SAWTRI TECHNICAL REPORT

156

COMPARISON OF THE CARDING PERFORMANCE OF FILLET AND METALLIC CLOTHING

by

D. W. F. TURPIE, A. GELDARD

and

P. J. KRUGER

SOUTH AFRICAN WOOL TEXTILE RESEARCH INSTITUTE
P.O. BOX 1124
PORT ELIZABETH

COMPARISON OF THE CARDING PERFORMANCE OF FILLET AND METALLIC CLOTHING

by D. W. F. TURPIE, A. GELDARD and P. J. KRUGER

ABSTRACT

The single swift metallic card gave results which favoured its use in preference to the double swift fillet or double swift metallic cards for a long wool of 64's quality which was free to nearly free of vegetable matter. Fewer neps were produced with metallic clothing but the removal of vegetable matter was poorer.

KEY WORDS

Card clothing – fillet clothing – metallic wire – double swift card – single swift card – withdrawal force – neps – vegetable matter – percentage noil – mean fibre length.

INTRODUCTION

Topmakers are frequently confronted with the problem of whether or not to convert the clothing on their carding machines from fillet to metallic wire, or, if they are buying new machines, which of the two types of clothing to choose. The use of metallic wire is tempting in so far as it requires little or no fettling, with a resultant saving in labour costs. It is also unnecessary, if not undesirable, to use a fancy when carding wool with metallic wire, so that one possible source of nep formation is removed. However, it has been shown by WIRA[1] that the slivers from a single swift Continental card clothed with metallic wire were more cloudy and neppy than the slivers from a double swift standard Bradford card clothed with fillet. Furthermore, for wools containing 3% of vegetable fault the Continental card sliver contained more vegetable matter. The mean fibre length of both the card sliver and top obtained from the Continental machine were equal to or slightly longer than the values obtained from the Bradford card. The Bradford card resulted in slightly less noil than did the Continental machine, but there was a higher card reject.

The comparison referred to above was that of different types of carding machine, one clothed with fillet, the other clothed with metallic wire. The present paper is concerned with comparing two different types of clothing used on the same carding machine. This comparison is confined to the use of a long, good top-making wool of 64's quality which was free to nearly free of vegetable matter.

EXPERIMENTAL

A 60″ F.O.R. Continental Worsted carding machine was used for the trials. The machine consisted, at the commencement of the trials, of a newly clothed metallic forepart followed by two swifts and associated rollers covered with fillet. The forepart comprised a 700 mm breast with two pairs of workers and strippers, a 400 mm morel and 30-bladed burr beater. The swifts were 1,35 m in diameter with four pairs of workers (225 mm diameter) and strippers (100 mm diameter). The fillet clothing used was of the type normally associated with the processing of merino wool, progressing in density to 145's/13½ on the second swift and 150's/13½ on the second doffer, i.e. pin densities of 121 and 126 pins per square cm respectively. This clothing was fairly new and had been recently ground.

At the end of the first series of trials the fillet on the first swift and first doffer had been replaced with metallic wire of pin densities 47 and 39 pins per square cm respectively, and subsequent to this, the fillet on the second swift and second doffer had been replaced with metallic wire of pin densities 55 and 47 pins per square cm respectively. This change-over, however, was done in stages so that carding performance could be compared for the following arrangements:–

1. Double swift : fillet.
2. Single swift : metallic.
3. Double swift : metallic/fillet, i.e. first swift : metallic, second swift : fillet.
4. Double swift : metallic.

The carding performance was assessed by the measurement of the following parameters at various stages of processing from the card sliver to the top:–

1. The withdrawal force
2. The content of neps and vegetable matter
3. The mean fibre length of the top
4. The percentage noil removed during combing.

Before these measurements could be made, however, it was necessary to see that the two different types of clothing were being employed in an equitable manner. This task was not an easy one for two reasons, namely running-in and setting.

The running-in period for new metallic wire is normally about three months in an industrial plant. It was not possible to have such an extended run-in period in a research establishment, but the metallic wire was, however, given an extra-severe burnishing treatment, under supervision of the manufacturer of the wire, to minimise the period necessary to polish the pins. After burnishing each section, about 1 200 Kg of scoured wool was carded before any experimentation was undertaken.

With regard to setting, the metallic wire necessitates closer worker settings than does fillet, and the settings used on a single swift machine are different to settings used on a double swift machine. The only practical method of ensuring a fair comparison was a rather subjective one, and that was to arrange the settings in such a manner that the workers were all doing an approximately equal amount of work. Three degrees of carding were chosen, described by reference to the setting

of the final worker, namely "open" (0,46 mm), "medium" (0,38 mm) and "close" (0,31 mm).

