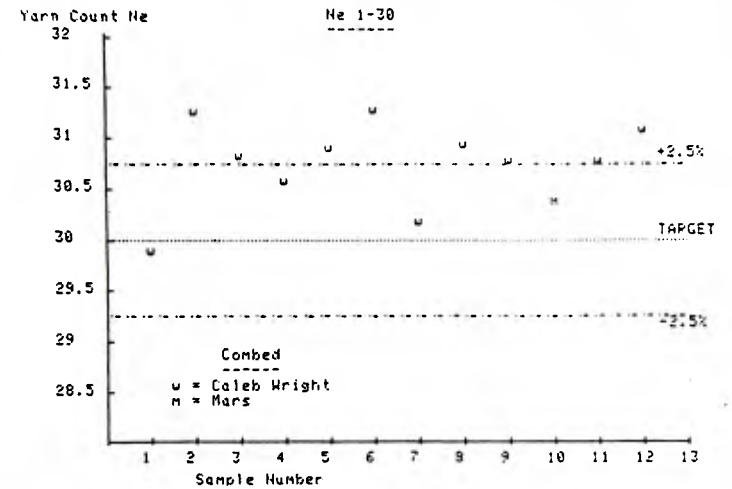
MILL No 2 :- VARIATION IN Ne MEASURED ON CONE



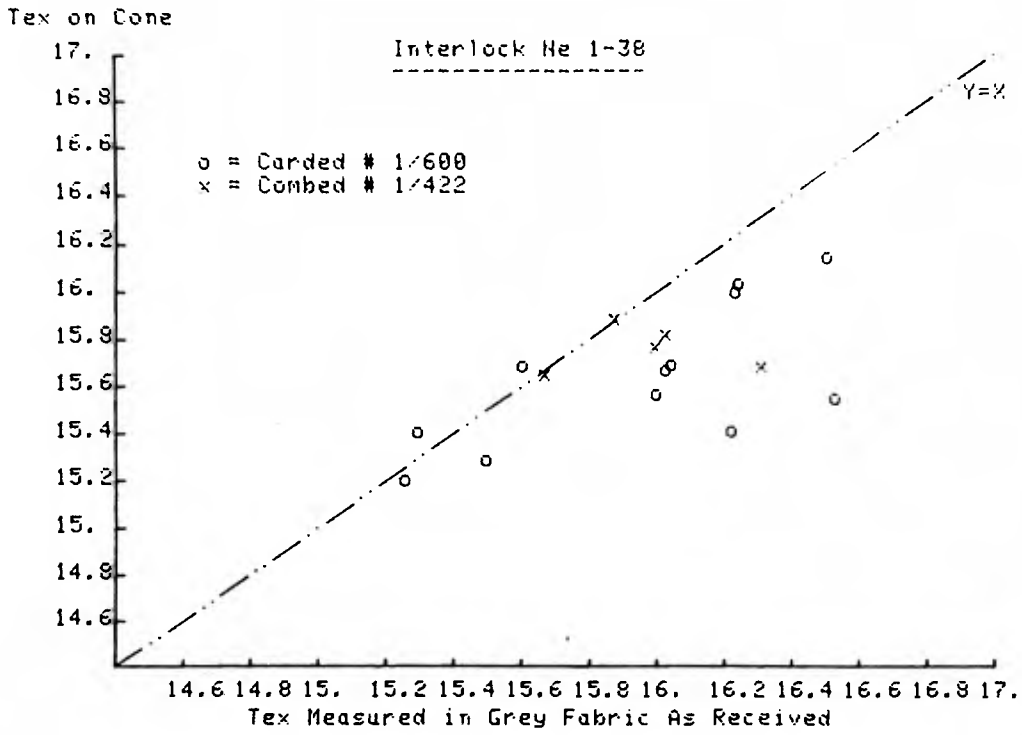
MILL No 2 :- VARIATION IN Ne MEASURED IN GREY FABRIC BY SUPPLIER



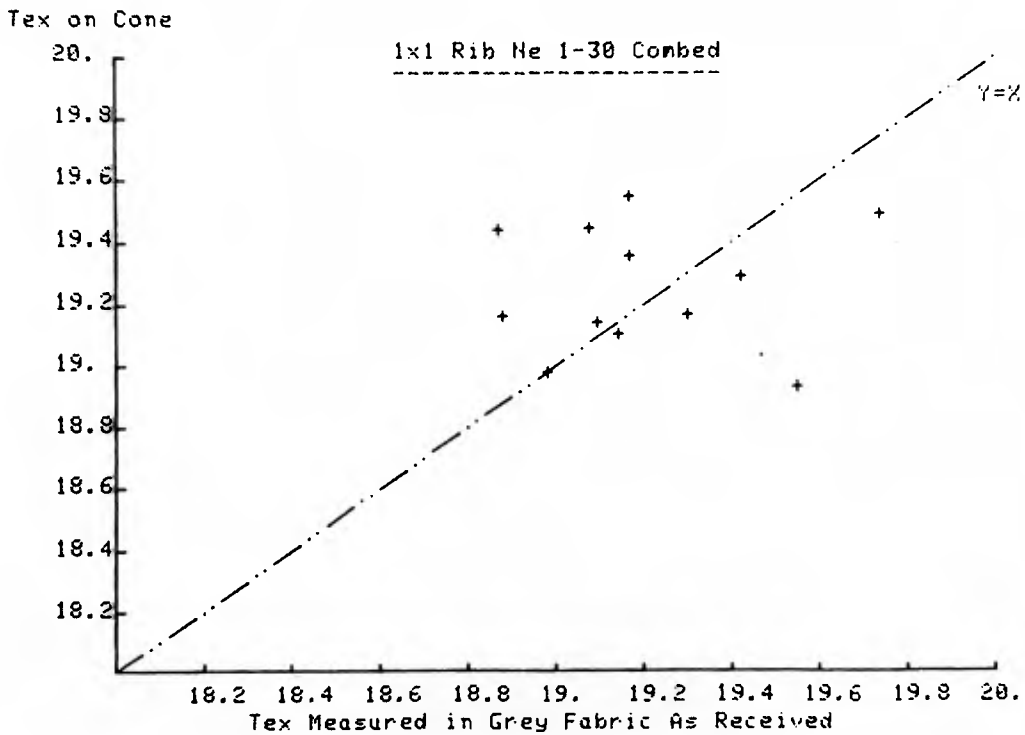
MILL No 2 :- VARIATION IN Ne MEASURED IN GREY FABRIC



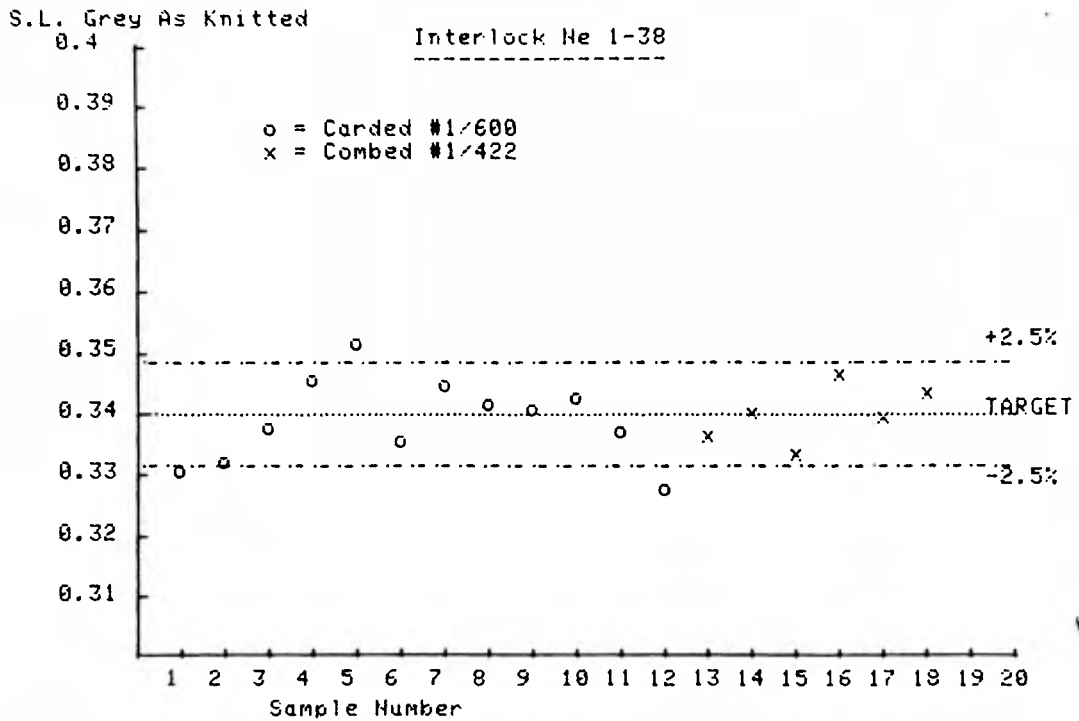
MILL No 2 :- TEX MEASURED IN GREY FABRIC Vs ON CONE



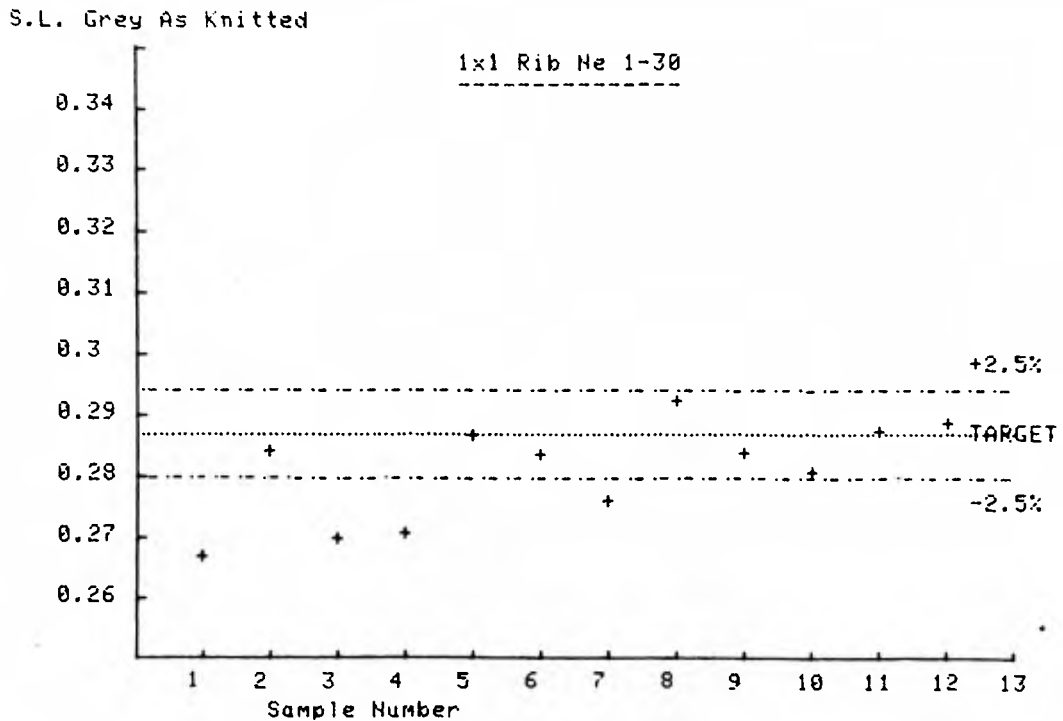
MILL No 2 :- TEX MEASURED IN GREY FABRIC Vs ON CONE



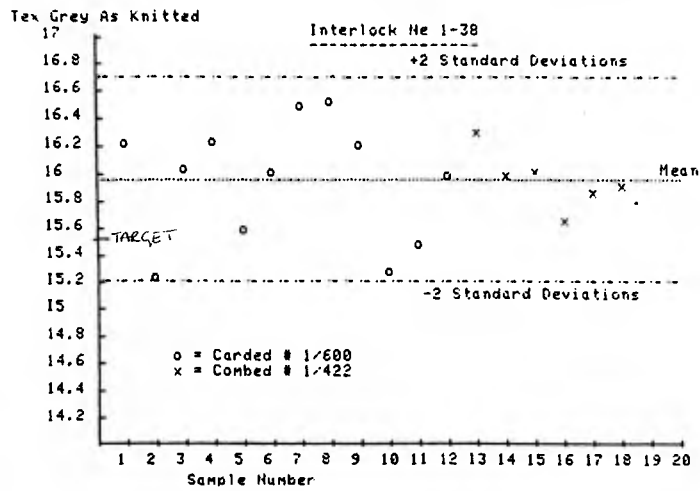
MILL No 2 :- VARIATION IN STITCH LENGTH GREY AS KNITTED



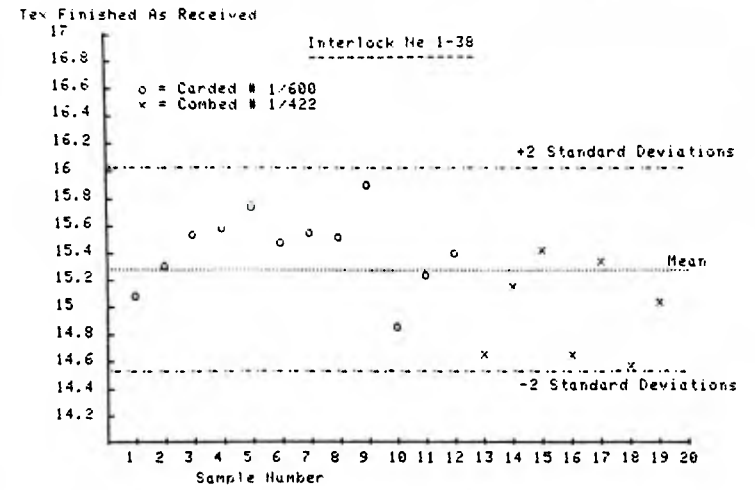
MILL No 2 :- VARIATION IN STITCH LENGTH GREY AS KNITTED



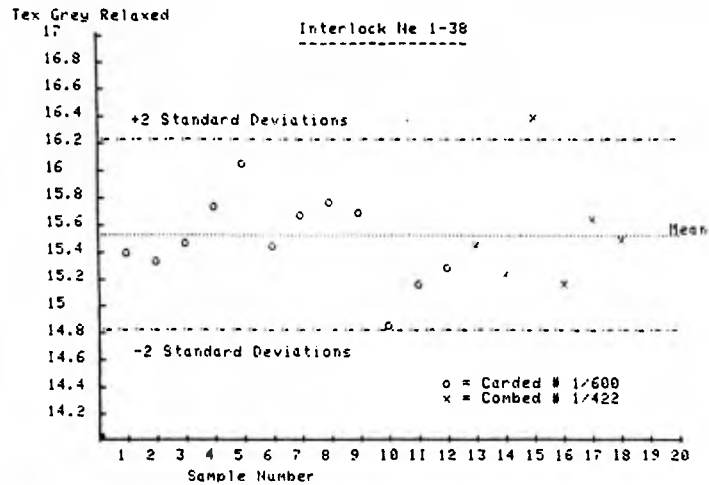
MILL No 2 :- VARIATION IN TEX IN GREY FABRIC AS KNITTED



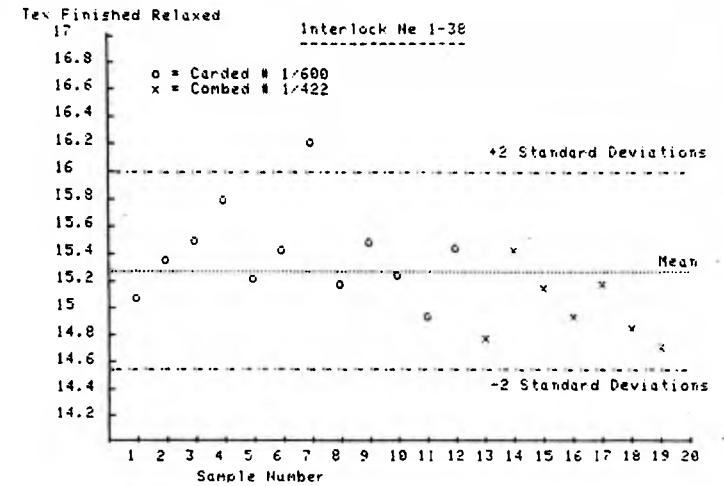
MILL No 2 :- VARIATION IN TEX IN FINISHED FABRIC AS RECEIVED

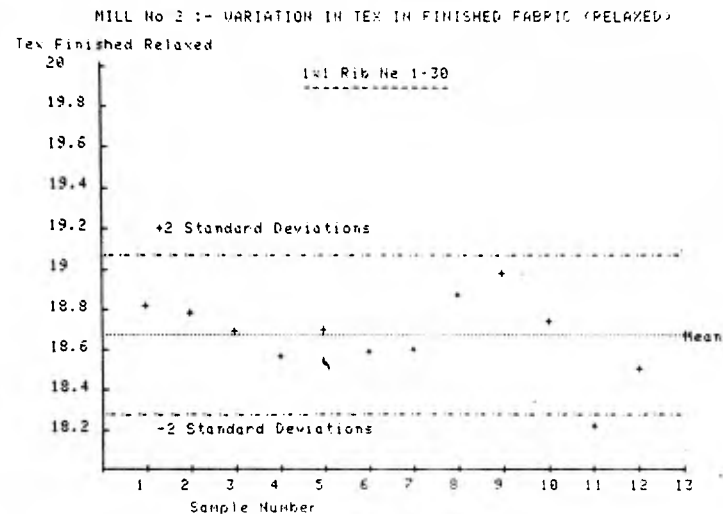
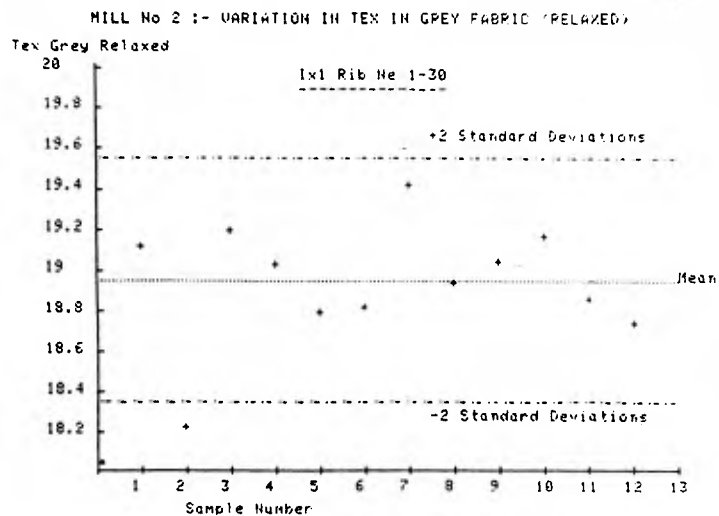
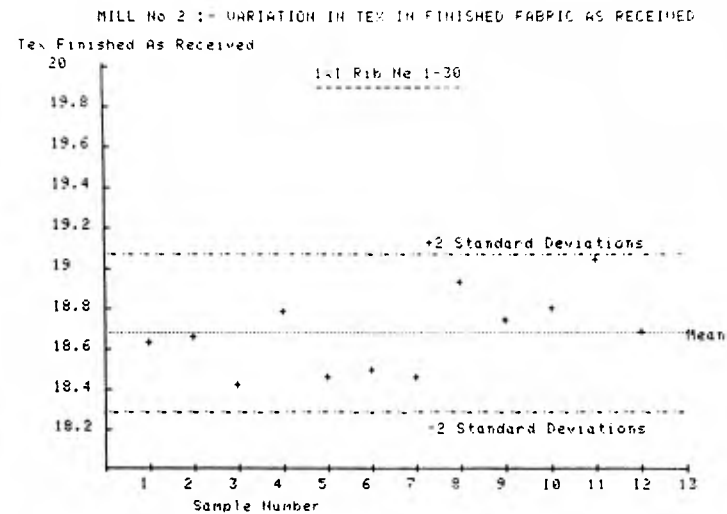
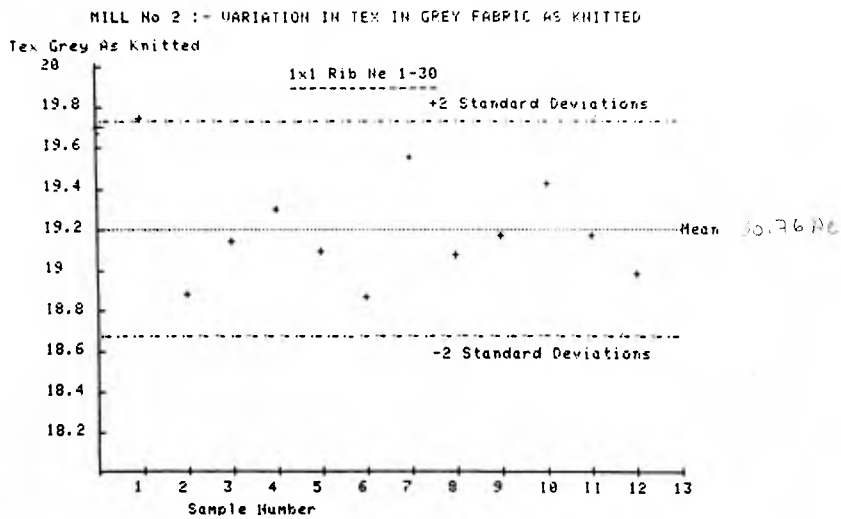


