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Inter-Port Differences in Processing Performance of Similar Wools

Part I: The Processing Performance of a 12 Months 60/64's During Topmaking

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INTER-PORT DIFFERENCES IN PROCESSING PERFORMANCE OF SIMILAR WOOLS
PART I:
THE PROCESSING PERFORMANCE OF A 12 MONTHS 60/64's DURING TOPMAKING

by D.W.F. TURPIE

ABSTRACT

A comparison in the processing performance during topmaking of a 12 months 60/64's good topmaking wool (Type 49) from the ports of Durban, Port Elizabeth and Cape Town was made. There were no *significant differences in processing performance between the Durban and Port Elizabeth wools. One of the most interesting findings, however, was the apparent rôle played by crimp, (which is* not *one of the physical characteristics generally measured in an objective test) for it was shown that the Cape Town wools (which happened to be rather overcrimped compared with the wools from the other ports) had a poorer processing performance. It would be advantageous to include an estimate of crimp in a future objective measurement programme.*

INTRODUCTION

The annual production of shorn wool in Southern Africa amounted to 100 million kg greasy in the 1976/7 season and was marketed in four ports, namely Port Elizabeth (37 million kg), Durban (24 million kg), East London (23 million kg) and Cape Town (16 million kg)[1]. Geographically, these cities are situated along a coastline extending some 2 000 km and it is not surprising, therefore, that the offerings of different classes and types of wool are somewhat different at each of these ports since the wools originate most commonly in areas which are geographically situated most closely to each respective port. For example[1], while most of the merino fleeces offered at the various ports are of good topmaking style, Cape Town and East London have a relatively higher percentage of spinners style fleeces amongst their offerings than the other two ports. Port Elizabeth's offerings of bellies comprise a higher percentage of inferior and carbonising qualities than the other three ports. Durban has relatively more average and inferior topmaking fleeces amongst its merino fleece wool offerings than is found at the other ports, but on the other hand it has the highest relative percentage of good average merino bellies, average style lambs and locks suitable for scouring. Statistics available from some of the earlier seasons, e.g. 1973/4[2] show also for example, that while the bulk of the offerings

of merino fleece wools in Durban and East London were of 64's quality, the bulk of similar offerings in Port Elizabeth and Cape Town were coarser, namely of 60/64's quality.

The South African Wool Board have an official type list[3] (amended from time to time over the years) which enables inter alia the class, style, length and fineness of a particular lot of wool to be specified by a number, and so facilitates merchanting internationally. Many merchants have their own private type lists as well. These, however, generally not only list types which are judged by similar criteria, but frequently a range of mixtures (the precise composition of which are often a closely guarded secret). In spite of the detailed specifications which are used to accurately describe a particular lot of wool it is known by those who are, or have been, intimately involved with wool merchanting that there can be a certain prejudice expressed from time to time with regard to the *port* from which the wool is obtained.

In view of the above remarks it was decided to study the processing performance of similar specific types from the various ports during topmaking. This report deals with the *first* such comparison in a series of such investigations.

EXPERIMENTAL

Raw materials

Nine bales of raw wool were made up by the South African Wool Board from many samples of *type 49*, this being described in their official type list[3] as "good topmaking merino fleece wool, good style, sound, skirted, slight burr and/or seed, up to 2% vegetable matter, may contain good broken and good backs, 62's quality (21,1 to 22 μm), 12 months length (75 to 90 mm)". Three bales were made up from Durban offerings, three from Port Elizabeth offerings and three from Cape Town offerings. The first of each set of three bales was confined to wools which were offered for *sale* during December in that port, whereas the second and third bales were confined to wools which were offered for *sale* in that port during January and February, respectively. (The actual dates of *shearing* were not recorded). On receipt of these bales at SAWTRI each lot was divided into small portions by hand and layer-blended, sampled carefully by hand, then re-packed into its container and cored. An amount calculated to represent 70 kg on a clean basis in accordance with the core-test yield results, was then withdrawn from the bale and scoured.

Scouring

All details were the same as in a recent investigation on the processing performance of South African wools[4]. Processing of the nine lots was carried out in random order and that order maintained throughout processing.

Carding and Combing

All details were the same as in the abovementioned investigation except for the following:

The card was set at a swift speed of 115 r/min. Relevant settings of the workers to the swift were 2,03 1,63 1,22 0,91 0,71 0,56 and 0,46 mm from the first to eighth worker, respectively. Drafts during gilling were 6, 7 and 8 for the 1st, 2nd and 3rd gilling respectively and the ratch was set at 38 mm in all cases. Combing took place at a gauge of 31 mm and a gill feed of 6 mm . The length characteristics of the tops were measured on the Almeter.

