Field to Fabric Research on White Specks - Fabric Quality

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Abstract

White speck neps cause significant financial losses to the textile industry and the following studies look at several factors that may affect white specks. Processing factors, such number of lint cleaners used at the gin, mill card settings, and combing are studied, as well as varietal differences, to see the effect on white specks in the finished fabrics. This paper examines the white speck phenomena as seen in US and Australian studies. The first study has 4 extreme US varieties that were grown specifically to produce different levels of white specks. In this study, it happens that the tandem card was improperly set during installation results in much higher levels of white specks than single carding, showing the importance of proper settings and maintenance. The second study looks at 26 U.S Leading varieties studied (LVS) by AMS (Agriculture Marketing Service of the USDA, they measures what are perceived to be the important quality measurements on all cotton produced in the USA). This study also includes five extreme varieties grown in the same field (similar to the first study) and processed identically in the gin and mill.. This study also compares carding with combing. Four varieties from the 26 Leading Variety Study by AMS were carded and combed and the fabrics are analyzed for white specks. The final two studies are collaborative studies between US and Australia. The cottons were grown in Australia and the studies compare ring to rotor spinning and different levels of lint cleaning at the gin. The first year used small seed cotton samples (300lbs) and the second year used full modules of seed cotton. Combing was found to reduce the white speck problem, while other processing seems to open and separate the immature fibers spreading the white speck problem. Ultimately we would like to develop strong predictions of white specks from high-speed instruments that test bale fibers, and have the white speck potential included in the classification of cottons.

Introduction

One of the most significant problems facing the U.S. cotton textile industry is the presence of white speck neps, undyeable defects in fabrics. Since uniform surface color is a desirable aspect for fabrics, the inclusion of white specks is detrimental to fabric quality. With demand for ever-higher quality fabrics, neps are an increasingly important concern to all cotton growers, ginners and textile mills. The white speck defect causes an estimated annual cost to textile manufacturers that exceed two hundred million dollars [1].

In a broad sense, the term nep refers to an entangled knot of fibers. In a study of neps in fabrics, Hebert demonstrated that for all neps he identified, 96% appeared as white specks containing some immature (poorly developed) fiber [2]. As illustrated in Figure 1, white specks in a fabric (Figure 1a) appear as shiny masses, which when moderately magnified are seen to consist of entangled fiber (Figure 1b). Closer examination at higher magnification clearly demonstrates that the fibers have extremely immature, flat, ribbon-like structures (Figure 1c) [3]. These very immature fibers contain very little cellulose, absorb very little dye, are highly reflective, and appear as white specks when a fabric is dyed a dark shade. Thus, cotton maturity is the causative factor of white specks. Immature clusters of fibers in a fabric are often not visible as defects until dyeing, rendering the fabric unsuitable for commercial use. This reemphasizes the need to accurately quantify maturity at the bale and white specks and to investigate the relationship between both parameters.

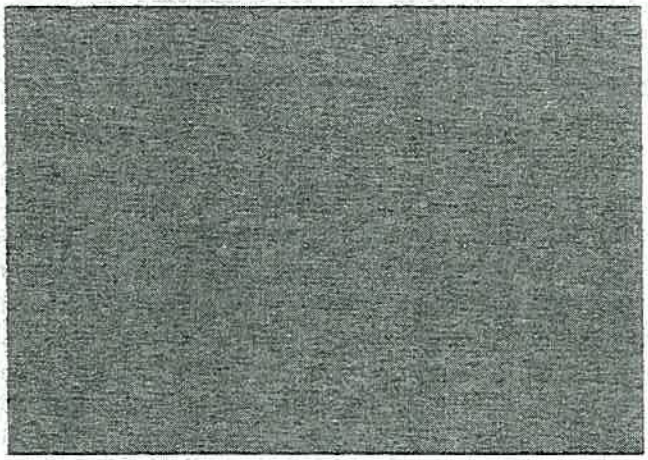

Figure 1 a. White specks on dyed fabric

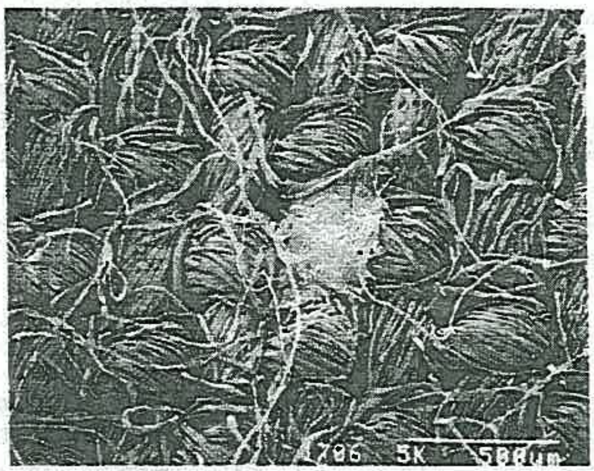

Figure 1 b. White speck close-up

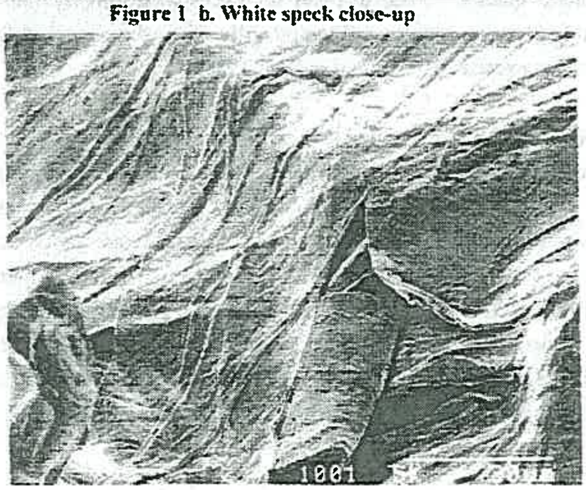

Figure 1 c. White speck at high magnification

Figure 1: White Speck and Immature Fiber

Classically, neps are measured by counting them in a card web, but now AFIS™ can be used for high-speed measurement of neps in fiber samples. Image analysis is being used to quantify white speck neps, on dyed fabric. Initial research has shown strong correlation between AFIS™ data and white speck content of fabric. More research is necessary to establish relationships between bale data and the quality of the finished product. Although the process in gin and textile mills can contribute to the formation of neps, fiber maturity is the causative factor of white specks because immature fibers contain little cellulose and do not retain dye. It would be extremely useful to know the quantitative relationship between fiber maturity and fabric white specks and to predict the white speck problem from raw fiber quality before the fabric production. The growers and the mills are seeking fibers that derive the greatest profit. They would like to see a better cotton fiber developed, and have more knowledge of the relationship between fiber parameters and performance. Technology to measure more attributes of cotton on a larger scale is becoming available and research is needed to determine the accuracy of this data. The U.S. & Australia have been collaborating in research to: 1) gain fundamental knowledge of the nature and behavior of cotton and neps; 2) gather baseline data on the level and characteristics of neps in cotton; and 3) predict white specks on fabric using high speed fiber data.

Varietal impacts on white specks are not readily discernible because of the interaction with gin and textile processing. Mechanical processing factors such as the level of lint cleaning at the gin and card wire condition in the mill also affect the level of white speck on the finished fabric[4]. This work indicates that for an effective study to relate fiber to fabric quality, cotton processing (gin & mill) should be a constant in evaluations for white speck potential (WSP). Australia has much more diverse growing regions in a concentrated area as compared to the U.S. and can more economically provide a wide variety of cottons processed at one gin from different growing regions. In the spirit of cooperation, Australian cotton researchers provided cottons ginned at one location for each year. This minimized mechanical interactions, so the study is not comparing conditions of different gins on white speck, at least for each individual study, but true fiber properties resulting from field and varietal differences. The studies will also include different levels of lint cleaning which will show the effect of increased lint cleaning on a variety of cottons.

White Speck Studies

The Four studies for this paper area as follows:

(1). *EVS* (Extreme Variety Study) – Eight cotton varieties from controlled field, gin and mill conditions. These 8 fabrics have visibly different levels of white specks and include extremely low and high levels of white specks. They are being used used as the standards for developing the image analysis protocol and to monitor accuracy during software development. Two lots for each variety were single carded using the Mark IV card, and the other two were tandem carded using the newly installed Mark IV tandem card. It was later found that the Tandem card was not set properly on one side, and this caused the fibers to migrate towards the side of the carding cylinders that was set too wide, increasing the level of white specks. Fabrics were woven from 30/1 warp yarns and 40/1 filling yarns for all varieties to produce eight fabrics. The yarn was spun, woven, and dyed at the USDA Southern Regional Research Center (SRRC).

(2). *LVS* (Leading Variety Study-US) – 31 dyed filling faced sateen fabrics. 13 varieties with 2 samples from different gins (the level of lint cleaning was not reported for this study, but, typically 2 lint cleaners would have been the standard, but occasionally only 1 lint cleaner was used. Three lint cleaners were used at one gin and on the stripper harvested cottons) (3 varieties, 6 samples are combed and show the lowest levels of white specks) and 5 varieties from controlled field, gin (2 lint cleaners) and mill conditions to relate fiber properties to the white speck problem. Ginned lint was sent to the Cotton Quality Research Station, a USDA lab in Clemson SC, for processing and analysis. The yarn was woven and dyed at SRRC.