Method:

All the rollers on the card were fettled and a quantity of soft waste put through the machine for a period of 30 minutes prior to the commencement of each experiment. The object of doing this was to fill the fillet clothing partially. The use of newly fettled fillet would otherwise have resulted in a high proportion of short fibres becoming embedded in the clothing during the critical period before equilibrium had been reached, and would have resulted in a false impression as regards the mean fibre length and percentage noil results.

Twenty-five kilograms of carefully blended scoured wool having a residual grease content of 0,6% was used in every experiment. The choice of such a small amount of wool was mainly to eliminate the effect of blunting of the worker points over the long series of experiments. (It was not considered wise to introduce a grinding operation between experiments as the degree of grinding might be extremely difficult to control). One per cent of Eutectal [Manufacture de Produits Chimiques, Breteuil-Sur-Noye (Oise), France] plus sufficient water to bring the regain up to 20% was added to the scoured wool before carding. This increased the ether extractible matter to 0,9% before carding. Ambient conditions of relative humidity and temperature were 70% and 21 °C respectively.

The production rate was maintained constant at 16,5 Kg/hr with a swift speed of 82 r.p.m. After discarding the card sliver produced during the first five minutes of each experiment, during which period equilibrium had not yet been reached, the sliver was collected and given identical treatments on the gill boxes and comb. A St. Andrea Novara rectilinear comb was used at a gauge setting of 26 mm for the combing trials.

Measurements:

The withdrawal force was measured by withdrawing a fringe of fibres from a sliver through pins[2].

Neps and vegetable matter were counted visually on a Toenniessen top testing machine using transmitted light.

The mean fibre length measurements on the tops were carried out on the new SAWTRI Fibre Length Tester[3].

RESULTS AND DISCUSSION

The results of the various trials are given in Table I. These results are given for open, medium and close comparative worker settings, with the average for these three settings also given in each case.

TABLE I

DIFFERENCES IN CARDING AND COMBING PERFORMANCE USING FILLET AND METALLIC WIRE

	DOUBLE SWIFT FILLET				SINLGE SWIFT METALLIC				ONE SWIFT METALLIC ONE SWIFT FILLET				DOUBLE SWIFT METALLIC			
	Open	Med.	Close	Av.	Open	Med.	Close	Av.	Open	Med.	Close	Av.	Open	Med.	Close	Av.
Before Combing:																
Withdrawal Force (Kg/g)	13	14	13	13	14	14	12	13	10	10	9	10	10	8	9	9
Neps per 20 g	336	326	304	322	162	169	154	162	355	330	298	328	176	161	141	159
Veg. Matter per 20 g																
longer than 3 mm	30	33	27	30	40	42	45	42	26	37	28	30	42	46	41	43
shorter than 3 mm	90	88	86	88	98	105	126	110	74	88	96	86	116	131	114	120
After Combing:																
Neps per 20 g	80	82	81	81	44	53	52	50				not	measured			
Veg. Matter per 20 g																
longer than 3 mm	2	0	0	1	0	2	1	1				not	measured			
shorter than 3 mm	4	3	5	4	7	6	5	6								
% noil	4,3	4,6	4,5	4,5	3,8	3,6	3,8	3,7	4,6	4,5	4,6	4,6	3,9	4,1	4,1	4,0
m.f.l. (cm)	7,9	8,0	7,9	7,9	8,1	8,1	8,1	8,1	7,6	7,7	7,6	7,6	7,7	7,6	7,5	7,6

Withdrawal force and mean fibre length:

Measurements of the withdrawal force before combing on the slivers produced by the single swift metallic card showed clearly that its power to disentangle the fibres was equal to that of the double swift fillet card. A noticeable reduction in the withdrawal force was brought about by using one metallic swift plus a second swift which was either fillet or metallic. With regard to these latter combinations the reduction in withdrawal force was, however, accompanied by a reduction in mean fibre length after combing. This suggests that increased breakage resulting from a greater or more severe disentanglement contributed to the reduction in the withdrawal force. The mean fibre lengths of the slivers from the single swift metallic card after combing were longer than those obtained when using one metallic swift plus a second swift which was either fillet or metallic, and also showed a definite improvement over the results obtained when a double swift clothed with fillet was used. Variations in mean fibre length after combing with variation in worker settings gave no noticeable trend.

