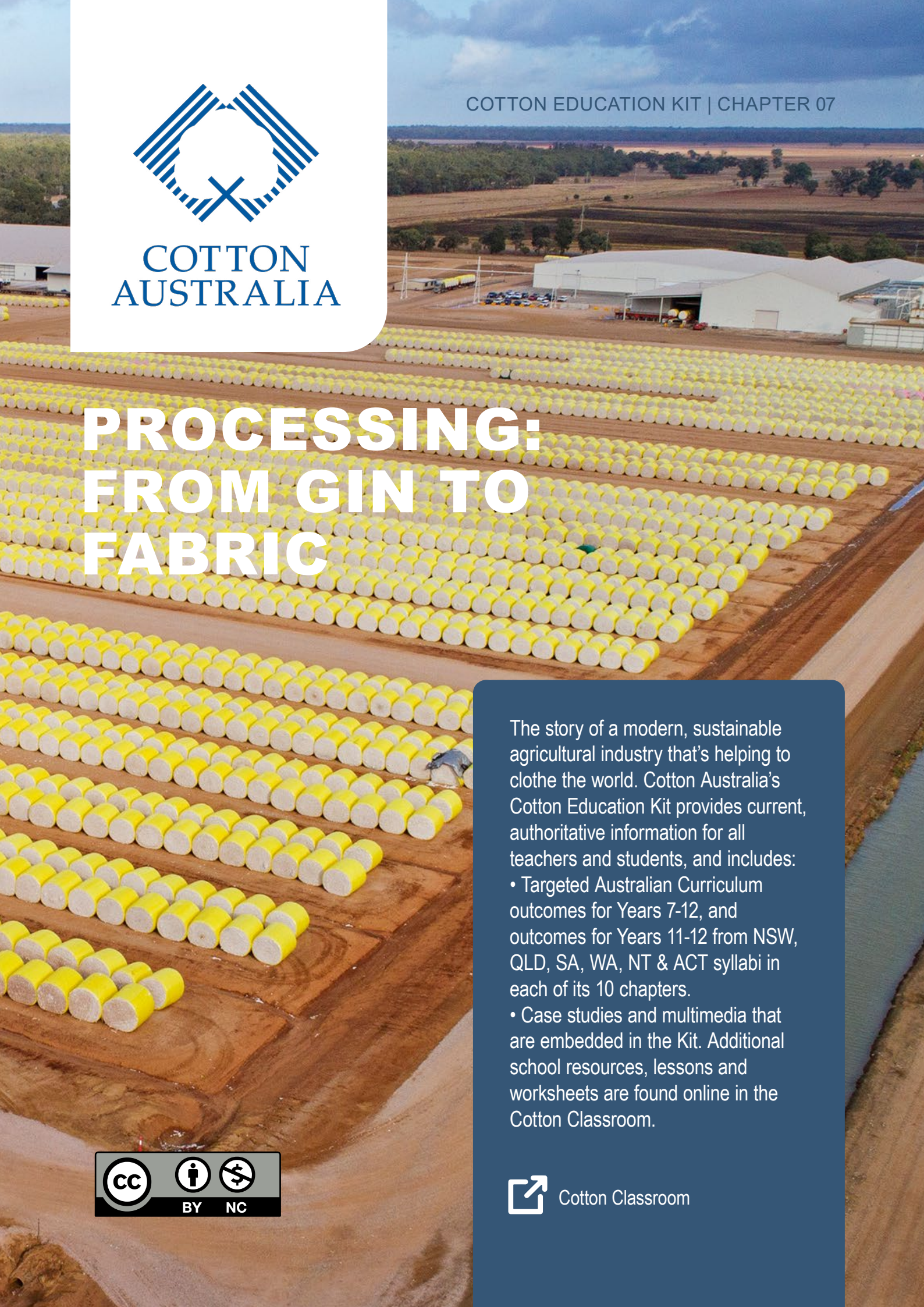
COTTON AUSTRALIA

PROCESSING: FROM GIN TO FABRIC



The story of a modern, sustainable agricultural industry that's helping to clothe the world. Cotton Australia's Cotton Education Kit provides current, authoritative information for all teachers and students, and includes:

- Targeted Australian Curriculum outcomes for Years 7-12, and outcomes for Years 11-12 from NSW, QLD, SA, WA, NT & ACT syllabi in each of its 10 chapters.
- Case studies and multimedia that are embedded in the Kit. Additional school resources, lessons and worksheets are found online in the Cotton Classroom.