(3). *1998 Australian Crop* – 60 dyed filling faced sateen fabrics from 8 Australian varieties (including 3 Bt varieties) with several field locations per variety, one and two lint cleaners at the gin, followed by controlled mill conditions (Figure 5,and 7) to relate fiber properties to the white speck problem. 1998 Baseline study, intended to provide information on neps and other quality attributes across three growing regions for a selection of major varieties. The samples were also split in the gin to examine the effects of two different lint cleaner treatments (1 and 2 lint cleaners). Ginned lint was sent to the Cotton Quality Research Station, a USDA lab in Clemson SC, for processing and analysis, using the same protocol as the U.S. Leading Variety Study. The yarn was woven and dyed at the International Textile Center in Lubbock,TX. This study provided the first objective comparison of a cross-section of Australian cotton with a cross-section of USA cotton.

(4). *1999 Australian Crop* – 72 dyed filling faced sateen and knit fabrics from 15 Australian varieties (including 7 Bt varieties) with several field locations per variety, zero and two lint cleaners at the gin, followed by controlled mill conditions to relate fiber properties to the white speck problem. 1999 Baseline study based on the 'catchment' of one gin in the Gwydir valley, intended to develop the cooperative links and expertise to carry out more of the work within Australia. The samples were also split in the gin to examine the effect of two different lint cleaner treatments. Lint samples were sent to the Southern Regional Research Center, a USDA lab in New Orleans USA, Yarns were spun by International Fibre Centre (IFC), Melbourne, VC, AU.

Table1: Extreme Variety Study--US

Fabric ID	VARIETY	Gin LC	MILL	SIZE-YARN-WEAVE
EVS30S	ExAcala -30S	2	Carded	40f/30w-Ring-Plain
EVS32S	ExAcala -32S	2	Carded	40f/30w-Ring-Plain
EVS90S	DPL-90S	2	Carded	40f/30w-Ring-Plain
EVS826S	STV-825S	2	Carded	40f/30w-Ring-Plain
EVS30T	ExAcala -30T	2	Tandem Carded (Misset)	40f/30w-Ring-Plain
EVS32T	ExAcala -32T	2	Tandem Carded (Misset)	40f/30w-Ring-Plain
EVS90T	DPL-90T	2	Tandem Carded (Misset)	40f/30w-Ring-Plain
EVS825T	STV-825T	2	Tandem Carded (Misset)	40f/30w-Ring-Plain

Table II: Leading Variety Study-US

Fabric ID	VARIETY	Gin LC	MILL	SIZE-YARN-WEAVE
LVS 31	DP 5690	2	Carded	36f/30w-Ring, Sateens
LVS 32	Acala Maxxa	2	Carded	36f/30w-Ring, Sateens
LVS 33	DP 5415	2	Carded	36f/30w-Ring, Sateens
LVS 34	MD 51	2	Carded	36f/30w-Ring, Sateens
LVS 35	DP 90	2	Carded	36f/30w-Ring, Sateens
LVS 25 C	C-Pima S-7	1 or 2	Combed	36f/30w-Ring, Sateens
LVS 26 C	C- Pima S-7	1 or 2	Combed	36f/30w-Ring, Sateens
LVS 19 C	C-Acala Maxxa	1 or 2	Combed	36f/30w-Ring, Sateens
LVS 20 C	C-Acala Maxxa	1 or 2	Combed	36f/30w-Ring, Sateens
LVS 21 C	C- Acala Royale	1 or 2	Combed	36f/30w-Ring, Sateens
LVS 22 C	C-Acala Royale	1 or 2	Combed	36f/30w-Ring, Sateens
LVS 04	DP 5415	3LC	Carded	36f/30w-Ring, Sateens
LVS 23	DP 5415	3LC	Carded	36f/30w-Ring, Sateens
LVS 13	Paymaster HS 26	Extra pre cleaners & 2LC	Carded	36f/30w-Ring, Sateens
LVS 14	Paymaster HS 26	Extra pre cleaners & 2LC	Carded	36f/30w-Ring, Sateens
LVS 15	Paymaster HS 200	Extra pre cleaners & 2LC	Carded	36f/30w-Ring, Sateens
LVS 16	Paymaster HS 200	Extra pre cleaners & 2LC	Carded	36f/30w-Ring, Sateens
LVS 01	DP 90	1 or 2	Carded	36f/30w-Ring, Sateens
LVS 02	DP 90	1 or 2	Carded	36f/30w-Ring, Sateens
LVS 03	DP 5415	1 or 2	Carded	36f/30w-Ring, Sateens
LVS 05	DP 50	1 or 2	Carded	36f/30w-Ring, Sateens

LVS 06	DP 50	1 or 2	Carded	36f/30w-Ring, Sateens
LVS 07	DP 20	1 or 2	Carded	36f/30w-Ring, Sateens
LVS 08	DP 20	1 or 2	Carded	36f/30w-Ring, Sateens
LVS 09	DP 51	1 or 2	Carded	36f/30w-Ring, Sateens
LVS 10	DP 51	1 or 2	Carded	36f/30w-Ring, Sateens
LVS 11	STV-453	1 or 2	Carded	36f/30w-Ring, Sateens
LVS 12	STV-453	1 or 2	Carded	36f/30w-Ring, Sateens
LVS 17	DP 50	1 or 2	Carded	36f/30w-Ring, Sateens
LVS 18	DP 50	1 or 2	Carded	36f/30w-Ring, Sateens
LVS 19	Acala Maxxa	1 or 2	Carded	36f/30w-Ring, Sateens
LVS 20	Acala Maxxa	1 or 2	Carded	36f/30w-Ring, Sateens
LVS 21	Acala Royale	1 or 2	Carded	36f/30w-Ring, Sateens
LVS 22	Acala Royale	1 or 2	Carded	36f/30w-Ring, Sateens
LVS 24	DP 5415	1 or 2	Carded	36f/30w-Ring, Sateens

Table III: 1998 Australia Crop

Fabric ID	VARIETY	Gin LC	MILL	SIZE-YARN-WEAVE
NuC-M-1	NuC	1	Carded	36's & 22's f, 30's w, Ring, Sateens
NuC-M-2	NuC	2	Carded	36's & 22's f, 30's w, Ring, Sateens
NuC-Mc-1	NuC	1	Carded	36's & 22's f, 30's w, Ring, Sateens
NuC-Mc-2	NuC	2	Carded	36's & 22's f, 30's w, Ring, Sateens
V15i-A-1	V15i	1	Carded	36's & 22's f, 30's w, Ring, Sateens
V15i-A-2	V15i	2	Carded	36's & 22's f, 30's w, Ring, Sateens
V15i-Tn-1	V15i	1	Carded	36's & 22's f, 30's w, Ring, Sateens
V15i-Tn-2	V15i	2	Carded	36's & 22's f, 30's w, Ring, Sateens
CS5-M-1	CS5	1	Carded	36's & 22's f, 30's w, Ring, Sateens
CS5-M-2	CS5	2	Carded	36's & 22's f, 30's w, Ring, Sateens
CS5-V-1	CS5	1	Carded	36's & 22's f, 30's w, Ring, Sateens
CS5-V-2	CS5	2	Carded	36's & 22's f, 30's w, Ring, Sateens
V15-RB-1	V15	1	Carded	36's & 22's f, 30's w, Ring, Sateens
V15-RB-2	V15	2	Carded	36's & 22's f, 30's w, Ring, Sateens
V15-Ts-1	V15	1	Carded	36's & 22's f, 30's w, Ring, Sateens
V15-Ts-2	V15	2	Carded	36's & 22's f, 30's w, Ring, Sateens
V2i-K-1	V2i	1	Carded	36's & 22's f, 30's w, Ring, Sateens
V2i-K-2	V2i	2	Carded	36's & 22's f, 30's w, Ring, Sateens
V2i-Ba-1	V2i	1	Carded	36's & 22's f, 30's w, Ring, Sateens
V2i-Ba-2	V2i	2	Carded	36's & 22's f, 30's w, Ring, Sateens
Si-Br-1	Si	1	Carded	36's & 22's f, 30's w, Ring, Sateens
Si-Br-2	Si	2	Carded	36's & 22's f, 30's w, Ring, Sateens
Si-Ba-1	Si	1	Carded	36's & 22's f, 30's w, Ring, Sateens
Si-Ba-2	Si	2	Carded	36's & 22's f, 30's w, Ring, Sateens
V2-DE-1	V2	1	Carded	36's & 22's f, 30's w, Ring, Sateens
V2-DE-2	V2	2	Carded	36's & 22's f, 30's w, Ring, Sateens
V2-Ts-1	V2	1	Carded	36's & 22's f, 30's w, Ring, Sateens
V2-Ts-2	V2	2	Carded	36's & 22's f, 30's w, Ring, Sateens
DP-A-1	DP	1	Carded	36's & 22's f, 30's w, Ring, Sateens
DP-A-2	DP	2	Carded	36's & 22's f, 30's w, Ring, Sateens
DP-C-1	DP	1	Carded	36's & 22's f, 30's w, Ring, Sateens
DP-C-2	DP	2	Carded	36's & 22's f, 30's w, Ring, Sateens
V2-S-1	V2	1	Carded	36's & 22's f, 30's w, Ring, Sateens
V2-S-2	V2	2	Carded	36's & 22's f, 30's w, Ring, Sateens

