A STUDY ON THE OPEN YARN QUALITY PART II: EFFECT OF SOME BLOW ROOM MACHINERY VARIABLES ON YARN QUALITY

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ABSTRACT

In this paper the effect of some blowing room machinery variables on the produced yarn quality is studied. The effect of basic settings of three types of machines, namely: bale opener GBR, Axiflo AFA and Kirschner beater RK, on the properties of an OE Yarn of count Ne 12 with a nominal twist factor 4 is investigated. It is found that the most significant parameters are:feed roller speed to the kirschner beater, a value of 10 r.p.m. is the best. Also, the best settings of the grid bars under the beater are 10, 16 mm. An improvement in the yarn tenacity from 8.86 g./ tex to 11.94 g./tex is achieved. Yarn evenness improved from 19.5% to 19%. Yarn breaking extension increased from 5.11% to 5.32%.

INTRODUCTION

There is hardly many work relating directly the blow room machinery parameters to the final produced yarn properties. However, there are many researches relating parameters affected by the performance of the blow room machineries to the yarn propertics for example degree of cleanliness, degree of fibre opening, regularity of flow of material from blow room as reflected on sliver regularity and% of short fibers in the fed slivers, on the produced yarn quality.

Luenschloss (9) has pointed out that the high percentage of short fibres by OE spinning has positive effects on the yarn properties.

Schenek (12) investigated the problem of fine dust in rotor spinning and its effect on the yarn quality, the found that the collection of fine dusts in the groove of the rotor cause contineous deterioration in yarn quality that may or may not results in an ends-down.

Barella et-al (1) has concluded that the cleanliness of the rotor is a factor of major importance in the determination of the properties of the rotor spun yarn. The properties of the yarn from inner most part of the bobbin (begining of cycle are some what significntly better than the properties of the yarn from outer layers of the bobin (end of cycle).

In another study (15), it has been found that the yarn strength is deteriorated from 9.9 gm/tex to 8.4 gm/tex due to the accumulation of dusts in the groove of the rotor.

Chewning (3) has concluded that the yarn evenness of the rotor yarn is adversly affected by the presence of trashes into the yarn.

It has been establised in the earlier papers (2) that the new cleaning devic seems to be efficient for when device is used, speciallly for the periodic irregularity.

Wolf (17) has mentioned that actually the only negative inflnence on the regullarity of open end yarn is from residues in the rotor groove.

Hemslie (7) said that not only yarn strength and regularity are affected by deposits in the collecting surface, but also the appearance can be modified.

Towery et-al (16) through that if end break average due to residue would occur in 20 hours, yarn deterioration would be measured after 8 hours.

IN this research the the effect of blowing room variables on final yarn properties is studied, and as the frist part of this paper was related to the effect of these variables on the sliver quality,

EXPERIMENTAL WORK

Trials for extended experiments (4) has been done to study the effect of each blow-room machinery factors on the properties of the open-end yarn producced.

Basic experiments results analysis has been taken as a guide to chose the factors and their levels which affects significantly on the measured properties.

From the preliminary and basic experiments, it is clear that the main factors of differnt blowing-room machineries are the feed roller speed (r.p.m.) and the grid bars angle settings respectively.

The change of that independent factors has nearly the same effect on dependent variables for each machine of

the opening line.

Three different blow-room machineries has been chosen for the investigation of the extended experiments, these machines are bale opener, GBR., Axiflo opener, AFA, and Kirschner beater R.K.

The obtained results has been studies and analysis to get the recommended setings for the blow-room machineries, i.e. the best factor poition of each machine which effect on the improvement for the measured properties.

Table (1) illustrates the experimental arrangement in this research.

Table 1. Experimental Arrangement

Exp. No	Factors setting position		
	A	B	C
1	1	-5	19
2	3	5	19
3	3	5	19
4	4	5	19
5	3	-5	19
6	3	5	19
7	3	15	19
8	3	25	19
9	1	-5	19
10	2	5	19
11	3	15	19
12	4	25	19
13	2	-5	10
14	3	5	15
15	3	15	20
16	3	25	24
17	1	-5	10
18	2	5	15
19	3	15	20
20	4	15	24

* See the notations on the next page.

RESULTS AND DISCUSSIONS

a- Bale Opener GBR

The produced open-end yarn spun from carded slivers which were performed by the effect of various bale opener factors under extended investigation, were studied and analysed with regard to both the Useter statistics standard and the preliminary open-end yarn produced from processing low grade cotton.

These open-end yarn which has been produced has noinal yarn count 20 Nm (12's) and nominal Twist factor (4).

The physical and mechanical open-end yarn measured properties has been illustrated in Table (2).

1.O.E. YARN STRENGTH (R.K.M) AND ELONGATION %:

Figures (1) and (2) represents the plotting of the effect of grid bars setting positions and spicked lattice, evenner roller settings of the bale opener GBR under investigation, on the produced open-end yarn strength in (R.K.M.), it is clear that the obtained open-end strength due to the effect of factor (A) setting positions were (8.86, 11. 34, 10.08 and 10.14) (R.K.M.) respectively, while the obtained results of perliminary open-end yarn is (9.73 R.K.M.) and from the Uster qualtiy standard it is (10.25 R.K.M.) at 50% all over the world.

The obtained results at the grid bars setting positions (A = 2 and 3) gives the high value of R.K.M. respectively and it is higher than that obtained in the preliminary open-end yarn produced and reaches the Uster quality standard. This agrees with obtained results of the carded sliver produced at this setting position of the grid bars, where, the trash content% is the lower value (0.10%) at this poition.

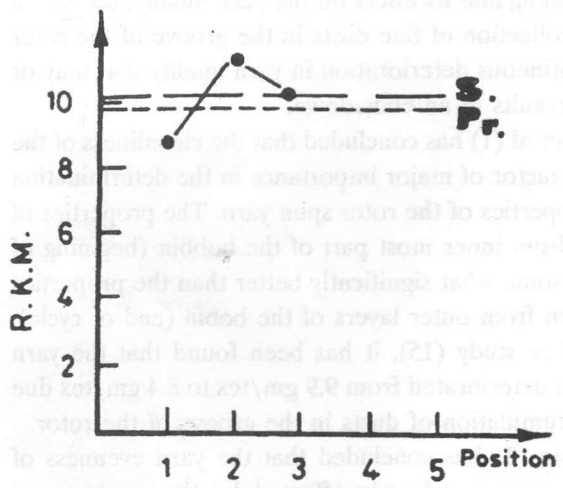

Figure 1. The effect of factor (A).

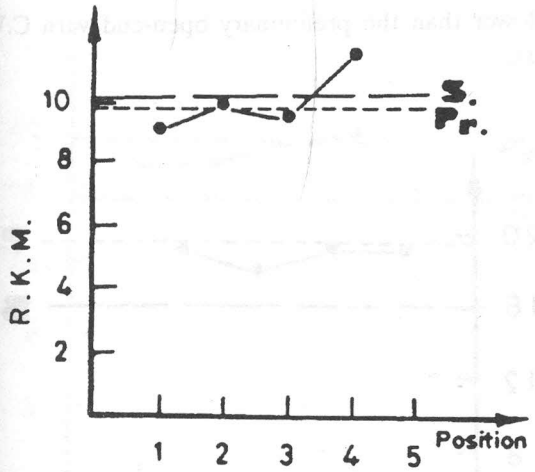

Figure 2. The effect of factor (A).