MILL No 2 :- VARIATION IN TEX IN GREY FABRIC (RELAXED)

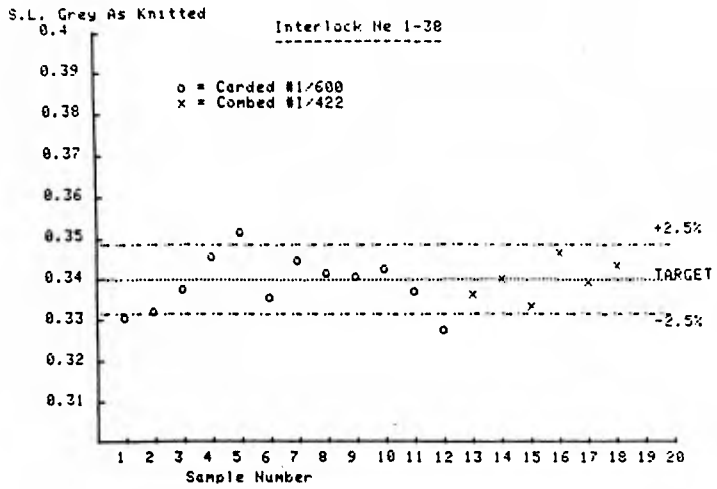


MILL No 2 :- VARIATION IN TEX IN FINISHED FABRIC (RELAXED)

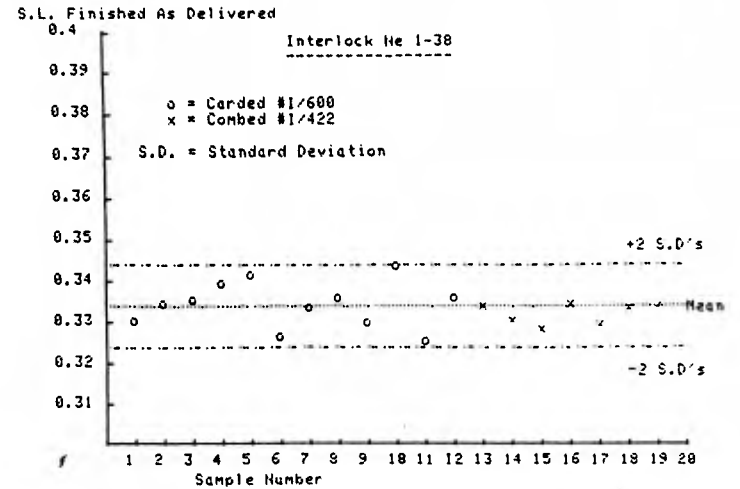




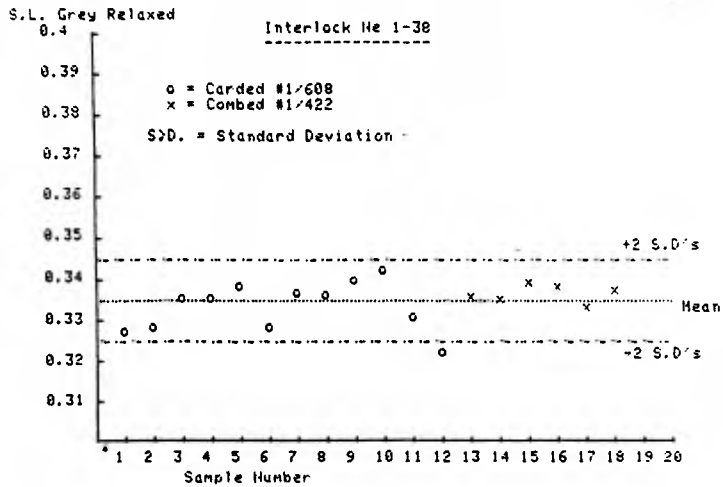
MILL No 2 :- VARIATION IN STITCH LENGTH GREY AS KNITTED



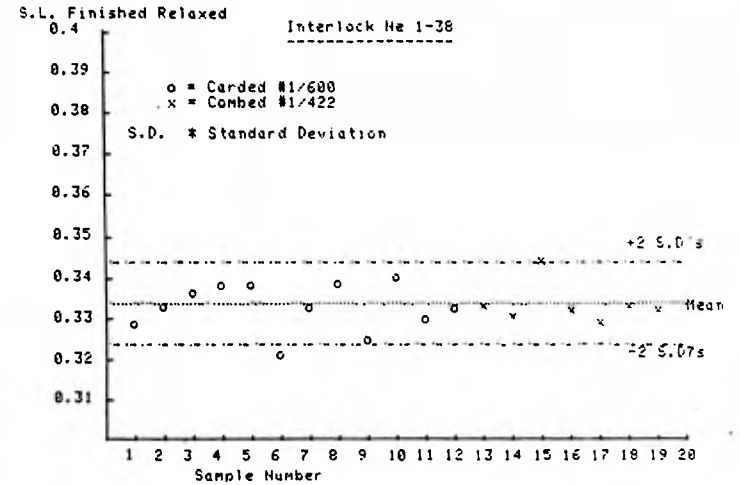
MILL No 2 :- VARIATION IN STITCH LENGTH FINISHED AS DELIVERED



MILL No 2 :- VARIATION IN STITCH LENGTH GREY RELAXED

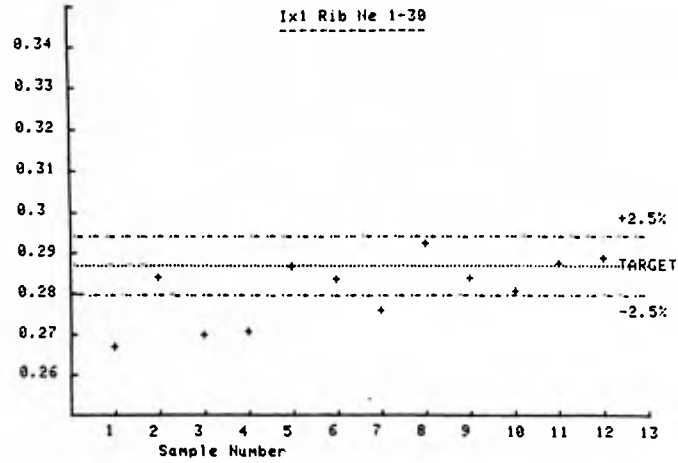


MILL No 2 :- VARIATION IN STITCH LENGTH FINISHED RELAXED



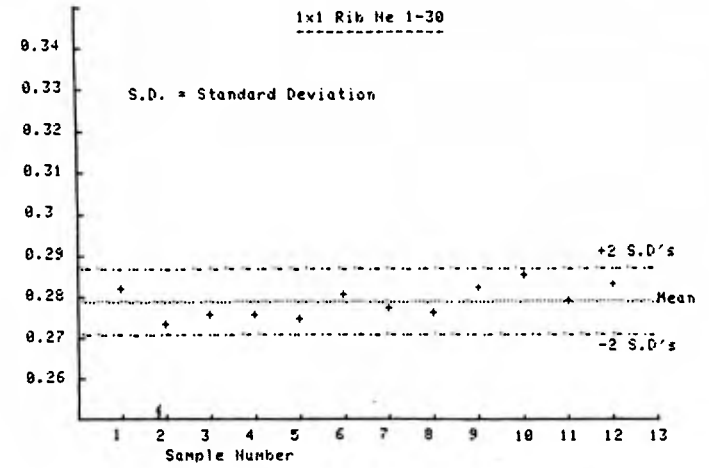
MILL No 2 :- VARIATION IN STITCH LENGTH GREY AS KNITTED

S.L. Grey As Knitted



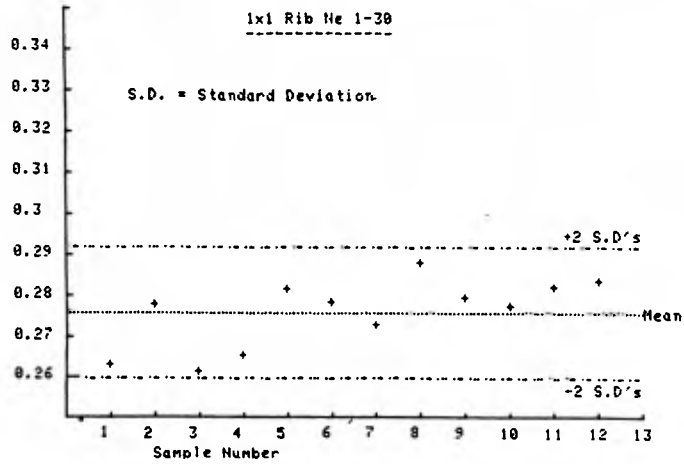
MILL No 2 :- VARIATION IN STITCH LENGTH FINISHED AS DELIVERED

S.L. Finished As Delivered



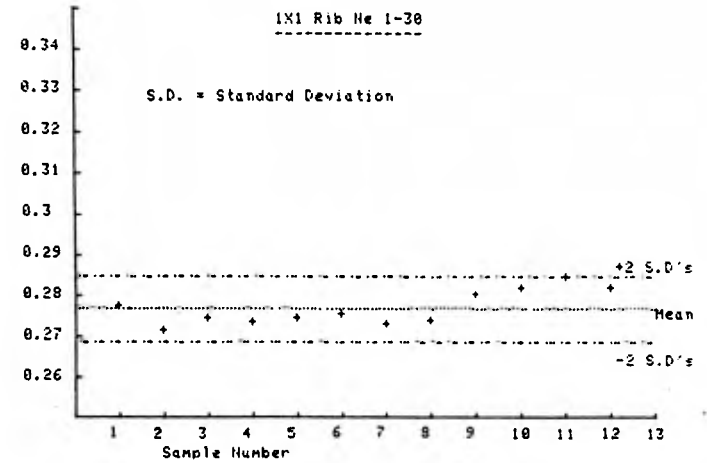
MILL No 2 :- VARIATION IN STITCH LENGTH GREY RELAXED

S.L. Grey Relaxed

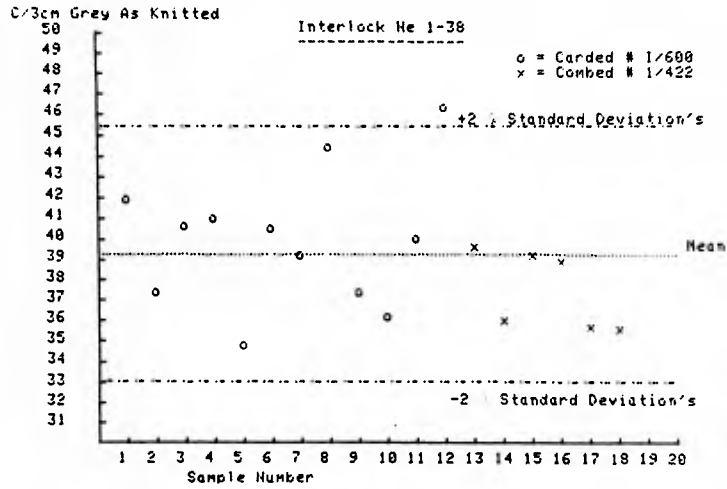


MILL No 2 :- VARIATION IN STITCH LENGTH FINISHED RELAXED

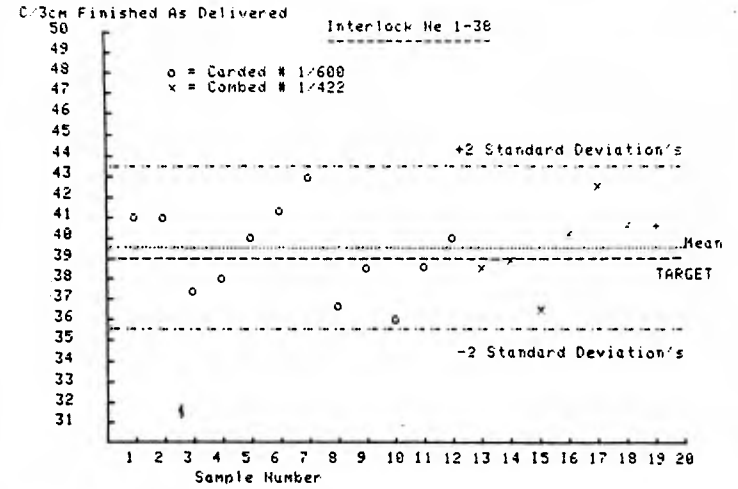
S.L. Finished Relaxed



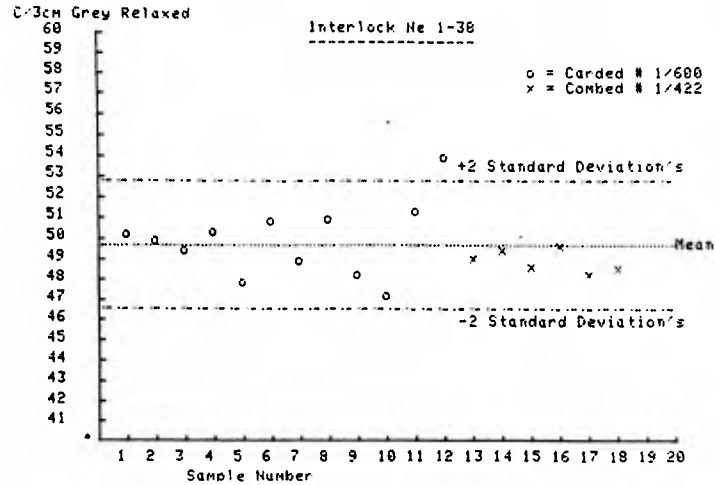
MILL No 2 :- VARIATION IN C/3CM GREY AS KNITTED



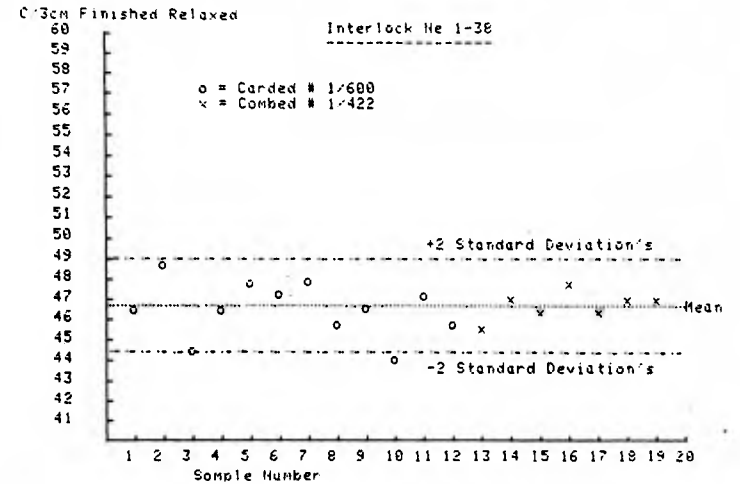
MILL No 2 :- VARIATION IN C/3CM FINISHED AS DELIVERED



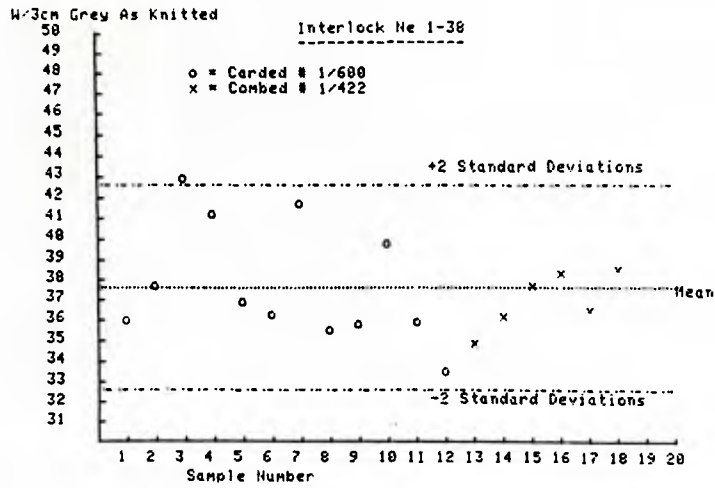
MILL No 2 :- VARIATION IN C/3CM GREY RELAXED



