ASSURING COTTTON QUALITY FROM FIELD TO MILL - THE IMPORTANCE OF AN INTEGRATED APPROACH

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Abstract

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. Several sections in the BMP are critical and are highlighted in the BMP Handbook. Members must comply with all critical issues to be certified. Gins that comply will be certified by Cotton Australia. This paper will provide an overview of some of the critical areas of the BMP Handbook for Ginning.

Introduction

Australian cotton growers have a responsibility to their natural environment, workers, and the communities in which they operate, and they take these responsibilities very seriously. As a consequence, a Best Management Practices (BMP) program, which was originally launched in 1997 and reviewed and redeveloped in 2006, represents the cotton industry's commitment to the world's best practice in cotton production. Although, it is a voluntary farm management system, two hundred and fifty farms, the majority of the larger cotton growers are certified. This program ensures that cotton is produced with best practice across a range of focus areas such as land and water, soil health, biodiversity, climate change and energy, bio-security, chemical, insect and pest management, human resources, and technology. This program is well known amongst the more traditional consumers of Australian cotton and is seen as a positive initiative which has also recently allowed BMP certified farms to participate and obtain a small premium as part of the Better Cotton Initiative (BCI).

What is perhaps less known is that BMP programs were also originally developed for the Classing sector in 2004 and the Ginning sector in 2008. Both of these two BMP Handbooks have been extensively reviewed and updated with the BMP Handbook for Classing closely aligned to the Guideline for Commercial Standardized Instrument Testing of Cotton as compiled by the ICAC Task Force on Commercial Standardization of Instrument Testing of Cotton as well as the requirements of the ICA Bremen International Laboratory Certification Program. The BMP program was also initially introduced into the Warehousing and Dispatch sector in 2011, later incorporated into the BMP Handbook for Ginning. A BMP Handbook was also initially formalized for Harvesting in 2012 and reviewed and updated in 2014.

In Australia cotton gins are located in both New South Wales (NSW) and Queensland (Qld) in close proximity to cotton growing areas. Since Australia only produces Upland cotton (*Gossypium hirsutum* L.), saw ginning is the most prevalent gin technology; with 40 super high capacity saw gins. As the construction of gins is expensive, there has been a trend in Australia, to replace smaller gins with larger, more productive gins which are capable of producing more than a 1,000 bales per day and more than 100,000 bales per season. The cost of cotton production in Australia is one of the highest in the world, at almost three times the world average, with high yields and high-quality cotton fiber ensuring that the industry has remained competitive. The cost of production and labor issues in terms of consistency, dependability, liability, wages, insurance, safety, etc., initiated the implementation of standard practices and installation of gin process control systems to assist in controlling throughput, quality, operating cost, improve safety, and maintain consistency in day-to-day operations.
This paper will concentrate on introducing some of the more crucial aspects of the BMP Handbook for Ginning. All members of the Australian Cotton Ginners Association (ACGA) 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. Several sections in the BMP are critical and members must comply with all critical issues to be certified. Gins that comply will be certified by Cotton Australia.

Moisture Management

The cotton fiber is hygroscopic, which means that it is able to absorb or desorb moisture from the surrounding atmosphere. The cotton fiber will therefore be affected by other parts of the plant that are also hygroscopic, such as the seeds, the boll bracts, and particularly the leaves during harvesting, storage, and processing. Fiber moisture content will influence how it adheres to other fibers and plant matter and will have a significant effect on the physical properties, most notably the dimensional, mechanical, tensile, and electrical properties. Moisture content influences all stages of cotton processing including harvesting, storage and ginning and consequently may affect grower returns. It is therefore critical that moisture is measured and monitored during the harvesting and ginning processes.

There are many ways to measure the moisture content prior to, during and after the ginning process. Some methods include subjective measurement by 'hand and eye', with more accurate determination by objective sensor technologies mainly in the form of electrical resistance-based instruments calibrated to gravimetric moisture content. These instruments can be either handheld devices (i.e., Delmhorst C-2000W/CS, etc.) or gin process control systems (i.e., Uster® Intelligin, Samuel Jackson Moisture Mirror, Vomax 851M & B, etc.) with strategically placed sensors to provide in-line measurement. Most of the gins in Australia use a combination of handheld devices and gin process control systems to monitor and adjust moisture content.