Figure (3) represents the obtained C.V.% strength which inducates the value (17.39%). In this case which is higher than that obtained in preliminary (15.71%) and Uster quality standard (10%).

But the open-end yarn elongation% as represented in Figure (5) gives (4.6%) at this setting position (A = 3) which is lower than that mentioned for the Uster quality standard (8%).

Yet, the open-end yarn strength and elongation% is highly in fluenced by the effect of grid bars angle setting position and this results agrees with the obtained carded sliver reults and the trend is increasing this grid setting position and this results agrees with the obtained carded sliver results and the trend is increasing this grid bars setting position the yarn strength increases, and C.V.% strength increases while elongaton% decreaes.

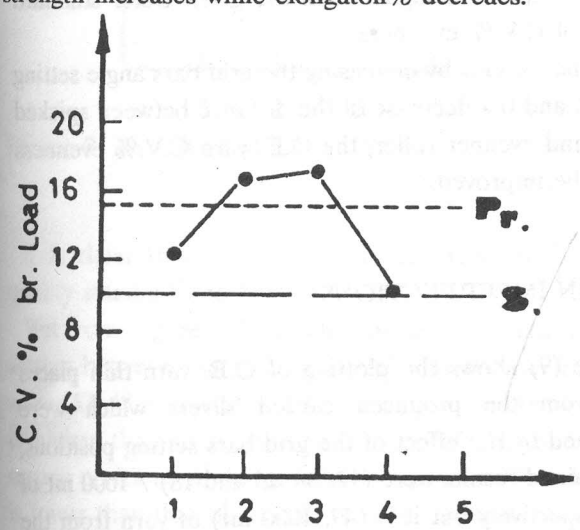

Figure 3.The effect of factor (A).

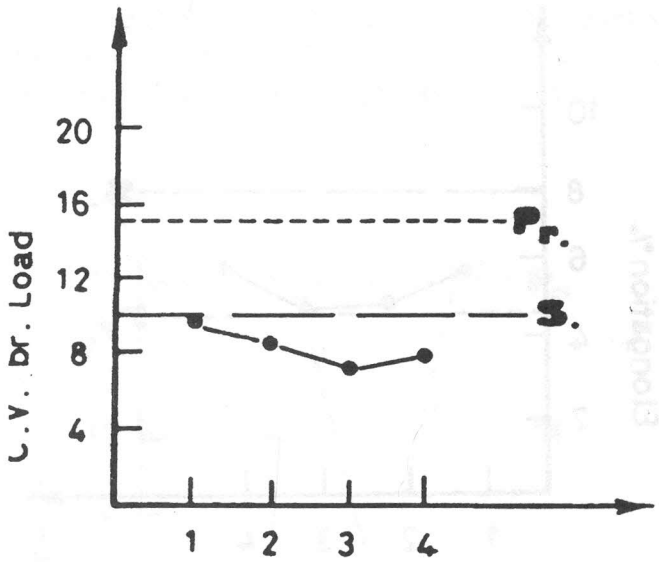

Figure 4. The effect of factor (B).

While, the open-end yarn strength which is prroduced from carded sliver performed by the effect of spicked lattice and evenner roller setting (distance_ positions were (9.090. 9.80 and 17.7) R.K.M. respectively as given in ure (2) and it is cl clear that, by the increase of this distance between the spicked lattice and evenness roller, the obtained values reaches the Uster standard quality at position (B = 5 mm and 25 mm) respectively. But the C.V. % strength reusults were (10.69%, 9. 9.57%, 7.49% and 7.99%) respectively and this is lower than that obtained in case of grid bars angle setting poistions, this due to the effect of increasing this distance as given in Figure (4).

While the elongation% results obtained in this case were (4.75%, 4.4%, 4.88% and 5.02%) as shown in figure (6) and it also lower than the Uster quality standard and that obtained in case of grid bars setting poitions hence the produced open-End yarn strength C.V.% strength and elongation is also influenced by the effect of distance between the spicked lattice and evenness roller.

The results shown that strength (R.K.M.) increases and C.V.% strength decreases while elongation increases due to the increases of this distance (b).

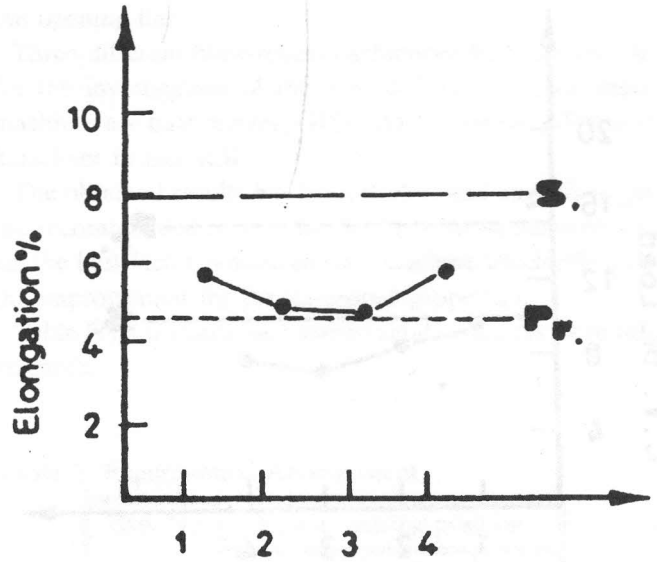

Figure 5. The effect of factor (A).

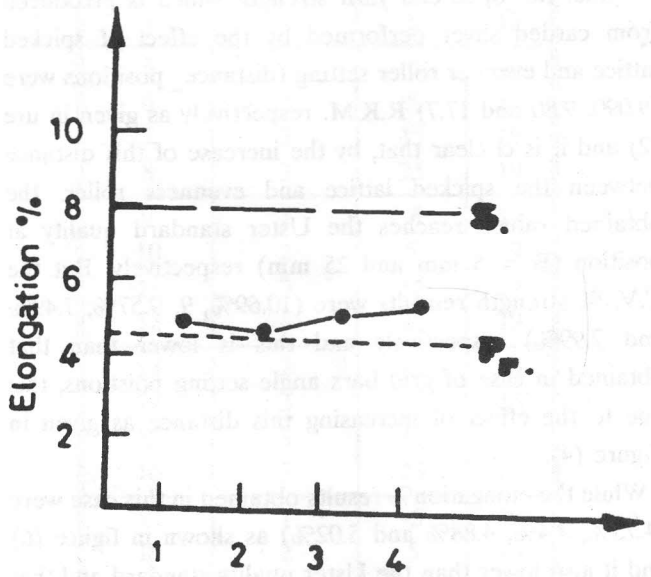

Figure 6. The effect of factor (B).

2.O.E. YARN C.V.% EVENNESS:

Figure (7) represents the effect of grid bars engle setting positions the lowest value has been found at grid bars setting position (A = 3) which is (18.1%) but the Uster standard quality C.V.% evenness is (16%) at 50% all over the world and it is higher than that Uster standard values but is lower than the preliminary open-end yarn C.V.% evenness.

