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Some Observations on the Electronic Classification of Yarn Faults

by

L. Hunter

SOUTH AFRICAN WOOL AND TEXTILE RESEARCH INSTITUTE OF THE CSIR

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ABSTRACT

Some results obtained and observations made during routine tests carried out with a capacitance yarn fault classifying instrument on about 400 Kg of yarn are reported. Special attention is paid to the variation which can occur in results obtained on different segments of yarn from the same yarn lot, mainly due to the non-homogeneous nature of a spun yarn. Confidence limits calculated on the basis of the results obtained in this investigation are given and are shown to be generally larger than those predicted by a Poisson distribution except in the case of low counter values corresponding to the more severe type of faults.

One of the conclusions drawn is that to obtain valid results it is important that the regain of the yarn should be known to enable the instrument to be set accordingly. It is especially important to ensure that no dampness exists in the yarn, for example in the centre of packages after steaming or wet treatments, since this would lead to erroneous results.

KEY WORDS

Yarn fault classifying – Classimat – variation in faults – fault distribution.

INTRODUCTION

Recent years have seen the advent of various electronic instruments which continuously monitor the cross section of a yarn during cone winding and which count and classify thick places occurring in the yarn according to their length and cross-section. If the instrument functions on the capacitance principle (an example of such a type of instrument is the Uster Classimat[1–4]) the yarn cross-section, in terms of its mass per unit length, is measured as it passes between the two parallel plates of a capacitor. In this case variation in the yarn linear density changes the capacitance of the capacitors which is converted into an electric signal and used as a measure of the yarn linear density variation. Other factors, notably the moisture content of the yarn and the type of fibre, which affect the di-electric constant of the material between the plates of the capacitor can, however, also affect the capacitance and give rise to erroneous results. Nevertheless, provided the moisture content of the yarn being tested is known and provided it does not vary unduly along the length of the yarn it is possible to adjust the instrument accordingly, thereby correcting for the different regain levels of each yarn lot being tested. Similarly, it is possible to set the instrument according to the type of fibre or fibre blend being tested and provided blending is reasonably uniform it should not have an adverse affect on the results obtained[5].

Instead of the capacitance method referred to above an optical method can also be used to measure the cross-section (diameter) of the yarn during winding. In this case the thickness of a fault is assessed in a manner similar to that done visually. Disadvantages which are sometimes said to be associated with this type of system are flattening of the yarn cross-section during the test, effect of colour differences and yarn twist, ageing of the light source, etc. These disadvantages have to a large extent been overcome in the latest yarn clearing and classifying instruments functioning on the optical principle. The Crabtree Yarnalyser is a fault classifying instrument which functions on the optical principle.

The yarn fault classifying instruments can be used for either routine quality control purposes or as a means for determining appropriate clearing levels and for setting the corresponding clearer installation so that it removes faults overstepping the pre-determined limits. In the former case the instrument is attached to a cone winder and the faults present in the yarn are classified and counted during routine winding operations. If required, the faults may be extracted by means of the cutter-clearer arrangement normally incorporated in the classifying instruments. The number of faults recorded can then be compared either with external values, for example with the Uster Statistics[2], in the case of the Uster Classimat, or with internal standards built up during the course of time. The latter is preferable, although it may take some time to compile appropriate standards. If the classifying instrument is used as a basis for determining clearer levels, a trial test is normally undertaken with it on a sample lot of yarn. On the basis of the information so obtained the required level of clearing is selected and set on the clearer installation. In a recent article[6] consideration was given to this aspect of fault classifying by using the Uster Classimat as the classifying instrument and the Uster Automatic, Peyer D, Peyer P.I. 12 and Loepfe F.R. 30 yarn clearers.

An Uster Classimat installation has been in use at SAWTRI for about three years and it was considered to be of some value to report on some observations made and results obtained during routine tests carried out on a range of yarn lots. Systematic data on about 15,4 million metres (approximately 400 Kg) of yarn were collected during this period. The installation's essential function was that of a yarn clearer. In this report the main emphasis has been placed on the variation which can occur in the results obtained on different segments of yarn from the same yarn lot and on the fault distribution. The lots tested comprised yarns spun at SAWTRI as well as commercial yarn lots, and although consisting mainly of pure wool yarns a few corespun, intimate blend and synthetic yarns and one cotton yarn were included as well.

