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Scouring Conditions

**Part I: The effect of Liquor pH During
Backwashing on the Subsequent Combing
Performance of Neutral Scoured Wool**

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SCOURING CONDITIONS

PART I: THE EFFECT OF LIQUOR pH DURING BACKWASHING ON THE SUBSEQUENT COMBING PERFORMANCE OF NEUTRAL SCoured WOOL

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ABSTRACT

The combing performance of backwashed slivers is dependent on the pH of the liquor during backwashing and on the reagent used to control pH. Combing performance deteriorates with deterioration in wool style brought about by weathering and this deterioration is accentuated when backwashing takes place at pH values of above 10,5. For a good topmaking style of wool backwashing with soda would appear to result in improved combing performance but for fine wools a liquor pH of 6,5 should be avoided, a slightly lower pH being preferred.

KEY WORDS

Backwashing — pH — combing performance — weathering — withdrawal force — compressibility — relaxation — entanglement — wool — wool style.

INTRODUCTION

The investigation described in this paper is the first of a series in which the objective is to find a set of scouring conditions, with particular emphasis on pH, which will give optimum results in subsequent mechanical processing.

Scouring conditions should be such that the entanglement of the resultant scoured fibre should be as low as possible. The reason for this is that entanglement causes fibre breakage in subsequent processing, and fibre length is one of the characteristics of the fibre that should be preserved. Low entanglement, however, is not the only prerequisite for optimum conditions in the processes which follow. It would be useless, for example, to produce a low entanglement if this were accompanied by fibre damage which may render the fibre weak, brittle or yellow etc.

The effect of pH during grease wool scouring on subsequent processing performance is not yet fully understood, but the wool will be damaged if the pH is too high. Values of pH which can be used with safety are dependent on temperature. The minimum temperature cannot be lower than the melting point of the wool grease (approx. 40°C) and elevated temperatures may effect the activity of the alkaline agent and result in fibre damage. If too much soda is added to the scouring solutions or the temperature is kept too high over too long a period, or both, the

cystine bonds in the wool protein are attacked. The wool also becomes progressively yellower the higher the pH of the scouring liquor becomes. In commercial practice it is normal to scour at temperatures of 50° to 52°C at liquor pH values of around 10 in the first scouring bowl for efficient removal of the wool grease and impurities, the temperature decreasing to 40°C and the pH to that of the local supply in the final rinse bowl.

Some investigations have been carried out on the effect of the pH of the aqueous extract of scoured wool and wool tops on subsequent mechanical performance^(1, 2). The pH of the aqueous extract is measured according to I.W.T.O. standard procedures and although it will generally be related to the pH of the scouring liquors in which the wool was originally scoured it need not necessarily be the same. In certain cases, where wools have undergone chemical treatment subsequent to scouring, the pH of the aqueous extract can be completely different to that of the liquor in which scouring originally took place. In general, however, for wools which have not been carbonised, the pH of the aqueous extract is usually found to vary from 7 to 11, but an upper limit of 10,0 has for reasons including fibre damage, colour and fly in spinning been recommended in a paper by H. Zahn *et al*⁽¹⁾. Tests carried out by Henning⁽²⁾ on the processing performance during combing and spinning of an undyed wool show that for values of the pH of the aqueous extract from 7,0 to 10,5 there is a conflict between preservation of the fibre and processing performance. Henning states that it is therefore not feasible simply to require the lowest possible pH of the aqueous extract for scoured wool and tops to avoid any alteration in the wool because the deterioration in processing performance incurred makes it necessary to reach a compromise. Attempts must be made to reach a pH at which there is satisfactory preservation of the fibre combined with an admissible influence on processing performance. Henning sees this compromise at a pH of the aqueous extract of 9,5 with 9,8 as an upper limit.

The work referred to above with regard to the optimum pH of the aqueous extract of wool tops was confined to the alkaline range.

Apart from the most common aqueous scouring procedure, namely that of scouring in alkaline medium, scouring can be accomplished in neutral or even in acid media. In the case of neutral scouring nonionic detergents are used, sometimes in conjunction with neutral builders such as sodium chloride and sodium sulphate. Temperatures employed are generally higher than for alkaline scouring and whilst usually in the range of 60° to 65°C, can be as high as 70°C. Favourable conclusions from washing in neutral medium were drawn by Koussens *et al*⁽³⁾. In the case of acid scouring isoelectric scouring at around a liquor pH of 4,5 was tried before World War II. It was claimed that this resulted in higher wool yields. Originally corrosion of equipment was a problem, and scouring temperatures were high (circa 70°C) but more recent work enabled corrosion to be controlled and new detergents to be used efficiently at 52°C⁽⁴⁾.

It is well-known that wool is appreciably more stable to acid than to alkali. Scouring in the acid range of pH values is therefore of interest if preservation of

fibre length is a possible consequence. Within this range of pH lie two points which may or may not be of significance with regard to the processing performance of wool. One of these points is the isoelectric point. The isoelectric point is the point at which the total charge in the protein is equal to zero. It is therefore of importance in relation to processes involving either the removal or deposition of substances. It has generally been assumed that the isoelectric point of wool also represents the point of maximum stability of the fibre⁽⁵⁾. This point is in the region of pH 4.2 when measured in acetate buffers⁽⁵⁾ but varies according to the buffer used and to the method used for the determination. The other point is the point at which no chemical combination of the protein with acid or alkali takes place. This point has been referred to as the iso-ionic point although this term is more often, and perhaps more correctly used in the case of soluble proteins⁽⁶⁾. It was reported that wool does not combine significantly, in the absence of a salt, with alkali below pH 10 or with acid above pH 5. Under these circumstances it has what was called an "iso-ionic range". In the presence of a salt, however, it was found that it does combine significantly at all pH values except near pH 6.4. At this latter value the point of zero combination was sharply defined⁽⁵⁾. The point of zero combination involves only the acidic and basic properties of the fibre and it is therefore of importance when studying such wool processes as are related to these properties, for example felting.