Cotton Classroom

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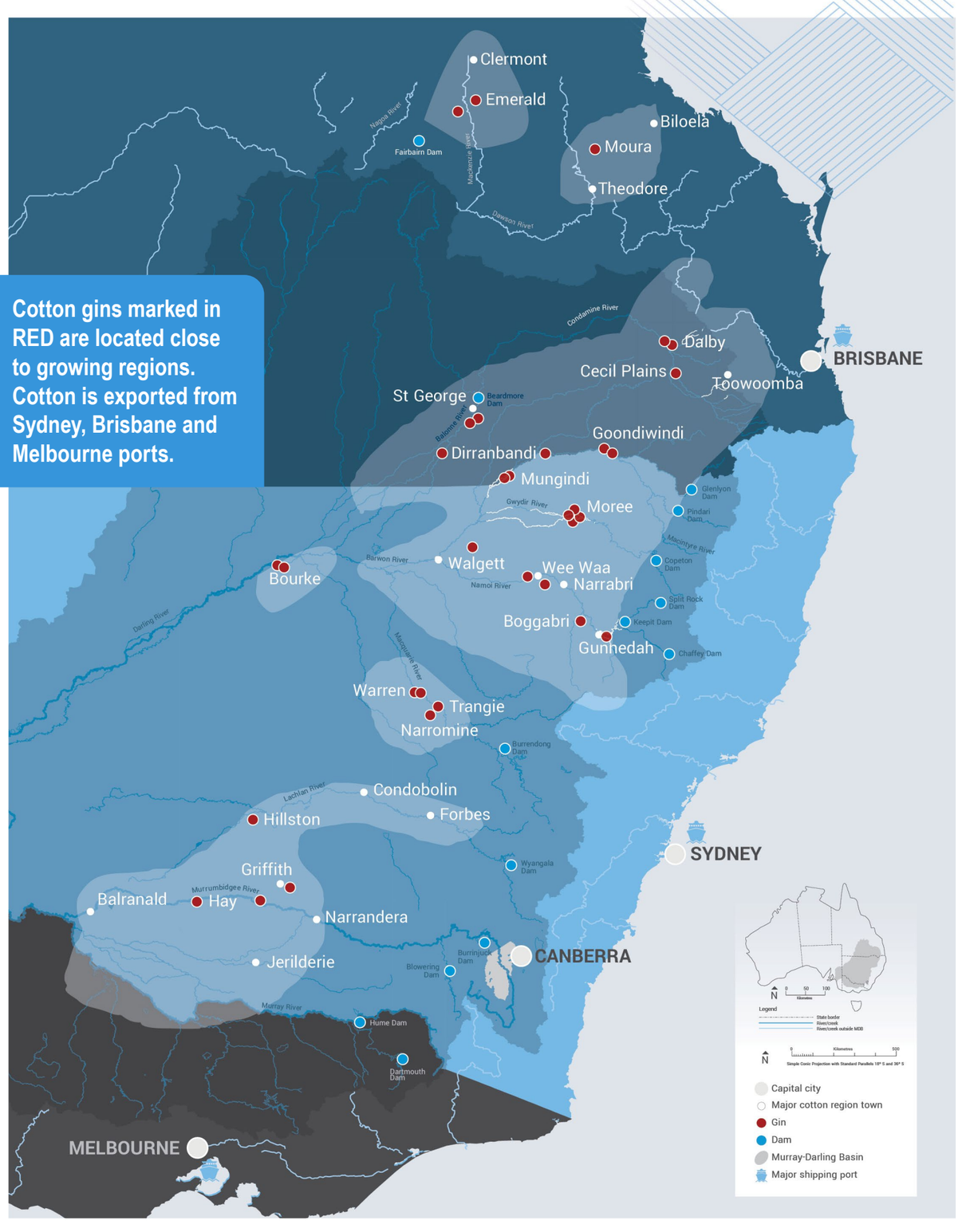
COTTON REGIONS IN DETAIL



Cotton gins marked in RED are located close to growing regions. Cotton is exported from Sydney, Brisbane and Melbourne ports.

Cotton gins like this one are mostly located in cotton regions to cut transport costs and can work around the clock in peak season.

GINNING

Cotton gins are factories that complete the first stage of processing cotton – separating the lint from the seed. Gin is short for engine. In Australia, gins are in cotton areas to avoid costly transport.

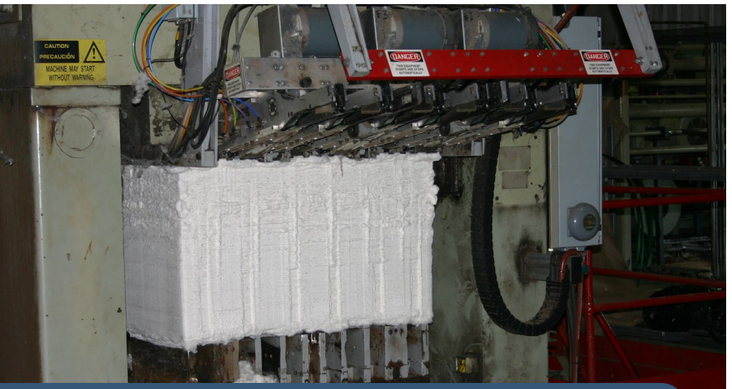
Before the gin was invented, the lint and seed was separated by hand cotton is still ginned by hand in some parts of the world. It can take one person a whole day to separate only half a kilo of the lint from the cottonseed. Modern gins can separate and bale about 230,000 kilograms of cotton in one day.

THE GINNING PROCESS

The seed cotton arrives at the gin in round bales. The first step in the ginning process is where the cotton is sucked into ducting by pull fans that carry it to a dryer. Cotton must be ginned with a moisture level of 5%. The cotton is dried out if it is too wet, or water is added if it is too dry, to ensure the correct moisture level. Next, the cotton goes through several stages of cleaning equipment to remove leaf trash,

After cleaning, the cotton is then ready for separation in the gin stand. The gin stand removes the seed from the lint. In Australia, most cotton is ginned with saw gins where fast-moving circular saws grip the fibres and pull them through narrow slots.

The raw fibre, now called lint, has any remaining trash removed and makes its way through another series of pipes to a press where it is pressed into bales under very high pressure. Each bale weighs 227kg. Samples are taken from each bale for classing and the bales are wrapped in stretchy white cotton fabric to protect the lint. They are now ready for transport to one of the ports for shipping into overseas markets.



Cotton is pressed under very high pressure by a bale press into bales weighing 227kg each.

Gin is short for engine. Source: Southern Cotton.

Cotton bale being fed into an unwrapping machine.

GINNING AND **BEST PRACTICE**

Ginners have to comply with the Australian Cotton Ginners' Association Best Management Practice Handbook for Ginning, which is reviewed each year.

All members of the Australian Cotton Ginners, Association must comply with the current version of the Cotton Ginning BMP handbook. Gins that are operational during the ginning season will be audited via a scheduled formal audit. Members must comply with all critical issues to be certified. Gins that comply will be certified by Cotton Australia.

The critical issues are:

- Certification and calibration of all moisture measuring equipment, including in-line moisture measuring sensors;
- Certification and calibration of weighbridge and lint bale scales;
- Certification of test weights;
- Fire bales;
- Sample size.

Source: ACGA Best Management Practice for Ginning Version 18.0 February 2020

The Ginning Process from Southern Cotton.

Traceability of cotton from grower to the gin embedded in John Deere cotton pickers using Harvest Identification (HID).

PRODUCTS FROM GINNING

When the seed cotton is processed in the gin, three products result — cottonseed, lint and trash.

SEED

The seeds make up about 53% of the seed cotton weight that comes from the farms. They are very valuable and are used for a variety of products such as oil, plastics, stock feed, cosmetics and margarine.

Fuzzy seed that has been ginned from the lint is stored in large sheds.

Pressed bales about to be wrapped for transport. Source: Southern Cotton.