EXPERIMENTAL

In the majority of cases the yarns were allowed to condition for at least a week under standard atmospheric conditions (20°C and 65% R.H.) before the tests were carried out.

The Classimat was regularly checked and calibrated according to the instruction manual supplied with the instrument after it had had sufficient time to stabilise in each case. It may be noted that, in general, the instrument proved to be stable and normally it required only slight adjustment, if any, after it had been inoperative for some time. The instrument was mounted on a four head Schweiter cone winder which had to be modified to increase its speed to 400 metres/min, the minimum speed setting on the Classimat. Here again it is of interest to note that although the nominal winding speed of this winder is 400 metres/minute the actual yarn speed was found to be much lower and of the order of 330 metres/minute. It is important that the actual winding speed used should agree with the pre-set value on the Classimat since any discrepancy will be reflected in the length classification of the yarn faults.

The relevant details of the yarns tested and the test lengths employed are given in Table I. The number of tests carried out on each yarn can be obtained by dividing the total length of yarn tested by the average unit length.

RESULTS AND DISCUSSION

Since the yarn faults are classified into 16 different classes according to their length and cross-section, actually mass per unit length (see Fig. 1), it was impossible to display all the results in one table. The results have, therefore, been grouped according to the fault length and these are given in Tables II to V. The cumulative frequency values are given in keeping with the system adopted by the manufacturers of the Classimat instrument.

The tables give the mean counter results, normalised to 100 000 metres (100 km) in each case, and the coefficient of variation (C.V.) of the results. In some cases the number of tests carried out on the yarn were really too small to allow a meaningful C.V. to be obtained. Nevertheless, these results have been included for the sake of completeness.

From Tables II to V it is immediately apparent that the results obtained on different segments of yarn from the same lot can often vary greatly as exemplified by the large C.V.'s involved. This, therefore, indicates that caution must be exercised when the results obtained on different yarn lots are compared, lest an erroneous conclusion be arrived at. Normally, as the test length is increased the accuracy of a counter reading is improved although in the present case this effect is camouflaged by the inherent differences between the yarns on which different test lengths were employed. Uster[2] recommends that about 300 km, but not less than 100 km, of yarn should be tested for normal quality control purposes to obtain a representative result.

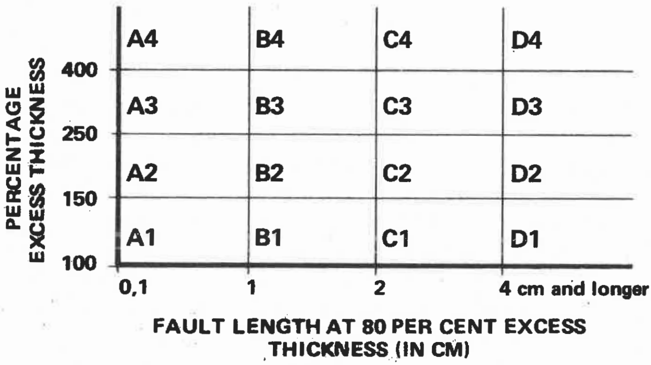

FIGURE 1

Fault classification system employed on Classimat

It has been suggested that the distribution of faults along the length of a spun yarn is not Gaussian (normal) but tends towards a Poisson or a negative binomial distribution[2, 7–9]. Therefore, the confidence range for the results obtained is much larger for a low counter reading than would be the case for a normal (Gaussian) distribution. In addition the inhomogeneity often inherent in spun yarn increases the error of test results still more. With a Poisson distribution, and assuming a homogeneous population, the confidence limits of a counter reading (x), as originally obtained, may be calculated as follows[7]: Confidence limits $= x \pm \lambda \sqrt{x}$ where λ equals 1,96 for the 95% confidence level and 2,58 for the 99% confidence limits. These are, however, the theoretical limits. Experience has shown that these limits must be extended in practice due to various factors, one of which being the "non-homogeneous" nature of the population. It has therefore been suggested[7] that in practice, the values for λ should be increased by 50%. The confidence limits now become

$$x \pm 3\sqrt{x} \qquad (95\%)$$

and

$$x \pm 4\sqrt{x} \qquad (99\%)$$

Therefore, 95% of the tests carried out on different sections of yarn, all of the same length and from the same yarn lot, should yield a result lying within the limits $x \pm 3\sqrt{x}$ where x is the counter reading obtained.