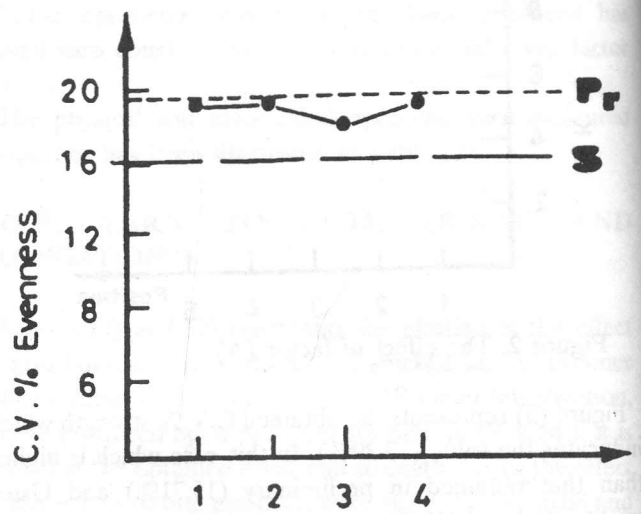

Figure 7. The effect of factor (A).

This high value is due to the effect of carded sliver evenness which is reflected on the produced open-end yarn C.V.% evenness.

Figure (8) shows the effect of the factor (B) on the O.E. yarn C.V.% evenness, it is clear that the lowest value is (18.04 at setting position (B = 5 mm) ant it is also than the obtained reuults of the prelimiary O.E. Yarn produced, and it is higher than the given Uster standard quality of C.V.% evenness.

Yet, the trend is by increasing the grid bars angle setting position and the decrease of the distance between spicked lattice and evenner roller, the O.E. yarn C.V.% evenness should be improved.

3. YARN IMPERFECTIONS:

Figure (9) shows the plotting of O.E. yarn thin places spun from the produced carded slivers which were performed by the effect of the grid bars setting positions, the obtained results were (12, 38, 25 and 18) / 1000 mt of yarn respectively but it is (49, 1000 mt) of yarn from the Uster quality standard.

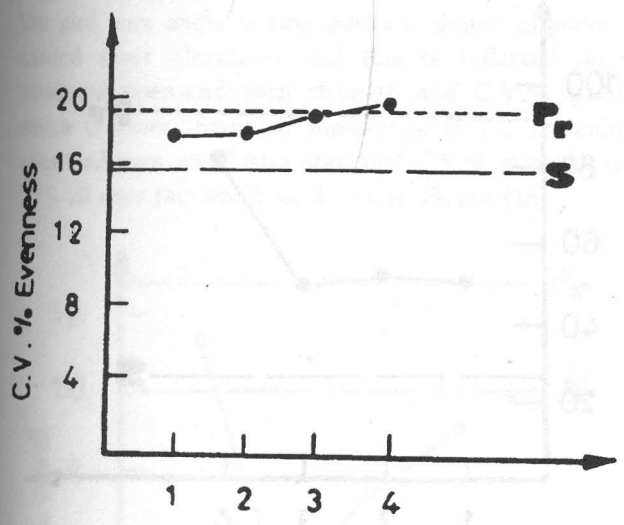

Figure 8. The effect of factor (B).

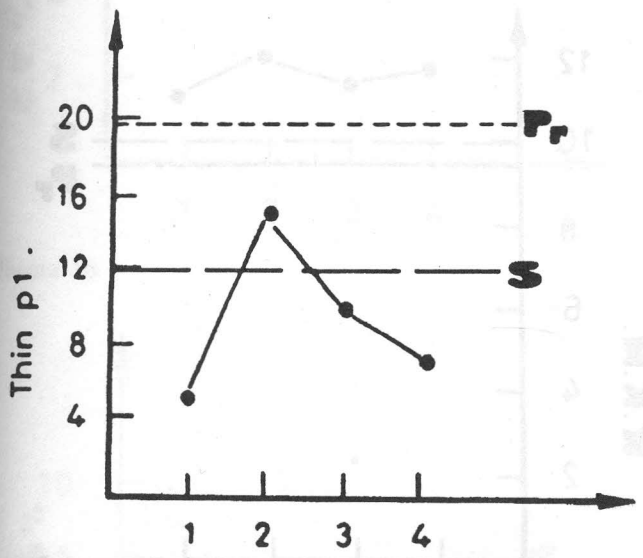

Figure 9. The effect of factor (A).

It is cl;ear that the obtained results reaches the Uster quality standard and better.

But from Figure (10) which represents the effect of the setting between the spicked lattice and evenner roller, it were (57, 48, 9 and 52) / 1000 mt of yarn and these values is higher than that obatined in case of grid bars angle setting positions while the value obtained at (B = 15 mm) is lower than that obtained for Uster standard quality.

These reults were higher than the Uster standard of quality neps (250 neps/1000 mt. of yarn) due to the cotton mix. with waste but it is lower than that obtained in the preliminary O.E. yarn (905 neps/1000 mt. of yarn).

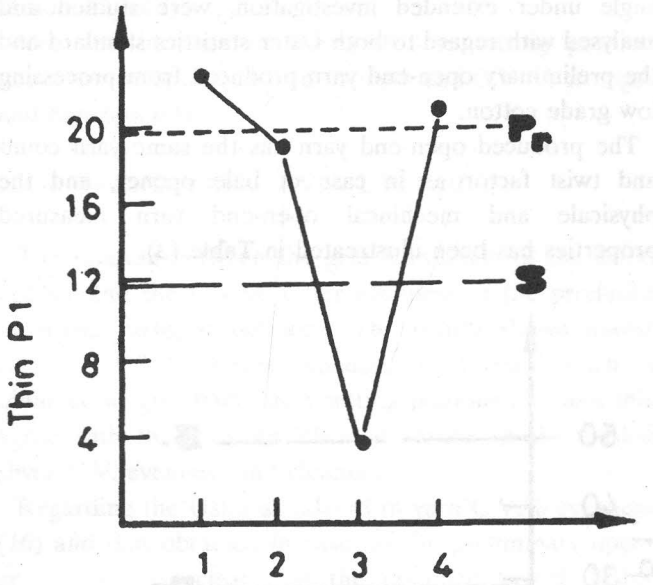

Figure 10. The effect of factor (B).

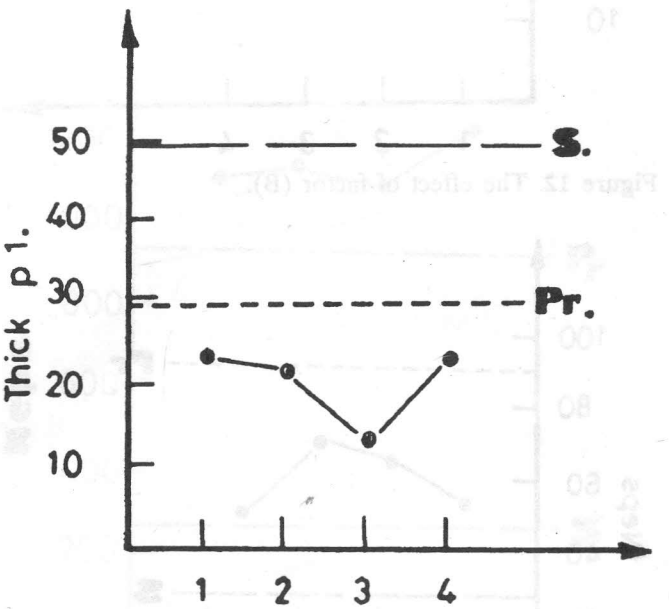

Figure 11. The effect of factor (A).