Requirements

- ✓ Bale moisture must not exceed 7.5% at any point in the bale, when measured at or near the point of weighing.
- ✓ Moisture measuring instruments, including in-line moisture measuring sensors must be regularly checked and calibrated on a yearly basis.
- ✓ Records of calibration of all measuring instruments must be kept.
- ✓ Heating and drying of cotton are recorded, with the following details required for each module ginned:
  - o Heaters on/off
  - o Level of heat (if any) applied.
- ✓ The moisture content of at least one bale per module must be recorded on shift reports, or other relevant documents, with moisture levels at both the gin stand and the bale checked and recorded as above.
- ✓ Records of action taken concerning 'wet modules' are to be recorded on shift reports.
- ✓ Records of communications from cotton classers and merchants, regarding moisture related problems must be kept, along with records of any consequential action.

Lint Management

Requirements

- ✓ The ginner is trained in cotton ginning:
  - o Gin Schools presented by gin manufacturers in association with ACGA.
  - o Obtain Certificate II, III and IV in Cotton Ginning currently presented by TAFE New England.
- ✓ The ginner must be given guidance on the classification of leaf grade biannually.
  - o By qualified classer.
  - o On site assessment.
- ✓ Leaf grade needs to be assessed by either the Uster® Intelligin in-line measuring system or by means of USDA Grade Boxes or standards prepared by a local classing facility. The USDA Grade boxes, or prepared standards must not be older than four years from the date of release.
- ✓ The Uster® Intelligin system must be calibrated at the start of every shift and recorded.
- ✓ The operational speeds and settings used during a gin run must also be recorded on the shift report.
- ✓ The condition of the seed-cotton, lint and cottonseed is continuously monitored, and appropriate adjustments made to settings and operations recorded. Trash levels in particular are monitored.
- ✓ The condition of cottonseed, motes and lint is regularly checked to ensure that there is no undue seed damage, seed coat fragments in the lint, excessive lint on the seed, or otherwise lost.
- ✓ For residual lint, sample jars of cotton seed, available from the ACGA, with residual lint at 8%, 10% and 12% are used for comparison and verification.
- ✓ Regular monitoring of residual lint must be undertaken and recorded.
- ✓ Evidence that the gin, module yard, bale holding area and surrounding areas are maintained in conditions that will not create safety, fire, or environmental risks.

- ✓ Weigh bridges must be certified annually by the appropriate State Authority or State-approved service provider; evidence of this must be retained.
- ✓ Bale scales are calibrated and certified annually by a qualified service provider; evidence of this must be retained.
- ✓ Bale scales are calibrated and recorded at least once per shift with check weights that are certified.
- ✓ The check weights only require a mass value certificate or certificate of accuracy from a qualified service provider, at least every five years to ensure that they are within tolerances. Evidence of this must be retained.

Fire Bales

Requirements

- ✓ The Fire Bale Procedure should be documented and communicated to all staff.
- ✓ Receivers of cotton must be notified of any bales that are suspected of or have the potential to be 'fire' bales.
- ✓ Minimum requirement for managing 'fire' bales is removing two bales before and two bales after the suspected bale. Bales must be segregated for a minimum of 14 days before release.
- ✓ Fire bales must be identified with red tags which must be left on the bales when leaving the gin yard.
- ✓ Fire bales should be stored in a demarcated area which is removed from other bales and combustible material and accessible by a fire hydrant or hose.
- ✓ Bales identified as fire bales (and/or adjacent bales) by the origin gin and/or contracting merchant must be segregated at the receiving warehouse for a minimum of 2 days prior to general intake (in addition to isolation days at the gin yard).
- ✓ Bales identified by the receiving warehouse as fire bales (but not previously) notified by the gin or merchant must be removed, and the entire incoming trailer segregated for a minimum of 7 days prior to intake into general warehouse.
- ✓ No smoking whilst loading or unloading bales.

Sample Management

Requirements

Classing samples will be taken, packaged, and dispatched to the relevant classing facility in accordance with the cotton classing BMP requirements.

A single sample from each side of the bale is the only sample taken at the gin unless otherwise authorized by the purchasing merchant. Each sample requires an identification tag.

Size

Samples must have the following dimensions:

Face (minimum) 120 mm x 220 mm
Height (minimum) 140 mm
Weight (minimum) 200 grams

Samples must not have holes from bolts in the press.

Sample Roll

Sample rolls shall meet the following requirements:

Plastic Type	Must be Virgin not Recycled
Length	800 – 900 mm
Diameter	400 – 500 mm
Weight	maximum of 13 kg
Capacity	maximum of 60 samples, unless end of gin run

Samples must be securely wrapped, in numerical order. The first and last bale tag must be displayed on the outside of the roll. If there are any issues with the samples the Classing Sample Issue Form must be completed and forwarded by email to the relevant gin manager.