If the counter results obtained on two different yarns are to be compared, for instance to ascertain whether or not they differ significantly, the following test may be applied[7]:

$$y = \frac{|x_1 t_2 - x_2 t_1|}{\sqrt{t_1 t_2 (x_1 + x_2)}}$$

where x_1 and x_2 are the counter readings obtained, t_1 and t_2 are the unit lengths tested, unit weights of material or unit times employed and y is a factor for determining the statistical significance. The above formula assumes a Gaussian distribution and a large sample size. It has been stated that, in practice, if y exceeds 4 the two results differ significantly at the 99% level of significance. Therefore, if for example, x_1 and x_2 values of 200 and 100, respectively, are obtained for a certain type of fault on two different yarns when 300 000 metres of each was tested, then

$$y = \frac{|200 - 100|}{\sqrt{300}}$$

$$= 5{,}9$$

Since this value is greater than 4 it could be concluded that the two yarns differ significantly in the number of faults they contain. Once again it must be emphasized that the counter results must be used in their original form (not corrected to 100 000 metres for instance) and that the length of yarn tested must be large.

Now returning to the results given in Tables II to V it is apparent that there is in fact a tendency for the C.V. values to increase for a specific yarn with a decrease in the number of faults recorded in the different classes. This emphasises the need to exercise caution when comparing low counter readings, since the error contained in these is, relatively speaking, much larger. Uster recommends that comparisons only be made in the case of counter readings which exceed 20[1] or even 30[7].

To establish whether the results here approximate to a Poisson distribution an analysis was carried out on the results of those yarns (Nos. 5, 6, 12, 15, 17, 18, 20, 23, 24, 25 and 26) for which a sufficiently large number of segments (6 or more) had been tested. A linear regression analysis was performed on the log of the standard deviation against the log of the mean counter readings, all the counter values and in their original form being used in the analysis. This means that within a fault length group the counter readings representing the cumulative frequency values were used. From the analysis the following equation was obtained:

$$\text{Standard deviation (S.D.)} = \frac{(\text{Mean counter result})^{0{,}74}}{138} \quad \ldots\ldots\ldots\ldots\ldots (1)$$

The correlation coefficient was 0,909 ($t = 28{,}7$) with 175 results.

In the case of a Poisson distribution the standard deviation equals the square root of the counter result i.e.

$$\text{S.D.} = (\text{mean counter result})^{0{,}5}$$

Values obtained by means of the regression equation differed significantly from those obtained by means of the above relationship, except in the case of low counter values.

A second analysis, this time incorporating only those faults counted in classes A4, B4, C3 and D3 and which are generally regarded as being objectionable, produced the following regression equation:

$$\text{S.D.} = 1{,}03 \text{ (mean counter result)}^{0{,}52} \qquad \ldots\ldots\ldots\ldots\ldots (2)$$

The correlation coefficient was 0,771 (t = 7,8) with 44 results. It is therefore apparent that, for these faults, the standard deviation of the results is in close agreement with that predicted by a Poisson distribution.

In Fig. 2, log standard deviation has been plotted against the log counter result with the straight line derived from the regression equation (1) superimposed. It is apparent that the line does not fit the data very well and it was therefore decided to fit a quadratic equation to the log results. The following equation, the curve of which is drawn in Fig. 2, was obtained.

$$\text{log standard deviation} = 0{,}444 \text{ (log counter result)} + 0{,}099 \text{ (log counter result)}^2 + 0{,}026 \ldots\ldots\ldots\ldots (3)$$

From this equation the predicted standard deviation values were derived for various counter results and the former were then multiplied by a factor of 2 to get the 95% confidence limits. These together with the values Uster suggested for the confidence limits, are given in Table VI. It is apparent from this table that the two sets of results agree reasonably well at low counter values while they differ considerably at higher counter values. The confidence limits predicted from the present experimental data increase much more rapidly than could be expected from a Poisson distribution and the values shown in Table VI can therefore be used as a rough indication of the accuracy of any counter reading obtained in practice.