Due to the nature of wool itself, and of scouring conditions in the bowls, variations in residual grease and entanglement exist, after scouring, not only within individual bundles of fibres, but from one bundle to another. To determine the entanglement of a scoured wool lot with any degree of accuracy is therefore a formidable task, and when looking for small differences in entanglement it is questionable whether such a determination would be practical. It would seem as though subsequent performance of scoured wool during mechanical processing is the best barometer of scouring conditions. However, the *carding* process is very sensitive, *inter alia*, to residual grease levels and it is not an easy task to scour different lots to precisely the same grease level. Furthermore, it is not yet known whether optimum residual grease levels for carding are the same for all pH values. Before attempting a large scale experiment to clarify this point it was considered expedient, therefore, to study the effect of a pH change on *combing* performance using carded slivers made from neutral scoured wool as the raw material and the backwashing process as the medium in which a pH change could be made. The results of this investigation would then be of help in interpreting the results of future, more elaborate, experiments using both scoured wool and grease wool as raw materials. In this investigation merino wools of similar length but of different style were used to assess the effects of weathering on the overall pattern of behaviour.

EXPERIMENTAL

Raw Materials

Three different lots of merino grease wool of similar length but of different style were used for this investigation. The styles selected were spinners, good top-

making and inferior, the differences between them being mainly attributed to differences in the amount of weathering which was visibly more severe in each case respectively. The wools were of sound staple and were all fairly free of vegetable fault. The wool of spinners style was 9/11 months in length and 21,6 μm in diameter. The wool of good topmaking style was 10/12 months in length and 22,5 μm in diameter. The wool of inferior style was 9/11 months in length and 19,8 μm in diameter. Differences in diameter between the styles were fortuitous.

Scouring

Scouring took place in neutral medium at 60°C using a nonionic detergent without a builder. Apart from detergent concentrations, which had to be adjusted to suit each lot, all other parameters were kept constant during scouring.

Carding

The three lots were all carded under identical conditions and *without* the use of a carding lubricant on a double swift metallic worsted card. About sixty cans of carded sliver was produced from each lot.

Backwashing

Selected batches of twelve cans of carded sliver at a time were used for the backwashing procedures, so that twelve ends could be fed simultaneously into the backwash bowls. Several experiments were conducted using one reagent at different concentrations on each batch. A new batch was used for each reagent.

The backwashing machine comprised two bowls, with accompanying squeeze rollers, followed by a suction drum drier.

At the commencement of every experiment the backwash bowls were charged with fresh water and the temperature raised to 50°C. This temperature was maintained for the duration of each experiment. During the heating up of the bowls additions of an acid or an alkali were made to change the pH of the liquor. On reaching 50°C these additions were continued very carefully until the desired pH was attained. The pH was monitored throughout the experiment and periodic additions made when necessary to maintain the desired level. After charging the first bowl with an addition of 0,01 *per cent* (by mass) of Lissapol NX (Shell Chemicals) for the purpose of assisting in the wetting out of the slivers, the slivers were passed through the system for twenty minutes at the rate of 3,2 metres per minute. This was the slowest speed attainable on the available equipment and provided a contact time of only 83 seconds from the time the wool entered the first bowl to the time that it entered the drier. Clearly this short time was insufficient to bring the wool into equilibrium with the liquor, with the result that only extremes of pH had any effect upon the pH of the aqueous extract of the wool. One of the purposes of the experiment, however, was to observe any changes in performance which may be brought about under such circumstances. The drier temperature was thermostatically controlled at 76°C.

Chemicals used for pH adjustment were of laboratory grade and comprised one or other of the following: Formic acid, acetic acid, hydrochloric acid, sodium carbonate and sodium hydroxide. These chemicals were used to obtain pH values of the liquors of from approximately 3 to 12 for the different experiments.

Gilling

After each experiment the slivers were gilled three times in rapid succession and then combed immediately. During the first gilling operation a pumping device with two heads was used for spraying the fibres as they entered the machine. One head was used to apply four *per cent* (by mass) of a 1:3 Eutectal/Water emulsion. The other head was used for applying additional water. In the latter case the setting was maintained constant within a series of experiments but varied slightly between series according to the approximate combing regain desired. All doublings, drafts, and other gill box settings were constant in all experiments.

Combing

A Schlumberger PB 26 comb fitted with a Unicomb 64's segment and a top comb of pin density 25 p.p.cm was used for combing all lots. The gauge setting was 28 mm and this, together with all other settings, was constant in all experiments. Four tests of two minutes duration were made for each experiment to determine the percentage noil.

Testing

Withdrawal force and compressibility were measured using the SAWTRI Withdrawal Force Tester⁽⁷⁾ and SAWTRI Compressibility Tester⁽⁸⁾ respectively. Vegetable particles were counted on a Toenniessen top testing machine. Whiteness was measured on a Zeiss Elrepho reflectometer and methylene blue dye absorption was measured on a Beckmann spectrophotometer. The pH values of the liquor were monitored on a Metrohm pH meter but actual values published (and also values for the pH of the aqueous extract of the wool) were obtained after cooling samples to 20°C and measuring the pH on a Metrohm potentiograph.

RESULTS AND DISCUSSION

The percentage noil obtained during the combing of the three different styles of wool which were backwashed at various liquor pH values is illustrated in Fig. 1. These wools had all been scoured to an identical residual grease level, namely 0.29 *per cent*. The pH of the liquor during backwashing was controlled by