RESULTS AND DISCUSSION

Grease wool

The grease wool characteristics of the T49 from the different ports are given in Table I. In general it appeared that the wools were fairly well matched with the exception of the crimp frequency. While the Durban and Port Elizabeth wools were inclined to be slightly undercrimped, the Cape Town wools were, on average 15% overcrimped. There were other slight discrepancies in, for example, diameter and length. The Cape Town wools appeared to be marginally finer than the others and also appeared to be the longest. The Durban wools appeared to be the shortest. There were no serious differences between the December, January and February values from each port with the possible exception once again, of crimp. It appeared that the January and February lots from Cape Town, particularly the former, were considerably more overcrimped than the December lot.

Scouring

The scouring results are given in Table II. It can be seen that similar grease levels were obtained on all the different lots and, on average, similar amounts of detergent were required. The scoured yields based on 16% regain were about 2,5% lower than the IWTO scoured yield results calculated at 17% regain. The percentage of bowl waste was about the same in each case. The compressibilities of the scoured wools showed that the Port Elizabeth wools were flabbier than the others, and that the Durban wools had the same compressibility as the Cape Town wools in spite of the Cape Town wools being overcrimped.

TABLE I

GREASE WOOL CHARACTERISTICS OF T49

	DURBAN				PORT ELIZABETH				CAPE TOWN			
	Dec.	Jan.	Feb.	Mean	Dec.	Jan.	Feb.	Mean	Dec.	Jan.	Feb.	Mean
Grease Wool Characteristics												
Mean fibre diameter	22,0	22,6	22,0	22,2	22,7	22,4	22,1	22,4	21,8	22,3	21,7	21,9
IWTO scoured yield, 17% regain	68,2	67,7	68,5	68,1	71,3	69,5	68,4	69,7	67,5	68,9	68,6	68,3
IWTO estimated commercial Schlumberger dry yield	65,6	65,1	66,1	65,6	67,9	66,3	65,0	66,4	64,8	66,3	66,1	65,7
Vegetable matter dry, grease basis	0,36	0,38	0,28	0,34	0,82	0,69	0,76	0,76	0,45	0,38	0,29	0,37
Staple length, unstretched (mm)	86,7	86,9	86,2	86,6	87,0	87,2	89,5	87,5	90,7	90,4	93,0	91,4
CV %	12,2	11,4	10,4	11,3	16,2	13,7	10,9	13,6	10,6	12,3	11,2	11,4
Staple length, stretched (mm)	93,8	94,1	93,9	93,9	94,6	94,6	97,5	95,6	98,1	98,9	101,2	99,4
CV (%)	12,2	11,2	10,5	11,3	16,3	13,8	11,5	13,9	10,2	11,7	11,2	11,0
Crimp frequency (No. per cm)	3,8	3,8	3,9	3,8	3,5	3,7	3,7	3,6	4,2	5,0	4,6	4,6
CV (%)	19,5	24,9	17,0	20,5	20,2	17,5	17,4	18,4	17,0	18,1	18,3	17,8
Deviation from Duerden (%)	-5	+2	-2	-2	-5	-3	-6	-5	+3	+30	+12	+15
Grease content (%)	14,8	15,5	14,9	15,1	17,1	17,0	13,0	15,7	17,6	18,1	15,3	17,0
Methanol insoluble fraction (%)	43,7	42,7	42,5	43,0	44,8	41,6	32,8	39,7	44,5	44,2	42,9	43,9
Suint content (%)	7,2	6,0	5,9	6,4	7,2	6,0	8,6	7,3	5,4	5,4	5,4	5,4
pH of suint	6,5	5,8	6,1	6,1	7,0	6,6	6,7	6,8	6,6	6,1	6,8	6,5
Staple strength (cN/tex)	2,6	2,9	2,4	2,6	2,4	2,6	2,6	2,5	2,8	3,1	2,8	2,9