LINT

Lint makes up approximately 37% of the seed cotton weight. Once the lint has been separated, it is compacted into bales for easy transportation. The cotton bales are then mostly transported directly to Australian ports for export to other countries to further process (spin) the cotton.

Bales of lint being forklifted into storage before being transported to ports for shipping.

TRASH

The remaining 10% of the seed cotton is a waste by-product or trash.

Cotton fibre waste can be used as a fertiliser and valuable soil amendment, cattle feed and in some cases, trash is used in manufacturing or in ethanol.

Cotton trash.

Converting waste to energy: does trash stack up?

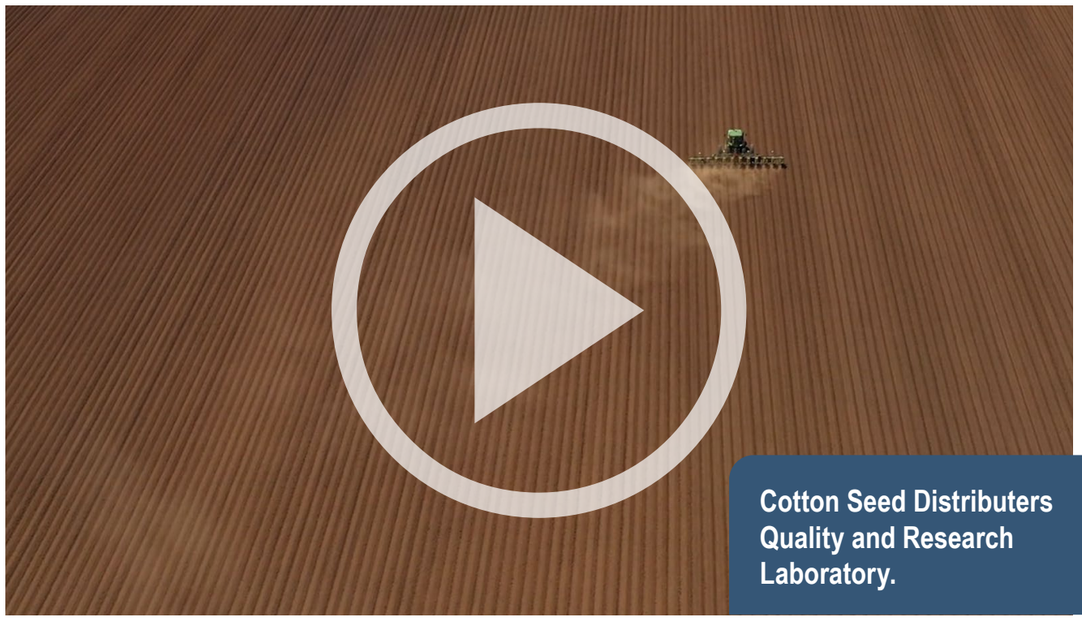
COTTON SEED FOR GROWERS

Cotton Seed Distributors (CSD) in Wee Waa, NSW, is the only company that supplies cotton seed to Australian cotton growers. CSD works in close partnership with CSIRO who have been developing cotton varieties since the 1960s, with the first commercial release in 1984. This partnership, underpinned by ongoing research and development, benefits growers' bottom line and is good for the environment and for rural communities.

The exceptional yield and adaptation of CSIRO varieties has seen Australia have the world's highest yielding cotton, as well as breeding plants with disease resistance and regional adaptation. CSIRO varieties have allowed the expansion of the industry further south and potentially much further north, which should help buffer the industry against the potential impacts of climate change in traditional cotton growing areas.

Cotton Breeding in Australia.

CSIRO - Over 100 cotton varieties and counting.



Cotton Seed Distributers Quality and Research Laboratory.

PROCESSING **COTTONSEED**

Cottonseed is separated from the lint during the ginning process. Before the seed can be crushed for oil extraction or used for planting future crops, it must be de-linted. This means removing any excess lint still attached to the seed. These final short fibres (linters) are used to make many industrial and domestic products.

After the linters are removed, the hull (the hard shell covering the seed) is removed. Inside the hull is the kernel – the valuable part of the seed. To produce oil, the kernels are flattened using rollers and then cooked at very high temperatures.

The kernels are squeezed and crushed and the oil flows out. This oil is then processed and refined further, turning it into a light yellow, tasteless, odourless oil. Cottonseed oil is used in the manufacture of products such as vegetable oil, margarine, soap and cosmetics.

The excess hulls and leftover kernels can be used to feed animals such as pigs, cattle and poultry.

Cottonseed can also be fed directly to livestock without crushing to produce meal, although the ration can also be combined with other feeds.

In Australia, it is important to note that the recent drought saw an increase in farmers' and feedlots' use of cottonseed, as access to other fodder decreased, and because cottonseed has a high proportion of oil and fiber content compared to some other feed grains. This new demand saw an increase in the value of uncrushed cottonseed and a shortfall of available cottonseed for crushing. This has resulted in the decline in crushing cottonseed locally, and most crushing plants closed in 2018 as it was uneconomic to continue.

Data on U.S. and global trade, production, consumption and stocks, as well as analysis of developments affecting world trade in oilseeds from the United States Department of Agriculture.

CLASSING

After the cotton is ginned, a sample is taken from each bale and sent away to classing rooms to have it graded for its quality. The cotton fibre is sorted into different quality-based grades (or classes). The higher the class, the better the quality of the cotton fibre, and the higher the price that will be paid.

How cotton is classed in Australia.

View videos showing some of the world-class technology used in Australia at ProClass to class cotton.

Cotton Incorporated and the classing of cotton in the USA.