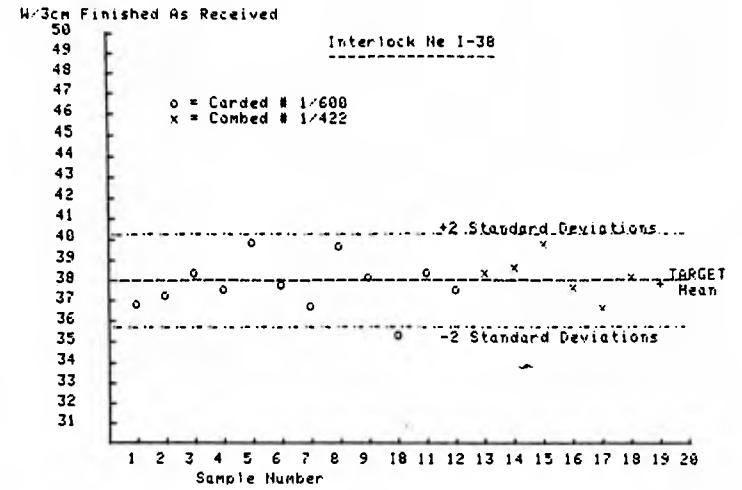
MILL No 2 :- VARIATION IN C/3CM FINISHED RELAXED



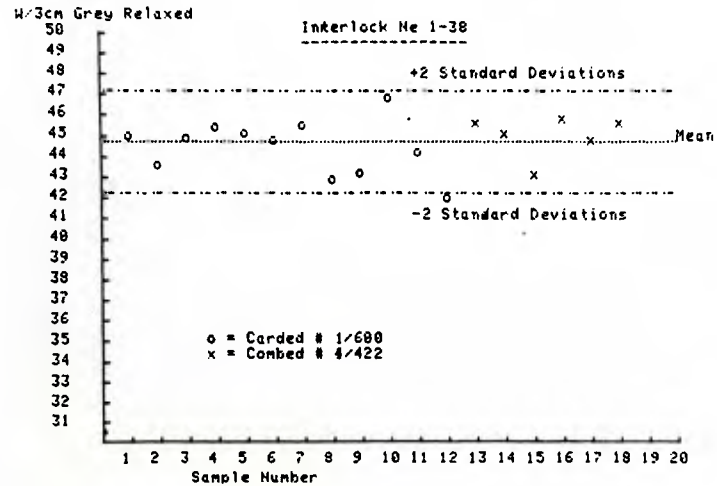
MILL No 2 :- VARIATION IN W/3CM GREY AS KNITTED



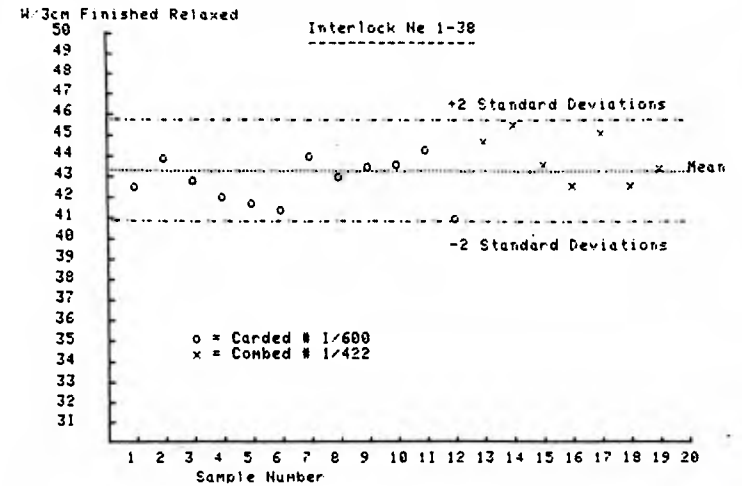
MILL No 2 :- VARIATION IN W/3CM FINISHED AS RECEIVED



MILL No 2 :- VARIATION IN W/3CM GREY RELAXED



MILL No 2 :- VARIATION IN W/3CM FINISHED RELAXED



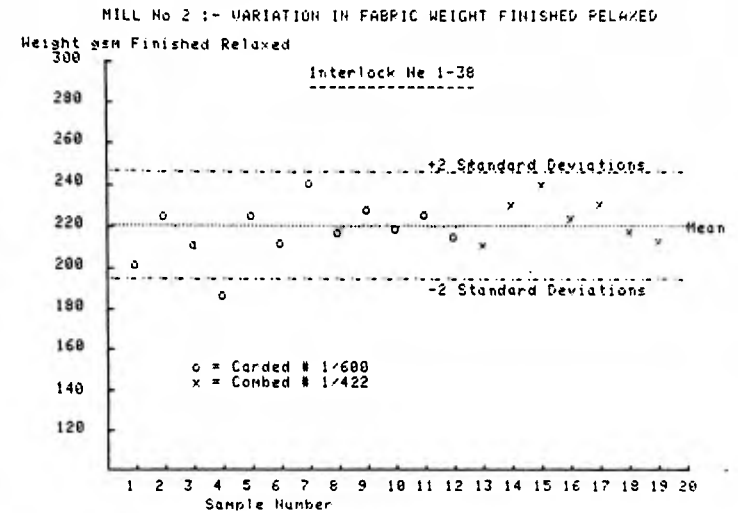
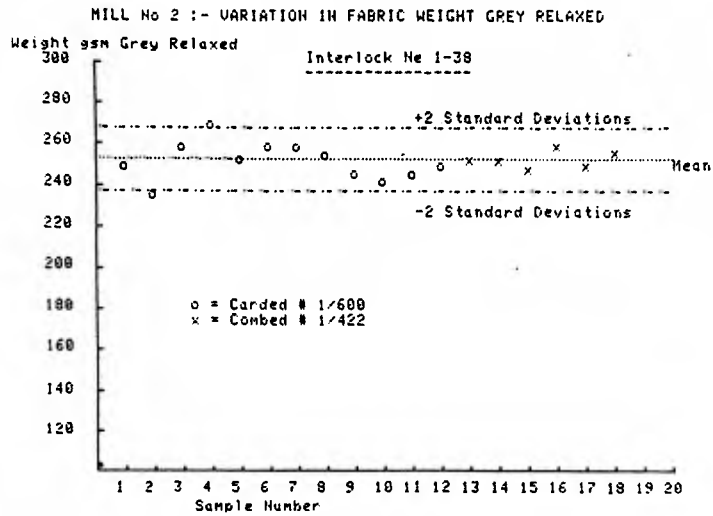
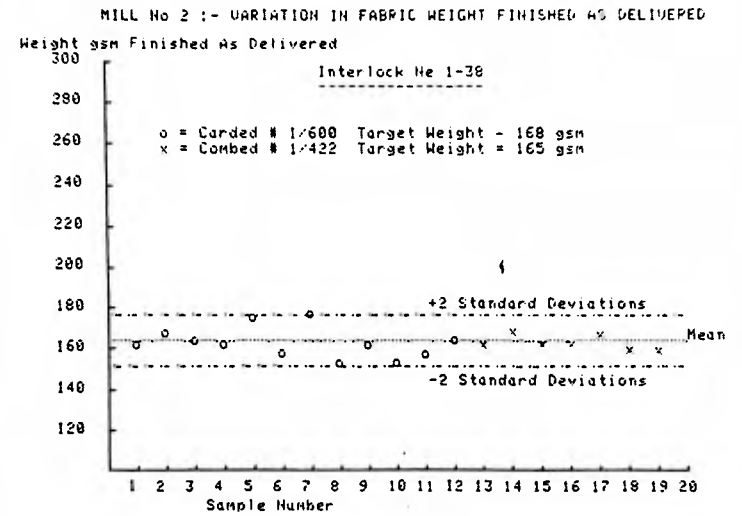
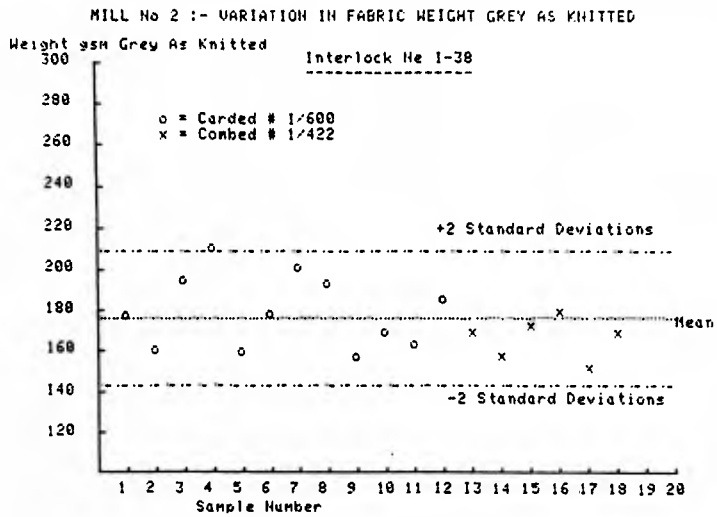
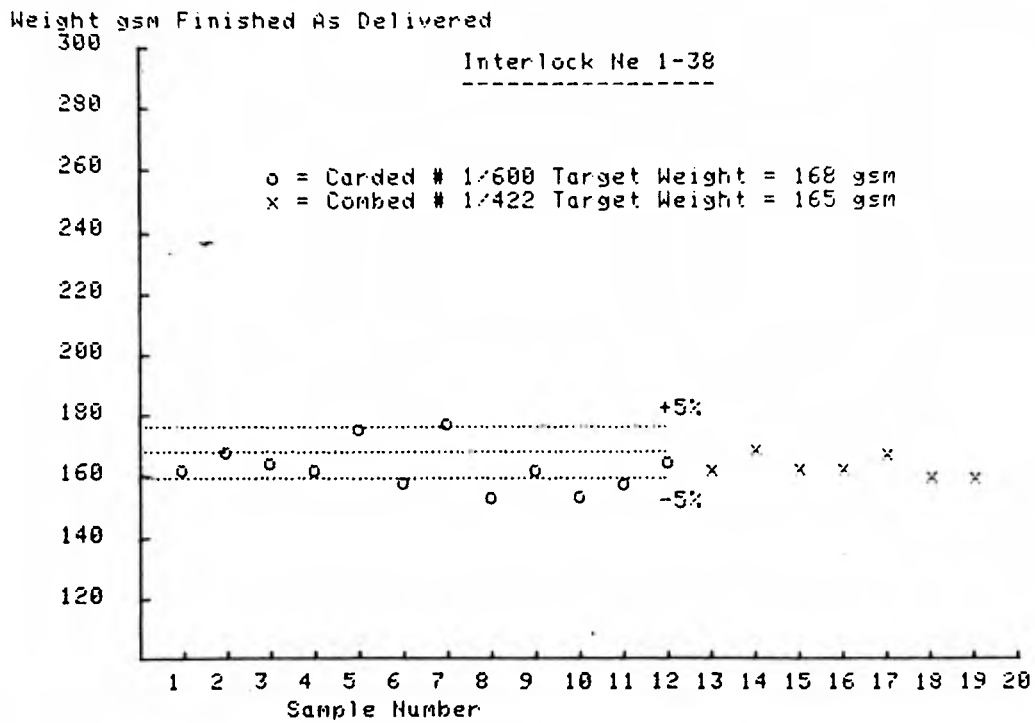
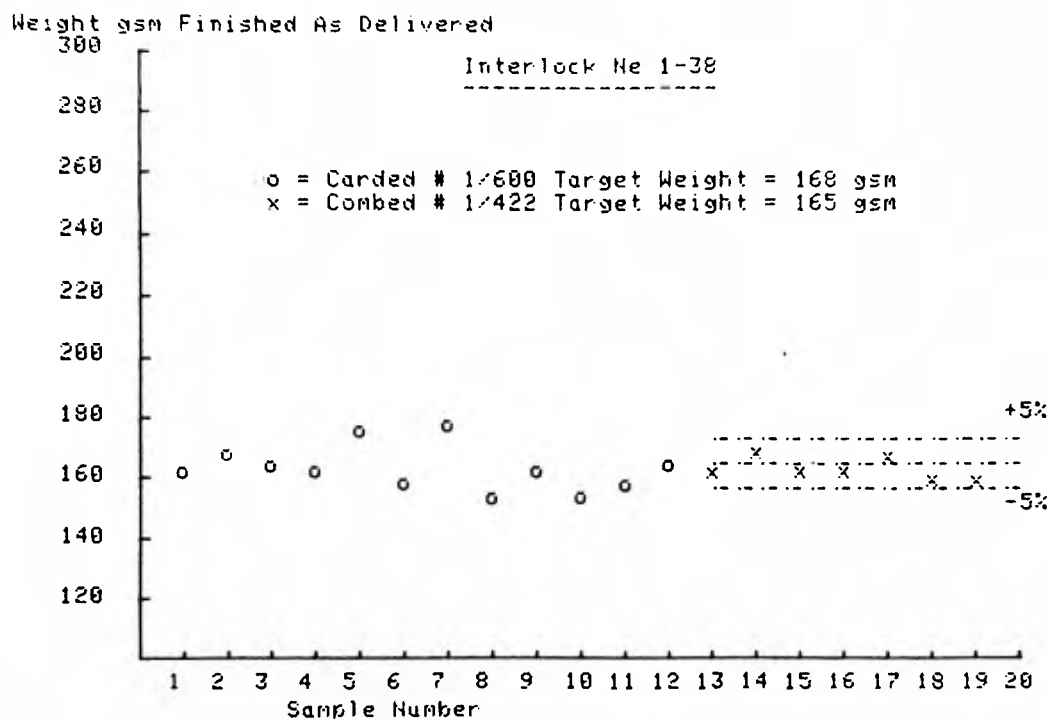


FIGURE 11

MILL No 2 :- VARIATION IN FABRIC WEIGHT FINISHED AS DELIVERED



MILL No 2 :- VARIATION IN FABRIC WEIGHT FINISHED AS DELIVERED



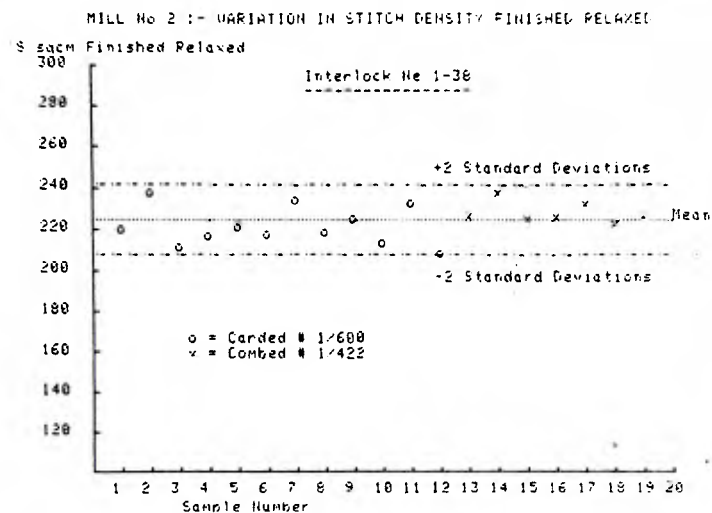
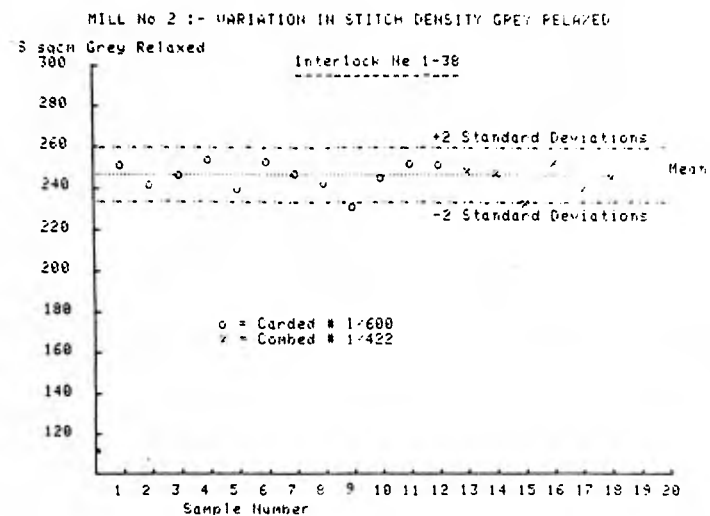
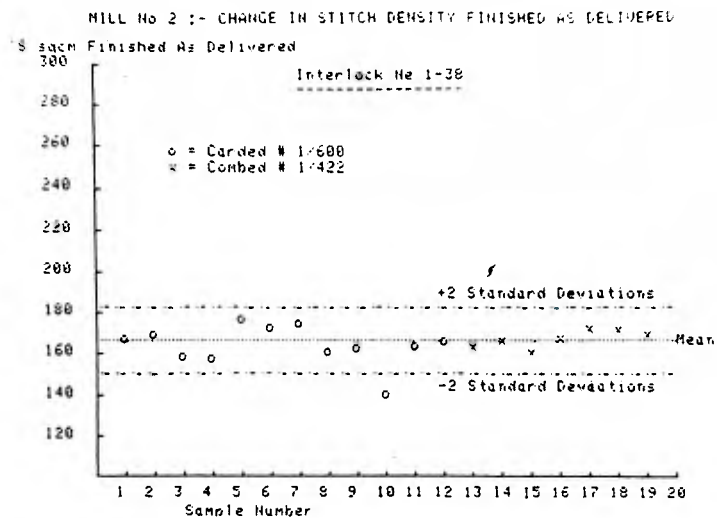
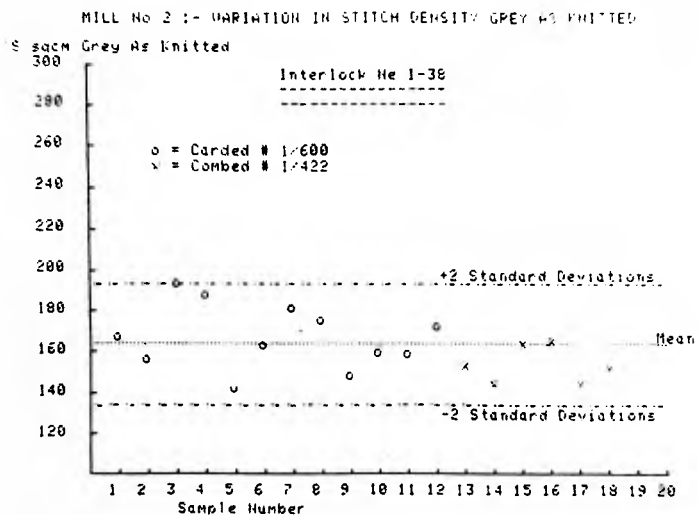
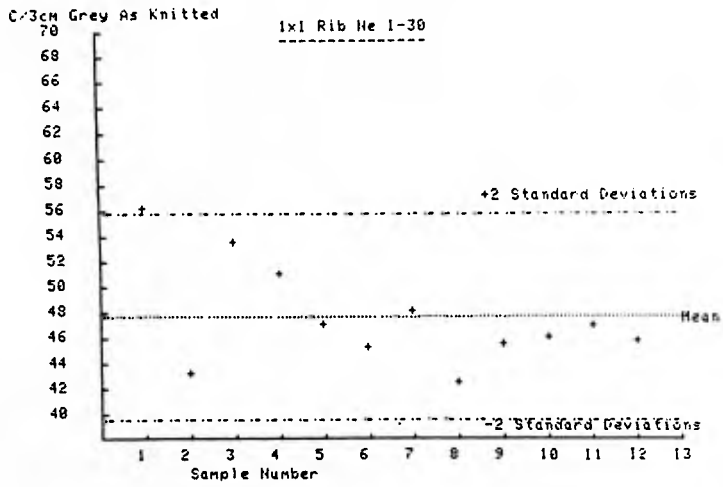
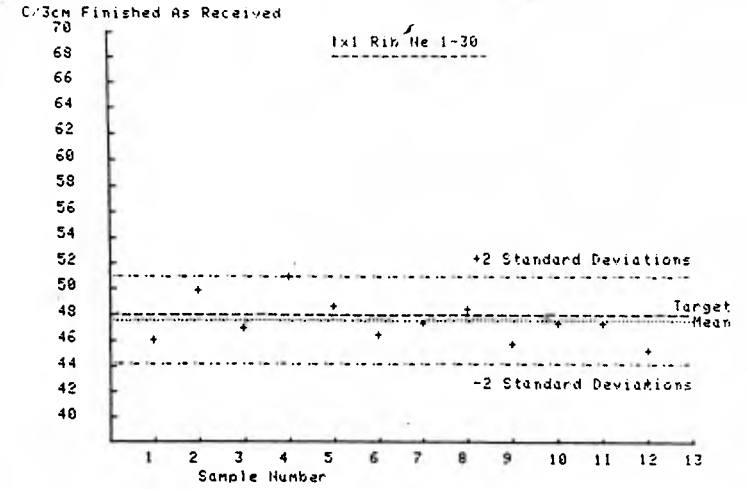