TABLE II

SCOURING, CARDING AND GILLING RESULTS

	DURBAN				PORT ELIZABETH				CAPE TOWN			
	Dec.	Jan.	Feb.	Mean	Dec.	Jan.	Feb.	Mean	Dec.	Jan.	Feb.	Mean
Scouring Results												
Av. detergent addition (mℓ)	65	54	11	43	43	43	54	47	33	108	22	54
Grease content of scoured wool (%)	0,40	0,41	0,38	0,40	0,39	0,37	0,39	0,38	0,40	0,38	0,36	0,38
pH of liquor in Bowl 1 at end	9,9	9,9	9,9	9,9	10,0	9,9	9,9	9,9	9,9	9,9	9,9	9,9
Bowl waste (% on greasy)	0,9	0,7	0,8	0,8	0,9	0,7	0,7	0,8	0,6	0,6	0,8	0,7
Scoured yield at 16% regain	66,2	64,5	66,1	65,6	67,6	67,9	65,8	67,1	65,3	66,9	64,9	65,7
Compressibility of scoured (mm)	20,2	19,5	18,6	19,4	17,5	18,1	17,6	17,7	17,9	21,0	18,9	19,3
Carding Results												
Card rejects (% on greasy)	1,8	1,9	2,0	1,9	2,4	2,2	2,0	2,2	2,2	2,1	2,0	2,1
Card yield (%)	97,7	97,5	97,5	97,6	96,9	97,3	97,4	97,2	97,2	97,4	97,4	97,3
Neps after carding (per 20 g)	114	108	95	106	91	109	64	88	66	65	70	67
Vegetable particles after carding (20 g)	190	181	181	184	336	264	269	290	219	206	168	198
Dichloromethane extractable matter (%)	0,63	0,61	0,68	0,64	0,60	0,62	0,69	0,64	0,60	0,69	0,79	0,69
Gilling Results												
Neps before combing (per 20 g)	164	129	97	130	87	92	113	97	73	67	97	79
Vegetable particles before combing (per 20 g)	158	149	160	156	273	181	212	222	171	200	156	176
Regain before combing (%)	21,3	20,2	20,1	20,5	20,3	21,1	20,0	20,5	20,9	20,8	20,9	20,9

Carding

The carding results given in Table II show that very similar amounts of rejects were obtained in all cases and the card yields were also very similar. The Port Elizabeth lots had a slightly higher vegetable matter count in the carded slivers than did the other two lots and, therefore, corroborated the slightly higher vegetable matter percentage shown by the core-test results. The Cape Town lots produced the least neppy slivers which was a probable consequence of their overcrimped nature.

Gilling

The gilling results supported the above findings with regard to vegetable matter and neps.

Combing

The combing results are given in Table III. The amount of comb shoddy was more or less constant for all lots, as also the comb yield. The dry-combed top and noil yields were all consistently about 1% to 1,5% lower than the yields expected from the core tests carried out on the grease wools. With regard to percentage noil it can be seen that the results for the Durban and Port Elizabeth wools were more or less the same but the Cape Town wools produced, on average, significantly more noil. The reason for this was most likely the higher crimp frequency since it has been shown elsewhere[4] that an increase in the crimp frequency of one crimp/cm produced an increase in noilage of about 1% absolute at a comb gauge of 28 mm . The percentage noil results were very reproducible as can be seen from the results for the five repeat tests for December, January and February. It can be seen that the December results on the Cape Town wools was considerably better than the results for January and February, and in fact was about on a par with the results from Durban and Port Elizabeth. This tends to confirm that the overcrimped nature of the wools from Cape Town during January and February was the cause of the discrepancy in the percentage noil results.

Top characteristics

The mean fibre length of the tops should be compared with the staple length of the raw wool. While the mean fibre length of the Port Elizabeth wools was 76,4 mm compared with a value of 73,9 mm from the Durban wools the former had a staple length some 1,5 mm longer in the first place. The conversion ratios for the wools from these two centres was, therefore, approximately the