Hence the yarn imperfection (thin places, thick places and neps is highly in fluenced by the factors under extended investigation of bale opener, GBR.

B- Axiflo AFA

The produced open-end yarns spun from carded sliver, which were performed by the effect of the axiflo grid bars angle under extended investigation, were studied and analysed with regard to both Uster statistics standard and the preliminary open-end yarn produced from processing low grade cotton.

The produced open-end yarn has the same yarn count and twist factor as in case of bale opener, and the physicale and mechincal open-end yarn measured properties has been illustreated in Table (3).

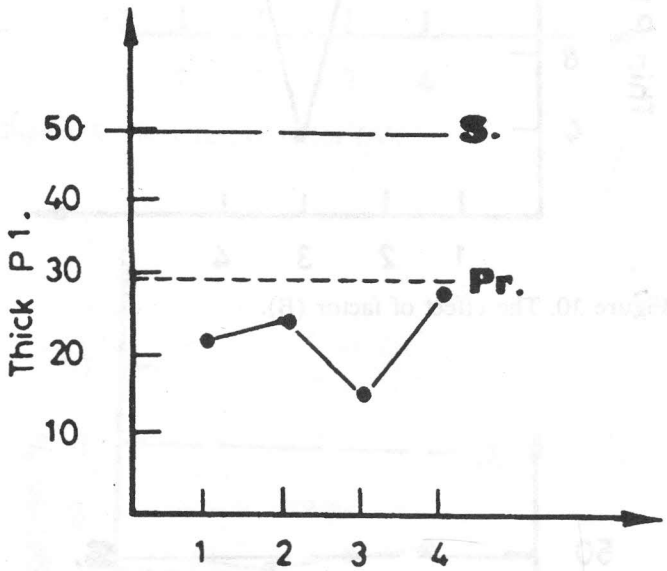

Figure 12. The effect of factor (B).

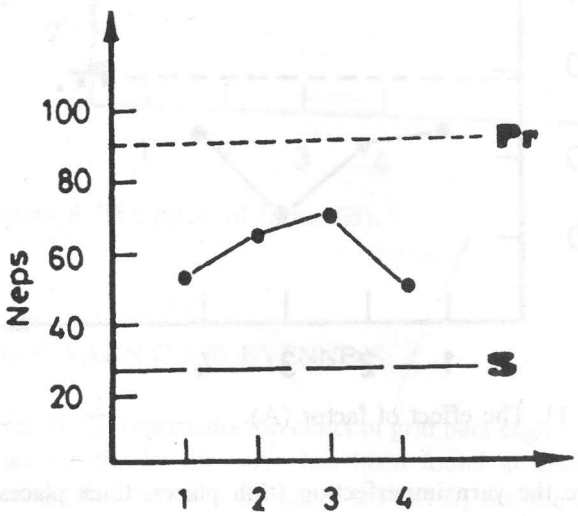

Figure 13. The effect of factor (A).

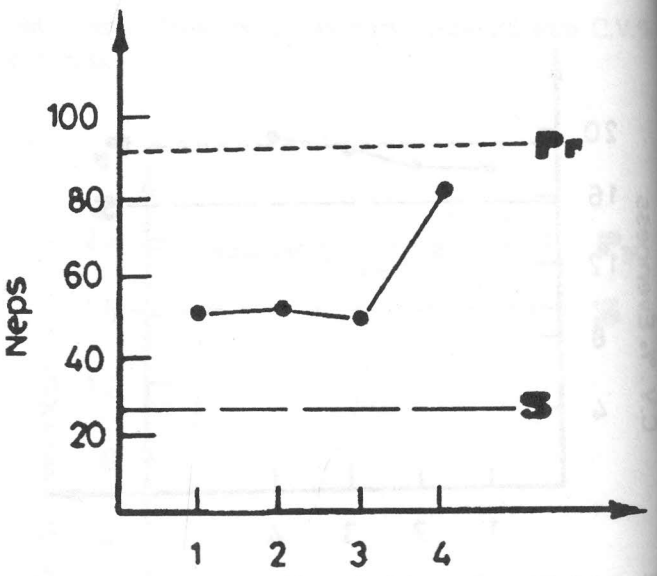

Figure 14. The effect of factor (B).

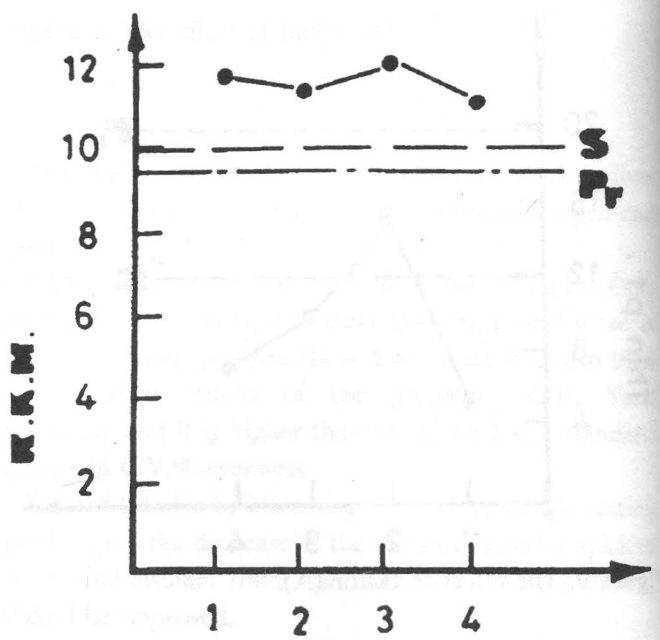

Figure 15.

1.O.E. YRRN STRENGTH AND ELONGATION%:

From Figure (1) it is clear that the highest value of yarn strength (R.K.M.) is (12.372) at grid bars setting position (3), this values of the (R.K.M.) obtained are higher than that obtained in the open-end priliminary experiments and Uster standard (R.K.M.), this agree with the obtained

results of the produced carded sliver where the increase of the gird bars angle setting position should imporve the carded sliver cleanlines and this is reflected on the produced open-end yarn strength and C.V.% strength which is lower than that mentioned in the preliminary open-end yarn and Uster standard C.V.% strength from 50% all over the world as shown in Figure (16).

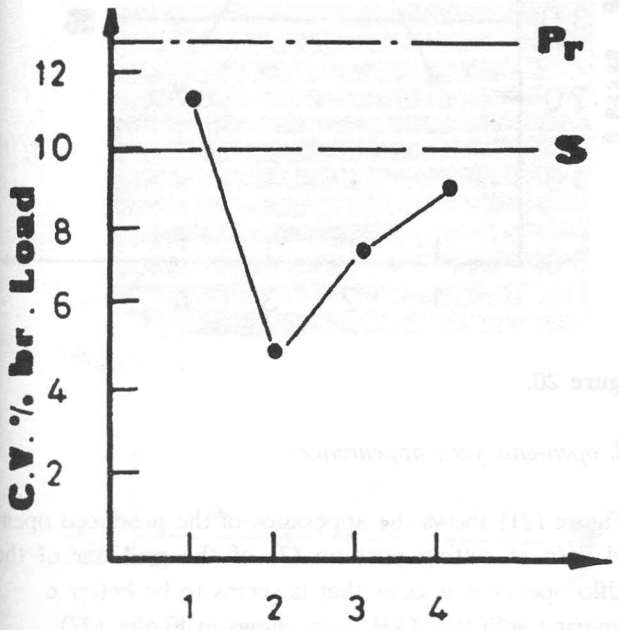

Figure 16.