FIGURE 13

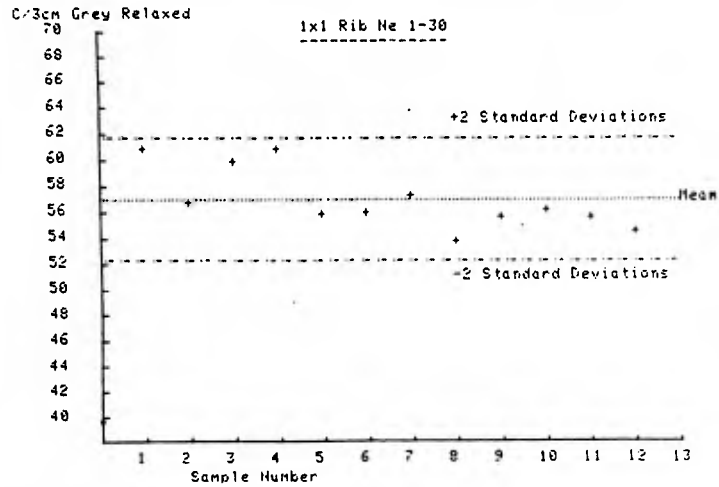
MILL No 2 :- VARIATION IN C/3CM GREY AS KNITTED



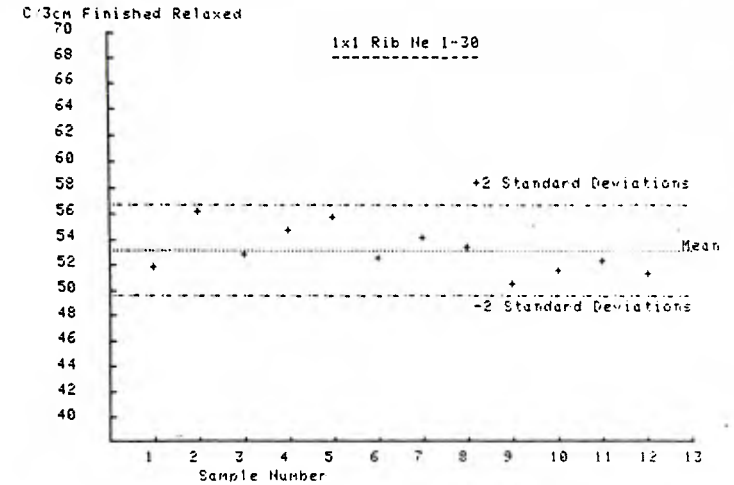
MILL No 2 :- VARIATION IN C/3CM FINISHED AS RECEIVED



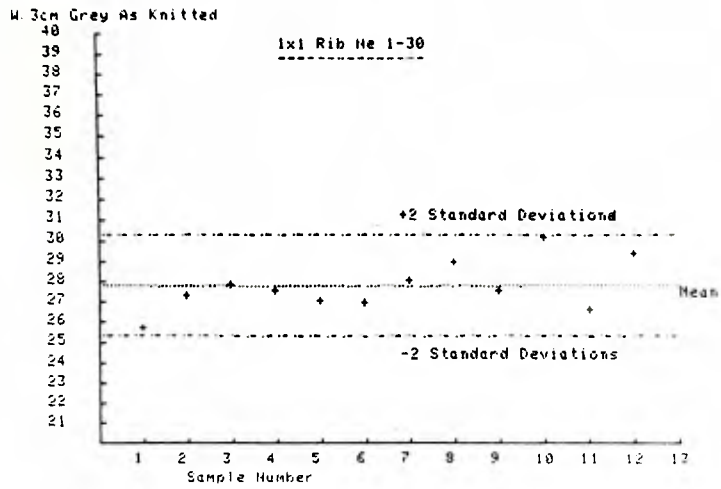
MILL No 2 :- VARIATION IN C/3CM GREY RELAXED



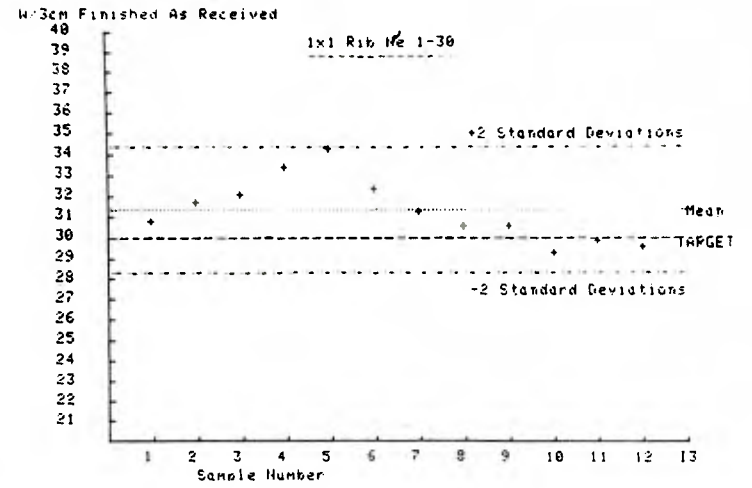
MILL No 2 :- VARIATION IN C/3CM FINISHED RELAXED



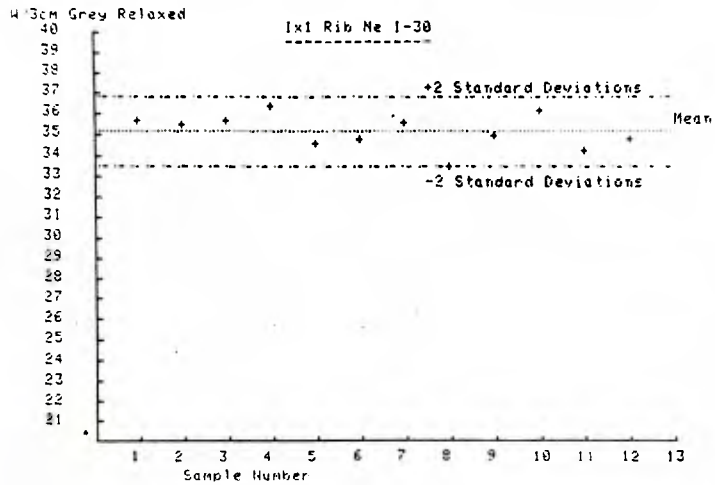
MILL No 2 :- VARIATION IN W/3CM GREY AS WHITTED



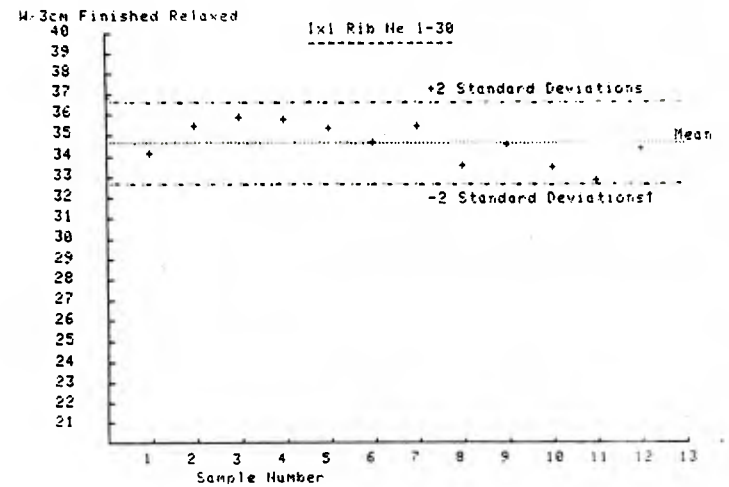
MILL No 2 :- VARIATION IN W/3CM FINISHED AS RECEIVED



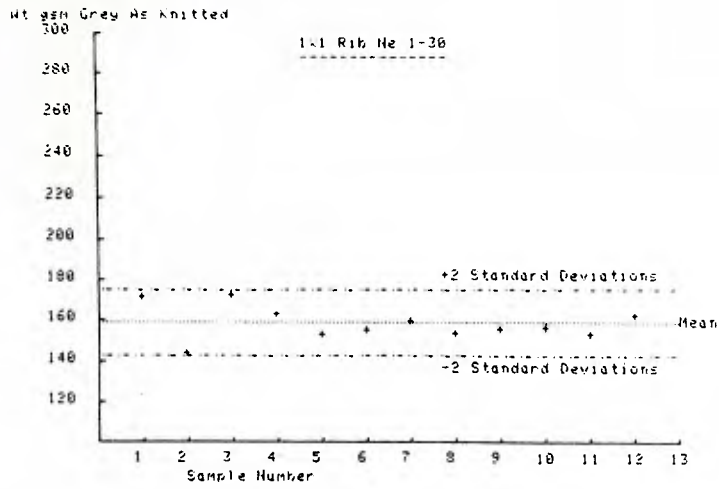
MILL No 2 :- VARIATION IN W/3CM GREY RELAXED