Contamination

Requirements

- ✓ Growers are formally advised of the role they play in avoiding the incidence of contamination and sticky cotton; pre-season and in-season communication/protocols systems put in place for discussing contamination/sticky cotton issues with farmers.
- ✓ Staff training and induction includes information on their role in eliminating contamination, with a focus on work procedures to prevent machinery parts, tools, and other contaminants, including hydraulic oil, entering the cotton stream (i.e., at the module yard, feeder bay, gin fall and bale pad). Induction/training form to be signed by employee.
- ✓ Gins must have protocols in place for managing sticky cotton.
- ✓ A clear and uncluttered workplace is maintained in and around the gin to reduce the risk of in-house contamination.
- ✓ Gins are encouraged to install sensors to detect and eliminate contaminants prior to the seed-cotton entering the ginning process.
- ✓ The installation of sensors will be a mandatory requirement for the 2022 ginning season.
- ✓ An accurate and detailed record (including photos) is kept by each gin of all contamination found in the gin (including plastic wrap caught on module beaters), and any resulting downtime.

Bale Size and Covering

Bale packaging is the final step in processing cotton at the gin. The stress on the ties (strap) after the bale is released from the press is a function of the uniformity of the lint distribution, bale weight, bale dimensions, density to which the bale was pressed, moisture content, tie length and other factors.

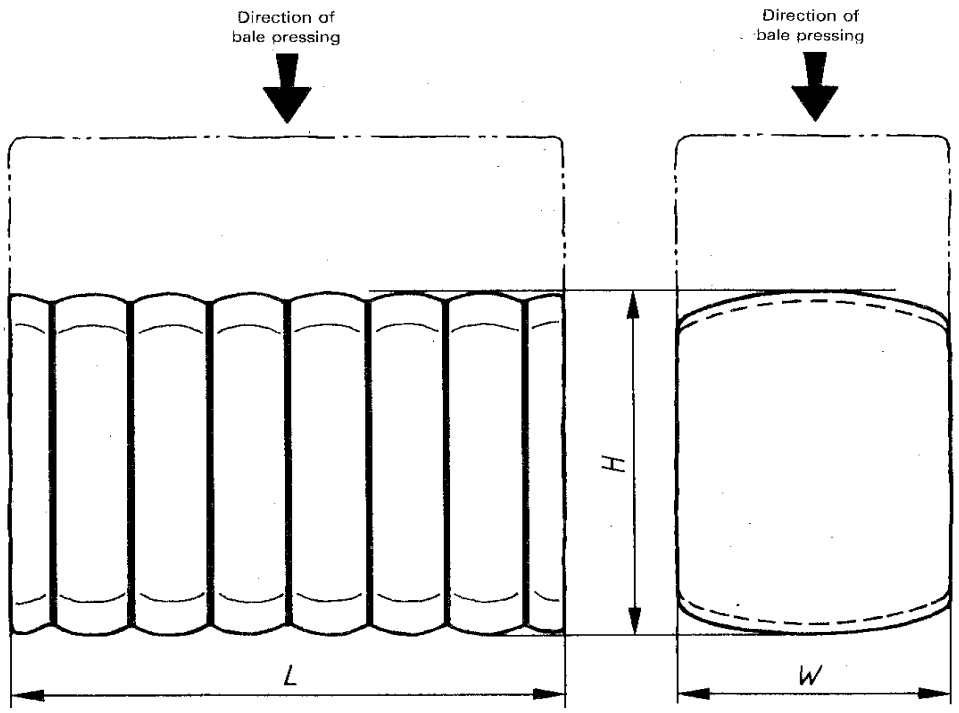
Bales should be square and fully covered. All bale covering material should be clean, in sound condition and of enough strength to adequately protect the cotton. Each bale is to be numerically identifiable by some form of ticket.

Dimensions

- ✓ Bale dimensions for High Density (HD) and Universal Density (UD) bales should be in accordance with ISO 8115.

Bale Type	L cm	L inch	W cm	W inch	H cm	H inch
HD	100-115	40-42	50-60	20-24	80-90	32-36
UD	130-145	53-55	50-60	20-24	80-90	32-36

- ✓ Bale net weights should average 227 kg, with a minimum of 150 kg and a maximum of 260 kg; with the aspirational goal to maintain bale weights between 185 kg and 245 kg.
- ✓ Tare weights are determined prior to the start of the season and circulated to the Australian Cotton Shippers Association (ACSA).