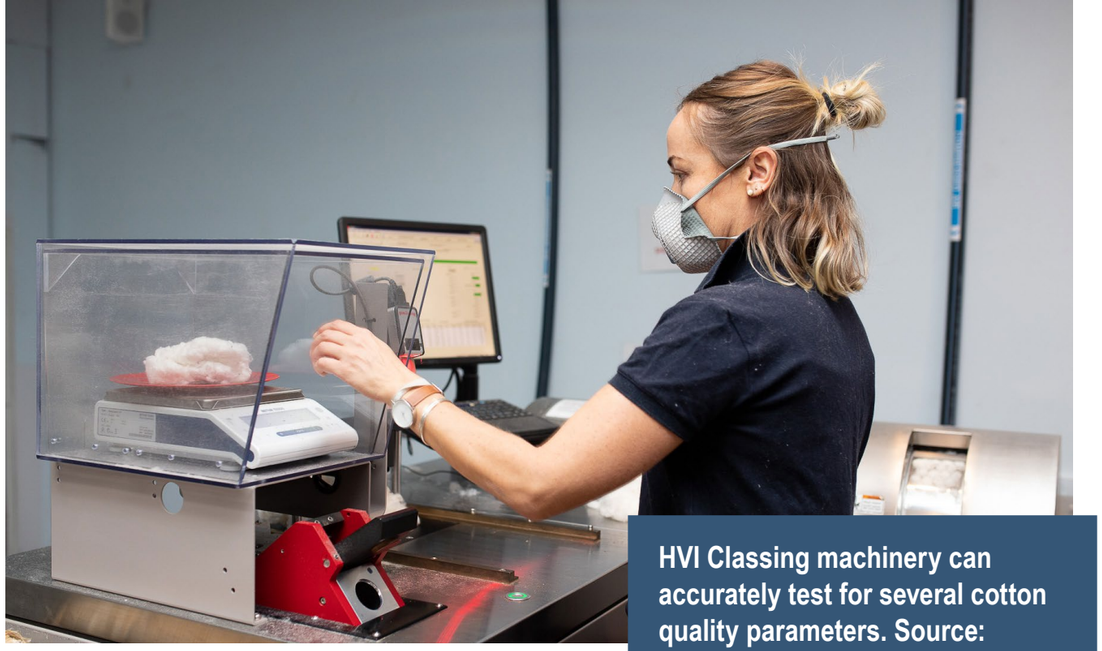
The Audiopedia.

TRADITIONAL CLASSING METHOD

The more traditional method of testing cotton quality involves using specially trained 'classers' who manually examine the cotton fibres. This testing involves the classer taking a sample from each bale of cotton and assessing it by:

- Colour (bright or dull, white or grey)
- Trash content (the amount of leaf in the sample)

Manual classers still largely determine the leaf, extraneous matter and preparation grades of cotton.



HVI Classing machinery can accurately test for several cotton quality parameters. Source: Australian Cotton Classers.

MODERN CLASSING METHOD - **HVI TESTING**

High Volume Instrument (HVI) testing is a machine-based method that can quickly and accurately check the quality and exact value of cotton fibres. The technique originated in the USA and Australian companies have also contributed to the world's knowledge about HVI testing.

An HVI test print-out includes information relating to the following areas:

- Colour grade (relating to any visible impurities and the degree of whiteness) ;
- Length (the price of cotton is roughly proportional to staple length. Australian crops typically produce 28mm staple if irrigated, but shorter from a dryland crop);
- Micronaire (the fineness of the cotton that affects how quickly it can be spun);
- Trash (the number of trash particles that are in the cotton sample);
- Strength (if the cotton is stronger, it can be used in smaller quantities);

At the end of the classing process, each 227kg bale of cotton carries a classing description. This grade will decide whether the cotton is sold for a higher or lower price, known as premium or discount.

Grading categories are set in each individual country and are revised and updated, usually on an annual basis. Australian cotton is ginned with state-of-the-art equipment and classed through modern, certified classing facilities that participate in the International Cotton Advisory Committee CSITC Round Trials to ensure the highest standards. Australia has an enviable reputation on the world market as a reliable supplier of very high-quality cotton, and can command a premium price for this reason. A recent study found new varieties from CSIRO's cotton plant breeding program had improved yield, HVI quality, and are showing superior textile performance attributes.

Visual classing for grading the colour of lint is done against the global standard lint sample of known grade, provided annually by the United States Department of Agriculture (USDA). Source: Australian Cotton Classers.

Overview of the quality of Australian cotton lint from 2011 to 2019 showing the grade, staple, micronaire, strength and uniformity.

A snapshot of the typical quality of Australian cotton lint.

A basic guide to cotton pricing & quality from CottonInfo.

CLASSING **BEST PRACTICE**

Classers have to comply with the Cotton Classers Association of Australia Best Management Practice Handbook for Classing, which is reviewed each year in February.

All Classing members of the Cotton Classers Association of Australia are audited annually, during the ginning season, to determine their compliance to the latest version of the Best Management Practice Handbook for Classing. The classing facility must have a quality assurance programme in place, which is based on ISO 17025:2017. A Classing member must comply with all critical issues to be certified by Cotton Australia.

The critical issues are as follows:

- Sample management – gin and classing;
- Classing facility has appropriate wall colour and lighting;
- Sample testing, including equipment set up, calibration check, calibration and use;
- Data transfer – the parameters must comply with the requirements.

Classing facilities that are certified as an 'ICA Bremen Certified Laboratory' by ICAB, will be audited on a triennial basis.

Source-Cotton Classers Association of Australia Incorporated, Best Management Practice For Classing Version 22.0 February 2020.

Cotton is warehoused before it is shipped.

SHIPPING THE COTTON TO MARKET

Once the cotton is ginned and pressed into bales it is loaded on to trucks and trains and sent to port for shipping, mostly to overseas markets. More than 99% of Australia's cotton is sent overseas, as there are no commercial spinning mills left in Australia for cotton.

Australian cotton is consumed all around the world and especially throughout Asia. The proximity of Australia to Asian countries means that Australian cotton can be delivered port-to-port in 7 – 14 days.

The Australian Cotton Story
This 20-minute video focuses on the processing and shipping of Australian cotton while discussing traceability, innovation, research and sustainability.

Australian Cotton Shippers Association (ASCA) talks about marketing cotton globally and the effects of COVID-19 on the marketing of Australian cotton.

Australia exports more than 99% of its annual crop, making it the fourth-largest exporter of cotton in the world.

The main ports for exporting Australian cotton are in Brisbane and Sydney. The cotton bales are warehoused, and once they are sold and ready to be shipped, they are loaded into large shipping containers.

The main customers for Australian cotton are spinning mills located in south-east Asia – China has traditionally been Australia's largest buyer of cotton, although new markets are emerging.