V2-H-1	V2	1	Carded	36's & 22's f, 30's w, Ring, Sateens
V2-H-2	V2	2	Carded	36's & 22's f, 30's w, Ring, Sateens
V2i-A-1	V2i	1	Carded	36's & 22's f, 30's w, Ring, Sateens
V2i-A-2	V2i	2	Carded	36's & 22's f, 30's w, Ring, Sateens
V2i-Br-1	V2i	1	Carded	36's & 22's f, 30's w, Ring, Sateens
V2i-Br-2	V2i	2	Carded	36's & 22's f, 30's w, Ring, Sateens
Si-S-1	Si	1	Carded	36's & 22's f, 30's w, Ring, Sateens
Si-S-2	Si	2	Carded	36's & 22's f, 30's w, Ring, Sateens
Si-V-1	Si	1	Carded	36's & 22's f, 30's w, Ring, Sateens
Si-V-2	Si	2	Carded	36's & 22's f, 30's w, Ring, Sateens
DP-Bfw-1	DP	1	Carded	36's & 22's f, 30's w, Ring, Sateens
DP-Bfw-2	DP	2	Carded	36's & 22's f, 30's w, Ring, Sateens
DP-Btr-1	DP	1	Carded	36's & 22's f, 30's w, Ring, Sateens
DP-Btr-2	DP	2	Carded	36's & 22's f, 30's w, Ring, Sateens
V15-Tn-1	V15	1	Carded	36's & 22's f, 30's w, Ring, Sateens
V15-Tn-2	V15	2	Carded	36's & 22's f, 30's w, Ring, Sateens
V15-WB-1	V15	1	Carded	36's & 22's f, 30's w, Ring, Sateens
V15-WB-2	V15	2	Carded	36's & 22's f, 30's w, Ring, Sateens
NuC-A-1	NuC	1	Carded	36's & 22's f, 30's w, Ring, Sateens
NuC-A-2	NuC	2	Carded	36's & 22's f, 30's w, Ring, Sateens
NuC-DE-1	NuC	1	Carded	36's & 22's f, 30's w, Ring, Sateens
NuC-DE-2	NuC	2	Carded	36's & 22's f, 30's w, Ring, Sateens
V15i-E-1	V15i	1	Carded	36's & 22's f, 30's w, Ring, Sateens
V15i-E-2	V15i	2	Carded	36's & 22's f, 30's w, Ring, Sateens
CS5-TE-1	CS5	1	Carded	36's & 22's f, 30's w, Ring, Sateens
CS5-TE-2	CS5	2	Carded	36's & 22's f, 30's w, Ring, Sateens

Table IV: 1999 Australia Crop

Fabric ID	VARIETY	Gin LC	MILL	SIZE-YARN-WEAVE
S40-S-0	S40	0	Carded	22f30w-Ring, Sateens; 22's Ring, Knits
S40-S-2	S40	2	Carded	22f30w-Ring, Sateens; 22's Ring, Knits
S189i-S-0	S189i	0	Carded	22f30w-Ring, Sateens; 22's Ring, Knits
S189i-S-2	S189i	2	Carded	22f30w-Ring, Sateens; 22's Ring, Knits
666-S-0	666Line XXXi	0	Carded	22f30w-Ring, Sateens; 22's Ring, Knits
666-S-2	666Line XXXi	2	Carded	22f30w-Ring, Sateens; 22's Ring, Knits
CS50i-S-0	CS50i	0	Carded	22f30w-Ring, Sateens; 22's Ring, Knits
CS50i-S-2	CS50i	2	Carded	22f30w-Ring, Sateens; 22's Ring, Knits
V2i-S-0	V2i	0	Carded	22f30w-Ring, Sateens; 22's Ring, Knits
V2i-S-2	V2i	2	Carded	22f30w-Ring, Sateens; 22's Ring, Knits
V15i-S-0	V15i	0	Carded	22f30w-Ring, Sateens; 22's Ring, Knits
V15i-S-2	V15i	2	Carded	22f30w-Ring, Sateens; 22's Ring, Knits
S189i (ct)-S-0	S189i (ct)	0	Carded	22f30w-Ring, Sateens; 22's Ring, Knits
S189i (ct)-S-2	S189i (ct)	2	Carded	22f30w-Ring, Sateens; 22's Ring, Knits
NuC37-S-0	NuC37	0	Carded	22f30w-Ring, Sateens; 22's Ring, Knits
NuC37-S-2	NuC37	2	Carded	22f30w-Ring, Sateens; 22's Ring, Knits
L23i-S-0	L23i	0	Carded	22f30w-Ring, Sateens; 22's Ring, Knits
L23i-S-2	L23i	2	Carded	22f30w-Ring, Sateens; 22's Ring, Knits
V2-S-0	V2	0	Carded	22f30w-Ring, Sateens; 22's Ring, Knits
V2-S-2	V2	2	Carded	22f30w-Ring, Sateens; 22's Ring, Knits
S189-S-0	S189	0	Carded	22f30w-Ring, Sateens; 22's Ring, Knits
S189-S-2	S189	2	Carded	22f30w-Ring, Sateens; 22's Ring, Knits

Opal-S-0	Opal	0	Carded	22f/30w-Ring, Sateens; 22's Ring, Knits
Opal-S-2	Opal	2	Carded	22f/30w-Ring, Sateens; 22's Ring, Knits
V16-S-0	V16	0	Carded	22f/30w-Ring, Sateens; 22's Ring, Knits
V16-S-2	V16	2	Carded	22f/30w-Ring, Sateens; 22's Ring, Knits
V2-G-0	V2	0	Carded	22f/30w-Ring, Sateens; 22's Ring, Knits
V2-G-2	V2	2	Carded	22f/30w-Ring, Sateens; 22's Ring, Knits
V15i-G-0	V15i	0	Carded	22f/30w-Ring, Sateens; 22's Ring, Knits
V15i-G-2	V15i	2	Carded	22f/30w-Ring, Sateens; 22's Ring, Knits
S189-Ha-0	S189	0	Carded	22f/30w-Ring, Sateens; 22's Ring, Knits
S189-Ha-2	S189	2	Carded	22f/30w-Ring, Sateens; 22's Ring, Knits
S189-M-0	S189	0	Carded	22f/30w-Ring, Sateens; 22's Ring, Knits
S189-M-2	S189	2	Carded	22f/30w-Ring, Sateens; 22's Ring, Knits
V16-M-0	V16	0	Carded	22f/30w-Ring, Sateens; 22's Ring, Knits
V16-M-2	V16	2	Carded	22f/30w-Ring, Sateens; 22's Ring, Knits
V2i-M-0	V2i	0	Carded	22f/30w-Ring, Sateens; 22's Ring, Knits
V2i-M-2	V2i	2	Carded	22f/30w-Ring, Sateens; 22's Ring, Knits
S189i-M-0	S189i	0	Carded	22f/30w-Ring, Sateens; 22's Ring, Knits
S189i-M-2	S189i	2	Carded	22f/30w-Ring, Sateens; 22's Ring, Knits
V2-M-0	V2	0	Carded	22f/30w-Ring, Sateens; 22's Ring, Knits
V2-M-2	V2	2	Carded	22f/30w-Ring, Sateens; 22's Ring, Knits
S40-M-0	S40	0	Carded	22f/30w-Ring, Sateens; 22's Ring, Knits
S40-M-2	S40	2	Carded	22f/30w-Ring, Sateens; 22's Ring, Knits
V2-M-0	V2	0	Carded	22f/30w-Ring, Sateens; 22's Ring, Knits
V2-M-2	V2	2	Carded	22f/30w-Ring, Sateens; 22's Ring, Knits
S189-J-0	S189	0	Carded	22f/30w-Ring, Sateens; 22's Ring, Knits
S189-J-2	S189	2	Carded	22f/30w-Ring, Sateens; 22's Ring, Knits
S40-J-0	S40	0	Carded	22f/30w-Ring, Sateens; 22's Ring, Knits
S40-J-2	S40	2	Carded	22f/30w-Ring, Sateens; 22's Ring, Knits
V16-W-0	V16	0	Carded	22f/30w-Ring, Sateens; 22's Ring, Knits
V16-W-2	V16	2	Carded	22f/30w-Ring, Sateens; 22's Ring, Knits
V2i-W-0	V2i	0	Carded	22f/30w-Ring, Sateens; 22's Ring, Knits
V2i-W-2	V2i	2	Carded	22f/30w-Ring, Sateens; 22's Ring, Knits
V15i-W-0	V15i	0	Carded	22f/30w-Ring, Sateens; 22's Ring, Knits
V15i-W-2	V15i	2	Carded	22f/30w-Ring, Sateens; 22's Ring, Knits
S189-W-0	S189	0	Carded	22f/30w-Ring, Sateens; 22's Ring, Knits
S189-W-2	S189	2	Carded	22f/30w-Ring, Sateens; 22's Ring, Knits
V2-W-0	V2	0	Carded	22f/30w-Ring, Sateens; 22's Ring, Knits
V2-W-2	V2	2	Carded	22f/30w-Ring, Sateens; 22's Ring, Knits
S40-Hu-0	S40	0	Carded	22f/30w-Ring, Sateens; 22's Ring, Knits
S40-Hu-2	S40	2	Carded	22f/30w-Ring, Sateens; 22's Ring, Knits
S40-C-0	S40	0	Carded	22f/30w-Ring, Sateens; 22's Ring, Knits
S40-C-2	S40	2	Carded	22f/30w-Ring, Sateens; 22's Ring, Knits
S189i-C-0	S189i	0	Carded	22f/30w-Ring, Sateens; 22's Ring, Knits
S189i-C-2	S189i	2	Carded	22f/30w-Ring, Sateens; 22's Ring, Knits
NuC37-C-0	NuC37	0	Carded	22f/30w-Ring, Sateens; 22's Ring, Knits
NuC37-C-2	NuC37	2	Carded	22f/30w-Ring, Sateens; 22's Ring, Knits
Emerald-C-0	Emerald	0	Carded	22f/30w-Ring, Sateens; 22's Ring, Knits
Emerald-C-2	Emerald	2	Carded	22f/30w-Ring, Sateens; 22's Ring, Knits
S189-Hu-0	S189	0	Carded	22f/30w-Ring, Sateens; 22's Ring, Knits
S189-Hu-2	S189	2	Carded	22f/30w-Ring, Sateens; 22's Ring, Knits

