AUSTRALIAN COTTON VARIETIES - THEIR PERFORMANCE IN THE MILLS

Chris Gorst, Spinning Manager, Bradmill Textiles Limited

During the past few years there has been a number of changes in the varieties of cotton grown in Australia, through DP 61, Namcala, DP 90, Siokra and Sicala. In this presentation I will be relating the performance of the newer type varieties (DP 9D, Siokra and Sicala) in the mills, particularly on the latest technologically advanced spinning equipment when compared to what was the industry standard fibre of DP 61.

The major Australian cotton yarn spinners are encouraged by the improvements the researchers and the growers have managed to obtain in the newer varieties. Increased fibre strength has given increased yarn strengths (particularly in rotor spinning), which generates improved fabric strength, and improved fabric production performance and efficiencies. The production of a finer, more mature fibre has also allowed the spinners to produce finer yarns than was possible before on the rotor spinning system.

Bradmill Textiles is the largest individual consumer of bales of cotton in Australia. We introduced DP 90 and Siokra into the mill in the 1986 crop and since then have run a blend of DP9D/Siokra moving towards predominately a large percentage of Siokra. Siokra will be used 100% in the 1988 crop. Sicala has only been sampled in small lots by the mills, further evaluation will be carried out by the spinners during this crop year.

Fibre requirements for the current and future technology of spinning will become more critical.

Rotor spinning is now the largest spinning system used in Australia with all the major spinners using this system to convert fibre into yarn. The critical fibre parameters for rotor spinning are strength, fineness/maturity, length/uniformity and cleanliness, in that order. Refer Appendix 1 which relates to the various methods of yarn formation and the critical fibre parameters for each method.

Fibre strength relates directly to yarn strength - high fibre strength means high yarn strength. The improvement in fibre strength from DP 61 to DP 90 has given increases in yarn strengths in the order of 10% - 15% (see Appendix 2). This has allowed open end spun yarns to be substituted for ring spun yarns in critical areas of strength requirements. Normal relationship between ring spun and open end yarns is that open end should be 90% the strength of ring spun. For example, denim yarns were intially produced from ring spun yarns. With the increase in fibre strength the yarns produced from a rotor spinning frame are capable of being used in a denim fabric, thus giving the spinner the advantages of using the rotor system. Stronger fibres have also allowed the spinning of finer yarns on the rotor system, usually as yarns go finer in density they also become weaker. At the high production speeds on the rotor spinners (up to 100,000 RPM rotor speed) the forces imposed on the forming yarn are large and therefore it is essential to have stronger fibres in order to

minimise the end breakage rate during spinning. The breakage of the yarn during the spinning process causes loss of production and consequently increases cost to manufacture.

Fineness and maturity are fibre parameters which can greatly effect yarn spinning performance. With rotor spinning it is generally acknowledged that a minimum number of 100 fibres in the cross section of the yarn are needed to enable a yarn to be spun. Therefore it follows that the finer the fibres the finer the yarn that can be spun from them. The fine fibres also need to be mature - it is no good to have fibres with a micronaire of 3.7 and a maturity value of 0.75. Immature fibres cause major processing problems for the spinner and dyers. During the opening and cleaning processes in spinning they are the cause of nep formation which has a detrimental effect on the appearance of the final yarn. Immature fibres also react adversely on the rotor spinner producing uneven yarn and often yarn faults. In the dyeing operation immature fibres have a different dye uptake to mature fibres. This causes shade variation and leads to an uneven appearance of the dyed fabric.

For the rotor spinning system Siokra would appear to be a better fibre than DP 90 as it is fully mature at a lower micronaire value, thus giving a finer fibre for spinning. Comments have also been made by spinners that Siokra seems to be more stable in its micronaire range than DP 90, particularly in adverse growing conditions.

With regard to fibre length and uniformity, the rotor spinning system because of its method of yarn formation can tolerate the use of shorter fibres than the ring spinning system.

Uniformity of fibre length is a critical factor. High variations in fibre length lead to adverse processing of the fibre. A minimum value of 45% uniformity ratio is required.