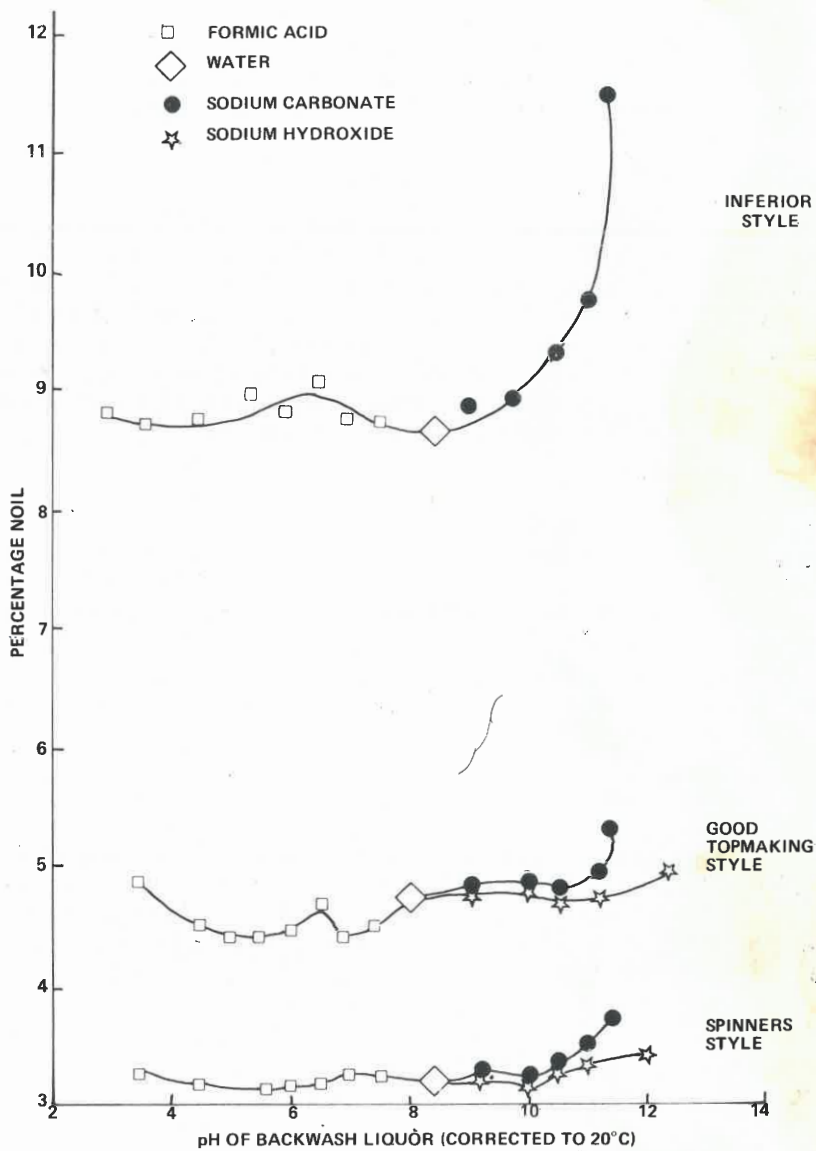


FIGURE 1
 Percentages of noil obtained for different styles of wool after backwashing at different liquor pH levels

TABLE I

THE EFFECT OF BACKWASHING CARDED SLIVER MADE FROM INFERIOR STYLE WOOL AT VARIOUS pH VALUES ON THE METHYLENE BLUE DYE ABSORPTION AND WHITENESS OF THE RESULTANT TOPS AND NOILS

pH of Liquor, (corrected to 20°C)	pH of the Aqueous Extract of the Wool		Methylene Blue Dye Absorption (%)		Whiteness (units as suggested by Beyer)	
	Top	Noil	Top	Noil	Top	Noil
3,0	3,7	3,1	86,0	93,3	8,8	6,7
4,0	4,4	4,8	84,6	92,3	9,6	6,6
5,0	6,7	6,9	86,6	91,6	9,4	5,3
6,5	6,9	6,9	84,7	93,3	10,3	6,4
7,3	7,1	6,9	84,8	92,4	9,5	5,9
8,5	7,1	7,0	85,1	92,4	9,6	6,8
9,5	7,1	7,1	85,2	93,2	9,0	6,6
10,0	7,3	7,2	85,3	91,3	9,4	5,2
10,5	7,8	7,3	84,8	93,1	10,4	6,2
11,0	9,1	9,3	87,1	93,2	9,2	3,6
11,3	10,0	10,1	87,9	92,3	7,1	1,4
	Average		85,6	92,6	9,3	5,5

using either formic acid or sodium carbonate. In the case of the spinners and good topmakers styles sodium hydroxide was used as well. From the discussion of further results in this paper it will be appreciated that there is some justification for joining the points in the manner depicted in Fig. 1.

In spite of the good topmaking style being slightly longer and coarser than the spinners style, and the inferior style being of the same length but finer than the spinners style, there are clearly differences of large magnitude between the percentages of noil found for these three wools. These differences can be attributed to weathering, a higher overall breakage taking place on the more weathered wools.

Whilst treatments with liquor pH values of from 3 to 10 had little practical effect on percentage noil, treatments at a liquor pH of 11 and above with sodium carbonate resulted in a deterioration in combing performance. This deterioration was much more pronounced for the inferior style than it was for the spinners, or good topmaking styles. Treatment with sodium hydroxide at a liquor pH of up to 12 had little effect on percentage noil. Higher liquor pH values were accompanied by chemical degradation of the fibres evidenced by a noticeable yellowing.