Packaging

- ✓ Bales are either strapped inside or outside the wrap, by plastic straps as follows:
  - HD - 6 plastic straps
  - UD - 6 plastic straps.

Bales must be packaged in accordance with the following table:

Grade A Standard	Grade B Compliant
HD Bale Plastic Strap Cotton Wrap	UD Bale Plastic Strap Cotton Wrap

- ✓ The module yard and bale holding area are constructed and managed to minimize the risk of weather and other damage.
- ✓ Bale holding area is concreted, and loading area is well-drained. Evidence of improvement, e.g., roofing, (or of planned improvement), where warranted.
- ✓ Bales with damaged coverings must be redressed before dispatch from the gin.
- ✓ Non-containerized loads of bales leaving the gin must be securely tied down and appropriately tarped, considering the distance to be travelled, the prevailing weather conditions and any agreed arrangements for bale transport.

Labelling

- ✓ Bale numbering must comply with industry standard nomenclature.
- ✓ Bale tag to be placed within the top third of the bale on front and back.
- ✓ Bale tags on front and back of bale must be secured with wire tie or clip.
- ✓ Bale tag fastened to sit flat on the bale.
- ✓ Systems established to ensure identical bale tag number on each side of the bale (i.e., hourly check and log).
- ✓ No BMP status is to be included with the actual bale tag.
- ✓ Systems established to ensure bale numbers on title documents (packing lists) match physical bale tags.

Health and Safety

Sound workplace practices and operational arrangements for cotton ginning and occupational health and safety are essential, so that employers and employees at all levels within a site are empowered and encouraged to identify health and safety risks and options for dealing with these issues.

Everyone is responsible for achieving high standards of health and safety in the workplace. Commitment needs to be made to ensure the following:

- ✓ Providing a safe place to work
- ✓ Providing safe work systems
- ✓ Providing safe plant and equipment
- ✓ Establishing objectives and targets that drive continuous improvement
- ✓ People being informed and involved in health and safety in the workplace.

The main key elements that must be present are:

Occupational Health and Safety Management System

An OHMS must be in place, which provides a high degree of certainty that work conducted by the company towards health and safety for maximum efficiency and to the required standards. It provides guidelines for the training of company personnel in OHS procedures and is used as a tool for continuous improvement. Risk management is the process of identifying, assessing, and controlling risks, with follow up reviews establishing the effectiveness of controls.

Machine and Equipment Guarding

All ginning equipment and machinery should be fully guarded, all conveyor, augers, belts, chain drives, etc. to be covered or guarded to prevent injury or harm.

Fire Safety and Emergency Evacuation

Ensure fire safety controls are in place and emergency evacuation plans are developed and displayed in all areas and all employees have been trained in emergency evacuation procedures.

Processes to cover:

- ✓ Emergency planning
- ✓ Emergency procedures
- ✓ Emergency assembly points
- ✓ Roles and responsibility - fire safety wardens are identified in each area and training is provided, with all employees provided with emergency evacuation training
- ✓ Firefighting equipment - ensure adequate fire extinguishers of the right type (i.e., CO^2 powder or dry powder chemical extinguishers for electrical areas) is located in suitable locations and there are suitable working fire hose reels (water) used for general fires (cotton) when required. Ensure that fire extinguishers have been serviced and maintained within the prescribed period.

Personal Protective Equipment (PPE)

It is essential that employees be provided with the right type and quantities of PPE to suit the task required. The company has an obligation to ensure all workers are protected, i.e., dust in general, cotton dust, eyes are protected, hearing is protected, feet and hands, etc.

Clear signage must be displayed showing the PPE requirements in each area - use relevant safety signs.

Isolation, Lock Out Tag Out (LOTO) Procedures

When equipment and electrical equipment is faulty or out of service, it must be identified by using 'Danger' and/or ‘Out of Service' tags and records of isolation must be documented (Isolation Register) and kept including all repairs. Equipment that is isolated must not be used under any circumstances. As part of this process a test and tag program for electrical equipment should be introduced as part of the overall electrical safety.

Safe work permits
Is to ensure people can safely undertake excavations, work in confined spaces, work at heights and other high-risk work where there are no approved means of safe work without causing injury to themselves and others or damage to plant, equipment, or product. This is where risk assessments and strict controls must be in place to minimize risk.

Housekeeping
Operations in the gin and to external areas outside and around the site should be kept clean at all times. There needs to be a program of regular cleaning in place to ensure a clean and tidy workplace.