SPINNING TO **PRODUCE YARN**

Historically, cotton was spun by hand using spinning wheels. This practice is no longer used to produce commercial quantities of cotton yarns, but the method is still practiced as an artisan craft by some.

Cotton arrives at a spinning mill in bales. Most often mills specialise in one fibre, although some mills process a range of different types of fibres including cotton and man-made fibres including polyester and nylon.

At the textile mill, the cotton is put through a number of processes, depending on the setup in the spinning mill and the desired quality of the yarn to be produced.

1 OPENING, BLENDING AND CLEANING

The bales are laid down in a row (called a laydown), opened and blended through a range of machines. This ensures a consistent blend of fibres. The blended fibre is then put through more machines to loosen the fibre tufts and to remove leaf, sticks, boll parts, bark and seed fragments.

Blended and loosened cotton fibres ready for carding.

Carding technology as it begins to align fibres into a sliver.

2 CARDING

Next, the fibre is fed into a carding machine which is often referred to as “the heart of the spinning mill”. The carding machine individualises, aligns and further cleans the fibres before pulling them into a single, continuous, loose rope called ‘sliver’.

A look at the industrial design of a mini carding machine designed for mini-mills and laboratories.

This video shows a hobby carding machine and discusses the problem of short fibre length. It provides a good understanding of the process of carding.

3 DRAWING

Drawing is the process where the fibres are blended, straightened and the number of fibres reduced to achieve a desired density. It also improves the evenness of the sliver.

Drawing frame machine.

4 COMBING

This process removes any final waste from the cotton and makes it finer, stronger, smoother and more uniform compared to carded yarns. Combed yarns are also more expensive than carded yarns because there is an extra processing step and there is more waste.

How the combing technology works.

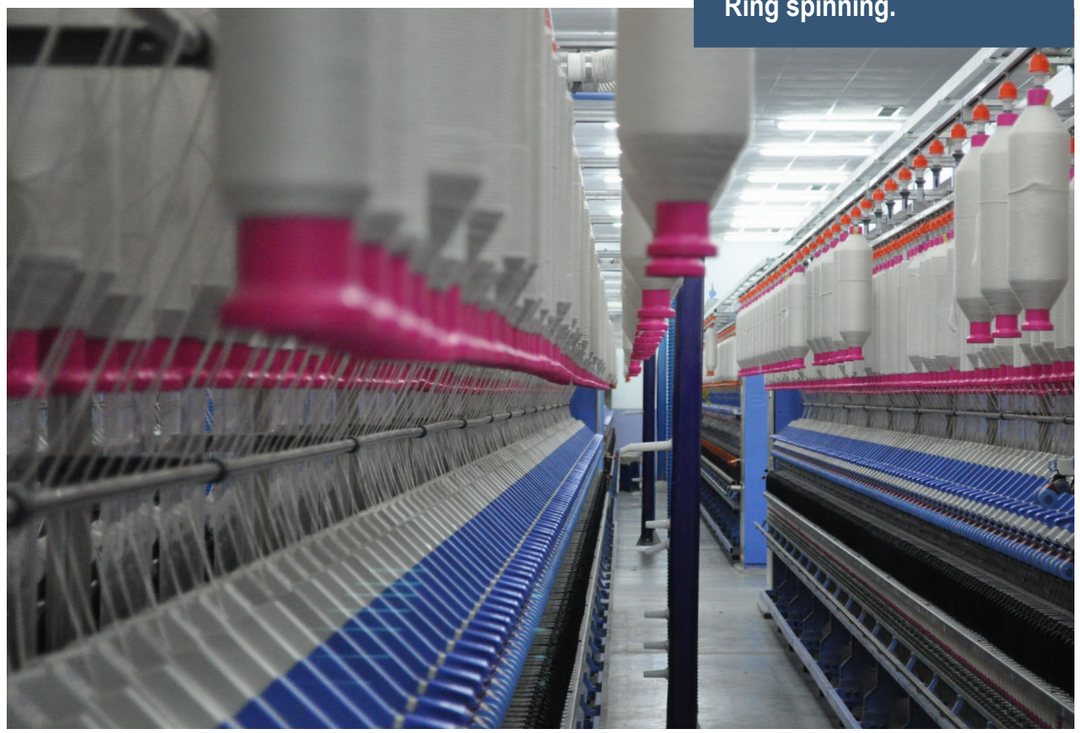
5 ROVING

In preparation for ring spinning, the sliver is condensed into a finer strand know as a roving, before it can be spun into yarn. The roving frame draws out the sliver to a thickness of a few millimetres and inserts a small amount of twist to keep the fibres together. This is then wound on to a bobbin in readiness for spinning yarn.

A series of short videos showing Opening Through Carding from CottonWorks.

Sliver being drawn up to be condensed into roving.

Ring spinning.



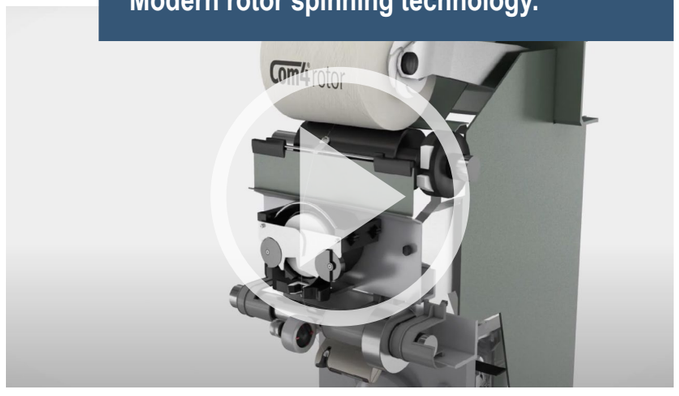
6 SPINNING

There are three main spinning systems used commercially to produce cotton:

RING SPINNING Ring spinning was perfected as a process by the end of the 19th Century. There are more than 213 million ring spindles installed worldwide that account for about 60% of all short-staple yarn production. Ring spinning draws out the roving and inserts a twist into the fibres by a rotating spindle and winding the yarn onto a bobbin simultaneously. It is a comparatively expensive process due to slower production speeds and additional processes.