Fabric Finishing and Dyeing and White Speck Analysis

The fabrics were finished with a 0.1% Prechem 70, 0.3% T.S.P.P. boiloff, a caustic scour of 1.1% Prechem SN, 1.1% Mayquest 80, 0.1% Prechem 70 and 0.7% sodium hydroxide (caustic soda), followed by the same boiloff procedure. They were then bleached (0.1% Prechem 70, 0.5% Mayquest BLE and 3.0% Peroxide (Albone 35) followed by an acid sour (0.1% acetic acid) and dyed with 4% Cibacron Navy FG Blue (owf), 0.5% Calgon, 8% NaCl, 0.8% Na_2CO_3 (soda ash) and 0.5% Triton X-100. This dye has a high propensity for highlighting white specks in finished fabrics.

The EVS fabrics were plain weave fabrics made with 100% experimental yarns in the warp and filling, The remaining studies were filling face sateen fabrics woven with a common combed warp. All studies were dyed identically and analyzed for white specks using Dr. Xu's Autorate system (version AR-4-02). White speck data was adjusted to 100% surface coverage for the experimental yarns for the LVS and Australian studies.

Common Aspects of Method

The EVS, Control for LVS and the Australian studies share certain aspects of method. Samples were identified in the field, and agronomic data collected. The samples were then ginned under certain settings, and samples of lint collected from the bale press. Smaller samples of lint were taken for lab analysis, and the rest sent to be spun into yarn, usually a fine count ring spun yarn. The ginned fiber samples were subjected to microscopic cross-sections, image analysis, NIR (Near Infrared), FMT/Micromat, a complete range of HVI and Automated Fiber Information System (AFIS) tests. (Some of the fiber tests for the 1999 Australian crop are still in process) The AFIS rapidly measures fiber properties such as length, diameter, maturity, and fineness. Some of the yarn was tested, the rest made into a fabric. That fabric was analyzed by computer image analysis for white speck nep content. In this way, data is available on the same cotton in lint, yarn and fabric form, in addition to data on how it was grown in the field.

An unusual part of the design of these studies is that the primary results are considered the fabric results. This is based on the standpoint that cotton is ultimately valued in fabric form. The decision about the value of the cotton happens there, plus or minus some marketing design, and manufacturing skill. The consumer has no interest in the measurements that were made on the cotton fibre or yarn many months and tens of thousands of kilometres ago. The consumer sees a textile and it either feels or looks like a quality item worth paying money for, or it doesn't. The better the perceived quality, the more money the consumer is prepared to part with before some other fibre (in textile form) becomes more attractive. The lint and yarn data which are more commonly used in cotton research are certainly used, but only to the extent that they can be linked to a realized quality attribute, or to the utility of the manufacturing process. Reliance on lint and yarn data without this caveat may lead to the situation where the cotton industry is speaking a different language to its customers when cotton quality is discussed.

Results

The EVS study clearly demonstrates the value of preventative maintenance in the mills (Fig. 2). The increase in white specks is almost double due to the card being improperly set. This also demonstrates the effect mechanical processing can have on the levels of white specks and why these studies were designed to minimize mechanical processing differences, at least within the study.

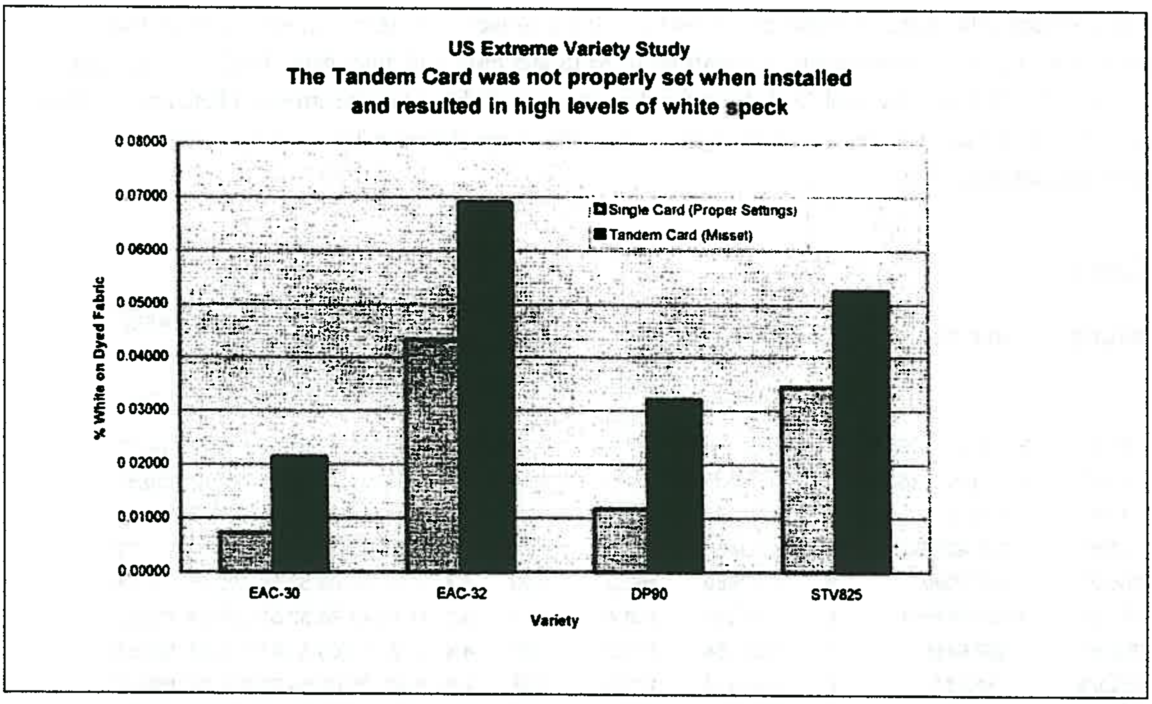

Figure 2: Detrimental effect of improperly set card shows impact of mechanical processing on white specks.

A sub study in the LVS study was the effect of combing on the level of white specks and Figure 3 clearly shows a major reduction of white specks after combing. Combing is one of the tools the mills can use to improve the quality of cottons with high levels of immature fibers.