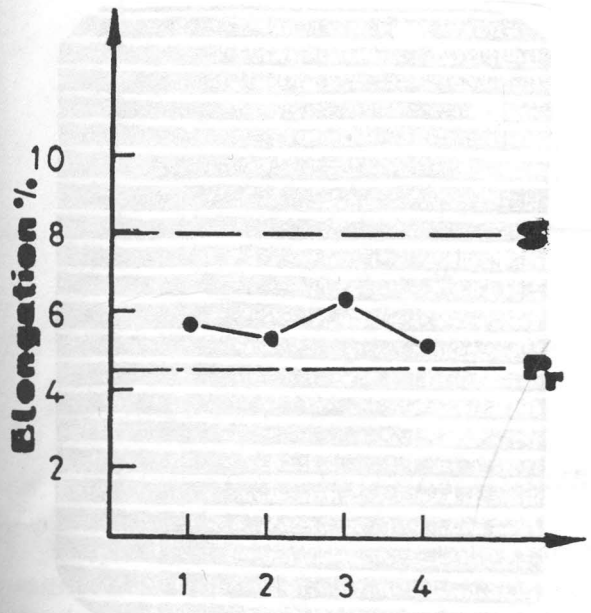

Figure 17-a.

But the open-end yarn elongation% as represented in Figure (16-a) shows that the obtained yarn elongation% at break are higher than that obtained in case of preliminary open-end yarn and lower than that mentioned with Uster standard quality.

Yet, the increase of the grid bars setting position improves the open-end yarn strength and C.V. % strength and elongation%.

2. OPEN-END YARN C.V.% EVENNESS:

The relation between the grid bars angle of the axiflo opener and the C.V.% Uster evenness of the produced open-end yarns, is obtained. The results shown lowest value of C.V.% Uster evenness is (17.3%) which is obtained at grid bars angle setting poitions (30, and this agree with the previous obained results of the carded sliver C.V. evenness and cleanliners.

Regarding the Uster standaerd of yarn C.V.% evenness (16) and that obtained in case off the preliminary open-end yarn, it is clear that the obtained C.V.% Uster evenness of O.E. Yarn is higher than that obtained in case of Uster statistics standard but lower that obtained in case of the O.E preliminary yarn.

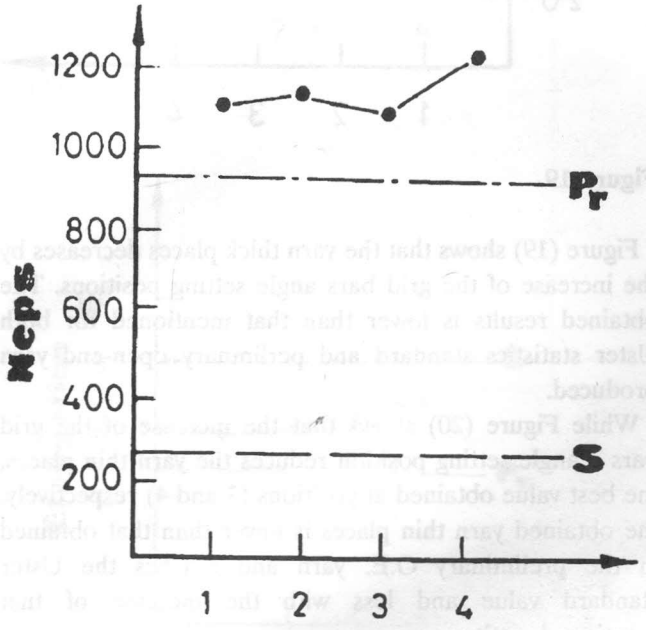

Figure 18.

2. Yarn Imperfections:

Figure (18) shows the relation between the grid bars angle setting positions of axiflo opener and the yarn neps/1000 mt. of yarn it is vlear that the trend is improving neps/1000 mt. of yarn due to the increase of that investigated grid bars angle under both beaters of axiflo. Although the obtained values of neps/1000 mt. of yarn is higher than the Uster standard it is lower than that obtained in the preliminary O.E. yarn produced. The increase of obtained neps/1000 mt. of yarn than the Uster standard measured quality is due to the cotton fibre mix. and production system.

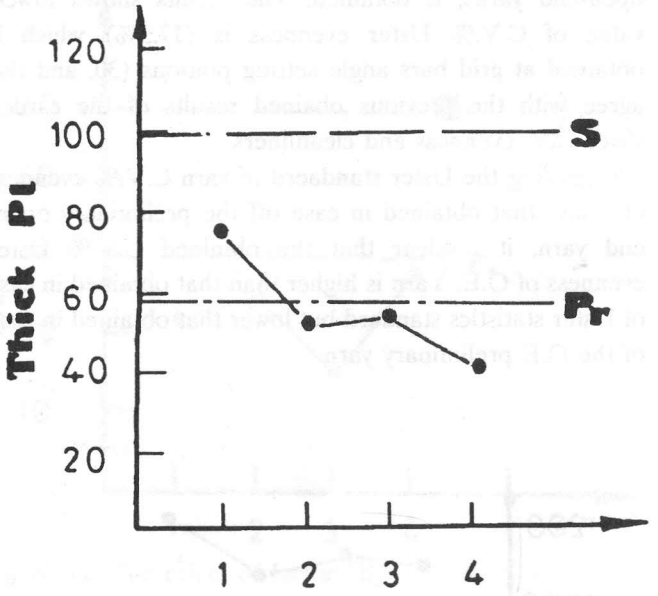

Figure 19.

Figure (19) shows that the yarn thick places decreases by the increase of the grid bars angle setting positions. The obtained results is lower than that mentioned for both Uster statistics standard and perlimnary open-end yarn produced.

While Figure (20) shows that the increase of the grid bars a angle setting position reduces the yarn thin places, the best value obtained at positions (3 and 4) respectively, the obtained yarn thin places is lower than that obtained in the preliminary O.E. yarn and reaches the Uster standard value and less with the increase of that mentioned setting.

Yet, the increase of the grid bars angle of the axiflo opener improves the open-end yarn imperfections.

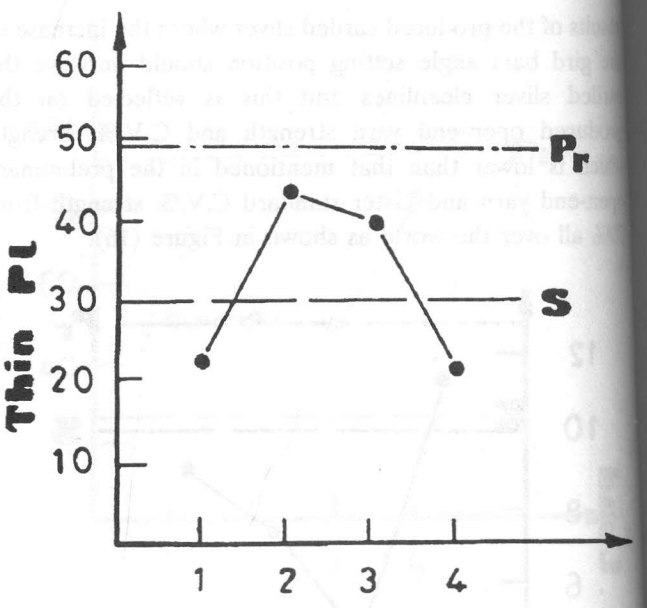

Figure 20.