ROTOR SPINNING (also known as open-end spinning) This was introduced in the mid-1960s. Today, there are more than 9 million rotors installed worldwide, which account for about 30% of short-staple yarn production. Sliver is fed into the machine and combed and individualised by the opening roller. The fibres are then deposited into the rotor where air current and centrifugal force deposits them along the groove of the rotor where they are evenly distributed. The fibres are twisted together by the spinning action of the rotor, and the yarn is continuously drawn from the centre of the rotor. The resultant yarn is cleared of any defects and wound onto packages.

Rieter Rotor Spinning Machine R 66 - Modern rotor spinning technology.



A series of short videos showing ring spinning, rotor spinning, air jet spinning, yarn numbering, yarn twist and yarn plying from CottonWorks.

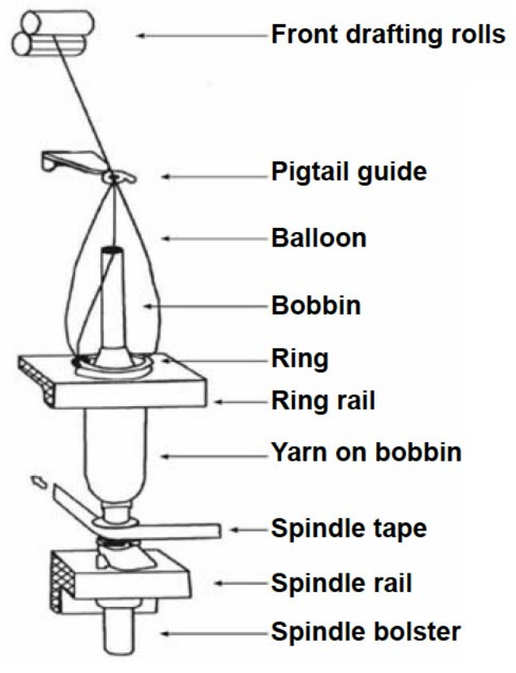
AIR-JET SPINNING

This was developed in the 1960s but was not commercially successful until the 1980s. There are currently about 500,000 airjet spinners installed world wide.

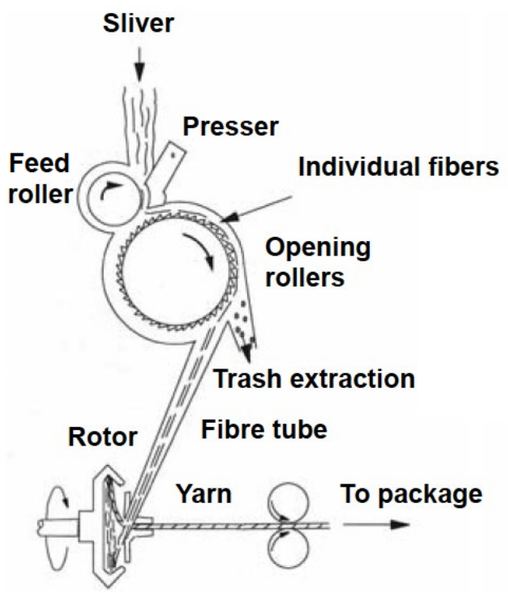
Sliver is fed into the machine and is further drawn out to the final count; and twist is inserted by means of a rotating vortex of high-pressured air. The resultant yarn is cleared of any defects and wound onto packages ready for use in fabric formation.

(These spinning processes are summarised from the FIBREpak, a guide to improving Australian Cotton Fibre Quality)

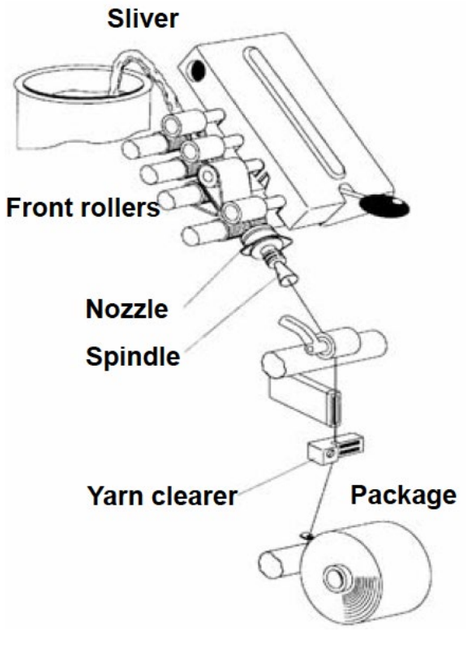
1 Ring Spinning



2 Rotor Spinning

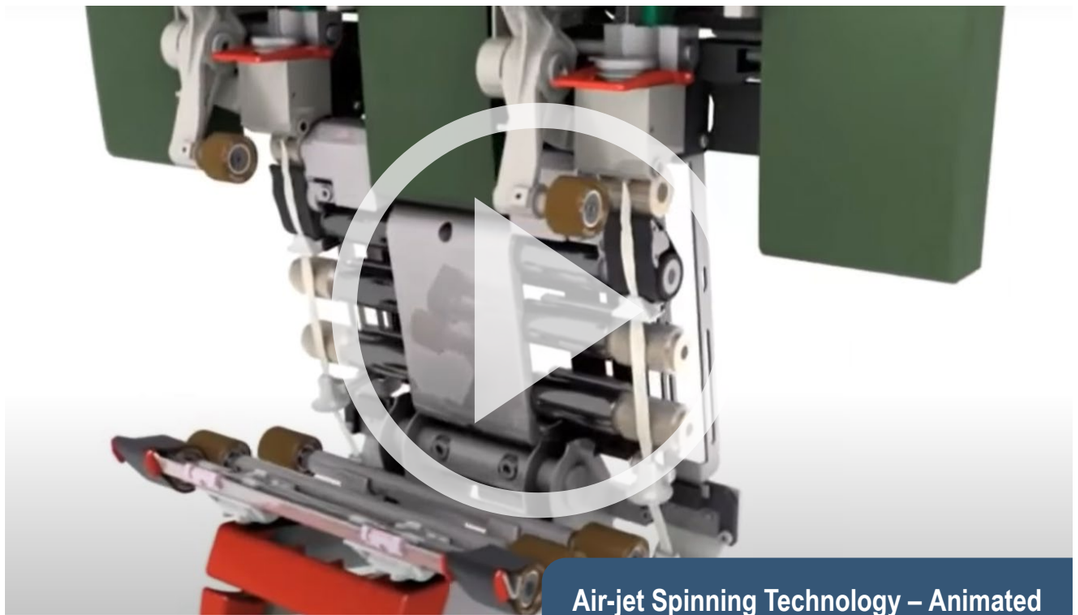


3 Air-Jet Spinning



Understanding yarn counts.