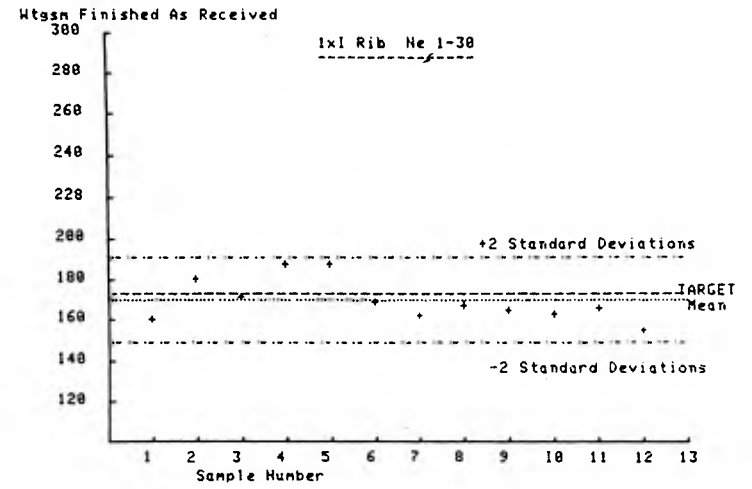
MILL No 2 :- VARIATION IN W/3CM FINISHED RELAXED



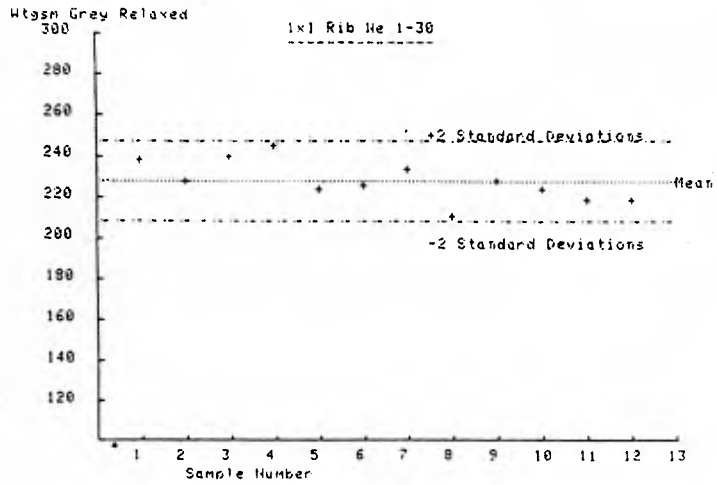
MILL No 2 :- VARIATION IN FABRIC WEIGHT GREY AS KNITTED



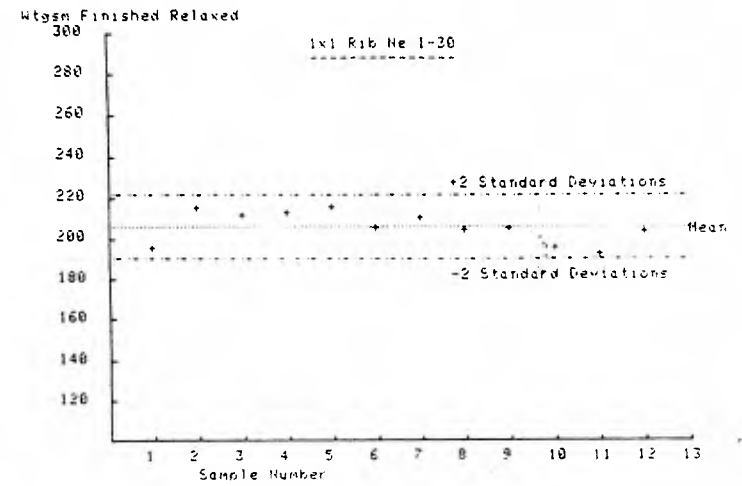
MILL No 2 :- VARIATION IN FABRIC WEIGHT FINISHED AS RECEIVED



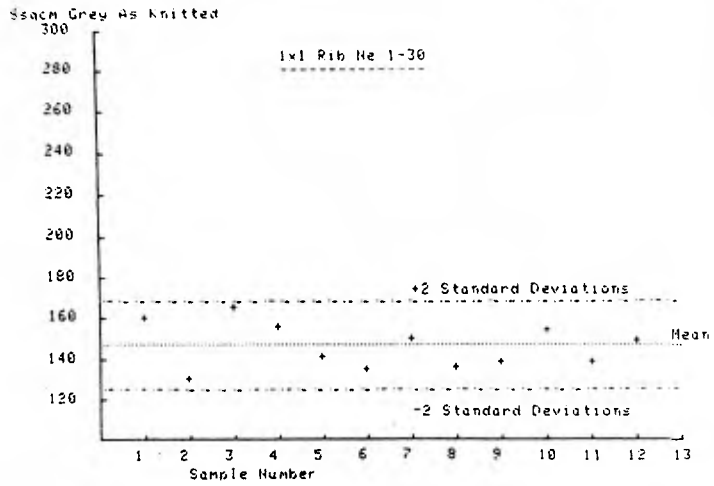
MILL No 2 :- VARIATION IN FABRIC WEIGHT GREY RELAXED



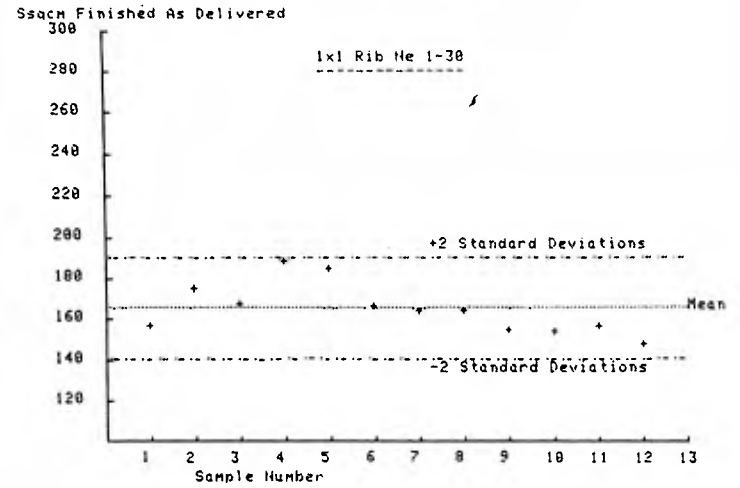
MILL No 2 :- VARIATION IN FABRIC WEIGHT FINISHED RELAXED



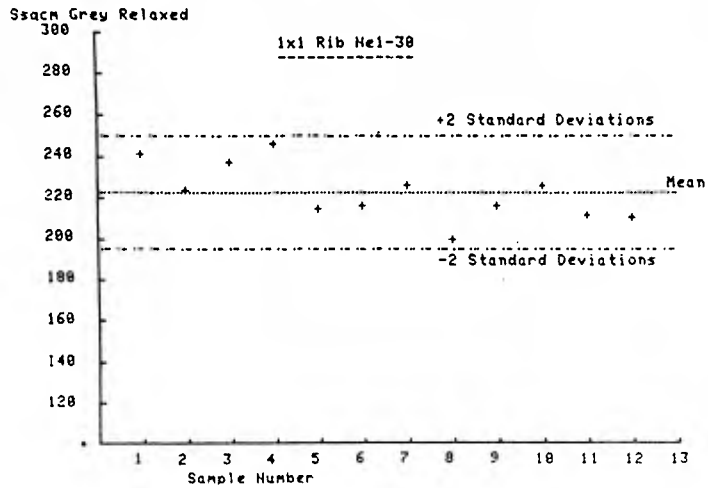
MILL No 2 :- VARIATION IN STITCH DENSITY GREY AS KNITTED



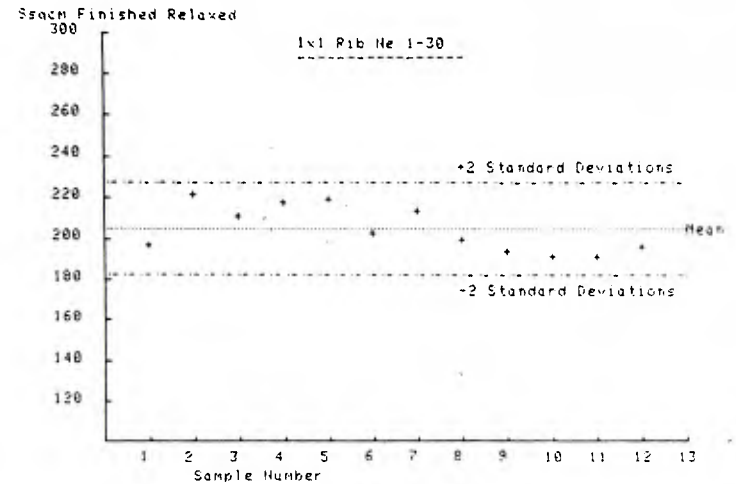
MILL No 2 :- VARIATION IN STITCH DENSITY FINISHED AS RECEIVED



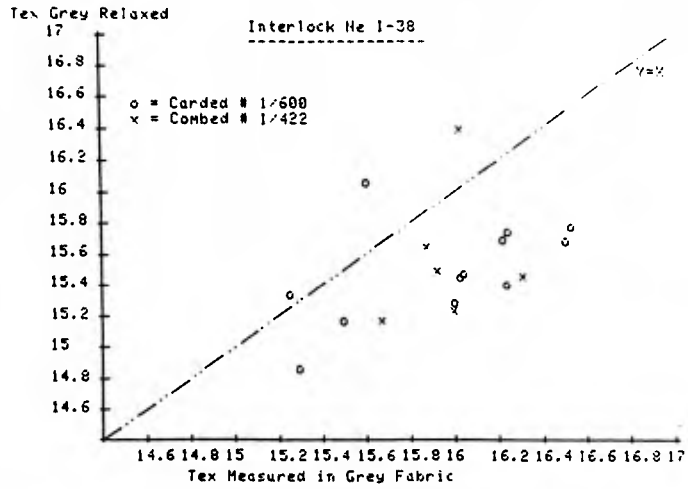
MILL No 2 :- VARIATION IN STITCH DENSITY GREY RELAXED



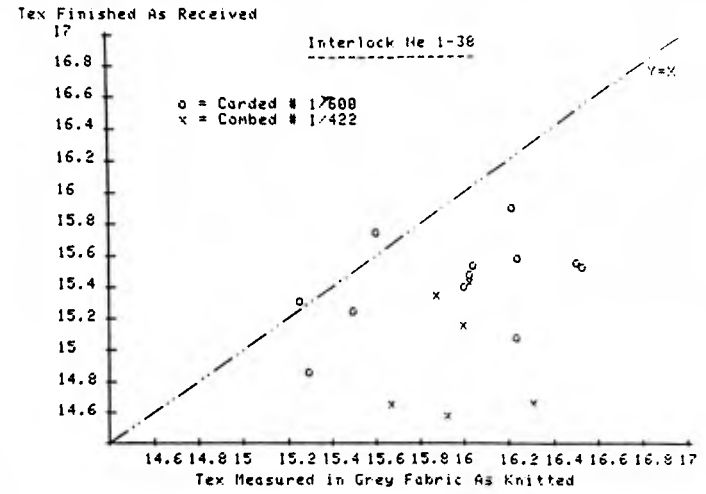
MILL No 2 :- VARIATION IN STITCH DENSITY FINISHED RELAXED



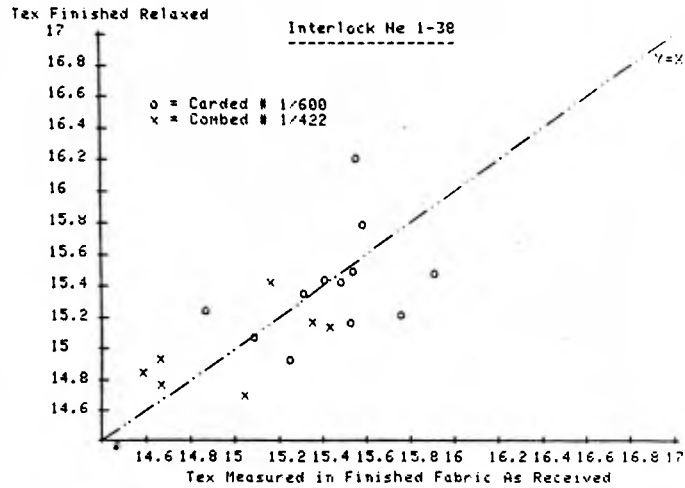
MILL No 2 :- CHANGE IN TEX DURING RELAXATION (GPE%)



MILL No 2 :- CHANGE IN TEX DURING FINISHING



MILL No 2 :- CHANGE IN TEX DURING RELAXATION (FINISHED)



MILL No 2 :- CHANGE IN TEX DURING FINISHING (RELAXED)

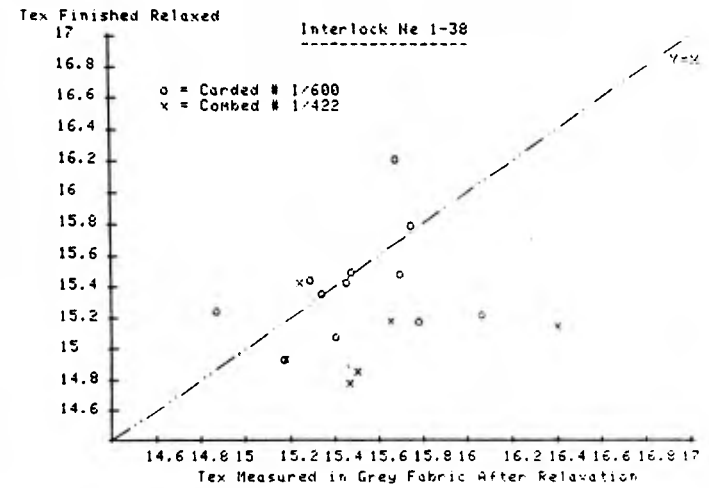
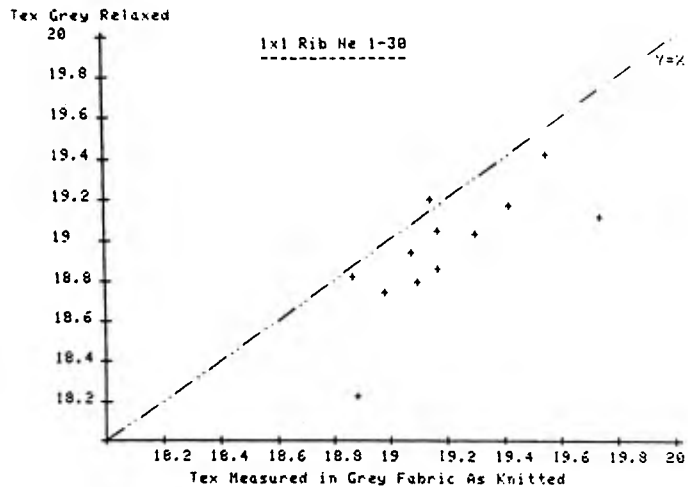
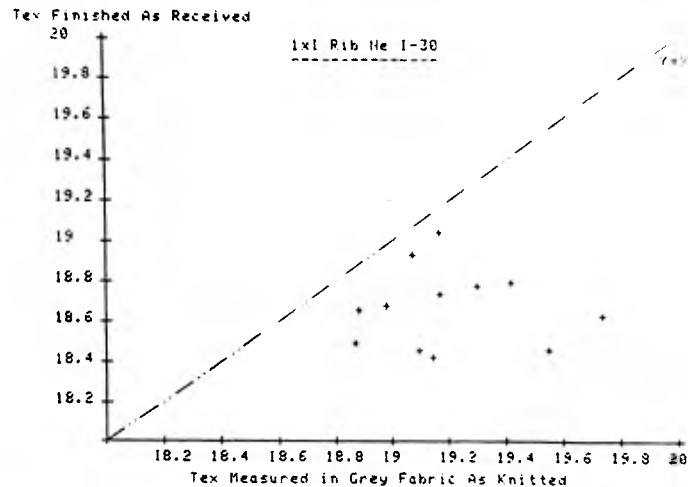


FIGURE 18

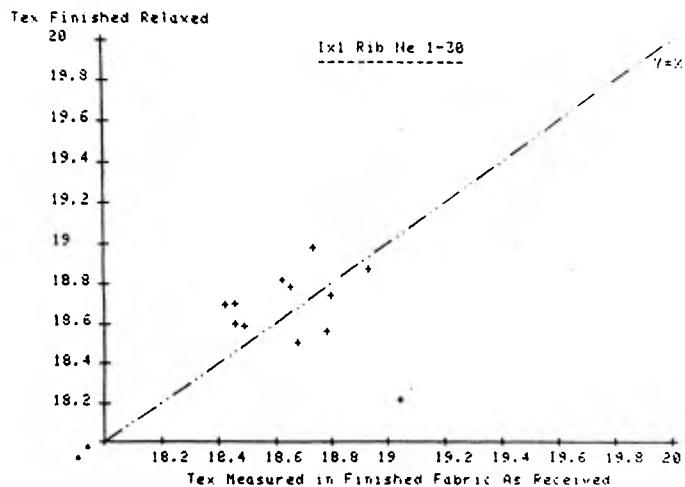
MILL No 2 :- CHANGE IN TEX DURING RELAXATION (GREY)



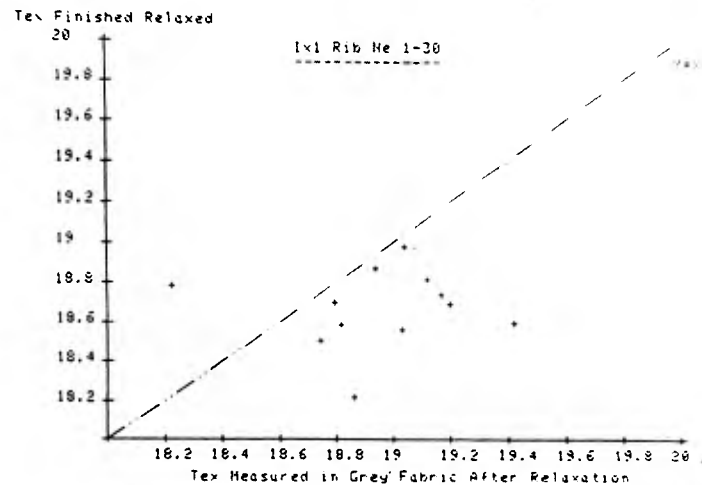
MILL No 2 :- CHANGE IN TEX DURING FINISHING



MILL No 2 :- CHANGE IN TEX DURING RELAXATION (FINISHED)

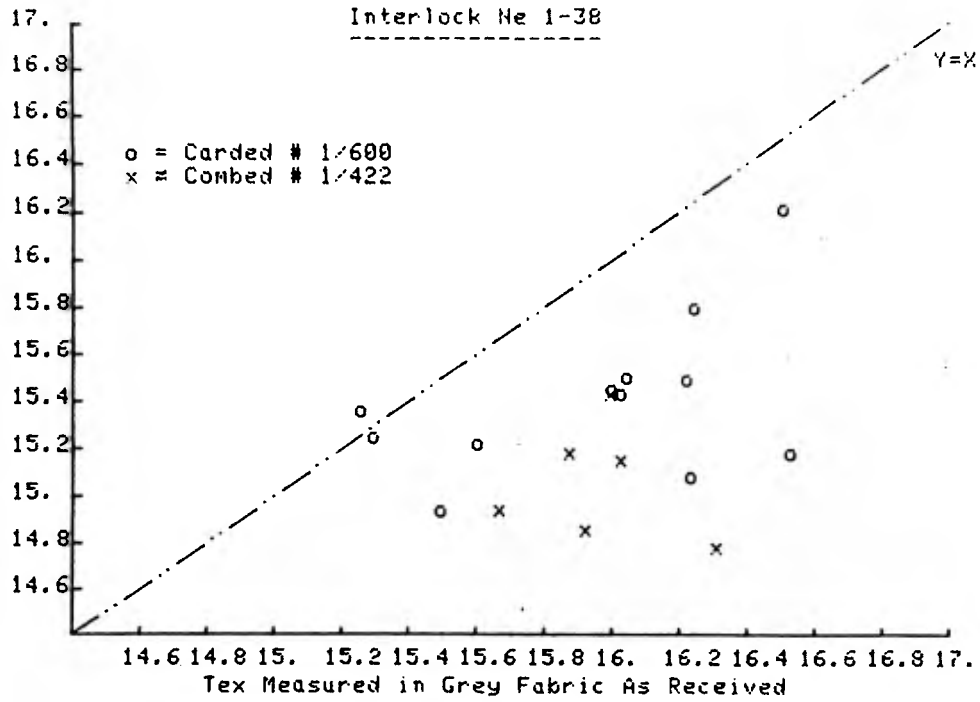


MILL No 2 :- CHANGE IN TEX DURING FINISHING (RELAXED)



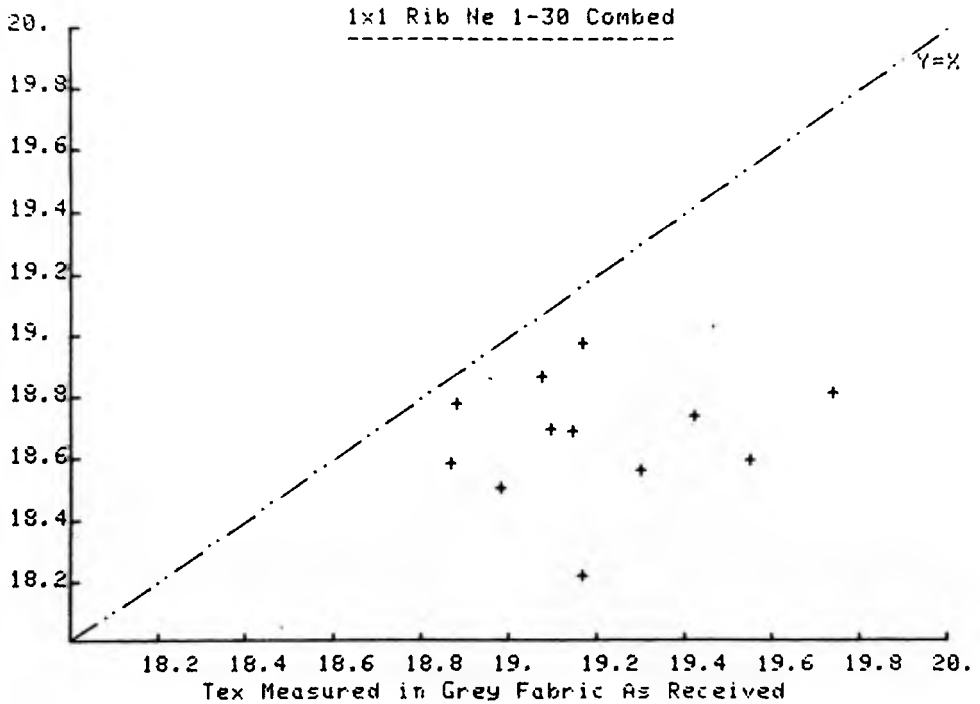
MILL No 2 :- CHANGE IN TEX GREY B.W. - FINISHED A.W.

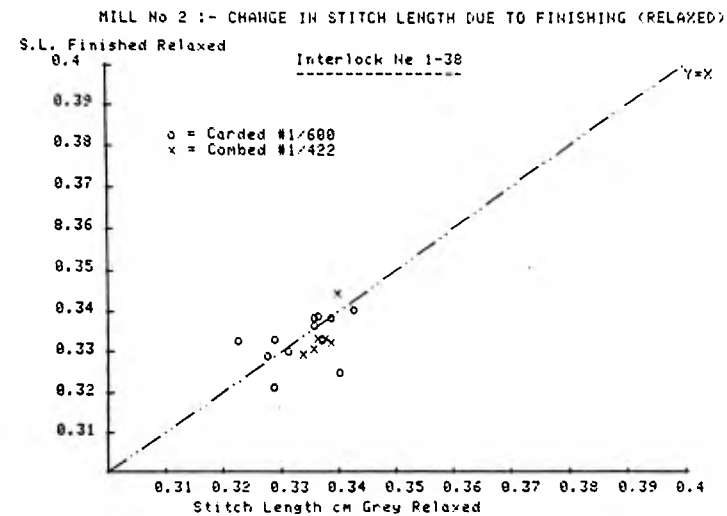
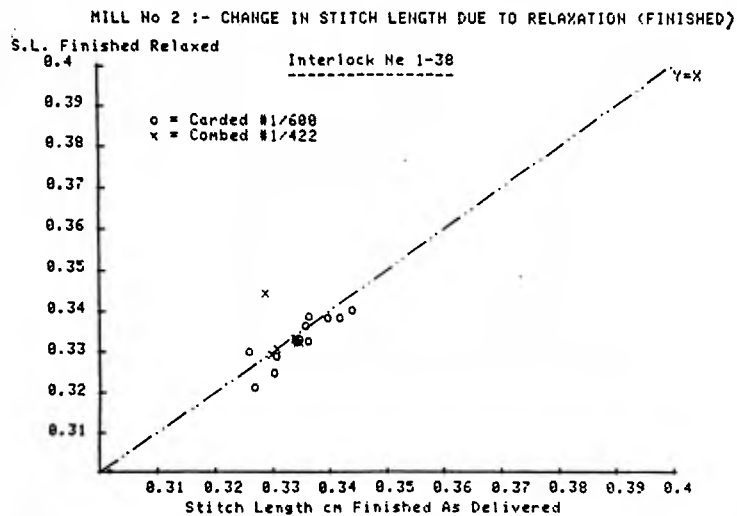
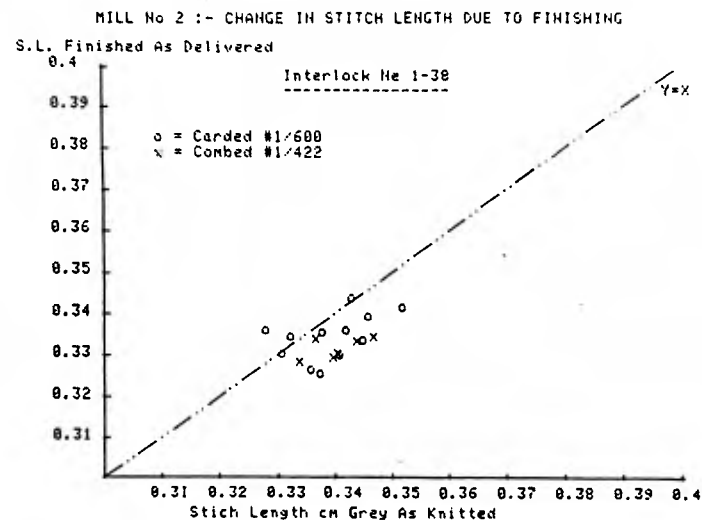
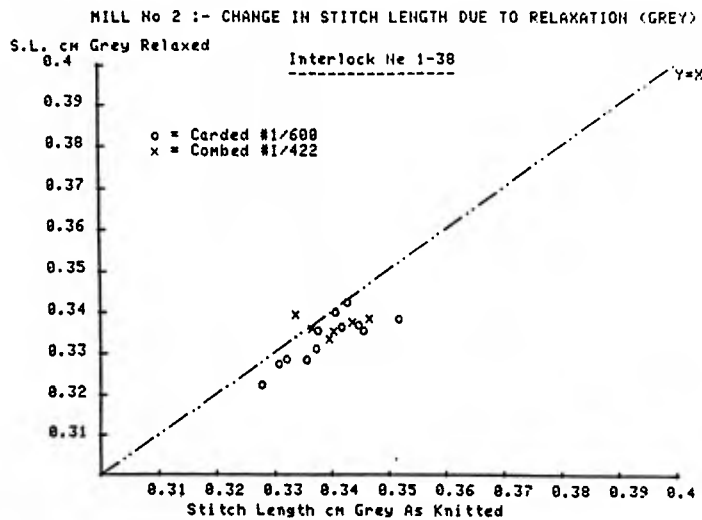
Tex Finished Relaxed