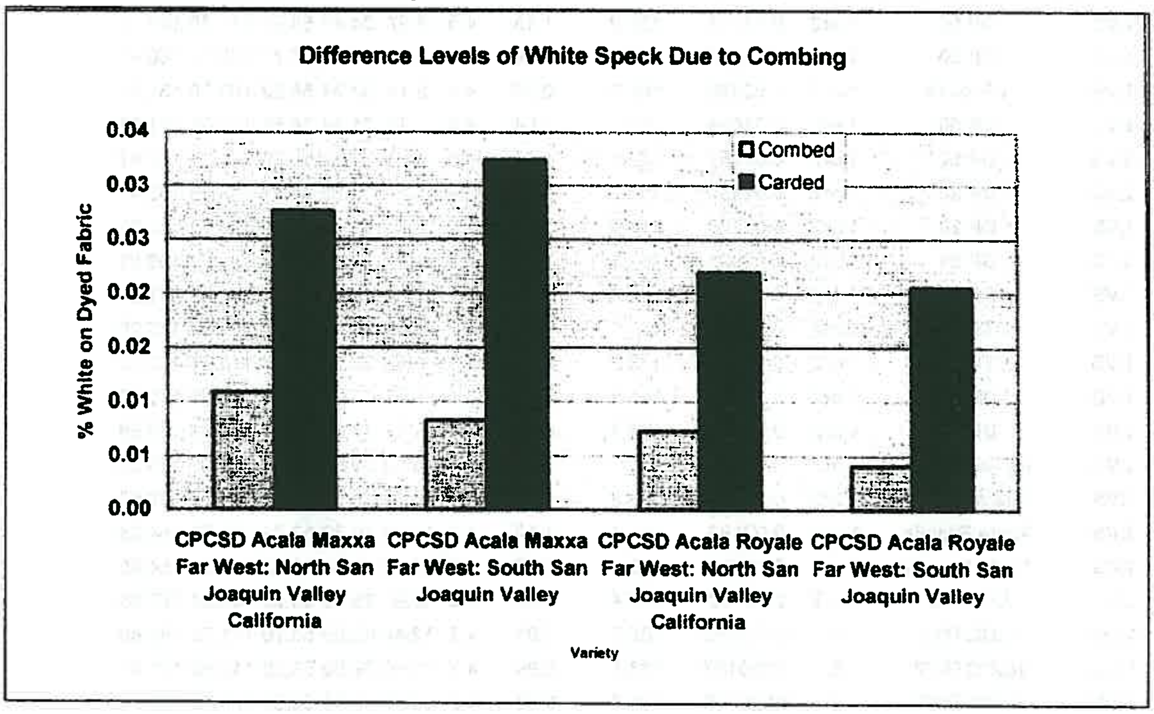

Figure 3: Combing significantly reduces white specks (These fabrics are from the LVS)

Figure 4 shows the levels of white specks for the two US studies. The large differences in the two extreme studies have shown strong correlations to AFIS and FMT bale fiber data. FMT Fineness and Maturity, HVI Micronaire, and AFIS Maturity data shown in Table 1 has the strongest bale fiber to fabric relationships for all of the studies. The Regression Statistics are shown in Table 2 for different combinations of studies.

Table 1

STUDY	VARIETY	LC	AR-4-02	FMT	FMT	HVI	AFIS Bale	AFIS Bale	AFIS Bale	AFIS Bale	AFIS Bale
			% white	Fineness (mtex)	Maturity Ratio	Mic	FFC	A(n)CV	P(n)	A(n)	FIN
EVS	ExAcala -30S	2	0.00730	187.0	0.93	4.5	7.32	33.77	51.02	108.22	164.50
EVS	ExAcala -32S	2	0.04325	154.0	0.81	3.6	14.00	38.83	50.05	99.00	150.52
EVS	DPL-90S	2	0.01170	179.0	0.79	4.1	8.43	35.08	52.40	107.55	163.52
EVS	STV-825S	2	0.03453	178.0	0.75	3.8	5.32	32.58	54.30	112.96	171.72
E-LVS	DP 5690	2	0.02689	162.2	1.06	4.4	7.99	37.03	53.89	108.05	164.24
E-LVS	Acala Maxxa	2	0.07543	138.4	1.04	3.8	14.15	41.76	52.52	100.74	153.12
E-LVS	DP 5415	2	0.01188	173.0	1.01	4.4	5.36	34.09	56.43	110.16	167.43
E-LVS	MD 51	2	0.01313	171.6	1.05	4.5	6.43	35.62	54.29	110.57	168.07
E-LVS	DP 90	2	0.01933	163.8	1.05	4.5	8.76	37.72	54.19	106.54	161.95
LVS-3LC	DP 5415	3	0.01368	194.0	1.00	4.7	3.44	30.80	58.68	114.91	174.65
LVS-3LC	DP 5415	3	0.03312	172.2	1.02	4.3	5.93	34.21	56.30	112.17	170.50
LVS-3LC	Paymaster HS 26	3	0.04119	150.8	0.96	3.8	7.61	35.48	56.63	105.43	160.25
LVS-3LC	Paymaster HS 26	3	0.02400	177.2	1.01	4.5	4.18	31.89	58.03	112.68	171.28
LVS-3LC	Paymaster HS 200	3	0.07710	238.2	1.01	3.9	8.88	36.72	55.49	104.33	158.59
LVS-3LC	Paymaster HS 200	3	0.03312	172.4	1.03	4.4	5.77	33.58	57.37	109.64	166.67
LVS	DP 90	1 or2	0.04325	158.2	1.13	4.5	5.97	34.41	55.97	111.70	169.77
LVS	DP 90	1 or2	0.03862	175.6	1.09	4.6	6.84	35.31	55.39	109.47	166.41
LVS	DP 5415	1 or2	0.02386	166.0	0.97	4.1	5.18	33.34	58.22	109.20	165.99
LVS	DP 50	1 or2	0.01654	169.8	1.04	4.4	3.48	31.34	58.55	113.06	171.83
LVS	DP 50	1 or2	0.01787	170.8	1.05	4.5	4.72	32.67	58.21	110.31	167.67
LVS	DP 20	1 or2	0.02980	158.2	0.96	3.9	5.91	33.56	58.61	106.89	162.47
LVS	DP 20	1 or2	0.03109	170.0	0.96	4.1	5.89	33.84	58.17	108.90	165.53
LVS	DP 51	1 or2	0.00935	189.6	1.02	4.6	3.73	31.03	58.87	111.79	169.91
LVS	DP 51	1 or2	0.01333	179.6	1.04	4.7	4.09	32.43	56.87	112.55	171.08
LVS	STV-453	1 or2	0.03927	162.8	1.03	4.2	5.35	33.26	57.87	109.35	166.20
LVS	STV-453	1 or2	0.02048	179.2	1.02	4.5	4.70	32.53	57.87	113.21	172.10
LVS	DP 50	1 or2	0.01276	161.8	1.07	4.4	3.70	32.01	57.66	112.36	170.76
LVS	DP 50	1 or2	0.02822	163.8	0.98	4.1	5.73	33.88	58.57	108.99	165.66
LVS	Acala Maxxa	1 or2	0.02766	152.2	0.98	4.3	10.92	39.50	53.42	105.05	159.68
LVS	Acala Maxxa	1 or2	0.03242	159.8	1.01	4.2	10.54	39.21	53.72	104.93	159.50
LVS	Acala Royale	1 or2	0.02193	144.4	1.12	4.2	11.16	40.30	53.08	101.50	154.26
LVS	Acala Royale	1 or2	0.02050	155.4	1.07	4.3	10.80	40.04	52.88	101.72	154.60
LVS	DP 5415	1 or2	0.02430	179.4	0.92	4.3	6.26	35.15	56.20	109.94	167.08
AU98	NuCOTN37	1	0.013383	180.5	1.01	4.7	12.40	40.00	53.70	111.70	169.80
AU98	NuCOTN37	2	0.016167	183.7	0.99	4.7	11.90	39.50	53.90	112.40	170.90
AU98	NuCOTN37	1	0.026165	163.7	0.93	4.2	16.00	42.80	52.90	105.70	160.70
AU98	NuCOTN37	2	0.030974	166.3	0.94	4.1	14.80	41.80	53.20	107.40	163.20
AU98	V15i	1	0.029676	158.0	1.02	4.3	14.20	40.80	52.40	106.70	162.20
AU98	V15i	2	0.026513	163.0	1.01	4.3	13.20	40.00	53.00	109.20	165.90
AU98	V15i	1	0.04366	155.1	0.94	3.9	14.40	40.20	52.50	104.60	159.00