3. open-end yarn appearance:

Figure (21) shows the apperance of the produced open-end yarn at setting position (3) of the grid bar of the Axiflo opener it is clear that is seems to be better c omparing with that O.E. yarn shows in Figure (22).

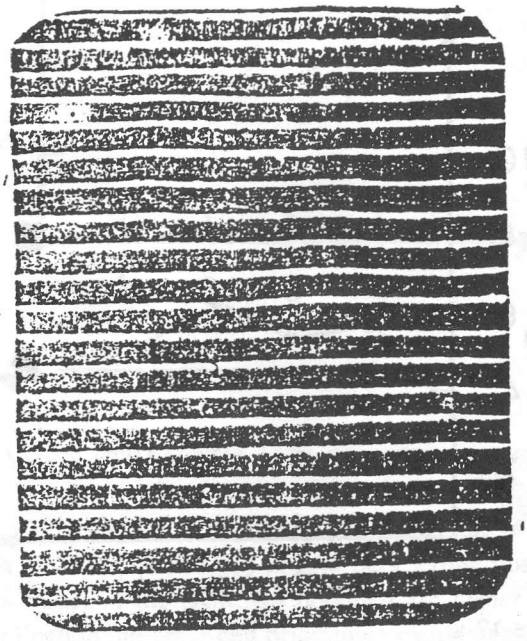

Figure 21.

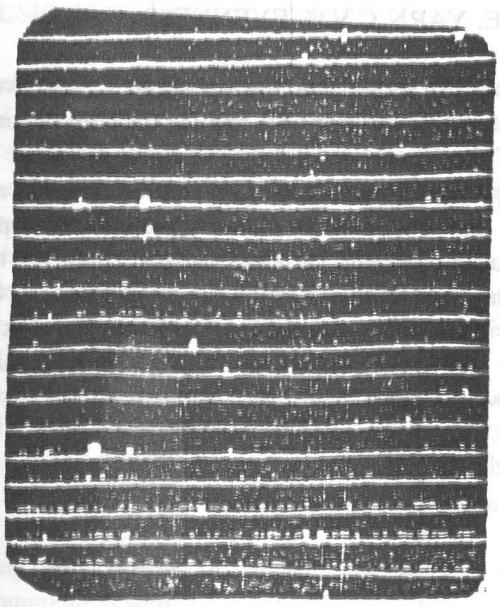

Figure 22.

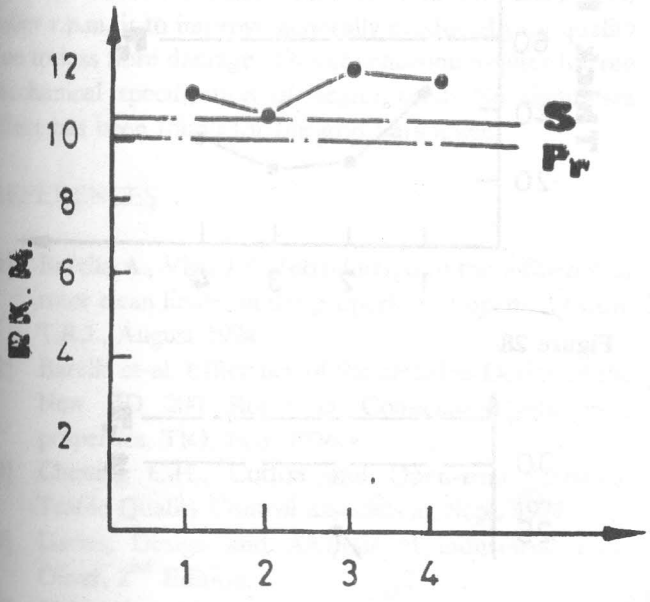

Figure 23.

C- KIRSCHNER BEATER RK

1. O.E. YARN STRENGTH AND ELONGATION 5:

The produced open-end yarns from the carded sliver which has been performed by the two factors of the Kirschner beater under incestigation of extended expended experiments has been analysed and studied according the Uster statistics standards qyality measure of O.E. yarn count 20 Nm (12's) at 50% level.

Table (4) indicates the produced open-end yarn properties the higest value of yarn strength were (11.96 and 12.32) R.K.M. for both factors respectively at positions (2) for feed roller speed r.p.m. and position (4) for the grid bars of the Kirschner beater.

The obtained results are higher than that obatined in case of prelimnary experiments, as shown in Figure. (23)

The C.V.% of O.E. yarn strength are lower at setting position (3) of the feed roller and setting position (3) of the grid bars under kirschner beater, as shiwn in Figure (24).

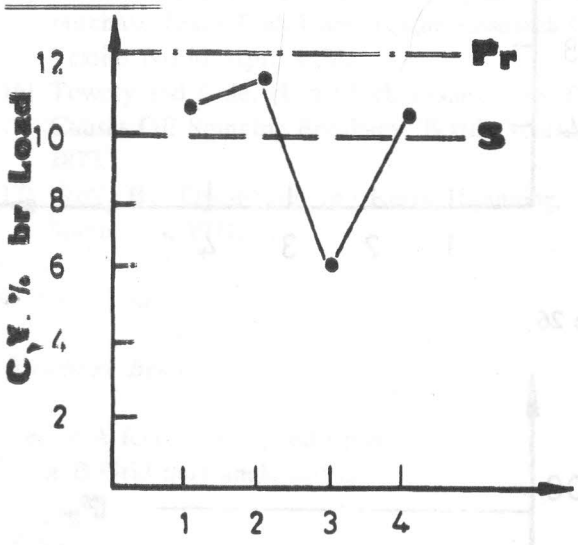

Figure 24.

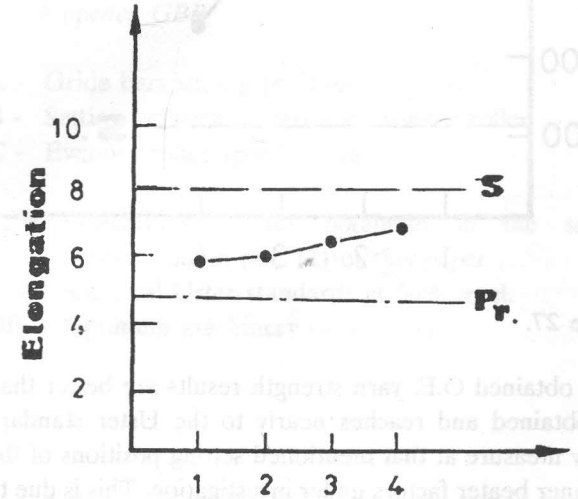

Figure 25.