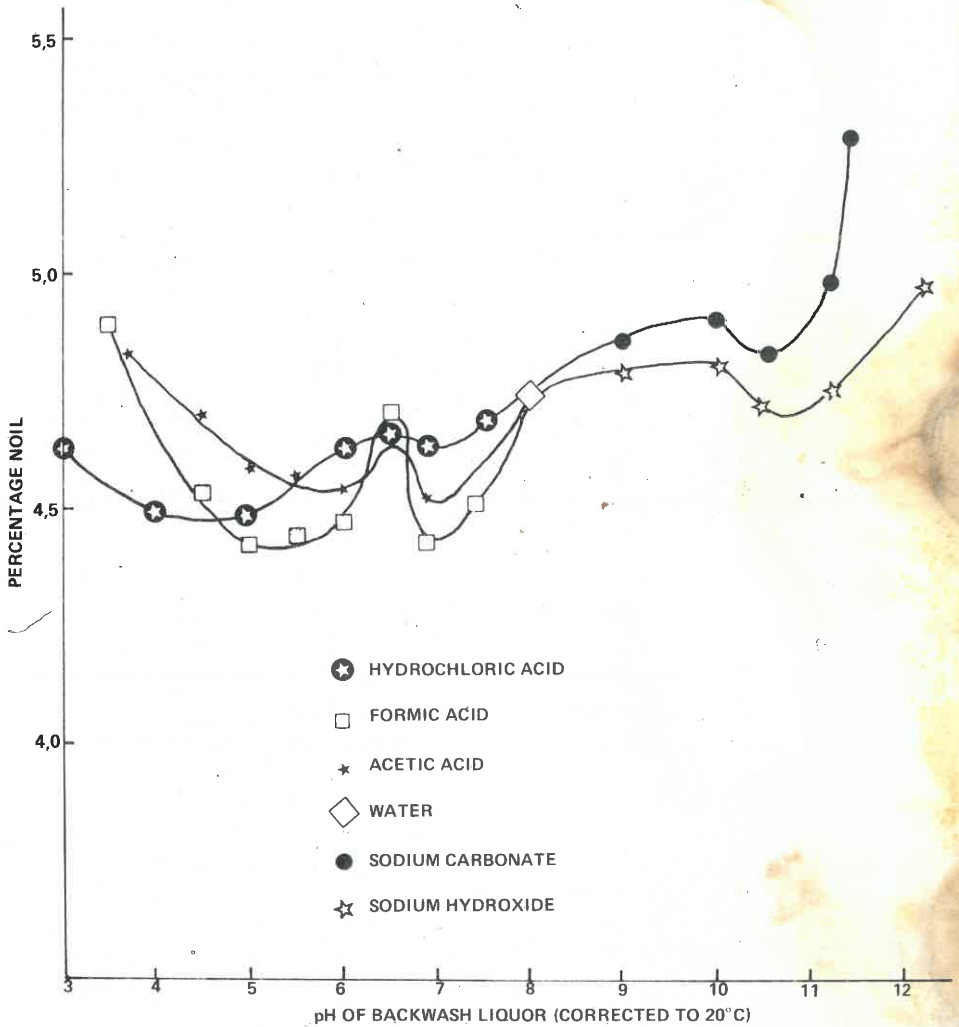


FIGURE 2

The effect of using different reagents at various pH levels of the backwash liquor on subsequent percentage noil obtained during combing (Liquor temperature 50°C)

Results of methylene blue absorption and whiteness analyses on the tops and noils produced in a repeat experiment on the inferior style of wool are given in Table I. All parameters in the repeat experiment were the same as in the experiment

referred to above excepting that the combing regain was four *per cent* higher. The reagents used for pH control were formic acid and sodium carbonate.

From Table I it can be seen that the percentage methylene blue dye absorption was fairly constant for the top and the noil over the complete range of liquor pH investigated but was consistently higher for the noil than for the top. This indicates that the noil contained a higher proportion of weathered fibres than did the top. Table I also shows that the value for whiteness of the noil was significantly

TABLE II
VALUES OBTAINED FOR THE pH OF THE AQUEOUS EXTRACT OF TOPS
PRODUCED FROM WOOL WHICH WAS BACKWASHED AT DIFFERENT
pH VALUES OF THE LIQUOR

Reagent Used	pH of Liquor	pH of Aqueous Extract of Top	Reagent Used	pH of Liquor	pH of Aqueous Extract of Top	
Hydrochloric acid	3,0	4,9	Water	8,0	6,9	
	4,0	6,2		Sod. Carbonate	9,0	7,0
	5,0	7,0			10,0	7,7
	6,0	6,9			10,5	7,7
	6,5	7,0			11,2	7,6
	6,9	7,0			11,4	9,8
	7,5	6,8			Sod. Hydroxide	9,0
Formic acid	3,5	4,3	10,0			6,7
	4,5	6,6	10,5	7,0		
	5,0	6,8	11,2	7,0		
	5,5	6,8	12,4	10,1		
	6,0	6,8				
	6,5	6,9				
	6,9	7,0				
Acetic acid	7,4	6,8				
	3,7	4,6				
	4,5	6,2				
	5,0	6,9				
	5,5	6,9				
	6,0	7,0				
	6,5	7,0				
6,9	7,0					

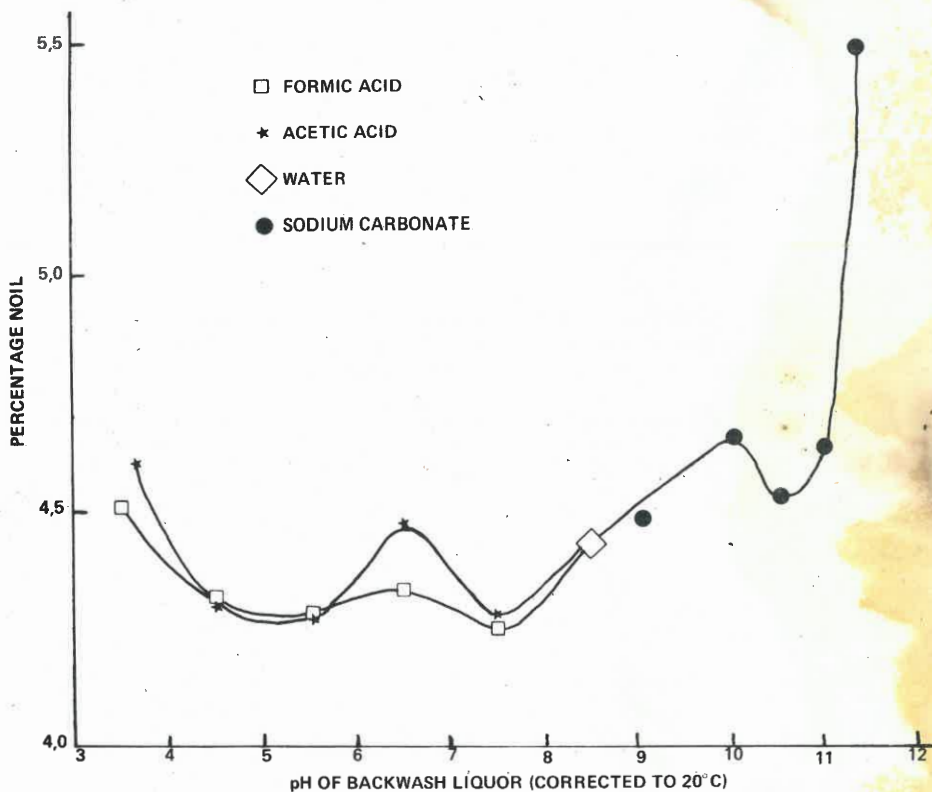


FIGURE 3

Percentage noil versus pH of the backwash liquor using different reagents at a backwash liquor temperature of 40°C