AU98	V15i	2	0.029771	149.2	0.99	4.0	14.50	40.40	52.80	104.70	159.20
AU98	CS50	1	0.038946	155.2	1.06	4.3	14.60	41.20	52.40	106.50	161.90
AU98	CS50	2	0.03689	158.5	1.02	4.3	14.30	41.40	52.60	107.40	163.20
AU98	CS50	1	0.042838	151.4	1.04	4.2	15.70	41.90	52.30	105.70	160.60
AU98	CS50	2	0.038757	152.0	1.04	4.2	15.60	41.60	52.30	104.90	159.40
AU98	V15	1	0.024551	154.9	1.07	4.4	11.90	38.90	52.80	110.50	168.00
AU98	V15	2	0.016926	149.4	1.07	4.3	17.40	43.80	51.60	103.80	157.80
AU98	V15	1	0.072388	144.0	0.97	3.9	12.80	39.80	52.60	108.70	165.30
AU98	V15	2	0.057043	141.5	1.01	3.9	17.50	43.30	51.40	102.70	156.10
AU98	V2i	1	0.028696	173.2	1.04	4.6	10.90	38.70	53.80	116.30	176.80
AU98	V2i	2	0.023444	175.5	1.01	4.6	12.40	40.00	53.30	113.70	172.80
AU98	V2i	1	0.083145	142.3	0.90	3.6	12.90	40.20	53.20	112.30	170.60
AU98	V2i	2	0.078019	143.8	0.91	3.7	16.10	42.50	52.30	103.30	157.00
AU98	Si189	1	0.018224	170.5	1.00	4.5	16.80	43.00	52.50	103.10	156.60
AU98	Si189	2	0.018382	163.0	1.03	4.5	11.30	38.90	53.40	111.90	170.10
AU98	Si189	1	0.060903	147.1	0.95	3.9	16.20	42.20	52.50	103.70	157.60
AU98	Si189	2	0.034264	153.7	0.96	4.0	16.10	42.00	52.50	103.90	157.90
AU98	V2	1	0.014902	164.9	1.01	4.5	10.60	38.40	53.70	112.80	171.50
AU98	V2	2	0.020217	163.3	1.02	4.4	11.30	38.60	53.70	112.20	170.60
AU98	V2	1	0.103931	140.3	0.87	3.5	18.80	43.60	51.80	99.20	150.70
AU98	V2	2	0.081943	136.6	0.88	3.5	19.70	44.40	51.50	98.80	150.10
AU98	D Pearl	1	0.042648	160.0	0.99	4.3	13.40	41.00	53.20	109.70	166.70
AU98	D Pearl	2	0.031765	160.9	1.00	4.3	14.60	41.10	53.20	108.20	164.40
AU98	D Pearl	1	0.04771	151.9	0.95	4.0	15.70	42.20	53.00	105.20	159.80
AU98	D Pearl	2	0.046286	156.6	0.92	4.0	15.70	42.10	52.90	104.60	159.00
AU98	V2	1	0.050779	155.2	0.98	4.2	14.30	41.50	52.60	109.20	166.00
AU98	V2	2	0.046729	157.4	0.98	4.1	13.30	41.20	52.90	111.00	168.70
AU98	V2	1	0.054892	160.1	1.00	4.3	12.90	40.50	53.00	112.40	170.90
AU98	V2	2	0.041193	162.3	1.00	4.3	14.20	41.30	52.80	109.20	166.00
AU98	V2i	1	0.074887	161.7	0.93	4.2	16.10	43.00	52.50	106.40	161.70
AU98	V2i	2	0.078336	155.6	0.97	4.1	15.50	42.10	52.70	106.30	161.60
AU98	V2i	1	0.050526	163.4	0.96	4.2	13.80	41.10	53.20	108.40	164.80
AU98	V2i	2	0.048944	163.6	0.95	4.1	13.30	40.80	53.40	109.60	166.60
AU98	Si189	1	0.070996	162.2	0.94	4.1	16.50	42.80	52.30	105.60	160.60
AU98	Si189	2	0.036985	155.0	1.00	4.3	14.20	41.20	52.60	107.90	164.00
AU98	Si189	1	0.04192	159.3	0.99	4.2	15.20	41.90	52.30	106.90	162.40
AU98	Si189	2	0.038978	164.2	0.97	4.2	15.70	41.90	52.40	105.40	160.20
AU98	D Pearl	1	0.063086	163.5	0.98	4.2	16.00	42.70	53.00	107.10	162.80
AU98	D Pearl	2	0.050336	160.5	0.96	4.1	15.90	42.40	53.10	106.00	161.20
AU98	D Pearl	1	0.059037	154.3	0.95	4.0	16.90	42.50	52.80	103.80	157.70
AU98	D Pearl	2	0.039896	151.4	0.99	4.2	17.40	43.30	52.70	103.50	157.30
AU98	V15	1	0.045306	154.9	1.03	4.4	13.20	40.00	52.50	108.80	165.40
AU98	V15	2	0.03496	155.8	1.04	4.3	12.50	39.20	52.70	109.20	166.00
AU98	V15	1	0.062675	143.3	0.99	4.0	17.50	43.90	51.50	102.40	155.70
AU98	NuCOTN37	1	0.016642	177.5	1.00	4.5	10.70	38.70	54.40	116.10	176.50
AU98	NuCOTN37	2	0.021356	177.2	0.97	4.5	12.50	40.10	53.90	112.20	170.50
AU98	NuCOTN37	1	0.02724	172.9	1.00	4.7	11.10	39.20	54.20	114.90	174.60
AU98	NuCOTN37	2	0.018761	172.9	1.01	4.5	12.00	39.90	54.30	113.60	172.70
AU98	V15i	1	0.044768	150.9	0.99	4.0	15.40	42.70	52.40	107.50	163.30
AU98	V15i	2	0.058689	148.1	0.97	4.0	16.10	42.90	52.10	105.50	160.40
AU98	CS50	1	0.047204	150.3	1.01	4.1	18.40	44.10	51.70	103.60	157.50
AU98	CS50	2	0.049102	150.9	1.03	4.2	14.70	41.60	52.30	107.70	163.80

AU98	V15	2	0.072862	145.0	1.00	3.9	.	.	.	.	.
AU99	S40	0	0.033097			4.3	17.10	43.40	52.10	103.50	157.30
AU99	S40	2	0.035024			4.3	15.70	42.40	52.60	105.30	160.10
AU99	S189i	0	0.018646			4.7	13.20	40.30	53.90	108.20	164.50
AU99	S189i	2	0.020356			4.5	16.30	42.10	53.50	103.70	157.60
AU99	666Line XXXi	0	0.096278			3.9	17.80	43.60	52.30	100.80	153.30
AU99	666Line XXXi	2	0.064579			3.7	20.10	44.20	52.30	97.00	147.50
AU99	CS50i	0	0.018149			4.4	15.60	42.00	53.30	105.90	161.00
AU99	CS50i	2	0.015943			4.4	15.30	41.40	53.70	106.10	161.30
AU99	V2i	0	0.029772			4.5	14.50	41.60	53.70	109.20	165.90
AU99	V2i	2	0.040774			4.4	14.00	41.10	54.20	108.20	164.50
AU99	V15i	0	0.04702			4.2	16.40	42.60	52.60	103.80	157.80
AU99	V15i	2	0.031823			4.1	18.00	43.40	52.50	101.10	153.70
AU99	S189i (ct)	0	0.027379			4.5	13.50	40.90	53.60	107.80	163.80
AU99	S189i (ct)	2	0.018553			4.4	16.90	42.40	53.30	103.30	157.00
AU99	NuC37	0	0.019019			4.8	13.00	40.50	54.20	110.00	167.10
AU99	NuC37	2	0.016067			4.7	13.90	41.00	54.50	108.80	165.40
AU99	L23i	0	0.027566			4.6	14.50	41.50	54.20	108.20	164.50
AU99	L23i	2	0.022935			4.5	13.60	40.80	54.80	109.30	166.10
AU99	V2	0	0.034123			4.4	11.70	39.20	53.70	112.70	171.30
AU99	V2	2	0.040245			4.3	15.20	41.60	53.70	106.40	161.70
AU99	S189	0	0.035459			4.4	11.90	39.40	54.00	111.30	169.20
AU99	S189	2	0.017932			4.3	13.90	40.10	53.80	106.40	161.70
AU99	Opal	0	0.015414			4.6	11.90	39.00	53.90	110.70	168.20
AU99	Opal	2	0.054386			4.5	14.30	40.80	53.50	106.30	161.60
AU99	V16	0	0.02943			4.3	16.20	42.70	52.10	104.60	159.00
AU99	V16	2	0.034745			4.2	16.80	43.10	52.40	103.70	157.60
AU99	V2	0	0.02278			4.4	14.20	40.90	53.70	108.50	164.90
AU99	V2	2	0.026602			4.3	13.30	40.80	54.40	109.90	167.10
AU99	V15i	0	0.031015			3.8	17.60	42.60	52.40	100.20	152.30
AU99	V15i	2	0.025484			3.8	16.80	42.10	53.20	101.60	154.40
AU99	S189	0	0.030394			4.3	16.00	42.50	52.70	105.00	159.60
AU99	S189	2	0.025173			4.3	14.70	41.40	53.40	107.20	162.90
AU99	S189	0	0.046554			3.9	18.60	43.80	52.70	101.20	153.90
AU99	S189	2	0.033377			3.8	17.50	43.30	52.30	100.90	153.30
AU99	V16	0	0.048947			4.0	21.10	46.00	51.10	99.20	150.80
AU99	V16	2	0.05625			3.9	19.00	44.50	51.90	100.30	152.50
AU99	V2i	0	0.084127			3.7	17.30	43.60	52.30	102.70	156.10
AU99	V2i	2	0.053174			3.8	18.40	44.00	52.70	101.30	154.00
AU99	S189i	0	0.025297			4.2	20.00	45.30	51.90	101.10	153.70
AU99	S189i	2	0.072286			4.1	18.90	44.60	52.60	102.00	155.10
AU99	V2(a)	0	0.075021			4.1	17.10	43.20	52.20	104.00	158.10
AU99	V2(a)	2	0.038256			4.0	15.20	42.50	53.70	107.40	163.30
AU99	S40	0	0.02682			4.5	15.40	43.10	52.40	107.90	163.90
AU99	S40	2	0.039033			4.4	14.80	42.40	53.10	110.00	167.20
AU99	V2(b)	0	0.042017			4.1	17.30	43.90	52.20	103.70	157.70
AU99	V2(b)	2	0.042576			4.1	14.90	41.90	53.70	106.80	162.40
AU99	S189	0	0.029741			4.1	14.20	41.30	53.70	108.70	165.30
AU99	S189	2	0.023588			4.1	16.10	42.60	53.80	105.40	160.20
AU99	S40	0	0.031046			4.3	16.20	43.40	52.80	107.20	163.00
AU99	S40	2	0.016036			4.4	15.10	42.00	53.10	107.70	163.60
AU99	V16	0	0.054914			3.7	18.40	44.60	51.60	102.30	155.50