Tables II to V also illustrate the rapid increase in the number of faults as the fault length and cross-section decrease. This, therefore, has a direct bearing on the number of faults removed (i.e. cuts made and therefore knots inserted) during clearing since a relatively slight increase in the degree of clearing would tend to increase the number of knots inserted (i.e. cuts made) considerably. In practice, faults of the nature of those occurring in classes B4, C4, D4 and D3 would nearly always be considered unacceptable and would therefore have to be removed and replaced by knots[4, 6, 10]. Faults in classes A4, C3 and D2 would in some cases also be regarded as undesirable and have to be cleared. Faults of the nature B3, C2 and D1 would only under certain, and rather more stringent, requirements be deemed undesirable. According to the results shown in Tables II to V, however, the latter clearing levels would generally increase the number of knots in the yarn and decrease the winding efficiency to unacceptable levels. It is therefore concluded that, in practice, an acceptable clearing level may include the classes A4, B4, C4, D4, C3 and D3 or possibly B4, C4, C3, D4 and D3. According to the yarns tested the former level would have led to, on the average, about 33 clearer cuts (and therefore

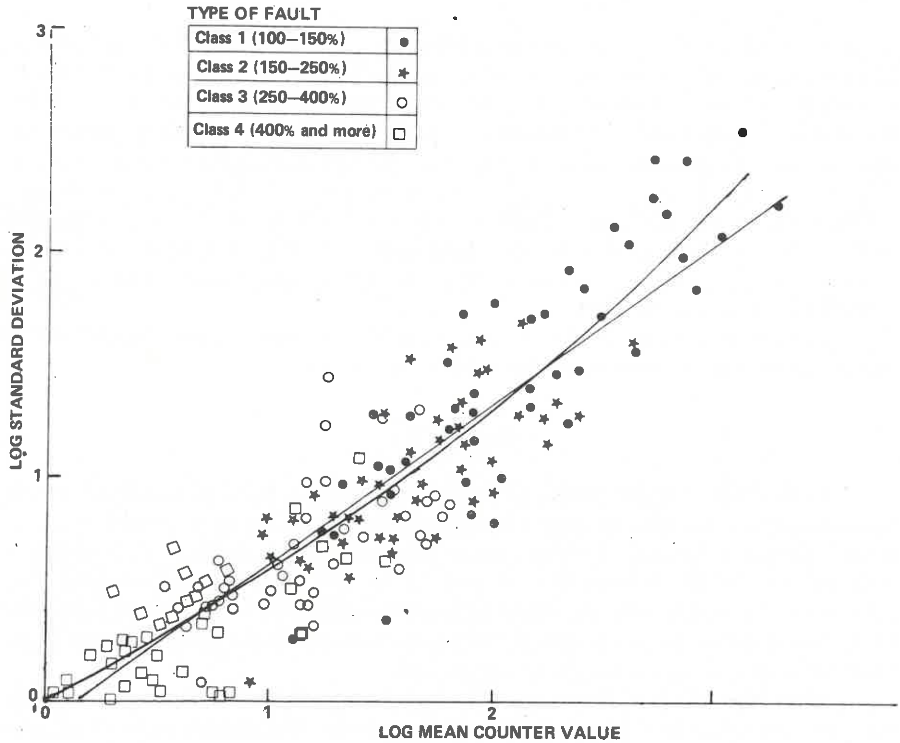

FIGURE 2

Log standard deviation of the counter values vs log mean counter value (cumulative frequency values)

33 knots) per 100 000 metres of yarn which could be regarded as acceptable. In extreme cases this would have led to as many as 113 cuts (and therefore knots) per 100 000 metres. This, however, is due to the high number of faults present in those particular yarns and not to the clearing level being too severe.

The Uster values[2], claimed to represent an average *worsted* yarn, have been included in the tables for comparative purposes. It is interesting to note that the averages of the results obtained in this study are generally higher than the Uster values, this being especially noticeable in the case of faults with a small cross-section (i.e. the more frequent type of faults). This could possibly be due to the fact that a proportionally large number of the yarns tested were rather fine, it being stated[2] that although neither yarn count nor fibre fineness had a direct influence on fault frequency, fine yarns do tend towards higher fault frequencies.