lower than that of the top over the whole range of liquor pH values. The colour of the noil was particularly poor at liquor pH values of 11 and above. The whiteness of the top was fairly constant except at a liquor pH of 11,4 at which pH it was significantly poorer. The pH of the aqueous extract of the tops and noils was practically unchanged within the pH range of 5 to 10,0. The lower whiteness of the noil was probably associated with a high degree of weathering and, in the case of liquor pH's of 11 or higher, with chemical attack.

Whilst the variations in percentage noil obtained between liquor pH values of 3 and 10 were of little practical consequence, these variations followed a pattern of possible scientific interest. This is illustrated in Fig. 2 which shows the results obtained for the good topmaking wool when various reagents were used. A larger scale has been used to show the pattern more clearly.

Since distinctly different curves were produced in each case it is clear from Fig. 2 that percentage noil is influenced by the reagent used for pH control. Maxima and minima in these curves which were independent of the reagent occurred at liquor pH values of 6,5 7,0 10,0 and 10,5. Minimum values which were dependent on the reagent used occurred at approximate liquor pH values of 5,8 (acetic acid), 5,3 (formic acid) and 4,5 (hydrochloric acid) indicating a possible shift to lower pH values with increasing acid strength. The values obtained for the pH of the aqueous extract of the tops for the various treatments shown in Fig. 2 are given in Table II. From this table it is obvious that only liquor pH values of below 4,5 and above 11 had any noticeable effect on the pH of the aqueous extract of the wool. However, there was clearly a difference in the physical behaviour of the fibres over this range which brought about definite changes in percentage noil. It can be inferred from this information that the percentage noil obtained during combing depends, *inter alia*, on the pH of the liquor in which backwashing takes place and on the reagent used to control pH rather than upon the pH of the aqueous extract of the wool. The results also show that backwashing of a neutral scoured wool in a slightly acid medium could have beneficial results on ultimate combing performance and would certainly be preferable to similar treatment in an alkaline medium.

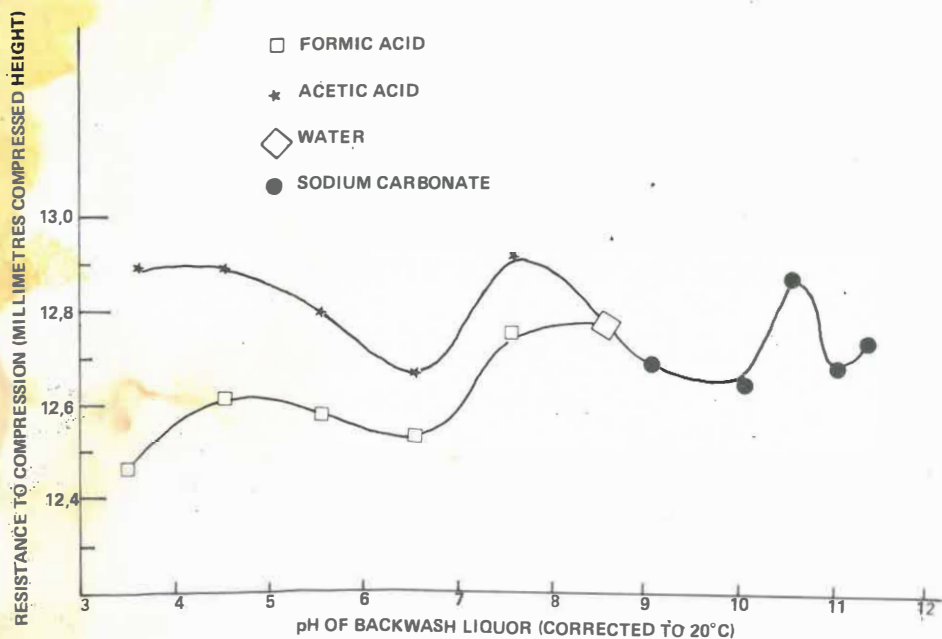


FIGURE 4

Resistance to compression of slivers backwashed with different reagents at various pH values of the backwash liquor