AU99	V16	2	0.066568	3.7	18.20	44.00	52.10	101.10	153.60
AU99	V2i	0	0.030953	3.9	13.10	40.10	53.60	108.70	165.30
AU99	V2i	2	0.037293	3.8	14.70	40.50	53.50	104.90	159.40
AU99	V15i	0	0.029026	3.9	14.40	41.10	52.80	106.90	162.50
AU99	V15i	2	0.02626	3.9	15.10	41.30	53.40	105.00	159.60
AU99	S189	0	0.011126	4.4	11.20	38.70	53.80	111.30	169.20
AU99	S189	2	0.008764	4.4	12.60	39.20	54.10	109.00	165.70
AU99	V2	0	0.022376	4.3	13.20	40.00	53.30	110.20	167.40
AU99	V2	2	0.026913	4.4	12.70	39.80	53.60	108.90	165.50
AU99	S40	0	0.024862	4.5	12.10	40.00	52.90	111.40	169.40
AU99	S40	2	0.014016	4.4	13.40	40.60	53.00	109.00	165.70
AU99	S40	0	0.022283	4.1	15.20	42.00	52.10	108.00	164.20
AU99	S40	2	0.045622	4.1	17.60	43.90	52.20	104.10	158.20
AU99	S189i	0	0.042825	4.1	11.80	38.60	54.50	109.40	166.30
AU99	S189i	2	0.026447	4.0	15.70	42.30	53.00	104.50	158.80
AU99	NuC37	0	0.010815	4.6	12.80	40.70	53.50	112.80	171.40
AU99	NuC37	2	0.01874	4.5	11.60	39.80	54.10	113.90	173.10
AU99	Emerald	0	0.043073	3.8	14.60	41.20	53.20	106.50	161.90
AU99	Emerald	2	0.017932	3.7	14.60	40.90	53.70	106.10	161.30
AU99	S189	0	0.030021	3.7	14.10	40.70	53.20	107.40	163.30
AU99	S189	2	0.036578	3.7	15.80	41.90	53.00	103.70	157.60

White Speck can be predicted from FMT and AFIS Maturity data for the control studies that were grown in one field and had identical processing in the gin and mill. This also held true for the heavily cleaned cottons and the combed cottons from LVS. When the full studies are combined, the correlations degrade due to the interaction of different levels of gin processing and variability between mill processing from study to study. However, when only one level of cleaning at the gin is evaluated for a particular study the regression statistics improve dramatically. Even when the EVS, LVS, and Au98 studies are evaluated looking only at the 2 lint cleaners data a good correlation is found. (The mechanical processing for the LVS and AU98 were identical and the original EVS study was designed to match the processing at SRRC as closely as possible to CQRS). This indicates how important it will be to include levels of gin cleaning in the future prediction equations, and how important it is to the mills to know the gin processing history of the cottons when they are evaluating the fiber properties.

Table 2

ANOVA for % White on Fabric and Bale Fiber Properties

(FMT (Fineness & Maturity Ratio) & AFIS (FFC, A(n)CV,P(n), A(n), FIN))

	Regression Statistics	
Study	**Multiple R**	**R Square**
US Extreme	1	1
LVS Extreme Control	1	1
LVS- Standard	0.5837398	0.3407522
LVS - Combed	1	1
US-LVS- 3LC	1	1
EVS, LVS, Au98	0.6830492	0.4665562
EVS (2LC) , LVS (1or2LC), Au98 (2LC)	0.8705732	0.7578978
AU 98 1 LC	0.9001174	0.8102113

ANOVA for % White on Fabric and Bale Fiber Properties
(HVI (Micronaire) & AFIS (FFC, A(n)CV,P(n), A(n), FIN))

Study	*Regression Statistics*	
	Multiple R	**R Square**
EVS (2LC), LVS (1or2LC), Au98 (2LC), Au99 (1LC)	0.7590735	0.5761926
Au99 - OLC	0.7252789	0.5260294
Au99 - 2LC	0.749265	0.561398
AU 98 1 LC	0.8877703	0.788136
AU 98 2 LC	0.8575137	0.7353298

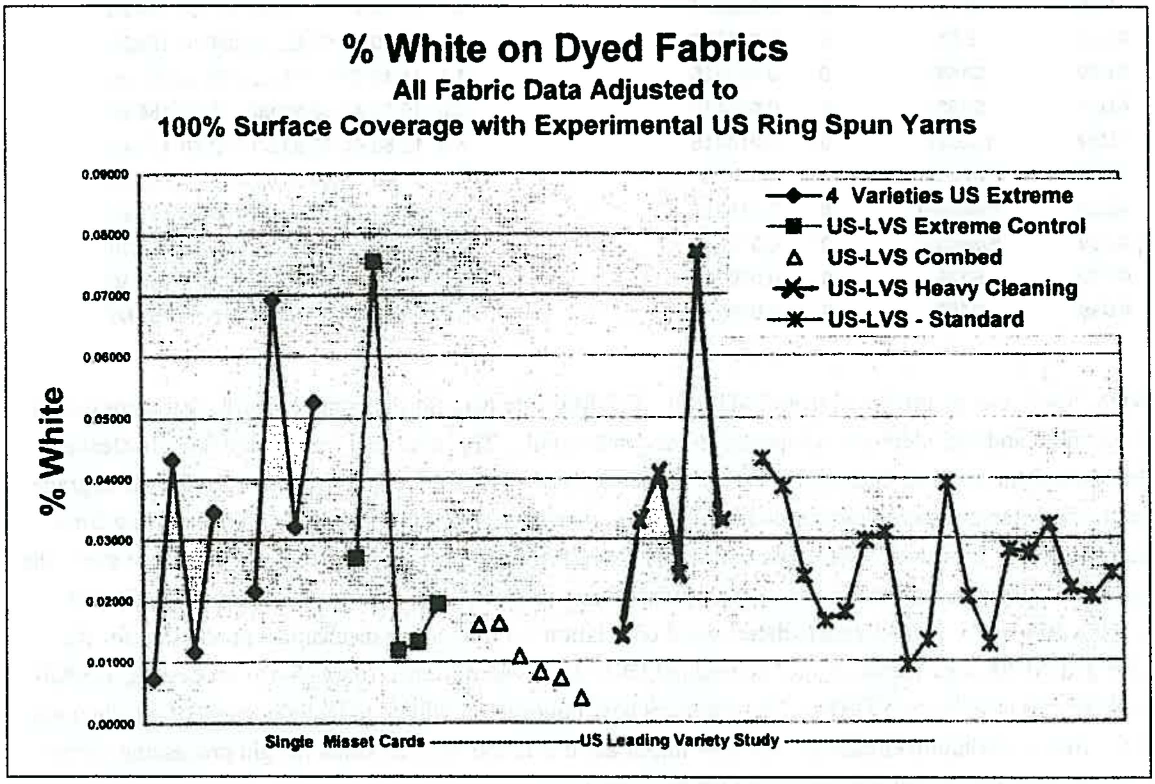

Figure 4: % White for US Extreme Variety (comparing Single carding to Misset Tandem Card) & US Leading Variety Studies (Extreme Varieties control, Combed cotton, Heavy Gin Cleaning and Standard)

Figure 5 dramatically demonstrates the effect of ring and open-end spinning on white specks. Open-end, or rotor spinning, has an opener that separates and cleans the fibers before spinning, which effectively removes much of the immature fibers which cause white specks. The open-end fabrics have a similar level of white specks as the LVS combed cottons (See white triangle data points in Figure 7). There is little difference between one and two lint cleaners in the AU98 study, but the 2 lint cleaner is slightly higher in white specks overall.