Finally, Tables VII and VIII illustrate how important it is to accurately assess the regain level of the material being tested and to ensure that the yarn has been dried thoroughly and conditioned properly prior to testing. Any dampness, for instance in the centre of the yarn package, would lead to grossly misleading values being obtained. Adequate time, therefore has to be allowed for the yarn to condition especially after steam setting or wet treatment. In fact, it is considered preferable always to approach the equilibrium regain from the dry and not from the wet side. It must be pointed out, however, that part of the differences displayed in Tables VII and VIII may be due to the non-homogeneous nature of the yarns since a different yarn segment was involved in each test. Furthermore, if the unacceptable faults only had been considered the differences would have been much less pronounced since it was the counter readings which represented the smaller type of faults which changed the most.

A material setting of 7,5, corresponding to the atmospheric conditions in which the tests were carried out, was used in both cases.

SUMMARY

In this report some results obtained on an electronic yarn classifying instrument during routine tests on approximately 400 kilogrammes of yarn have been presented. Special attention has been paid to the variation which may occur in results obtained on different segments of yarn from the same batch, stressing that care must be taken when comparing results obtained on different yarns lest erroneous conclusions be arrived at. This is mainly due to inherent variation in the fault frequency along the length of a spun yarn.

Reference has been made to the basis on which differences between yarns may be assessed as well as to practical clearing levels. The importance of correctly assessing the regain of a yarn under test and of ensuring that the yarn is in no way damp has also been emphasized and illustrated.

On the basis of the data obtained here 95 *per cent* confidence limits have been calculated for various counter values.

ACKNOWLEDGEMENTS

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TABLE I

DETAILS OF YARNS TESTED

Yarn No.	Fibre Type	Count (tex)	Average Unit Length (km)	Total Length Tested (km)
1	Wool/Polyester	R45/2	21,2	63,5
2	Wool/Polyester	R45/2	12,7	38
3	Wool/Polyester	R45/2	25,4	101,5
4	Wool/Polyester	R45/2	46,2	138,5
5	Wool	28	110,7	664
6	Wool	20	97,2	583
7	Wool	29	55,0	220
8	Cotton	30	133,0	266
9	Wool	24,5	127,7	383
10	Wool	22	87,7	263
11	Wool	25	36,0	72
12	Wool	28	137,7	826
13	Wool	37	50,2	150,5
14	Wool	64	28,3	85
15	Wool	24	61,2	367
16	Wool	29	120,5	482
17	Wool/Nylon	18	103,1	825
18	Wool	24	158,2	1740
19	Wool	24	88,7	266
20	Wool/Nylon corespun	18	98,8	593
21	Wool	28	41,8	167
22	Wool	22	250,3	751
23	Wool	24	132,7	1858
24	Polyester/Acrylic	R44/2	158,7	952
25	Polyester/Acrylic	22	143,2	1432
26	Wool	22	136,0	2176
Overall Length of Yarn Tested = 15463 km				

TABLE II

NUMBER OF CLASS A FAULTS (FAULT LENGTH 0,1 TO 1 CM) PER 100 KILOMETRES OF YARN CLASSIFIED ACCORDING TO THEIR CROSS-SECTION AS INDICATED IN PARENTHESES