The obtained O.E. yarn elongation% at break were (6.22 % and 5.52%) for both feed roller speed setting position (3) and the setting position (3) of the grid bars as shown in Figure (25).

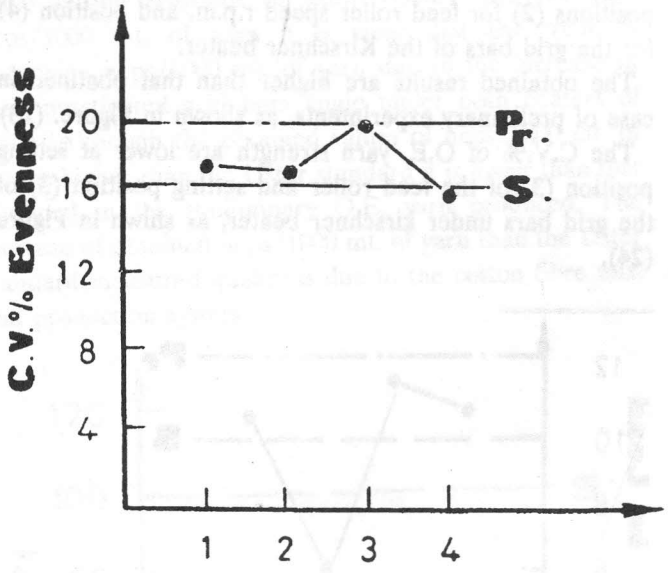

Figure 26.

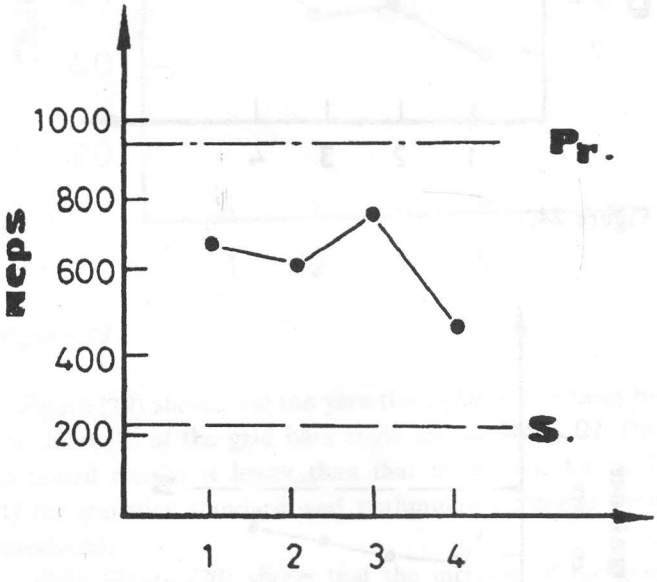

Figure 27.

The obtained O.E. yarn strength results are better than that obtained and reaches nearly to the Uster standard quality measure at that mentioned setting positions of the Kirschner beater factors under investigation. This is due to high sliver cleanliness which is reflected on the produced open-end yarns.

2. O.E. YARN C.V.% EVENNESS:

Table (3) shows that the open-end C.V.% evenness is low at setting positions (4) and (1) for both factors (A and B) of the Kirschner beater under investigation.

These results are (17% and 16.0 and) which are lower than that obtained in case of preliminary experiments produced open-end yarn and these also reaches the Uster standard quality measure as shown in Figure (24). experiment and it also reaches the Uster statistics standard while the yarn neps/1000 mt. of yarn obtained are relatively higher.

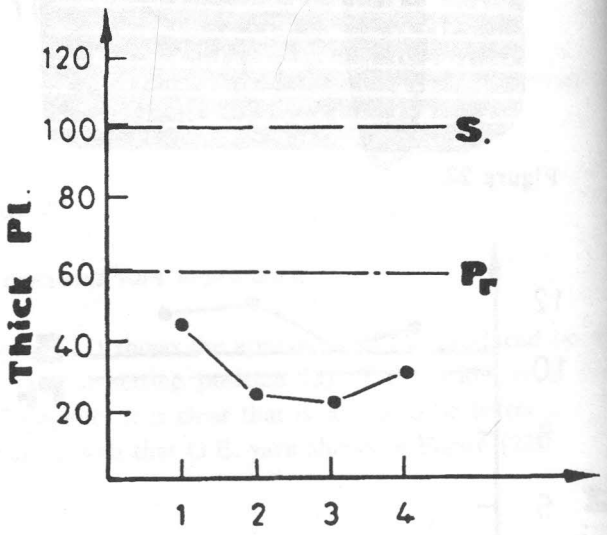

Figure 28.

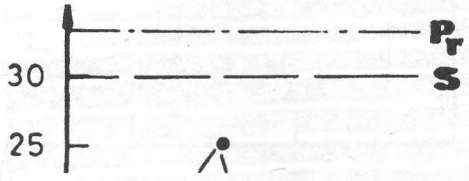

Figure 29.

The obtained O.E. yarn elongation% at break were (6.22 % and 5.52%) for both feed roller speed setting position (3) and the setting position (3) of the grid bars as shown in Figure (25).

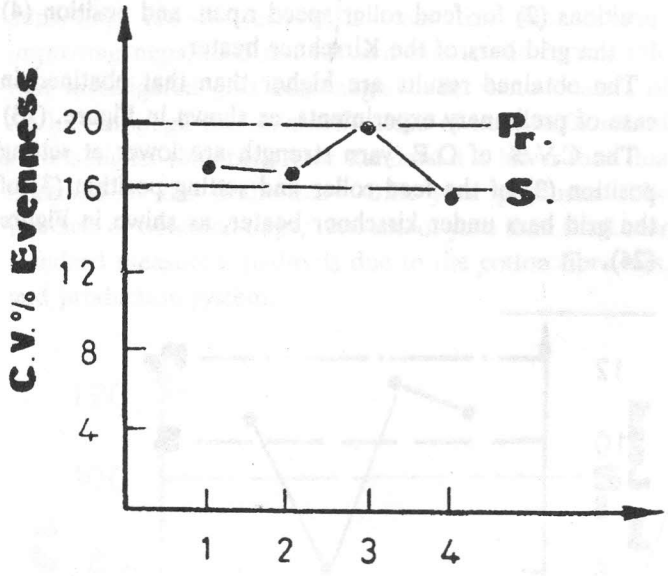

Figure 26.

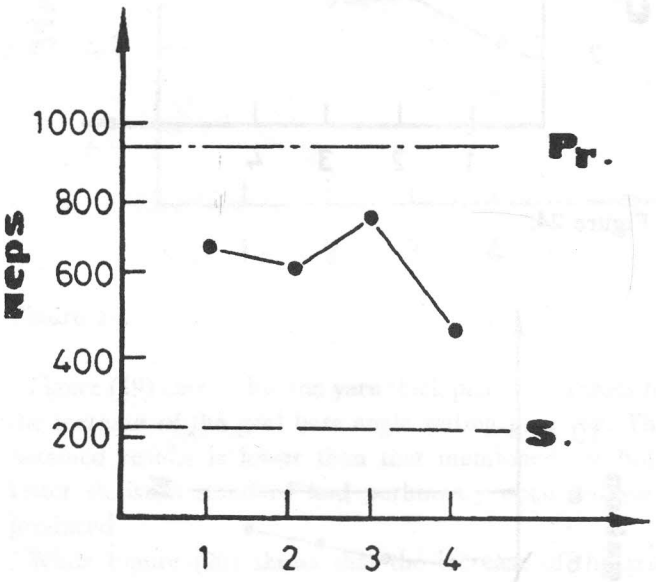

Figure 27.