Figure 1, 2 and 3 – courtesy of short Staple Manufacturing, McCreight, Feil, Bosterbaugh and Backe and FIBREpack



Air-jet Spinning Technology – Animated
Source: Textile Learner's Hub.

MANUFACTURING **FABRICS**

After the cotton lint has been spun into yarn it is then woven or knitted into fabric.

WOVEN FABRICS

Weaving is the oldest method of making yarn into fabric. While modern methods are more complex and much faster, the basic principle of interlacing yarns remains unchanged.

Weaving is done on a machine called a loom. Before the weaving can start, the loom needs to be set up with warp yarn. Warp yarn runs up and down the loom. Weft yarn is then woven (or sewn) over and under the warps from side to side. A torpedo-like implement at very high speeds does the weaving and can produce an almost endless variety of fabrics. Some of these machines carry the yarns across the loom at rates in excess of 2,000 meters per minute! The resulting fabric is particularly strong.

There are three basic weaves with numerous variations, and cotton can be used in all of them. The plain weave, in which the filling is alternately passed over one warp yarn and under the next, is used for gingham, percales, chambray, batistes and many other fabrics.

The twill weave, in which the yarns are interlaced to form diagonal ridges across the fabric, is used for sturdy fabrics like denim, gabardine, herringbone and ticking.

The satin weave, the least common of the three, produces a smooth fabric with high sheen. Used for cotton sateen, it is produced with fewer yarn interlacings and with either the warp or filling yarns dominating the "face" of the cloth.

Video describes the plain, basket and oxford weaves.

KNITTED **FABRICS**

Knitting fabric from cotton yarn is a simpler process than weaving. Knitting involves forming loops with one or more single continuous yarns and joining each loop to its neighbours to form a fabric that is stretchy, like t-shirt material.

Lengthwise rows of loops, comparable to the warp yarn in woven goods, are called wales. Crosswise rows, comparable to filling yarns, are known as courses.

Most cotton is knitted on circular machines which have needles fixed to the rim of a rotating cylinder. As the cylinder turns, the needles work their way from stitch to stitch producing a tubular fabric.

Depending on the width of the fabric desired, a modern knitting machine might use more than 2,500 needles. The number of needles varies according to the type of machine used and the fabrics produced.

The flat knitting machine is another basic type. Designed with a flat bed, it has dozens of needles arranged in a straight line and produces a knit fabric that is flat, similar to woven fabric. A flat knitting machine makes over one million stitches a minute, and can be set to drop or add stitches automatically in order to narrow or widen the fabric at certain points to conform to specific shapes. Knitting machines can be programmed to produce a wide variety of fabrics and shapes.

Knitting is the method of creating fabric by transforming continuous strand of yarn into a series of interlocking loops.

FIBREpak: A guide to improving Australian cotton fibre quality.

Animated flow chat showing the many different journeys of cotton to garment.

Cotton fabrics. Image and description of over 60 cotton fabrics and their uses.

FABRIC **FINISHING**

Most fabrics are finished to make them look and feel more attractive. This is the final step in the manufacturing process.

Cotton fabrics, as they come from the loom in their rough, unfinished stages, are known as greige goods. Most undergo various finishing processes to meet specific end-use requirements.

Some mills, in addition to spinning and weaving, also dye or print their fabrics and finish them. Others sell greige goods to converters who have the cloth finished in independent plants.

Cotton finishing processes are numerous and complex, reflecting today's tremendous range and combination of colours, textures and special qualities. In its simplest form, finishing includes cleaning and preparing the cloth, dyeing or printing it and then treating it to enhance performance characteristics.

There are literally hundreds of ways to finish off cotton fabrics to change its look and feel. More than one finish can be applied to a single cotton fabric and there are more innovations introduced all the time.

Some examples of cotton finishes include:

SCOURING - this process removes microdust;

BLEACHING - this produces an off-white colour;

GASSING - this produces a smooth finish to the fabric;

STENTERING - this prevents the shrinkage and wrinkling of knitted or woven fabrics;

SANFORISING - this prevents the shrinkage of woven fabrics;

CALENDERING - fabric is given a final press to produce different effects;

DYEING - colour can be added to the yarn or the fabric. Fabric can also be printed to apply colours and patterns;

PERMANENT PRESS - this finish prevents the need for frequent ironing;

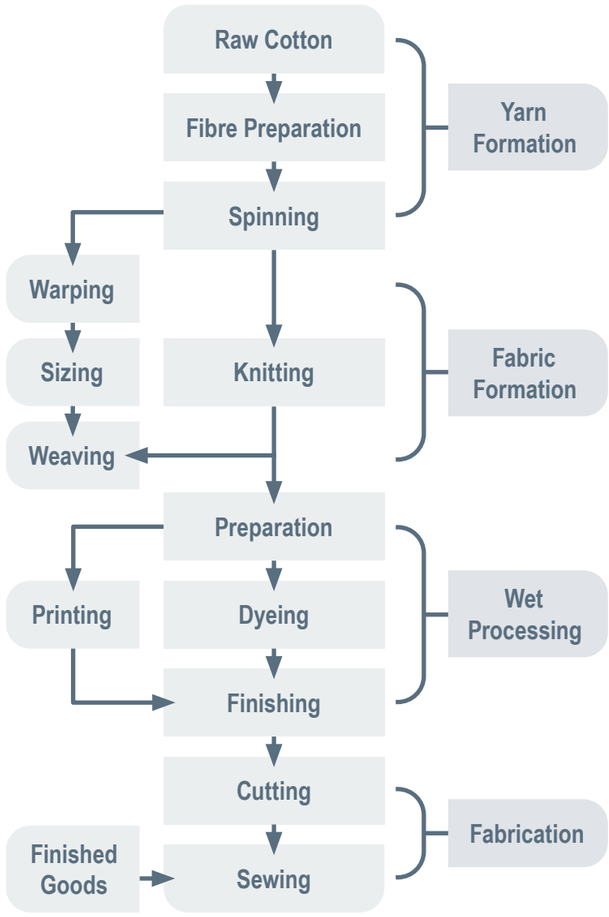
WATER REPELLENCY - this finish ensures water is repelled, not absorbed;

FIRE RETARDANT - finishes such as cotton proban.