The new high speed spinning technologies are very susceptible to excessive amounts of impurities in the cotton fibre. These cause an increase in breakage rate at the machine and consequently loss of production (see Appendix 3). The finer particles of trash, (pin trash and micro dust), also cause excessive wear on the spinning components of the rotor spinner. These trash particles are very abrasive and cause an effect similar to sand blasting. Under adverse conditions the life of some machine components has been reduced by a factor of three. Early replacement of the components adds significantly to the costs incurred in producing the yarn.

In order to try and reduce the amount of pin trash and micro dust in the yarn, the opening and cleaning areas of the spinning mills are becoming more sophisticated in an attempt to reduce as many of the impurities as possible prior to spinning.

There has been a definite trend in the past few years for cotton bales to contain more pin trash (this is even evident in U.S.D.A. grade boxes). The pin trash is presumably caused by a number of

factors, i.e. growing conditions, plant type, picking conditions and ginning conditions. Whilst the spinning industry is trying to improve processing conditions to remove the pin trash, steps should be taken to ensure that it is not in the cotton in the first place.

The increase in pin trash is of serious concern to the spinners.

Although not directly related to growing conditions I would like to raise the point of preparation of cotton from the gins. This, like the pin trash level, has shown a deterioration during the past few years. The cotton bales now have a stringy look to them as though the cotton has been over-processed. Obviously this has a detrimental effect on the quality of the yarn that is produced.

Listed on Appendix 2 are typical fibre and yarn parameters for DP 61, DP 90, Siokra and Sicala. These are averages taken over a number of deliveries into Bradmill Textiles' Yarraville spinning mill. As can be seen, the increase in fibre strength over DP 61 of DP90, Siokra and Sicala is evident in the increased yarn strengths. The fibre length values are very similar. The Sicala sample was only a small one; whether the length value achieved there is continued in bulk deliveries will have to be seen. Both Siokra and Sicala have lower micronaire values than the Delta Pine varieties - this is advantageous for rotor spinning, as explained, provided the fibre is fully mature. Trash content levels of Siokra and Sicala are higher than the Delta Pine varieties. This could be related to the increased levels of pin trash that are

currently being experienced by the spinners.

With regard to the future developments and requirements of spinners, there will be further developments of the new technology spinning systems, particularly in producing finer yarns and stronger yarns. Itemised in Appendix 1 are the critical fibre parameters for four different types of spinning systems. Currently the majority of spinning in Australia is done using the rotor system and ideal fibre specification for that method of spinning would be:

Strength : 25 g/tex minimum
Length : 34/32" Staple
Uniformity : 45% or better
Micronaire : 3.5 - 4.0 fully mature
Trash Content : 1.5% or less with minimum pin trash and microdust.

Ṣiokra fibre appears at this stage to fit into the broad requirements of the spinning industry. Sicala at this stage is really an unknown quantity as most of the spinners have only sampled small quantities of this fibre.

APPENDIX 1

RING SPINNING	ROTOR SPINNING	AIR JET SPINNING	FRICTION SPINNING
Length/Uniformity	Strength	Fineness/Maturity	Friction
Strength	Fineness/Maturity	Cleanliness	Strength
Fineness	Length/Uniformity	Strength	Fineness/Maturity
	Cleanliness	Length/Unformity	Length/Uniformity
		Friction	Cleanliness