The obtained O.E. yarn strength results are better than that obtained and reaches nearly to the Uster standard quality measure at that mentioned setting positions of the Kirschner beater factors under investigation. This is due to high sliver cleanliness which is reflected on the produced open-end yarns.

2. O.E. YARN C.V.% EVENNESS:

Table (3) shows that the open-end C.V.% evenness is low at setting positions (4) and (1) for both factors (A and B) of the Kirschner beater under investigation.

These results are (17% and 16.0 and) which are lower than that obtained in case of preliminary experiments produced open-end yarn and these also reaches the Uster standard quality measure as shown in Figure (24). experiment and it also reaches the Uster statistics standard while the yarn neps/1000 mt. of yarn obtained are relatively higher.

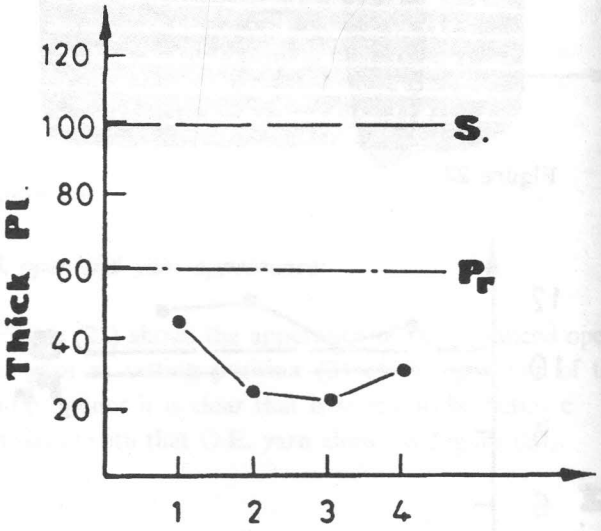

Figure 28.

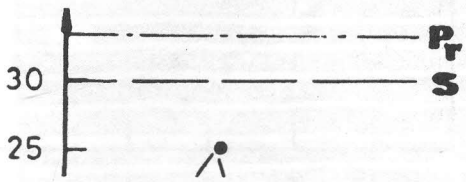

Figure 29.

CONCLUSIONS:

The performance of blow room machineries affects the quality of the prosuced sliver. The present work proved that the effect of some of the parameters of the blow room machineries reflects significantly on the properties of the finally produced open-end yarn.

From the present work it may be concluded that the bale opener parameters mamely grid bars angle setting between the evenner roller and the spiked lattice if adjusted properly have a significant effect on yarn properties. Position 2 of grid pars angle gives best reulst for RKM C.V.% breakingg load. With a setting of 25 mm between spiked lattice and evenner roller best results for tenacity, elongation and C.V.% breaking extension is affected.

Referring to the results of the axiflo parameters, there is no recommended setting for the grid bars angle as there is significant of setting change on yarn quality.

As for kirschner beater the effect of increasing feed roller r.p.m. is to improve generally produced yarn quality due to less fibre damage. This conclusionn applies for the mechanical specification of beater used. No significant effect has been found for the grid bars angle.

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NOTATIONS

Kirschner Beater

Factor A feed roller speed r.p.m.
Factor B Grid bars angle setting

Axiflo

A - Grid bars angle

bale opener GBR

A - Gride bars setting position
B - Setting between spiked and evenner roller
C - Evenner roller speed, r.p.m.

P_r - Preleminary values obtained: in the set of experiments in part (1) of this paper
S - Satistical Uster standards at 50% level.
OP - Optimum machinery parameters.

table 2. Open-End Yarn Properties.

Exp. No.	Breaking load gm	C.V. &% of br. load	Elongation %	C.V.% of elongation	Yarrn Strength R.K.M.	C.V.% evenness	Yarn Neps	Yarn thick P_1	Yarn thin P_1
1	426.0	12.59	5.11	16.96	8.86	19.5	528	48	12
2	510.9	16.87	4.85	17.35	11.34	19.2	670	42	38
3	473.3	17.39	6.4	12.61	10.08	18.1	7.10	25	25
4	425.6	10.59	5.35	21.91	10.14	19.18	510	46	18
5	43.0	10.69	4.75	9.36	9.09	17.81	516	43	57
6	422.6	9.57	4.4	13.83	9.8	18.04	520	50	48
7	404.6	7.49	4.88	16.64	9.63	19.01	490	30	9
8	5.4.4	7.99	5.20	9..0	11.7	19.7	210	58	52
9	489.0	16.24	4.87	11.71	11.139	19.81	880	64	45
10	372.6	11.26	4.61	1274	8.32	19.5	910	56	47
11	484.8	6.84	5.0	9.12	11.12	12.24	755	44	32
12	442.9	9.62	5.06	2.27	10.37	17.57	665	52	41
13	500.3	15.32	4.83	9.55	11.45	19.9	266	42	18
14	525.7	8.34	5.05	10.66	12.08	19.98	910	30	9
15	477.6	7.67	4.68	20.59	11.08	19.6	626	44	19
16	489.2	9.65	4.92	15.2	10.96	18.07	688	58	57
17	506.3	14.48	5.23	10.4	12.08	17.55	850	54	41
18	474.2	15.21	5.17	13.68	10.63	17.10	810	58	34
19	478.5	12.04	5.35	6.6	10.62	18.5	715	38	22
20	574.0	8.02	5.32	7.12	11.94	19.10	680	48	25

Table 3.

Exp No.	Yarn strength R.K.M.	C.V. breaking load	Elongation %	C.V.% Uster evenness	Yarn Neps	Yarn thick p	Yarn thin P
1	11.659	11.2	5.82	18.05	900	68	22
2	11.772	4.96	5.61	18.92	820	53	43
3	12.372	7.64	6.15	17.3	730	55	40
4	11.427	9.14	5.18	19.10	690	39	22

Table 4.

ExP. No	Breaking load gm	C.V.% of br. load	Elognation%	C.V% of elongation	Yarn strength R.K.M	C.V.% evenness	yarn Neps	yarn thick P_1	Yarn thin P_1
1	512.2	10.83	5.94	8.82	10.500	17.0	660	43	17
2	474.2	11.52	6.08	7.77	10.05	17.0	618	29	25
3	540.9	6.16	6.22	3.62	11.196	19.16	755	22	9
4	476.6	10.53	6.36	7.93	11.00	16.0	467	30	7
5	521.3	12.17	6.01	8.90	10.68	16.05	910	30	10
6	517.2	12.83	5.57	12.74	10.43	16.50	1265	54	46
7	466.3	5.38	5.52	13.37	9.60	17.01	840	42	80
8	611.3	11.15	6.30	10.56	12.32	17.05	1200	56	38
9	653.5	10.97	6.52	6.93	13.85	17.04	520	42	11
10	578.5	7.55	6.1	8.68	11.80	19.19	1254	58	57
11	559.8	7.80	6.02	6.91	12.651	17.77	905	32	37
12	647.4	8.68	6.53	7.12	13.142	18.15	843	54	42