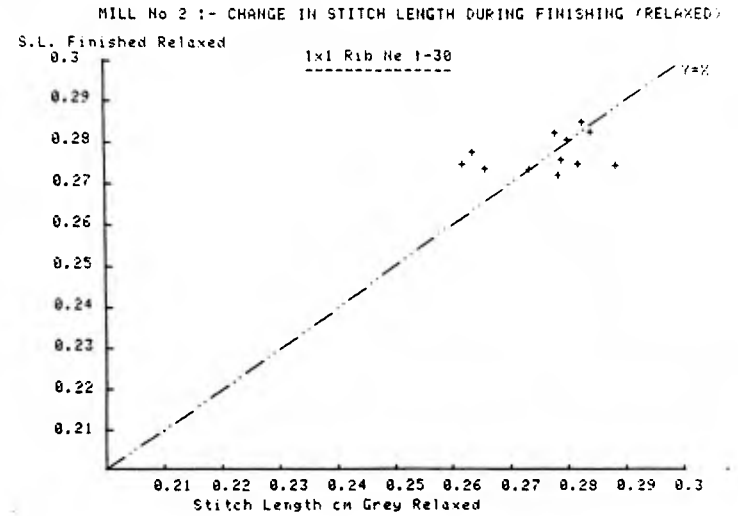
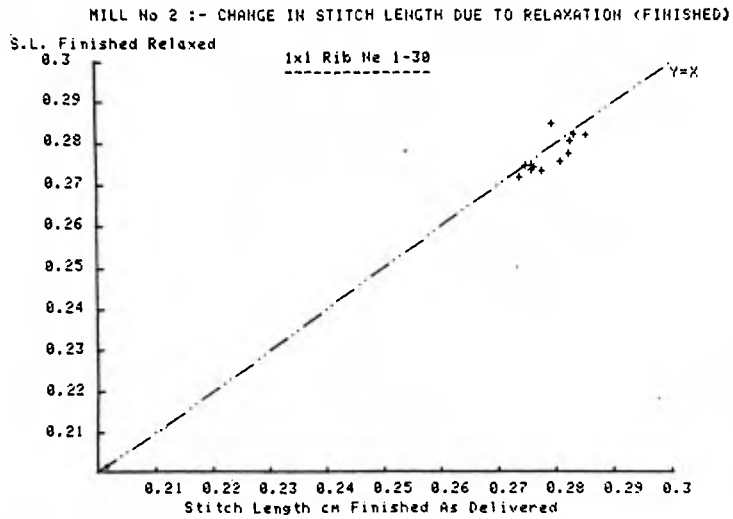
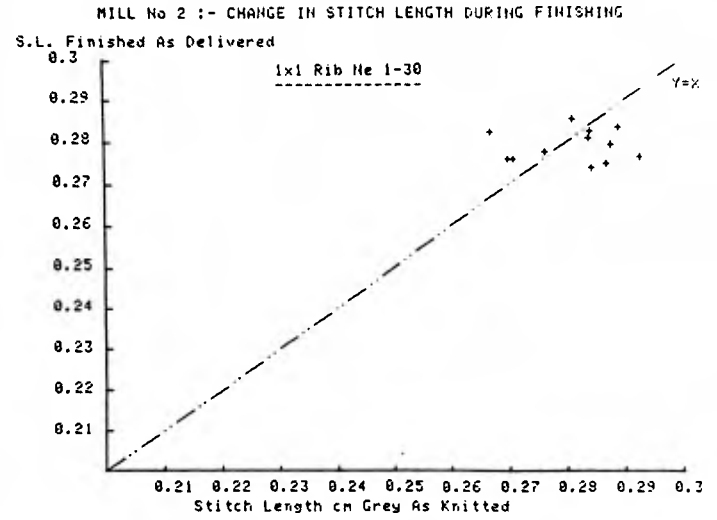
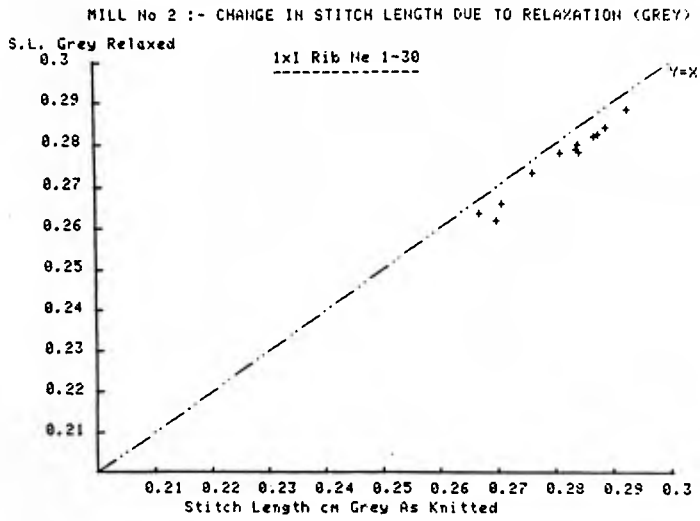


MILL No 2 :- CHANGE IN TEX GREY B.W. - FINISHED A.W.

Tex Finished Relaxed

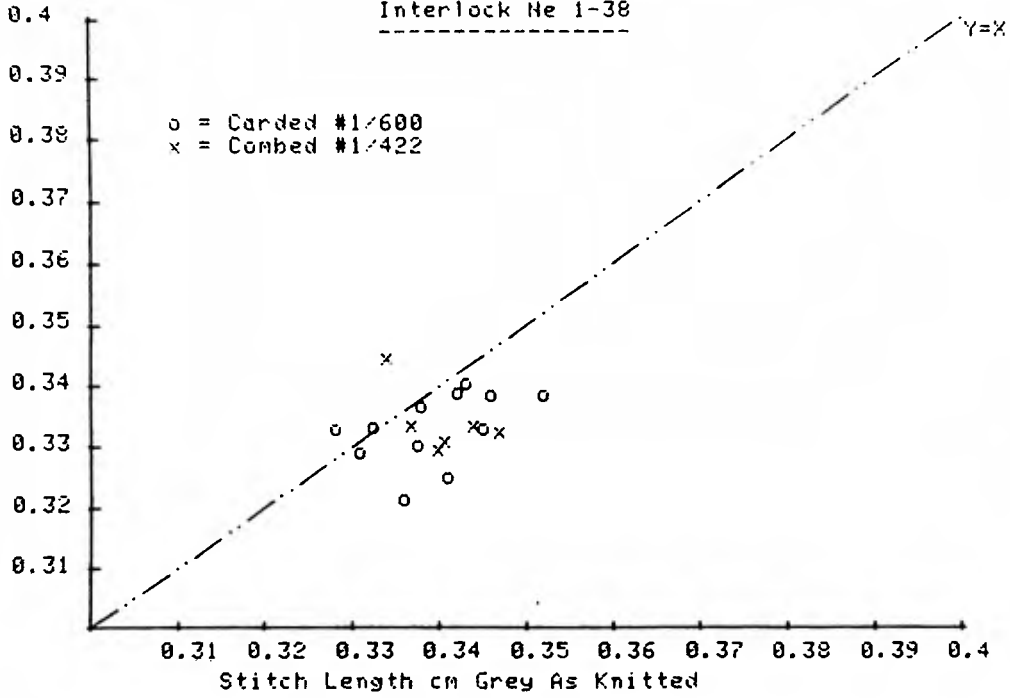






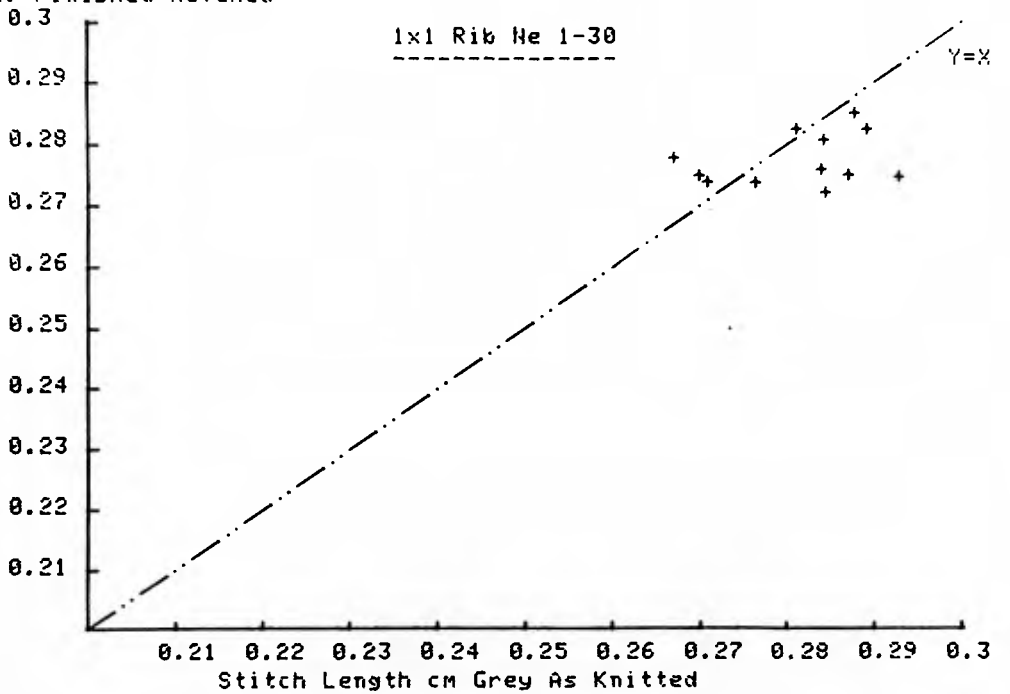
MILL No 2 :- CHANGE IN STITCH LENGTH GREY B.W. - FINISHED A.W.

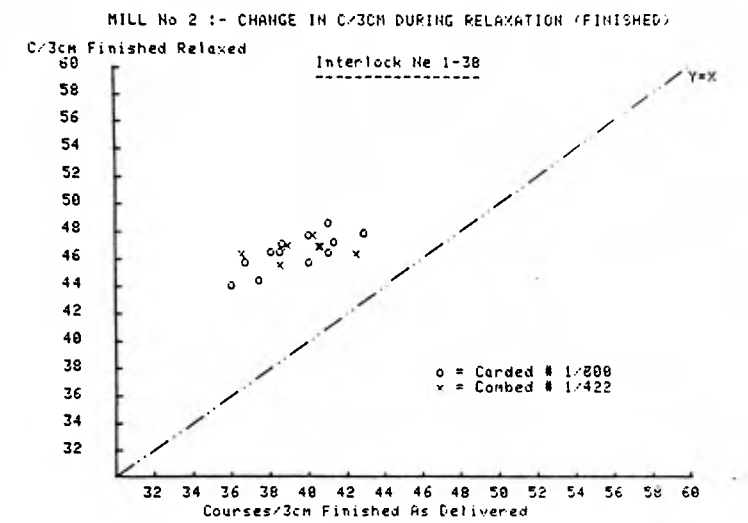
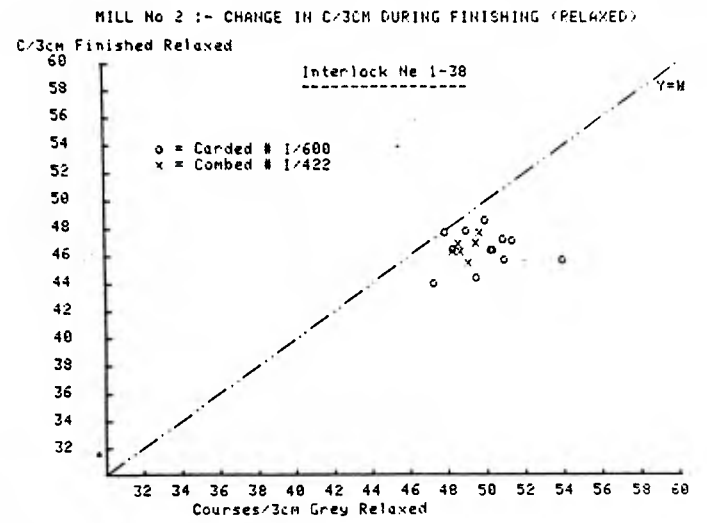
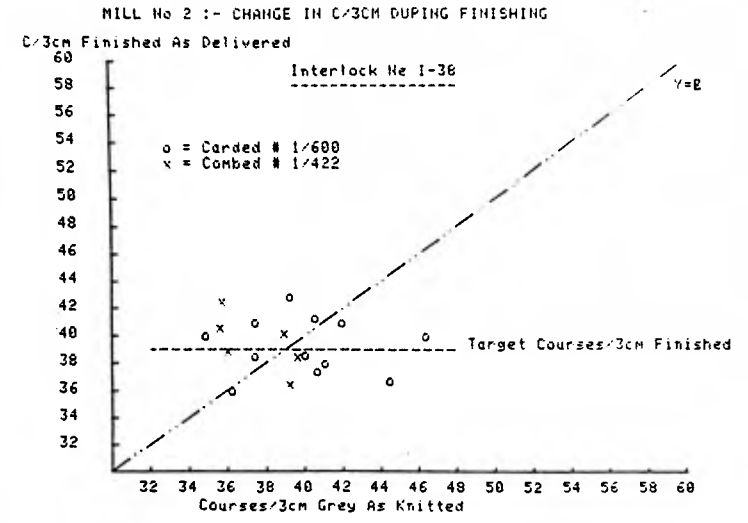
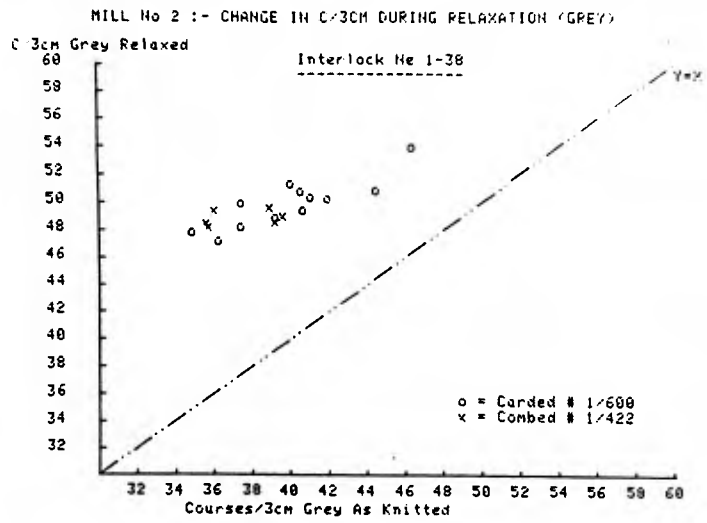
S.L. Finished Relaxed

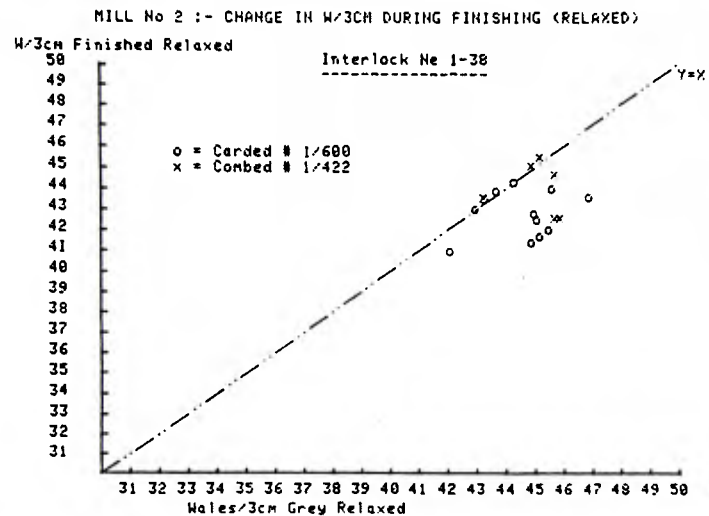
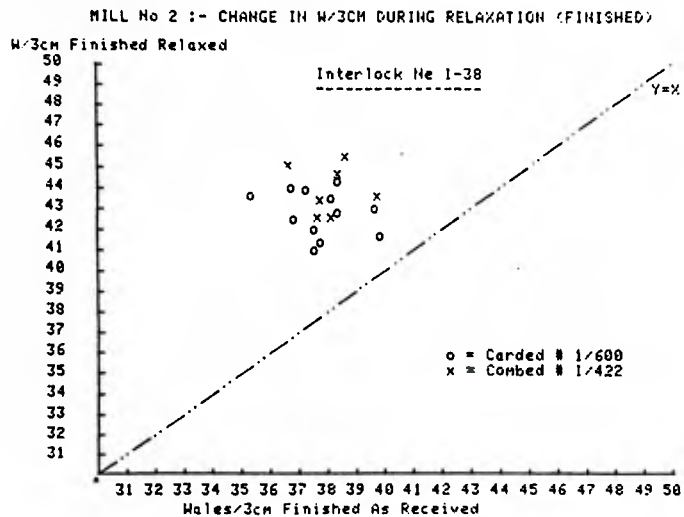
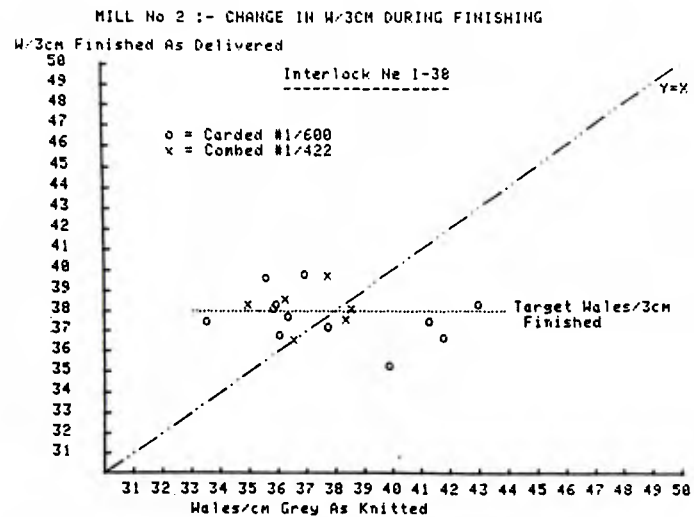
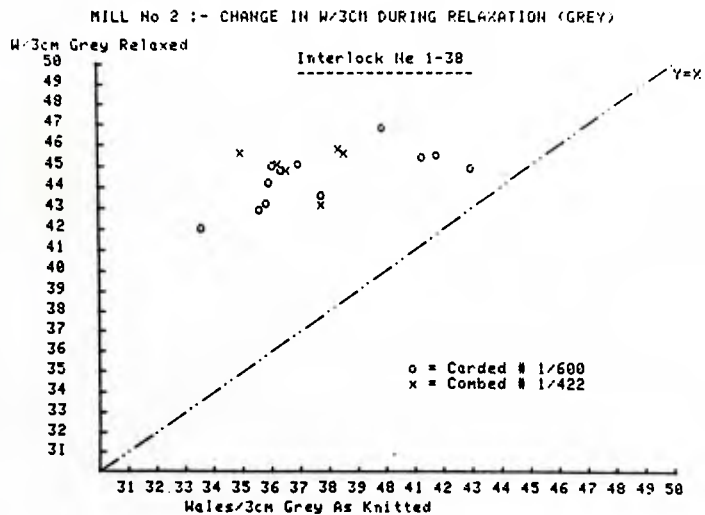