Yarn No.	CLASS 1 (100 to 150%)		CLASS 2 (150 to 250%)		CLASS 3 (250 to 400%)		CLASS 4 (Greater than 400%)	
	Mean	C.V. (%)	Mean	C.V. (%)	Mean	C.V. (%)	Mean	C.V. (%)
1	261	36	69	18	14	19	0	0
2	220	3	73	24	5	92	0	0
3	233	13	92	11	20	44	1	200
4	226	26	89	22	16	7	2	100
5	649	14	150	11	24	20	1	100
6	1292	29	85	27	18	156	2	70
7	336	57	43	23	4	93	1	100
8	167	22	80	29	8	0	1	100
9	381	11	71	11	8	20	1	100
10	214	0,5	32	4	6	20	1	100
11	224	5	42	17	5	16	3	141
12	223	8	52	16	14	22	2	73
13	189	14	73	22	7	43	1	173
14	165	55	82	61	14	56	3	100
15	236	14	78	19	16	33	2	122
16	558	11	86	16	9	32	1	67
17	754	9	177	11	36	18	5	27
18	107	32	26	32	4	54	1	80
19	106	36	23	43	4	0	0,3	173
20	1050	12	243	8	54	9	6	24
21	705	11	162	6	18	73	2	89
22	402	51	48	12	9	25	3	0
23	416	34	53	30	11	45	0,7	66
24	215	40	55	47	11	52	1,7	90
25	426	26	96	37	14	27	1,6	73
26	1359	10	303	10	41	14	3,8	47
Mean	457	22,3	92	21,8	14	38	1,8	85
C.V. (%)	81,4		72		80		80	
Uster values	250		50		10		2	

TABLE III

NUMBER OF CLASS B FAULTS (FAULT LENGTH 1 TO 2 CM) PER 100 KILOMETRES OF YARN CLASSIFIED ACCORDING TO THEIR CROSS-SECTION AS INDICATED IN PARENTHESES

Yarn No.	CLASS 1 (100 to 150%)		CLASS 2 (150 to 250%)		CLASS 3 (250 to 400%)		CLASS 4 (Greater than 400%)	
	Mean	C.V. (%)	Mean	C.V. (%)	Mean	C.V. (%)	Mean	C.V. (%)
1	40	56	29	58	12	101	0	0
2	27	9	20	16	7	89	0	0
3	36	10	24	7	9	30	1	200
4	34	55	26	57	10	87	2	100
5	172	16	88	12	31	27	3	59
6	731	28	55	32	13	34	5	67
7	140	89	13	74	2	20	1	200
8	59	6	38	25	7	20	2	47
9	89	24	17	16	4	16	1	100
10	56	10	19	26	8	53	1	100
11	66	23	43	32	8	47	2	141
12	63	18	26	15	11	19	4	47
13	45	4	34	16	14	25	3	35
14	38	81	28	81	14	77	7	100
15	53	7	36	16	18	34	6	72
16	109	20	13	30	4	40	1	82
17	385	9	160	8	54	14	12	21
18	26	47	8	48	3	62	1	60
19	26	34	10	11	5	12	1	115
20	429	26	132	14	49	16	14	18
21	226	9	110	17	31	32	10	6
22	195	50	33	21	14	10	6	0
23	109	36	16	27	4	37	1	64
24	44	81	26	85	11	98	3	91
25	21	37	11	53	4	77	1	155
26	175	13	34	17	8	34	2	55
Mean	131	31	40	31	13,7	43	3,5	85
C.V. (%)	124		96		98		80	
Uster values	60		25		10		3	

TABLE IV

NUMBER OF CLASS C FAULTS (FAULT LENGTH 2 TO 4 CM) PER 100 KILOMETRES OF YARN CLASSIFIED ACCORDING TO THEIR CROSS-SECTION AS INDICATED IN PARENTHESES

Yarn No.	CLASS 1 (100 to 150%)		CLASS 2 (150 to 250%)		CLASS 3 (250 to 400%)		CLASS 4 (Greater than 400%)	
	Mean	C.V. (%)	Mean	C.V. (%)	Mean	C.V. (%)	Mean	C.V. (%)
1	11	97	6	106	1	173	0	0
2	10	92	2	173	0	0	0	0
3	12	38	7	73	4	84	2	117
4	6	27	5	35	1	173	1	100
5	58	27	33	20	14	15	3	41
6	509	54	64	26	16	22	6	31
7	93	91	15	72	1	200	1	100
8	23	6	16	14	6	64	1	0
9	51	11	13	34	4	16	1	100
10	65	6	33	14	12	28	5	53
11	68	6	41	7	19	37	5	141
12	55	13	23	19	7	34	3	22
13	43	21	31	17	14	37	5	25
14	39	37	18	31	8	117	5	128
15	31	30	22	31	11	48	5	39
16	51	19	7	36	1	100	0,3	200
17	195	8	93	8	53	12	20	18
18	18	64	6	55	2	68	0,5	115
19	19	42	8	49	4	68	1	100
20	246	28	76	19	37	10	17	17
21	101	20	64	23	34	29	14	40
22	154	40	45	27	19	19	11	26
23	61	30	11	28	3	60	1,5	73
24	39	55	19	65	9	63	3	70
25	12	32	7	41	3	48	2	53
26	106	18	22	29	5	47	1	88
Mean	80	35	26	40	11	60	4	65
C.V. (%)	132		91		116		121	
Uster values	40		18		8		3	