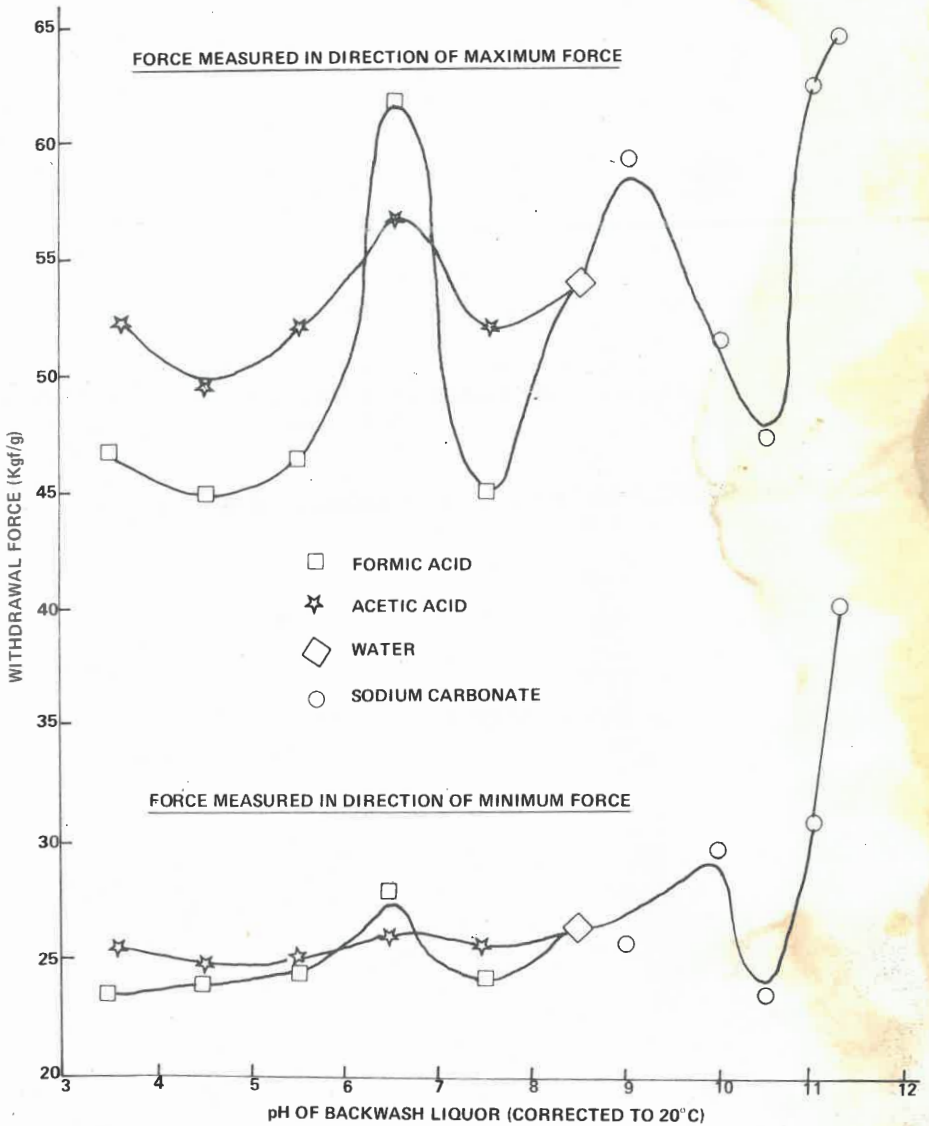


FIGURE 5

Withdrawal force of slivers backwashed with different reagents at various pH values of the backwash liquor

The pattern illustrated by Fig. 2 was reproduced for the same wool at a lower temperature in the backwash bowls, namely 40°C (see Fig. 3). The residual grease level of this lot was 0,42% after scouring. Maxima and minima occur in Fig. 3 which are unmistakably similar to those shown in Fig. 2, and in order that their occurrence may be explained tests were carried out to determine the withdrawal force and compressibility of the slivers after backwashing. These results are depicted in Figs. 4 and 5 respectively and it can be seen from these figures that maxima and minima occur in both the withdrawal force and compressibility curves at points closely rated to those found for percentage noil. Whilst the withdrawal force shows similar maxima and minima whether it is measured in the direction of maximum or minimum force, the effect of the pH of the liquor is more pronounced in the former direction. This suggests that whilst changes in the total frictional or cohesive forces have occurred with the different treatments these changes are associated with the trailing ends of the fibres and hence with the configuration of the fibre hooks.

The compressibility results show that the same maxima and minima referred to above are associated with minor changes in compressibility, higher withdrawal force being associated with lower resistance to compression, and *vice versa*. The compressibility values obtained for acetic acid were also higher than were the values obtained for formic acid. This suggests that treatment with acetic acid might have increased the crimp frequency with respect to the formic acid treatment thus producing slightly higher resistance to compression. Such a change could only have been brought about by a differential relaxation of the fibres in the two media. In the process of relaxation greater entanglement would ensue with higher degrees of relaxation, since the fibres, although in sliver form, are able to move relative to one another while relaxation proceeds, and the greater the relaxation, the greater it is possible for the relative movement.

Treatment with acetic acid produced slightly higher withdrawal force values than treatment with formic acid and this was more pronounced when measured in the direction of the trailing ends. Since the presence of fibre hooks in the trailing ends would increase the likelihood of entanglement it would seem that the slightly higher withdrawal force values obtained for acetic acid are confirmatory of a slightly higher degree of entanglement.

Further evidence to support this theory was obtained by examination of the vegetable matter count after backwashing. It is the author's contention that if some of the vegetable particles held by a wool sliver were held only loosely, and the slivers then subjected to a process which changes the entanglement, subsequent mechanical treatment can in many cases produce a change in the vegetable count which is related to the degree of entanglement. This follows simply because an entangling action tends to bind the particles more effectively to the surrounding fibres. Some, or all, of the mechanical treatments involving backwashing, suction drum drying and drafting of the samples on the Toenniessen testing machine made it possible for