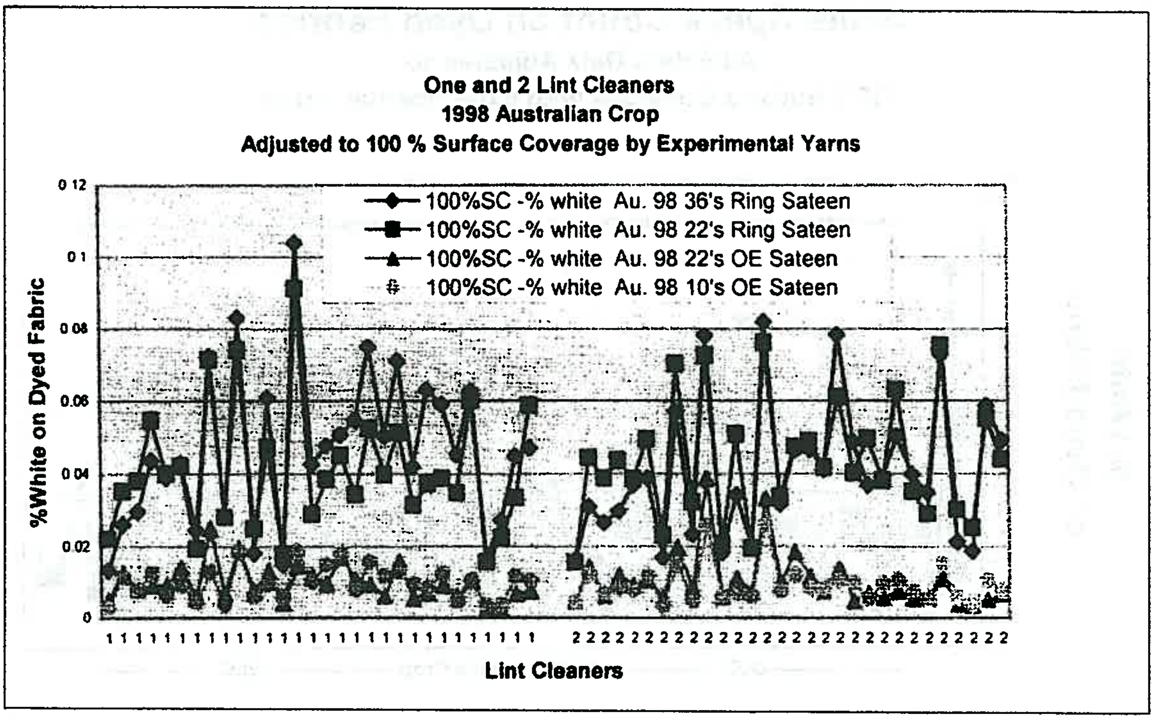

Figure 5: % White for Australia 1998 Crop Studies

The AU99 study showed little difference between 0 and 2 lint cleaners, which is unusual, since past studies have shown a strong difference.[4] Also, the correlations between fiber and fabric properties were not as strong and may be due to some spinning problems that occurred at IFC on some of the earlier lots of yarns. This was the first study run at IFC after they set up their new card and spinning room. Some air flow problems were affecting the card and it wasn't discovered immediately. It may have affected the end results for these yarns. We have to go back and determine which lots may have been affected.

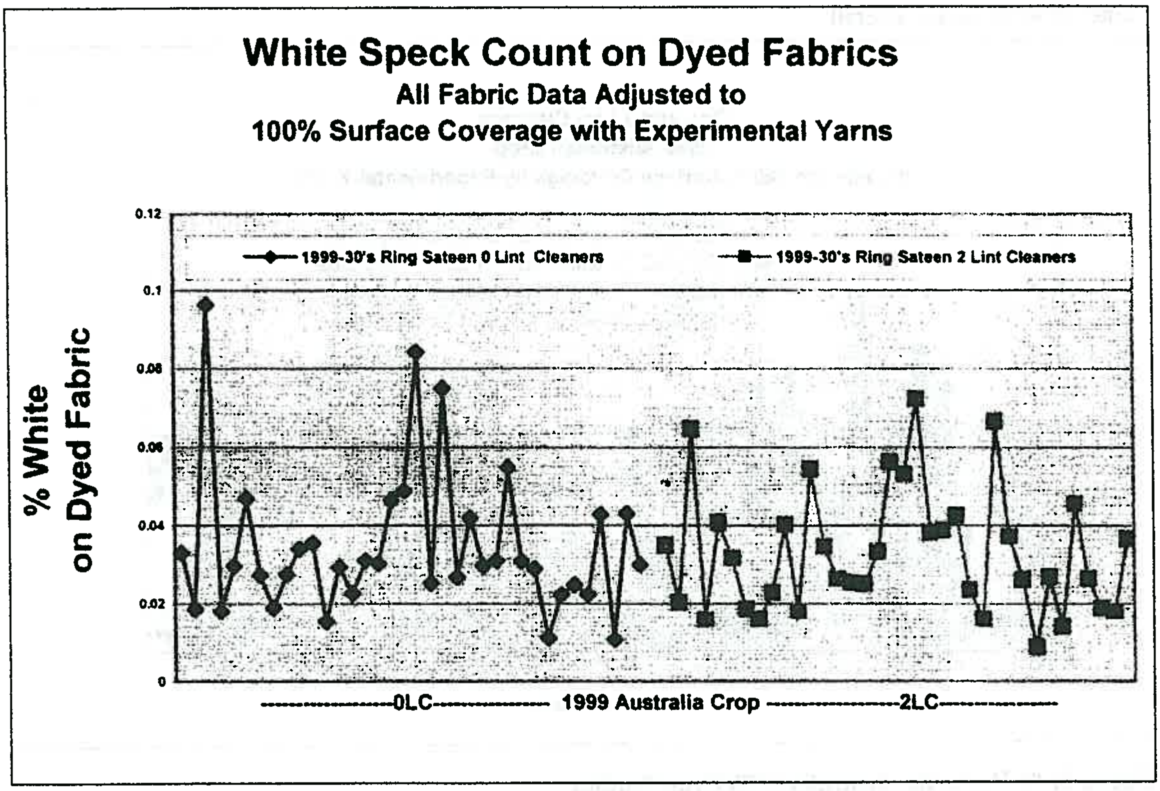

Figure 6: % White for Australia 1999 Crop Study

Figure 7 is rather busy, but the only way to effectively see all of the studies laid out together on the same scale. You can go back to the individual studies to see the specifics. What this does show is the Australian 98 and 99 studies have a much higher level of white specks that the US Leading Variety study. Note the last set of diamond shaped data points, those are the typical cotton from the LVS and they are significantly better than the AU98 and AU99 cottons, which indicates there is something going on in the field or with the varieties that would cause such a difference in the level of maturity/white specks. Some of the cottons are meant to be extremes in the study due to different field practices.

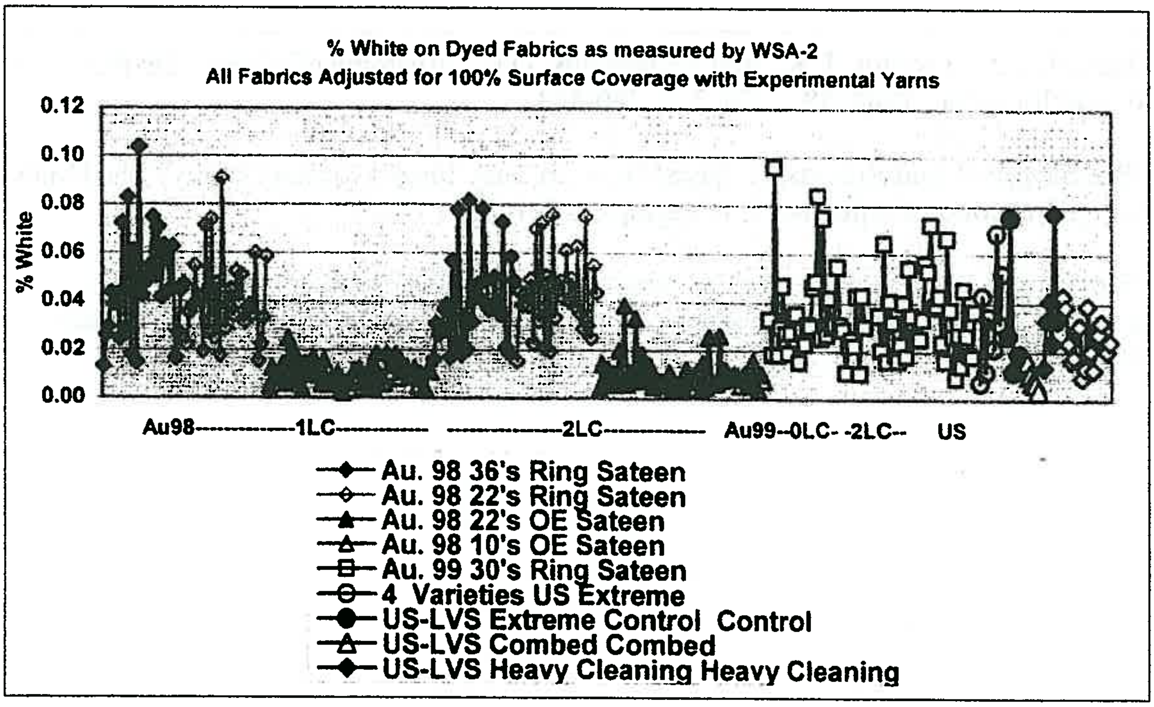

Figure 7: % White for all Studies (Australia 1998 & 1999, US Extreme Variety & Leading Variety Studies)

Conclusions

The research clearly shows the effects of mechanical processing on white specks and this indicates that several prediction equations may have to be developed to predict white speck depending on the level of lint cleaning in the gin. We can also see that if AFIS and FMT data indicates a maturity problem, hence a high white speck potential, those fibers could be combed, or rotor spun or used in whites only production line thereby eliminating white speck defects. The end product of this research should produce a white speck potential (WSP) value based on high speed fiber measurements that could be incorporated into the present grading system and could be included in future bale data. Cotton merchants could then direct cotton lint to specific markets based on WSP along with other fiber properties thereby maximizing the fiber potential and minimizing losses to the mill caused by white speck defects. Buyers could then objectively determine the quality of cotton, and minimize substitution and discounting relative to synthetic fibers. Cottonseed selection by growers can be made based on yield along with the ultimate quality of cotton fabric under prevailing conditions. The WSP values generated with the methods developed from this research would also be a valuable tool to the cotton breeder in developing future varieties with low white speck potential. The white speck system also has the potential to be an on-line grading system in the dye houses to uniformly measure fabric quality.

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