TABLE V

NUMBER OF CLASS D FAULTS (FAULT LENGTH GREATER THAN 4 CM) PER 100 KILOMETRES OF YARN CLASSIFIED ACCORDING TO THEIR CROSS-SECTION AS INDICATED IN PARENTHESES

Yarn No.	CLASS 1 (100 to 150%)		CLASS 2 (150 to 250%)		CLASS 3 (250 to 400%)		CLASS 4 (Greater than 400%)	
	Mean	C.V. (%)	Mean	C.V. (%)	Mean	C.V. (%)	Mean	C.V. (%)
1	2	173	0	0	0	0	0	0
2	17	41	11	54	5	92	0	0
3	5	69	4	82	0	0	0	0
4	7	48	4	50	1	87	1	100
5	31	33	23	28	12	29	6	20
6	213	41	86	36	45	46	25	49
7	25	73	6	50	3	38	2	67
8	7,5	9	7	20	4	71	2	71
9	28	20	19	41	6	58	3	100
10	56	21	46	19	25	14	13	37
11	46	20	29	3	16	32	5	141
12	58	9	40	10	10	15	3	70
13	53	40	41	39	24	33	10	72
14	62	32	41	41	29	65	13	109
15	21	14	13	18	8	26	4	80
16	17	19	7	45	3	23	1	77
17	98	9	72	10	43	12	29	13
18	13	47	6	57	4	64	1	64
19	26	58	16	67	5	111	3	145
20	84	24	56	27	34	25	17	29
21	81	21	57	45	32	57	15	43
22	136	19	100	13	63	13	44	3
23	30	31	14	33	4	50	2	81
24	68	57	40	59	19	64	8	58
25	24	24	15	30	7	49	5	59
26	49	31	20	35	4	59	2	66
Mean	48	38	30	35	16	44	8	60
C.V. (%)	96		90		106		127	
Uster values	25		12		6		2	

TABLE VI

PREDICTED 95 PER CENT CONFIDENCE LIMITS

Counter Value (x)	Confidence Limits Predicted from experimental data (= ± 2 S.D.)*	Confidence Limits suggested by Uster ($= \pm 3\sqrt{x}$)
1	$1\,{}^{+2}_{-1}$	$1\,{}^{+3}_{-1}$
2	$2\,{}^{+3}_{-2}$	$2\,{}^{+4}_{-2}$
5	5 ± 5	$5\,{}^{+7}_{-5}$
10	10 ± 7	10 ± 9
20	20 ± 12	20 ± 13
50	50 ± 23	50 ± 21
100	100 ± 41	100 ± 30
150	150 ± 58	150 ± 37
200	200 ± 74	200 ± 42
300	300 ± 108	300 ± 52
500	500 ± 176	500 ± 67
1000	1000 ± 353	1000 ± 95

*S.D. = Standard Deviation

TABLE VII

AN EXAMPLE OF THE EFFECT OF AN INCORRECT MATERIAL SETTING* ON THE TOTAL NUMBER OF FAULTS COUNTED PER 100 KM OF YARN

Material Setting	Total number of Faults counted (per 100 km)
5,5	1020
6,5	615
7,5	178

* The wool was tested at an R.H. of 50%. The correct material setting was therefore 6,5.

TABLE VIII

THE EFFECT OF TESTING A YARN WHICH HAD NOT BEEN DRIED PROPERLY AFTER WET TREATMENT ON THE TOTAL NUMBER OF FAULTS COUNTED*

Yarn Condition	Total number of Faults counted (per 100 km)
Conditioned	391
Damp	1745

* A material setting of 7,5,corresponding to the atmospheric conditions in which the tests were carried out, was used in both cases.

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