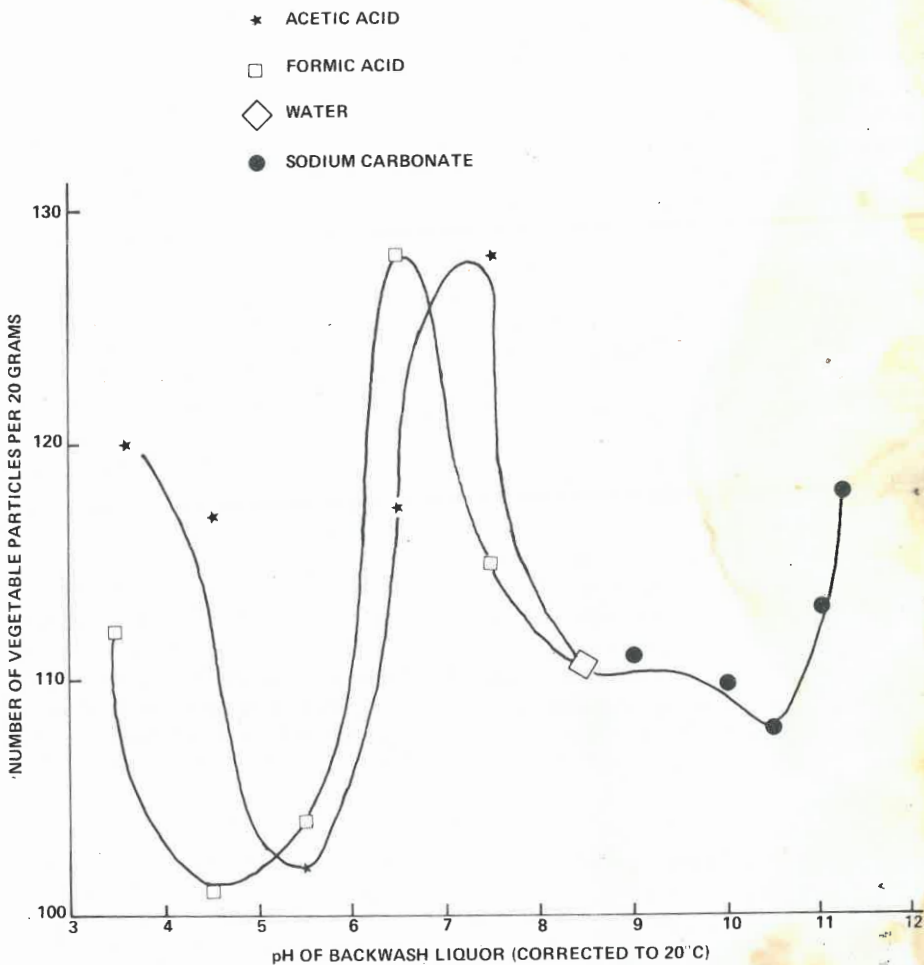


FIGURE 6

Vegetable impurity of slivers backwashed with different reagents at various pH values of the backwash liquor

some of the vegetable particles to fall out in the experiments under discussion. Whilst the numerical differences are relatively small, however, there would appear to be a correlation between the vegetable count obtained and the other parameters discussed previously and this is shown by Fig. 6. If the author's contention is correct it would seem that the propensity of the fibres to become entangled under the experimental conditions described was reduced when the pH of the liquor was in the

region of pH 4,5 on the acid side and pH 10,5 on the alkaline side and increased in the region of pH 6,5.

Still further confirmation of the reason for the behaviour described above was sought by examining the sliver linear density and comb production rate resulting from the various treatments with formic acid, acetic acid, sodium carbonate and

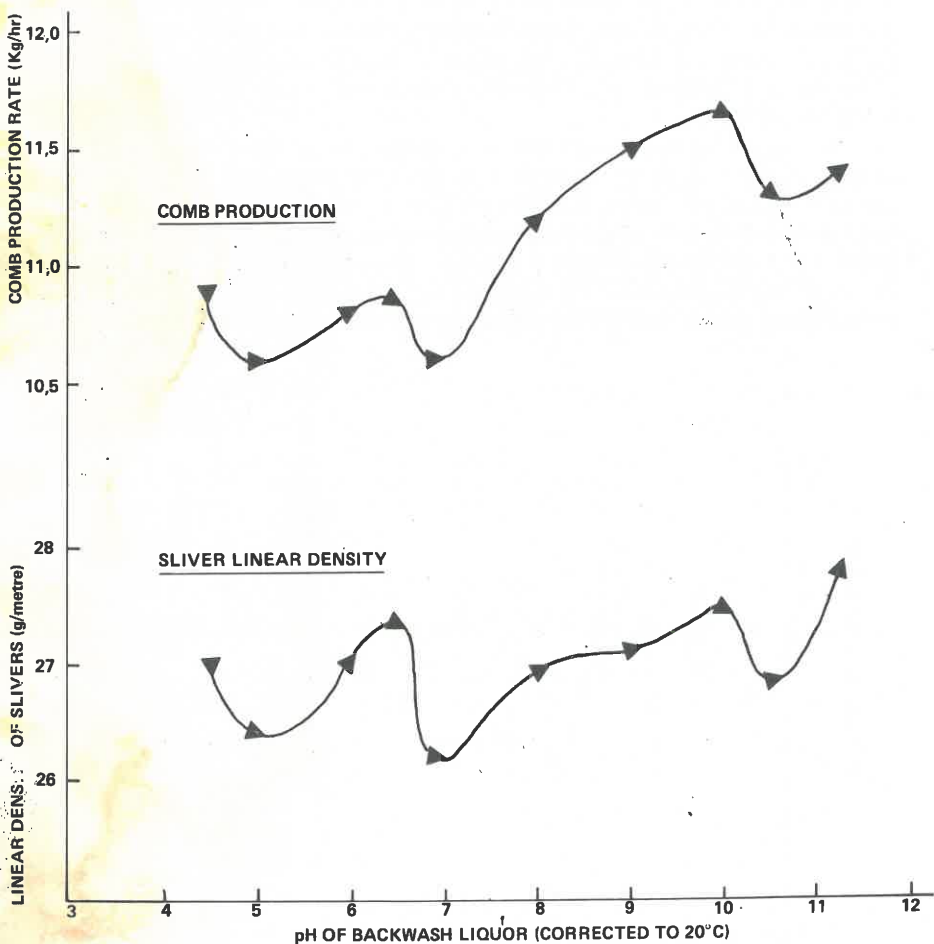


FIGURE 7

Variations in average sliver linear density after gilling and in comb production rate brought about by backwashing carded slivers at various pH values of the backwash liquor

sodium hydroxide in the second experiment described in this paper. The sliver linear densities for the first, second and third gilling operations obtained for all these reagents were averaged and similarly the comb production rates for all these reagents were averaged for each particular pH of the backwash liquor. These results are represented in Fig. 7 and it is again evident from the patterns shown in the figure that the maxima and minima seen in previous figures are repeated. An explanation for this behaviour is that although slivers of equal linear density were presented to the backwash machine subsequent changes in crimp frequency and entanglement produced changes in cohesive and frictional forces, with resultant slippage of the fibres during withdrawal in gilling and combing resulting in changes in the effective drafts obtained.