TABLE III

COMBING RESULTS AND TOP CHARACTERISTICS

	DURBAN				PORT ELIZABETH				CAPE TOWN			
	Dec.	Jan.	Feb.	Mean	Dec.	Jan.	Feb.	Mean	Dec.	Jan.	Feb.	Mean
Combing Results												
Percentage noil Test 1	4,04	4,22	3,82		4,43	3,92	4,04		3,99	5,07	5,26	
Test 2	3,97	4,25	3,86		4,41	3,94	4,02		4,04	5,01	5,21	
Test 3	3,94	4,26	3,78		4,43	3,96	3,97		4,11	5,02	5,30	
Test 4	4,08	4,25	3,79		4,47	3,98	4,01		4,08	5,06	5,35	
Test 5	4,06	4,26	3,86		4,45	3,91	4,13		4,04	5,24	5,33	
Average	4,02	4,25	3,82	4,03	4,45	3,94	4,03	4,14	4,05	5,08	5,29	4,81
Equivalent combing tear				19,9				19,5				17,2
Comb shoddy (% on greasy)	0,6	0,5	0,7	0,6	0,8	0,8	0,6	0,7	0,6	0,6	0,6	0,6
Comb yield (%)	101,2	101,3	101,2	101,2	100,8	100,9	101,2	101,0	101,1	101,2	100,9	101,1
Drycombed top and noil yield (%)	65,5	63,7	65,2	64,8	66,0	66,6	64,9	65,8	64,2	65,9	63,8	64,6
Characteristics of Top												
Mean fibre length (mm)	75,4	74,2	72,1	73,9	79,6	73,8	75,8	76,4	66,9	64,8	64,2	65,3
CV (%)	47,0	45,9	49,1	47,3	40,7	45,9	47,2	44,6	58,3	57,2	58,1	57,9
Fibres shorter than 25 mm (%)	3,2	3,3	5,5	4,0	1,0	3,4	3,1	2,5	9,4	9,3	10,1	9,6
5% length, or 'tail' length (mm)	123,0	122,3	122,8	122,7	124,5	121,6	128,3	124,8	127,5	121,1	122,0	123,5
Mean fibre diameter (μm)	22,2	21,8	21,7	21,9	21,8	22,1	21,8	21,9	22,0	22,0	21,6	21,9
CV (%)	22,7	22,3	22,4	22,5	22,1	22,4	22,3	22,3	21,7	20,1	21,9	21,2
Dichloromethane extractable matter (%)	0,62	0,57	0,52	0,57	0,65	0,62	0,61	0,63	0,64	0,63	0,77	0,68
Neps per 20 g	15	18	40	24	7	30	25	21	40	3	9	17
Vegetable particles per 20 g	14	12	11	12	10	26	14	17	12	10	9	10
Conversion ratio (Raw wool staple length to top)	1,15	1,17	1,20	1,17	1,09	1,18	1,18	1,15	1,36	1,40	1,45	1,40
Tail length: mean length ratio	1,63	1,65	1,70	1,66	1,56	1,65	1,69	1,63	1,91	1,87	1,90	1,89

same. The wools from Cape Town had the longest staple lengths and produced the shortest tops with the result that the conversion ratio of these wools was considerably worse than the others. It is apparent from the figures that the percentage of short fibre remaining in the tops made from the Cape Town wools was more than twice that from the wools from the other centres, but the tail lengths of all the tops was about the same. All tops were of approximately equal cleanliness from the point of view of neps and vegetable particles. The average diameter of the tops from the three different ports was all precisely the same, and was slightly finer than the grease wool from which they came. It would appear that the differences observed in the mean fibre diameters of the grease wool (Table I) could, therefore, probably be ignored, the suggestion being, in other words, that the wools from all three ports were to all intents and purposes of exactly the same diameter.

SUMMARY AND CONCLUSIONS

A series of investigations was initiated in which a study was made of any differences in processing performance during topmaking of similar specific types from the various South African ports. This first such investigation dealt with a comparison in the processing performance of a 12 months 60/64's Good Topmaking wool, known as type 49, from Durban, Port Elizabeth and Cape Town. Sample bales were made up from the December, January and February offerings of T49 from each of these ports separately to provide for replicate experiments.

It was found that the Cape Town lots were inclined to be rather *overcrimped*, (particularly in respect of the January and February offerings), compared with the lots from Durban and Port Elizabeth, and were also inclined to have the highest staple lengths. This overcrimping led to a significantly poorer processing performance in respect of the Cape Town wools (even in spite of the greater length), both with regard to percentage noil and the length characteristics of the top. The Cape Town *December* offerings, which were not so overcrimped, performed considerably better than the January and February lots. In respect of the other physical characteristics of the grease wools from the different ports it appeared that the wools were fairly well matched. Some minor differences in respect of properties such as staple length and vegetable fault were simply carried through so that it could be quite fairly stated that there was no significant difference in processing performance between the Durban and Port Elizabeth wools.

One of the most interesting findings in this study was the apparent rôle played by crimp. This characteristic is *not* one of the physical parameters which is generally measured in an objective test. It would seem that had these wools been matched in crimp there would have been no difference in processing

performance between the offerings of type 49 from Cape Town, Port Elizabeth or Durban. The more highly crimped nature of the Cape Town offerings considered here clearly resulted in a deterioration in processing performance. It would seem that it may be advantageous for the Wool Board to consider inclusion of an estimate of this parameter in a future objective measurement programme.

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