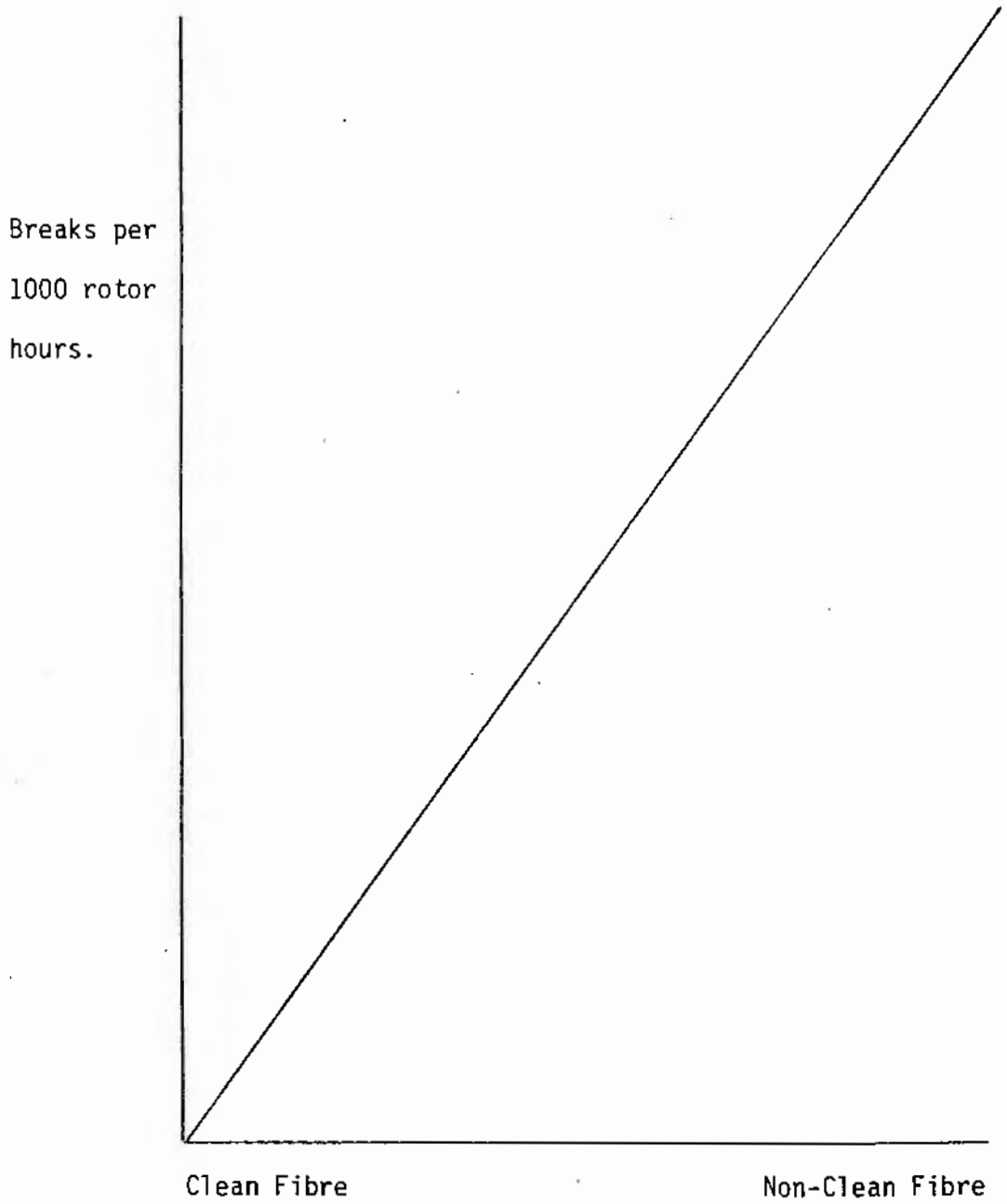
APPENDIX 2

Typical Fibre and Yarn Test Results

FIBRE	DP 61	DP 90	Siokra	Sicala
Length - 1/32"	35.0	36.0	36.5	37.9
Uniformity Ratio	44.0	44.4	43.7	45.9
Strength g/Tex	21.0	25.7	25.0	27.0
Micronaire	4.2	4.1	3.8	3.9
Trash Content %	1.5	1.5	1.8	1.7

YARN	DP 61	DP 90	Siokra	Sicala
Strength MN/Tex	109.0	125.0	119.0	120.0
Evenness CV%	13.1	13.5	12.7	12.5

APPENDIX 3



Fibre Cleanliness