Percentage noil:

When two swifts were used and the second swift was clothed with fillet, the percentage noil was higher, irrespective of the clothing used on the first swift. When two swifts were used, both of which were clothed with metallic wire, a noticeable improvement in percentage noil resulted. When one swift clothed with metallic wire was used the percentage noil was lowest. Variations in worker settings produced no apparent trend.

When two swifts were used and the first swift was clothed with metallic wire the withdrawal force and mean fibre lengths of the resultant slivers were of the same order whether the second swift was clothed with fillet or metallic wire. The percentage noil results, however, favoured the second swift being clothed with metallic wire. Therefore, whilst in both cases there had been more fibre breakage than when the single swift metallic card was used, it would seem that the use of fillet clothing on the second swift has resulted in the production of a greater number of short fibres than when metallic wire was used. This may perhaps be due to differences in doffing efficiency, the fibres being removed from the swift more quickly in the case of metallic wire.

Neps before combing:

The neppiness of the card slivers showed a tendency to decrease with closer worker settings, as would be expected. The presence of fillet clothing on the swift, whether in the form of a double swift card clothed with fillet, or in the form of a double swift card with the first swift metallic and the second swift fillet, produced the same nep count in the slivers. On the other hand the use of metallic wire, whether on the single or double swift card, also produced the same nep count, but this count was significantly (50%) lower than in those cases where fillet had been

used. In addition to the effect of the metallic clothing on the frequency of neps it is also likely that the use of a fancy will contribute to the increase in the nep counts.

Vegetable matter before combing:

Vegetable particles less than 3 mm in length occurred in all cases with a frequency about three times greater than for vegetable particles greater than 3 mm in length, irrespective of the type of clothing used. The presence of fillet clothing on the swift (whether in the form of a double swift card clothed with fillet, or in the form of a double swift card with the first swift metallic and the second swift fillet), produced the same vegetable matter count in the slivers. On the other hand a single or double-swift metallic card produced the same results for the amount of vegetable matter present in the slivers, but this amount was significantly higher. It can be concluded that fillet clothing is capable of removing a high proportion of vegetable matter and in these experiments did so with equal efficiency whether one or two swifts were used.

Neps and vegetable matter after combing:

Only the single swift metallic card and double swift fillet card have been compared for cleanliness of the top after combing. It will be seen that in both cases the comb removed about 70% and 96% respectively of the neps and vegetable matter originally present in the slivers.

CONCLUSIONS

The single swift metallic card disentangled the fibres with an efficiency equal to that of the double swift fillet card, produced significantly less neps and broke fewer fibres. This resulted in an improvement in the results for percentage noil and in the m.f.l. of the top. The use of two swifts clothed with metallic wire improved the disentanglement of the fibres significantly but resulted in more fibre breakage and a resultant deterioration in percentage noil to a value inbetween those obtained for the single swift metallic and the double swift fillet cards, and a deterioration in the mean fibre length of the top to a value which was the lowest of the three. There was no advantage to be gained by using two swifts clothed with metallic wire instead of one swift from a point of view of the cleanliness of the slivers.

The use of fillet clothing on the swifts, either in the form of a double swift fillet card or a double swift card having metallic wire on the first swift and fillet on the second swift, promoted the removal of vegetable particles, but also promoted the formation of neps. The increase in the number of vegetable particles found when using a single or double swift metallic card was significant. Considering that the wool used in the trials contained only very slight vegetable fault it would be difficult to recommend the use of the metallic card for wools containing heavier fault unless a more elaborate fore-part is used. This may well alter the breakage pattern adversely.

It can be concluded that for a long wool of 64's quality which was free to nearly free of vegetable matter the single swift metallic card gave results which favoured its use in preference to the double swift fillet or double swift metallic cards.

ACKNOWLEDGEMENTS

The authors gratefully acknowledge the assistance of the Departments of Scouring and Textile Physics of SAWTRI.

THE USE OF PROPRIETARY NAMES

The fact that chemicals with proprietary names have been mentioned in this report, does not in any way imply that SAWTRI recommends them or that there are not substitutes which may be of equal value or even better.

REFERENCES

1. *WIRA Report No. 7.* "Interim Report on a Comparison of Bradford and Continental Worsted Cards". April 1968.
2. Kruger, P. J. *S. African Wool Text. Res. Inst.*, Tech. Rep. No. 64 (1965), No. 66 (1966), and No. 67 (1966).
3. To be published.

Published by
The South African Wool Textile Research Institute
P.O. Box 1124, Port Elizabeth, South Africa,
and printed in the Republic of South Africa
by Nasionale Koerante Beperk, P.O. Box 525, Port Elizabeth.