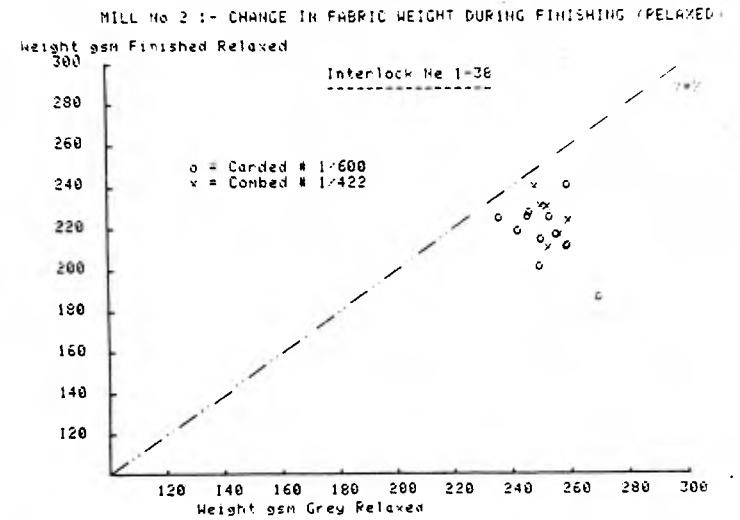
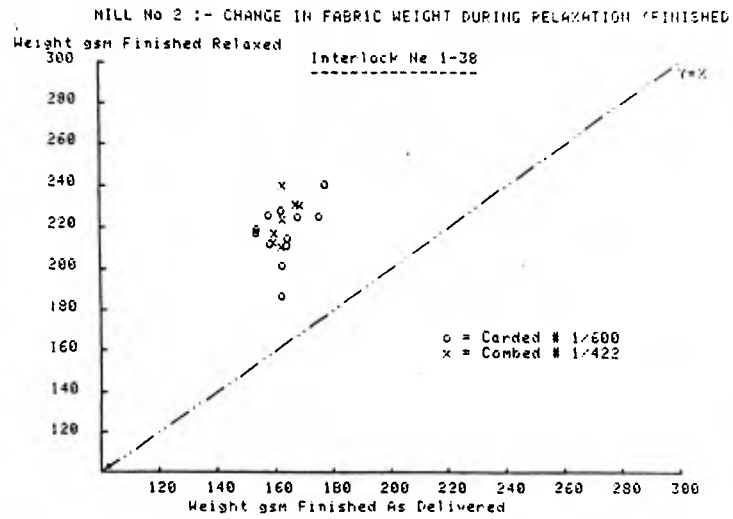
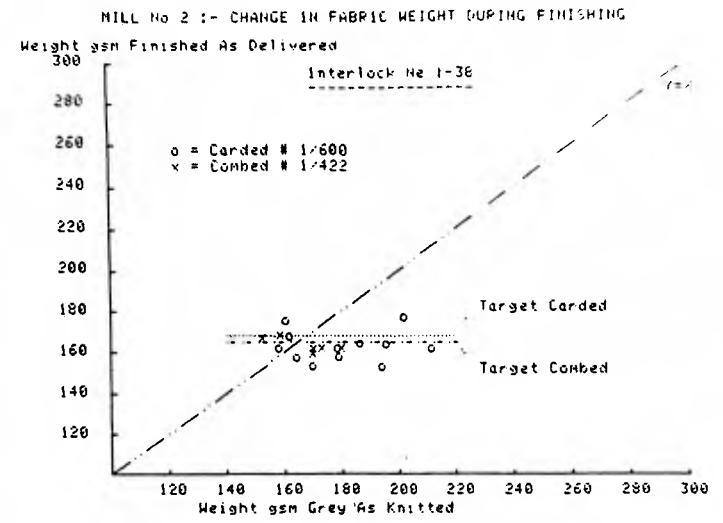
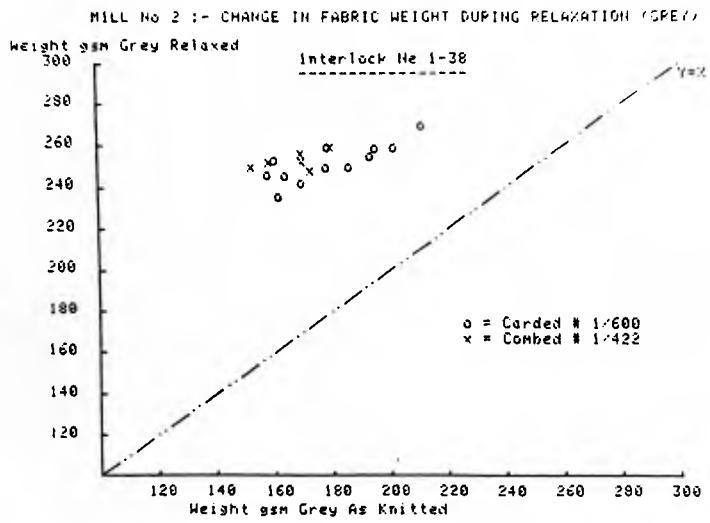
MILL No 2 :- CHANGE IN STITCH LENGTH GREY B.W. - FINISHED A.W.

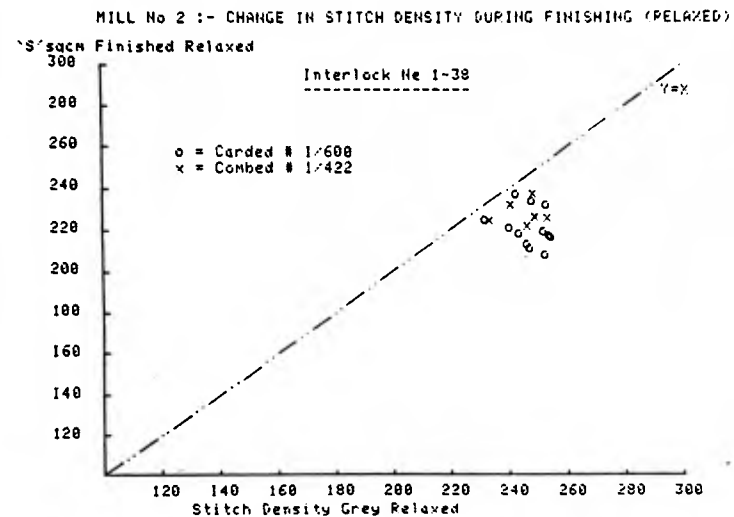
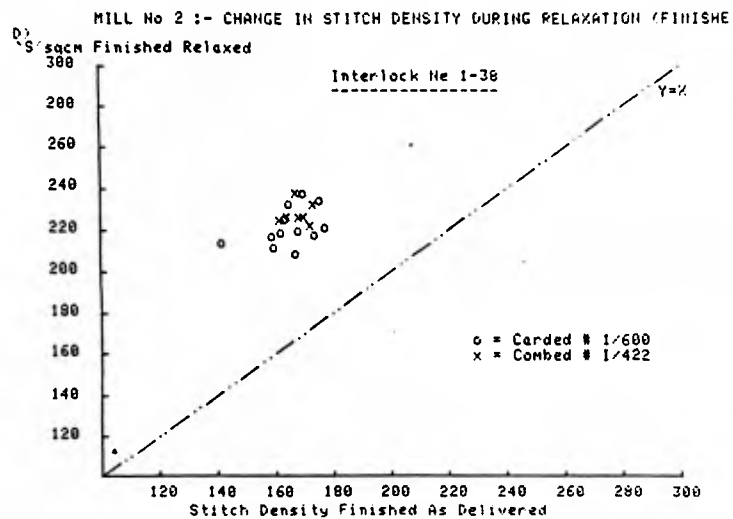
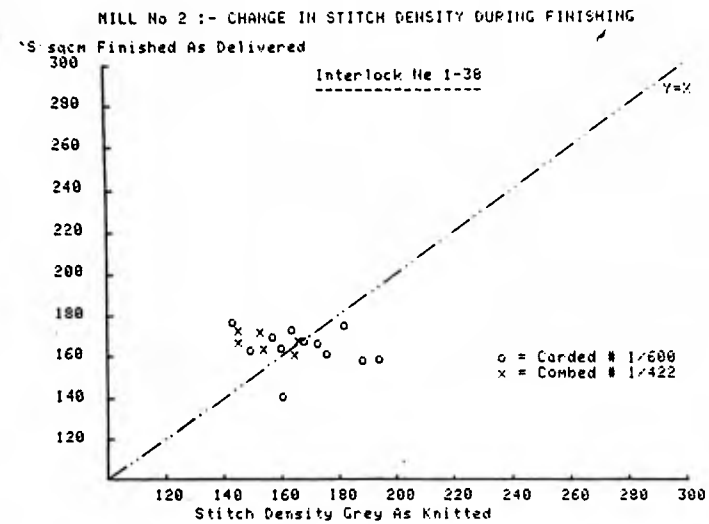
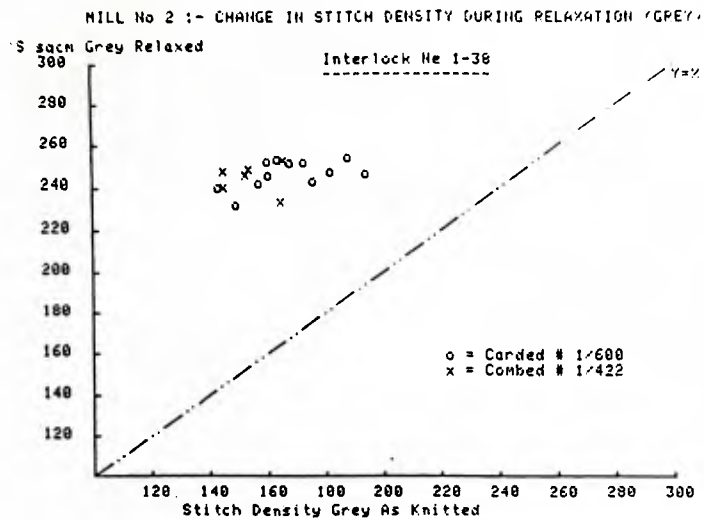
S.L. Finished Relaxed



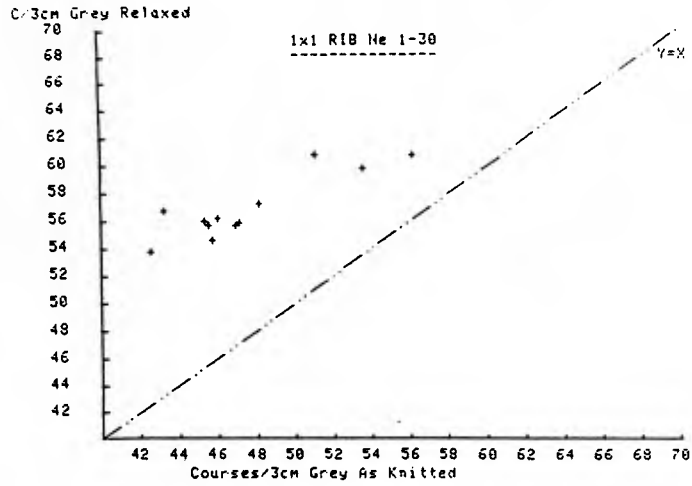




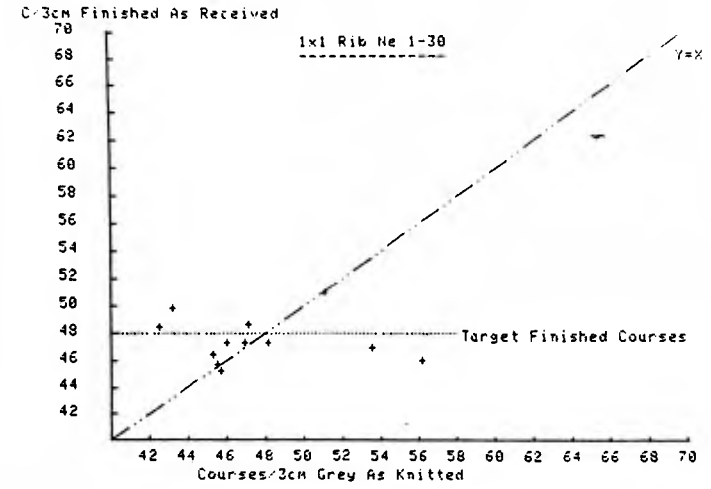




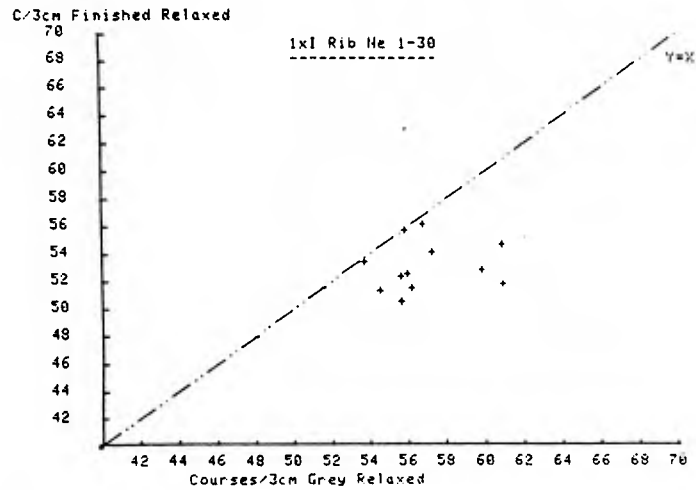
MILL No 2 :- CHANGE IN C/3CM DURING RELAXATION (GREY)



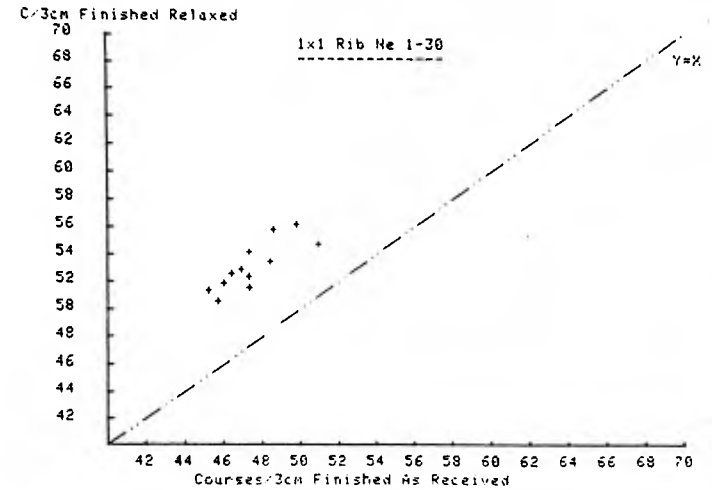
MILL No 2 :- CHANGE IN C/3CM DURING FINISHING



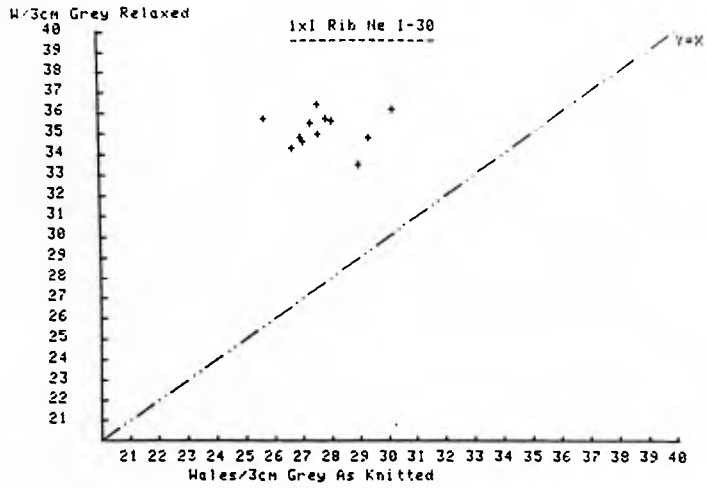
MILL No 2 :- CHANGE IN C/3CM DURING FINISHING (RELAXED)



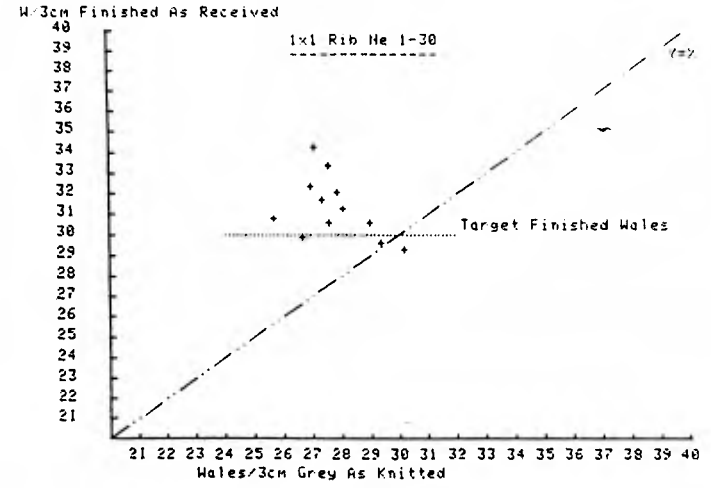
MILL No 2 :- CHANGE IN C/3CM DURING RELAXATION (FINISHED)



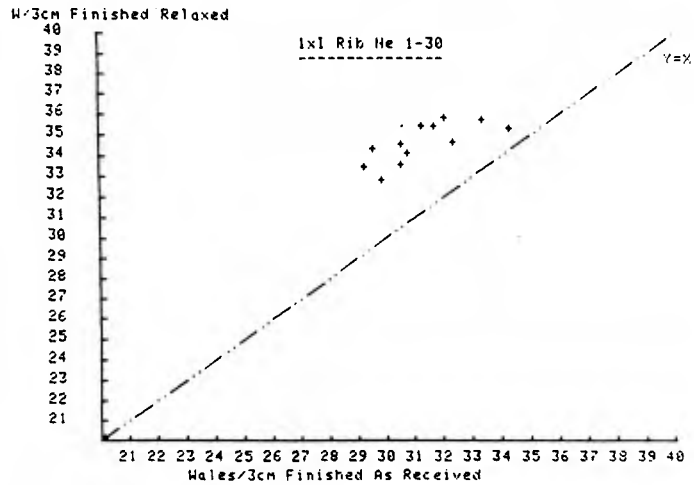
MILL No 2 :- CHANGE IN W/3CM DURING RELAXATION (GREY)