How T-Shirts Are Made In America | From The Ground Up.

A closer look at the technology used to transform raw cotton into yarn in How It's Made Cotton yarn.

GENERAL STEPS IN **MANUFACTURING COTTON TEXTILE** GOODS



This is textile dyeing machinery, one of the many finishes that can be applied to cotton.

A BRIEF **HISTORY OF DENIM**

Denim was first made in the 16th Century at a place called Nimes in France. The name ‘denim’ comes from the French words ‘serge de Nimes’ (fabric of Nimes). Indian sailors were wearing a similar fabric at about the same time. It is also said that Columbus was using denim sails when he first discovered America.

For a few hundred years, denim was mainly used as durable work clothing. Around the 1940s, denim started to be used in different clothing forms such as wet weather gear and sports clothes. It was not until the 1970s that denim started to become fashionable, particularly with American youth.

JEANS

During the Gold Rush of the 1850s in the USA, a man called Levi Strauss, unsuccessful at finding his own gold, became rich by making denim pants for more successful miners. This is where the name Levis comes from.

Jeans, however, were around a long time before Levi Strauss made his denim pants on the American gold fields. Jeans, like denim itself, go back to the 16th Century (about 400 years or so) when Italian sailors at the Port of Genoa wore denim trousers with a particular cut. The word ‘jeans’ comes from ‘Genes’, the French word for Genoa. Indian fishermen and sailors were wearing similar trousers called dungarees. Jeans were called “waist overalls” before 1960 when Levi Strauss changed it to its popular name of “jeans”.

The original jeans were a natural pale stone colour and not indigo (blue). Eventually the leaves of the Indigofera plant were used to dye the fabric a deep blue.

While styles have changed dramatically, jeans have shown remarkable resilience and over the years has become an expression of popular culture. In the 1960s flares, painted, stone-washed and marbled jeans were the rage. By the 1980s, stretch jeans, skin-tight jeans and later, designer jeans, were fashionable. In the 1990s, ripped and aged jeans were commanding a premium. Today’s styles and prices vary, with one company in Japan charging around $2,000 per pair!

Jeans have over the years had to compete with trousers made with other fibres including lycra, Teflon, nylon and corduroy, with cargo pants providing the greatest challenge of recent times. However, the dominance of denim has persisted for more than half a century and continues to grow in popularity. In 2018, the global jeanswear market was valued at approximately $100 billion U.S. dollars and was forecast to reach a value of around 128 billion U.S. dollars by 2023 (https://www.statista.com/).

Both jeans and denim continue to evolve as textile technologists develop new finishes and treatments. One such example is STORM DENIM ™, a product that is a water-repellent while not inhibiting cotton’s natural ability to breathe.

Global denim market – statistics and facts from Statista.

A short history of denim jeans.

COOL DENIM **FACTS**

- One bale of cotton can make 266 pairs of denim jeans;
- There exists 0.27 pairs of jeans for every man, woman and child on earth;
- One denim manufacturer says it takes 17 minutes to make a pair of jeans;
- Jeans could be found in some form in the middle ages.

Momatoro Jeans Japan.

An in-depth look into the construction of denim jeans from CottonWorks.

Denim Manufacturing - Weaving Processes - Drawing in and Warp Tying.

THEMES AND AUSTRALIAN CURRICULUM
OUTCOMES FOR SECONDARY SCHOOL

The Cotton Education Kit has been linked to the Australian Curriculum for Years 7-10, and targeted outcomes for Years 11 -12 from all state & territory curriculums across Australia. A list of themes is provided for teachers as a quick guide to assist linking the content to their unit of work or syllabi in their state or territory.

A full list of the individual syllabuses that have been mapped against the Cotton Education Kit can be found in the Cotton Classroom.

Cotton Classroom

CHAPTER SEVEN THEMES

- Ginning
- Processing Cottonseed
- Classing
- Shipping the Cotton to Market
- Shipping the Cotton to Market
- Spinning to Produce Yarn
- Manufacturing Fabrics
- Case Study – the Story of Denim

CHAPTER SEVEN
CURRICULUM OUTCOMES

Curriculum	Course	Chapter 7: Processing: from gin to fabric
State / Territory	**Senior Secondary Course**	
New South Wales (HSC)	Agriculture Life Skills (2018)	ALS1 ALS3 ALS13
	Industrial Life Skills (2018)	ITLS7
	Investigating Science (2017)	INS12-13
	Living World Life Skills (2017)	INS12-13
	Textiles and design (2013)	P3.1 P5.1 H4.2
	Textiles and Design Life Skills (2018)	TDLS6
Victoria (VCE)	Agriculture and Horticulture Studies (2020)	AoS 2 Food and fibre production
Queensland (QCE)	Agricultural Practises (Applied) (2019)	E6.1
Western Australia (WACE)	Plant Production Systems (General) (2017)	Unit 3: Sustainable production. Unit 4: Sustainable production
	Plant Production Systems (ATAR) (2017)	Unit 3: Sustainable production. Unit 4: Sustainable production
South Australia / Northern Territory (SACE)	Design, Technology, and Engineering Stage 1 (2020)	Material solutions: Clothing and textiles
	Design, Technology, and Engineering Stage 2 (2020)	Material solutions: Clothing and textiles
Tasmania (TCE)	Agricultural Systems (2019)	Unit 5: Agricultural Technologies
ACT (ACT SSC)	Design and Textiles A/T/M/V (2020)	Design for Futures

KEY **LINKS**

- Cotton Australia.
- 360-degree digital film of a cotton farm, the latest addition to Cotton Australia's suite of educational resources informing city and country residents about the Australian cotton industry.
- Google Arts & Culture
- Australian Cotton
- Cotton Research and Development Corporation
- Cotton Seed Distributers
- CottonInfo
- Primezone: Primezone provides teachers and students with access to the latest quality primary industries education resources

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