Finally, a further experiment was conducted to observe the pattern of behaviour of sliver shrinkage in wool tops when the tops were immersed in liquors having different pH values. For this purpose a 9/11 months superior topmaking style wool lot of 64's quality was neutral scoured and then processed into tops without the use of any additives. The tops were cut into pieces of approximately 35 cm in length and elastic bands placed near each end. The distance between the elastic bands was measured. The pieces of top were then placed in a flat cage having

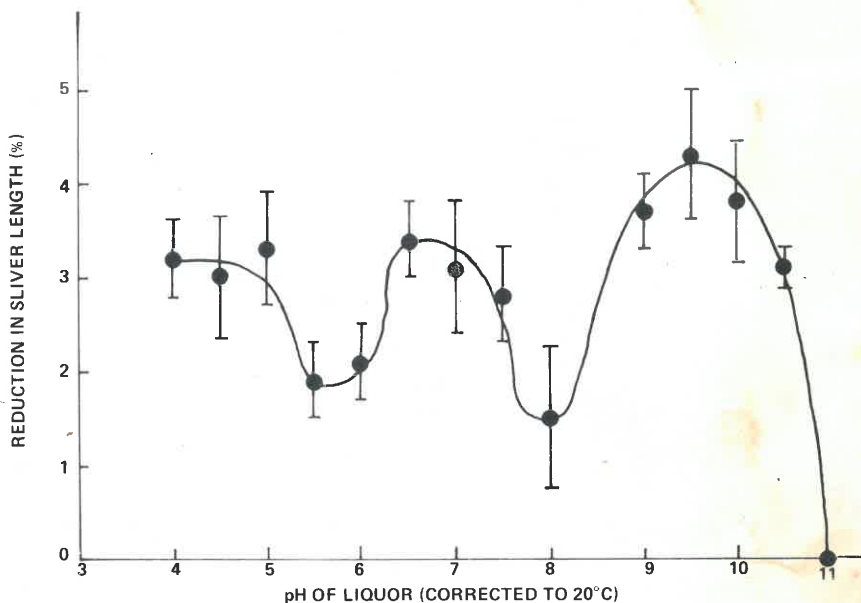


FIGURE 8

Reduction in sliver length of wool tops after two minutes immersion in liquors of different pH values

wire gauze on the bottom and lid. The cage was lowered carefully into a bath containing tap water to which 0,01% Lissapol NX had been added for wetting out purposes and to which either formic acid or sodium hydroxide had been added for the purpose of obtaining the desired pH of the liquor. The liquor temperature was maintained at 50°C but pH values recorded were those obtained after cooling a sample of the liquor to 20°C. After an immersion time of two minutes, the cage was withdrawn and the distance between the elastic bands measured again in order to determine the percentage sliver shrinkage. Four determinations were made at each of the different pH values selected and the standard error of the results was calculated. The results of this experiment together with the standard errors are shown in Fig. 8.

From Fig. 8 it is clear that different liquor pH values produce differences in sliver shrinkage in a given time and that at liquor pH values of 6,5 and 5,5 a maximum and minimum occur respectively. These values correspond closely to the maxima and minima observed in the results previously discussed. Other minimum and maximum values occur at liquor pH values of 8,0 and 9,5 respectively which, although not corresponding very well with those of the result previously discussed, give the curves a similar trend up to pH 10,5.

Up to liquor pH values of 10,5 differential fibre relaxation producing differential fibre shrinkage and entanglement would therefore seem to be the major mechanism by which differences in combing performance were produced in the experiments previously described. Above pH 10,5 sliver shrinkage decreased significantly but at these high pH values other factors, such as fibre damage, were probably responsible for the deterioration in combing performance.

Two of the points involving maxima and minima observed repeatedly in the measurement of the various parameters seem to be related to the pH values mentioned in the introduction to this paper, namely the isoelectric point and the point of zero combination, and it may well be that these values could be of importance in further studies of this nature.

SUMMARY

Treatment of carded slivers, made from neutral scoured wool, in a conventional backwash unit with various reagents at different pH levels did not have any noticeable effect on the pH of the aqueous extract of the wool except at extremes of pH. Nevertheless, differences in combing performance were observed.

In the acid range of liquor pH, differences in pH and also in the reagent used to control pH, led ultimately to differences in combing performance. In the case of a good topmaking wool a pH value of the liquor of about 6,5 gave relatively poor performance whatever the reagent was, whereas a pH of 7,0 gave good performance. Equally good performance was obtained at certain lower pH values of between pH 4 and 6 but in these cases the optimum seemed to depend on the reagent used and

in this respect a shift towards lower values was observed with increasing acid strength. Better performance was obtained with formic acid than with acetic or hydrochloric acids. Changes in combing performance in the acid range of liquor pH, however, were small and possibly of little commercial interest. Small changes were also observed in the case of spinners and inferior styles of wool.

In the alkaline range, variations in the pH of the liquor of up to pH 10 produced variations in combing performance which were of little practical consequence, irrespective of wool style. In the region of pH 10 to 10,5 a minimum was observed in the curves which seemed independent of the reagent used. Up to this pH value, combing performance was reasonable, but not as good as the performance obtained in the acid range. At higher pH values combing performance deteriorated. This deterioration was more rapid when sodium carbonate was used than when sodium hydroxide was used. The deterioration in combing performance when sodium carbonate was used was particularly pronounced in the case of an inferior style of wool indicating that this style is extremely sensitive to alkaline treatment.

Overall combing performance of spinners, good topmaking and inferior of wool showed clearly that differences in style, attributed in this case mainly to weathering, can produce differences in percentage noil of large magnitude.

CONCLUSIONS

Combing performance deteriorates rapidly with deterioration in wool style brought about by weathering. When carded slivers made from neutral scoured wools of different style are backwashed at different pH values deterioration in combing performance is accentuated at liquor pH values of above 10,5.

Combing performance is dependent, *inter alia*, on the pH of the liquor in which the wool is treated and on the reagent used to control pH. For a good topmaking style of wool combing performance would appear to be better when the wool is treated in acid medium but for optimum results it would seem as if a liquor pH of 6,5 should be avoided, a slightly lower pH being preferred.

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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.

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