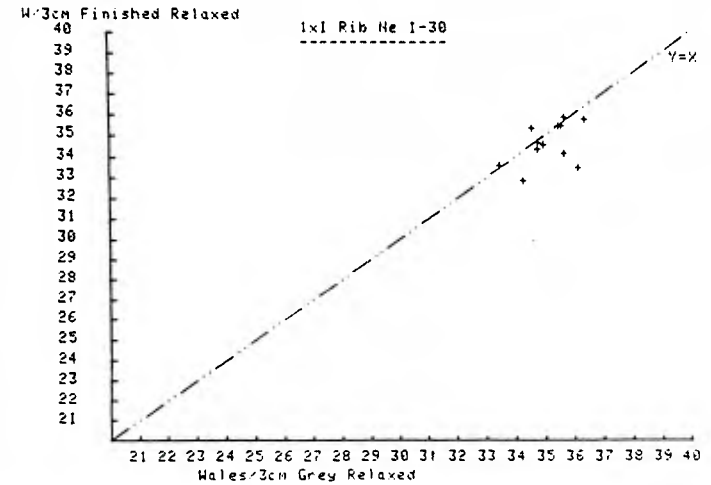
MILL No 2 :- CHANGE IN W/3CM DURING FINISHING



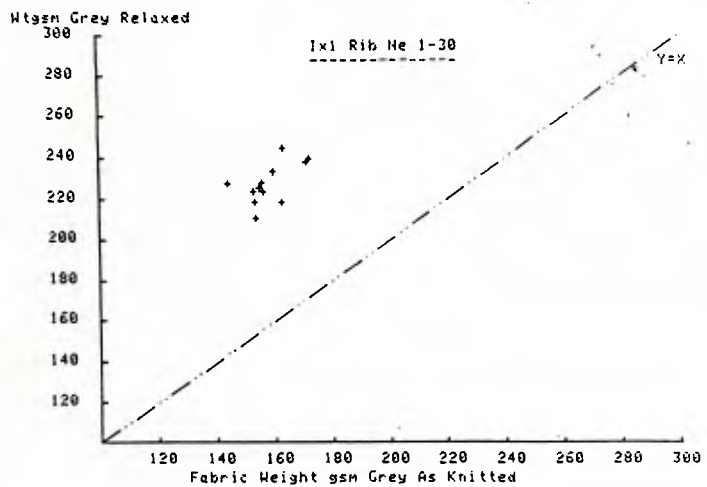
MILL No 2 :- CHANGE IN W/3CM DURING RELAXATION (FINISHED)



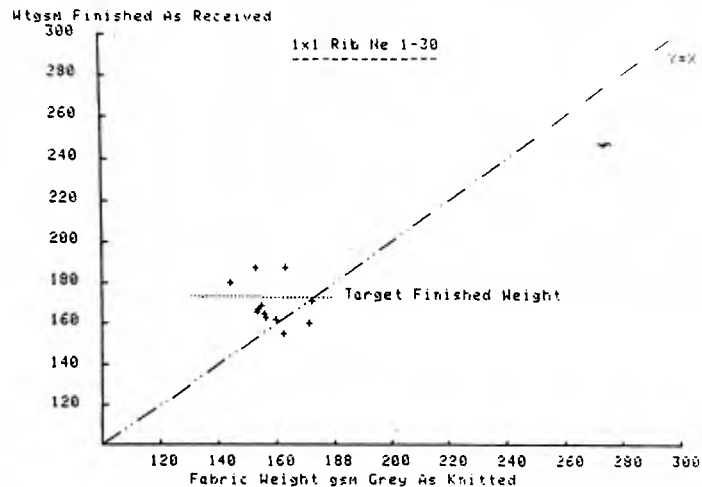
MILL No 2 :- CHANGE IN W/3CM DURING FINISHING (RELAXED)



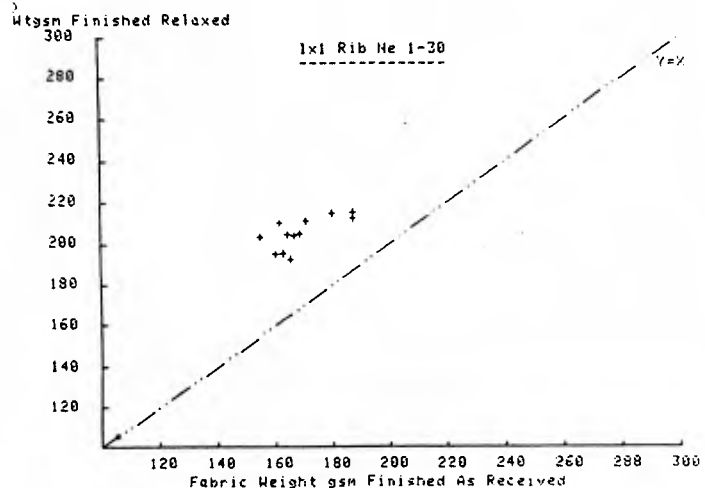
MILL No 2 :- CHANGE IN FABRIC WEIGHT DURING RELAXATION (GREY)



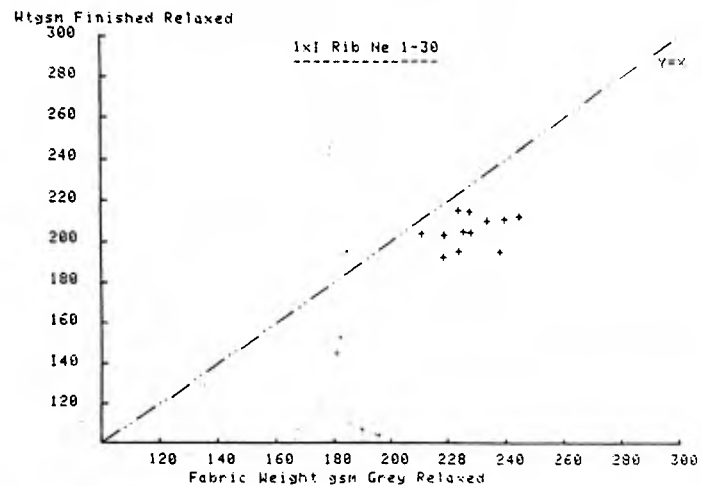
MILL No 2 :- CHANGE IN FABRIC WEIGHT DURING FINISHING



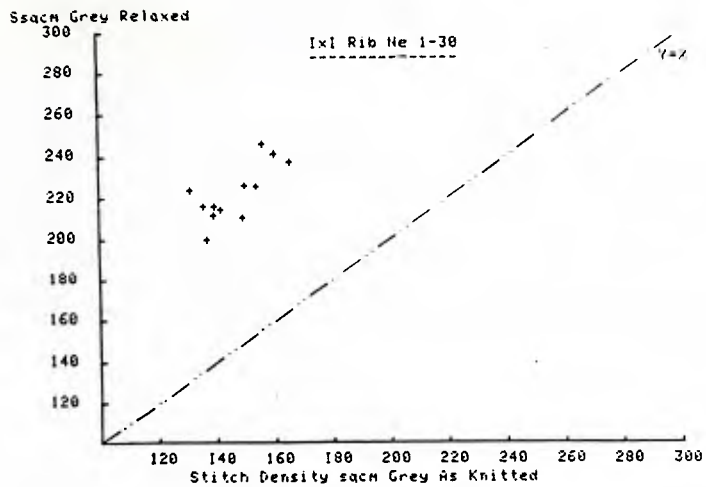
MILL No 2 :- CHANGE IN FABRIC WEIGHT DURING RELAXATION (FINISHED)



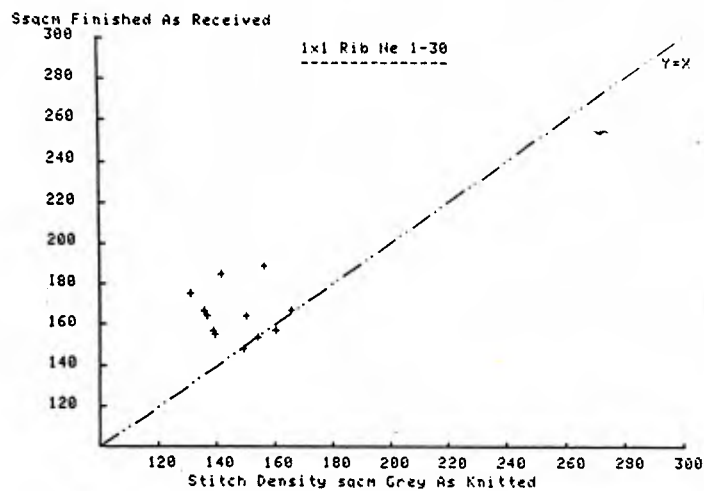
MILL No 2 :- CHANGE IN FABRIC WEIGHT DURING FINISHING (RELAXED)



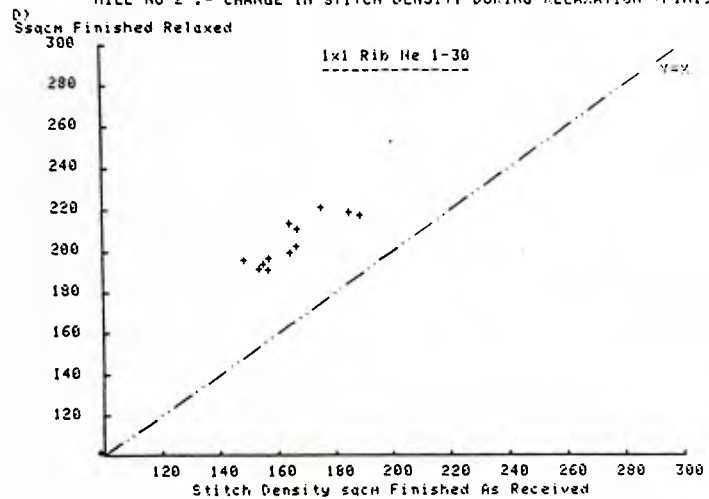
MILL No 2 :- CHANGE IN STITCH DENSITY DURING RELAXATION (GREY)



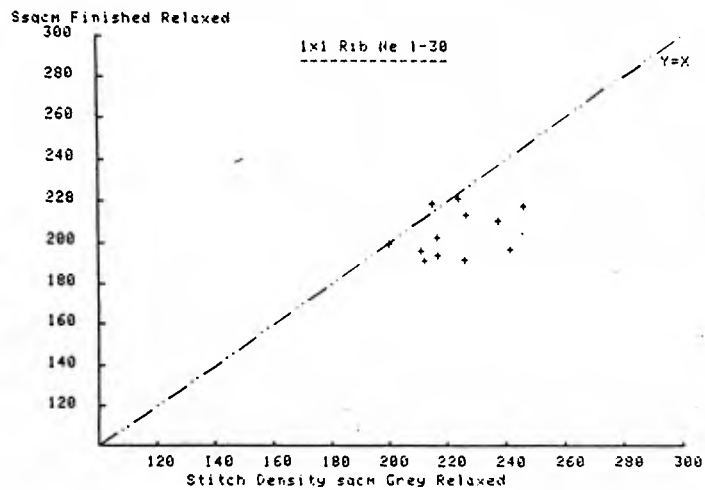
MILL No 2 :- CHANGE IN STITCH DENSITY DURING FINISHING



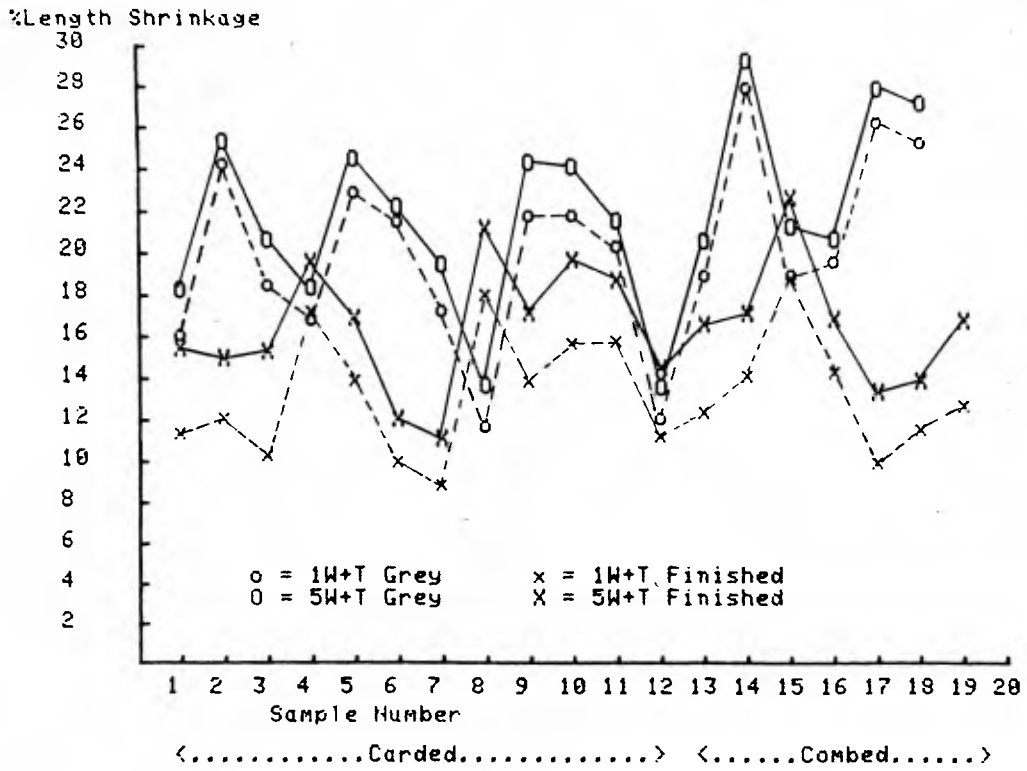
MILL No 2 :- CHANGE IN STITCH DENSITY DURING RELAXATION (FINISHE



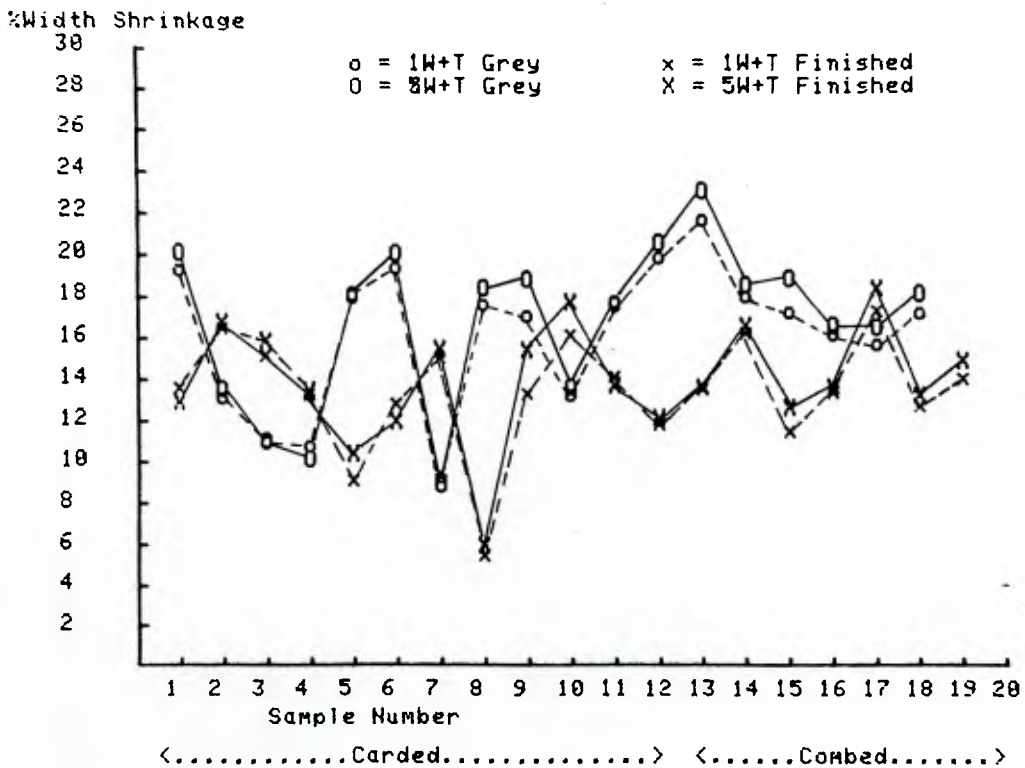
MILL No 2 :- CHANGE IN STITCH DENSITY DURING FINISHING (RELAXED)



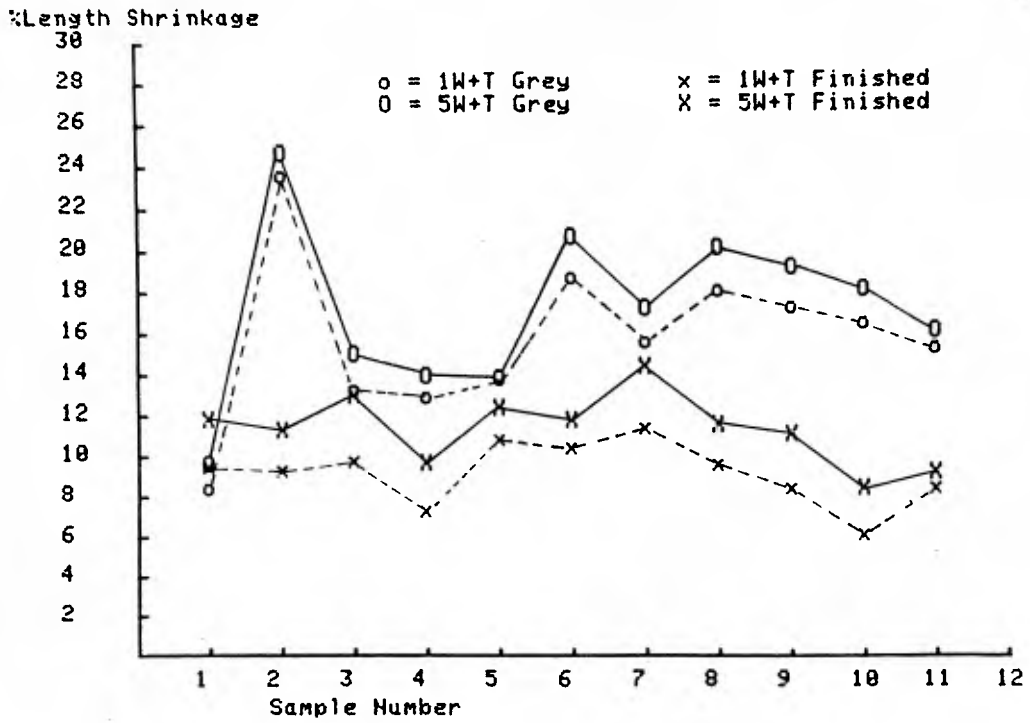
MILL No 2 :- INTERLOCK Ne 1-38 MEASURED LENGTH SHRINKAGE



MILL No 2 :- INTERLOCK Ne 1-38 MEASURED WIDTH SHRINKAGE



MILL No 2 :- 1x1 RIB Ne 1-30 MEASURED LENGTH SHRINKAGE



MILL No 2 :- 1x1 RIB Ne 1-30 MEASURED WIDTH SHRINKAGE