Training and Induction
Detailed training and induction must be delivered regarding machine safeguarding, fire safety, PPE, isolation procedures, reporting of incidents and unsafe acts. Visitors are required to sign logbook in office, given a short site induction and provided with the necessary PPE.

The content of training and induction needs to be appropriate and must meet the needs of the trainees' language, literacy and numeracy skills, level of existing knowledge and level of detail. Records of training must be established.

Accident/ Incident Notification
There must be a system in place to record all incidents that occur, type of incident, the cause, treatment, and corrective action taken to minimize the risk of the incident occurring again.

Unsafe Acts
Is an intentional or unintentional violation of an established safe work practice, procedure, method, or system. All employees must be made aware of safety procedures, safety protocols.

Safety Audit
Audits must be conducted, prior to and during ginning, to ensure that all stop buttons, safety devices and load break isolators are working. Records of safety audits must be maintained.

Environmental

Requirements
- ✓ Trash, dust, water run-off and noise shall be monitored in accordance with license requirements, as stipulated by Local Government and the Environmental Protection Agency (EPA).
- ✓ The gin, module yard, bale holding area and their surrounds, must be managed, and kept in such a manner as not to create environmental, fire or safety risks.
- ✓ Gins must have a module fire management policy and procedure in place.
- ✓ The requirements of State Authorities regarding safety environmental protection, and insurers regarding fire, must be fully observed.
- ✓ Gins will comply with the Memorandum of Understanding agreed between the cotton industry and the cattle industry regarding the supply of cotton trash for feeding of cattle.
- ✓ Round module plastic wrap to be recycled.

Chemical

A hazardous substance is defined as any flammable liquid, flammable gas, oxidizing substance, toxic gas, oil, grease or other toxic substance or any corrosive substance which either alone or as part of a compound or mixture causes injury or illness to persons if the substance comes into contact with the eyes or skin or the fumes or vapor are inhaled.

Requirements
- ✓ Safety Data Sheets (SDS) from product manufacturers and/or suppliers must be maintained for every product on site.
- ✓ Ensure current Register of all hazardous substances used or stored on sites is contained in the SDS folder and HAZMAT box, respectively and is not older than 5 years.

- ✓ Ensure there are identified separate storage areas for all hazardous substances, i.e., correct signage identifying chemicals and storage requirements.
- ✓ Ensure there is separation between non-compatible hazardous substances.
- ✓ Adequate bunding is supplied for containing hazardous substances
- ✓ Ensure risk assessments using the Risk Assessment for Hazardous Substances are conducted for the use, handling, storage, and disposal of hazardous substances.
- ✓ If the use of the hazardous substance causes a significant degree of risk to health, the Risk Assessment for Hazardous Substances, monitoring records and a health surveillance report must be kept for 30 years.
- ✓ If the use of the hazardous substance does not cause a significant degree of risk to health, the Risk Assessment for Hazardous Substances must be kept for 5 years.
- ✓ Ensure all containers are correctly labelled. Label containers when filling a small container from a larger container, i.e., label a spray bottle when filling it with window cleaner.
- ✓ Ensure the correct bunding associated with the hazardous storage to ensure all leaking chemicals are contained.
- ✓ Ensure contractors are trained in the safe usage, handling, storage, and disposal of any hazardous substances the contractor is using in relation to the work the contractor is performing.
- ✓ Ensure the contractor supplies an SDS for any substances the contractor brings on site.
- ✓ Ensure hazardous substances are disposed of in accordance with Local Government and EPA requirements.

Auditing Procedures

All ginning companies that are members of the Australian Cotton Ginners Association will be audited annually, during the ginning season, to determine their compliance to the latest version of the Best Management Practice Handbook for Ginning.

All individual operational gins will be audited and must be conducted while the gins are operational focusing on the entire BMP Handbook. These audits will be scheduled.

A checklist is used by the auditor which will be completed during the audit. The audit form is completed in duplicate; one to report back to the individual gin and one to be sent to Cotton Australia with a recommendation to certify/not certify the individual gin. If the individual gin complies with all the Critical issues highlighted in the BMP handbook for Ginning, Cotton Australia will forward certification to the individual gin which is valid for one year.

Conclusion

Over the years the Australian ginning industry has faced many challenges to which it has responded in a positive way which has allowed the industry to continue to contribute to adding value to the grower, merchant, and end-user of Australian cotton. One important initiative has been the development, implementation and assessment of Best Management Practices which has assisted in improving and standardized the day-to-day operations of the individual gins.

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Disclaimer

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