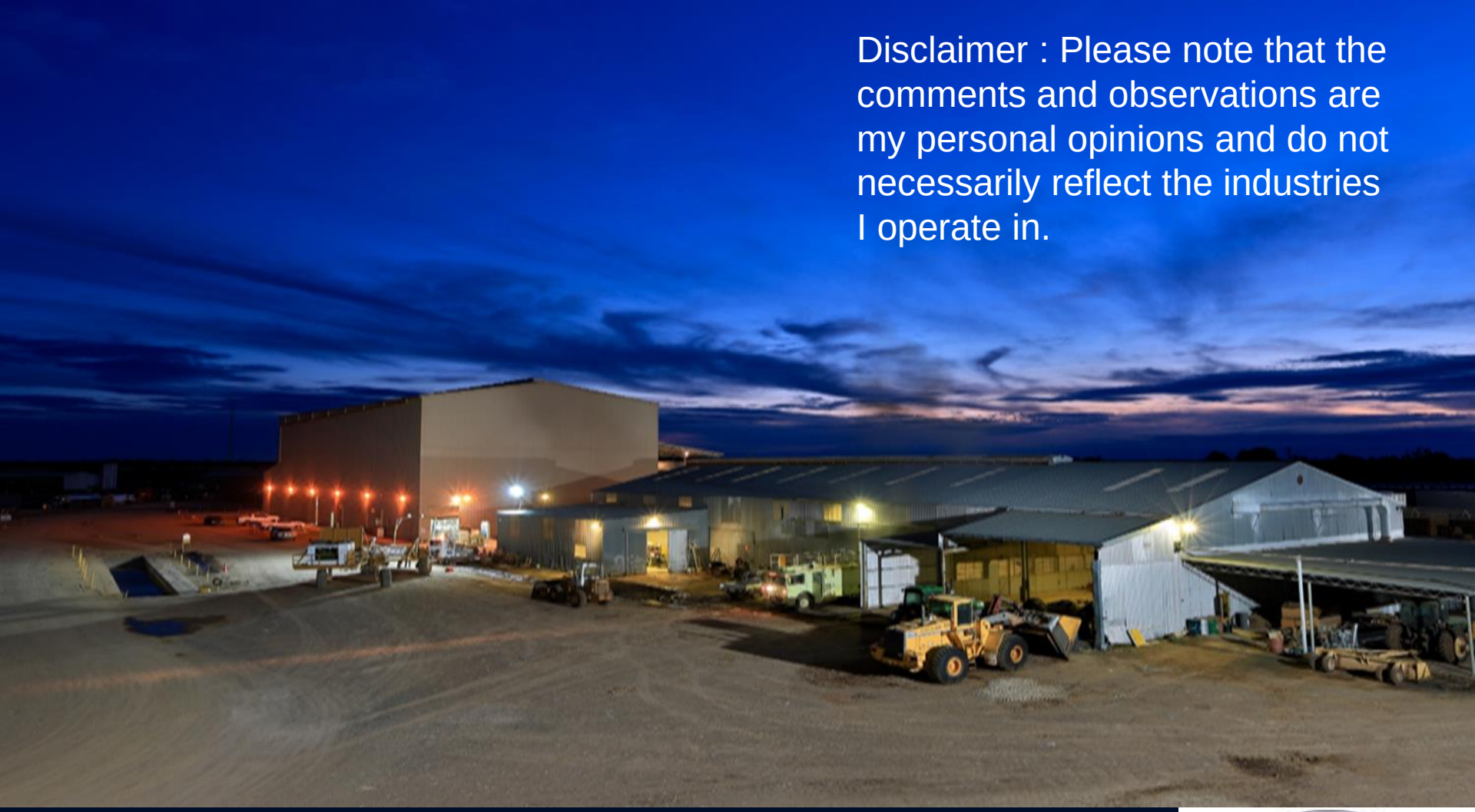


Disclaimer : Please note that the comments and observations are my personal opinions and do not necessarily reflect the industries I operate in.

Session 3:
Ginning and Fibre Quality- Market Demand

Marinus (René) van der Sluijs |Principal Consultant
Textile Technical Services, Geelong, Victoria, Australia

Australian Cotton Ginners Association

- Founded in December 1992 with the object to:
  - promote the common business interests of persons engaged in the cotton ginning industry within Australia.
  - encourage and promote cooperation, sponsor technical development and to seek improvement of communications and education within the ginning industry.
- Currently the Association has twelve ordinary members who have two delegates that are allowed to vote.
- There are also fourteen associate members who provide expert equipment and support to the gins.
- Forty-one super-high capacity saw gins of which 34 are operational
- Minimum production of 1,000 bales/day or 100,000 bales/ per season
- Early adapters of new technology
- Highly automated
- Always strive to achieve base grade (31-3-36)

Purpose & Objectives of Ginning

Purpose

Is to separate fibre from seed and produce cotton lint that is a saleable and processable commodity.

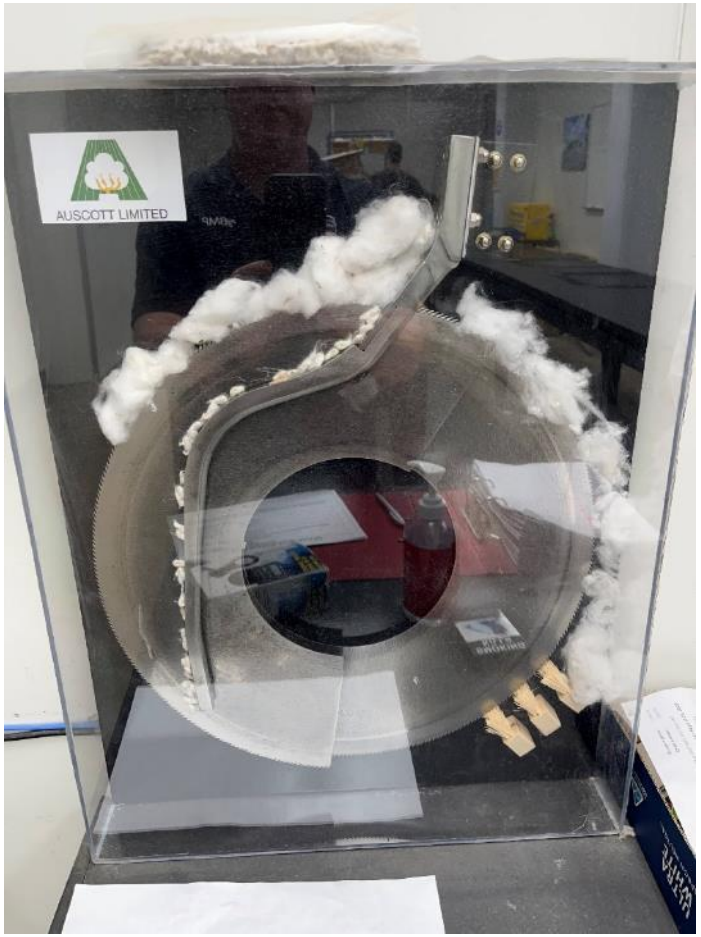
Objectives

- to produce lint of enough quality and quantity to enhance and maximize the return to the grower
- to produce a fibre with minimum damage to satisfy the demand from the spinner.

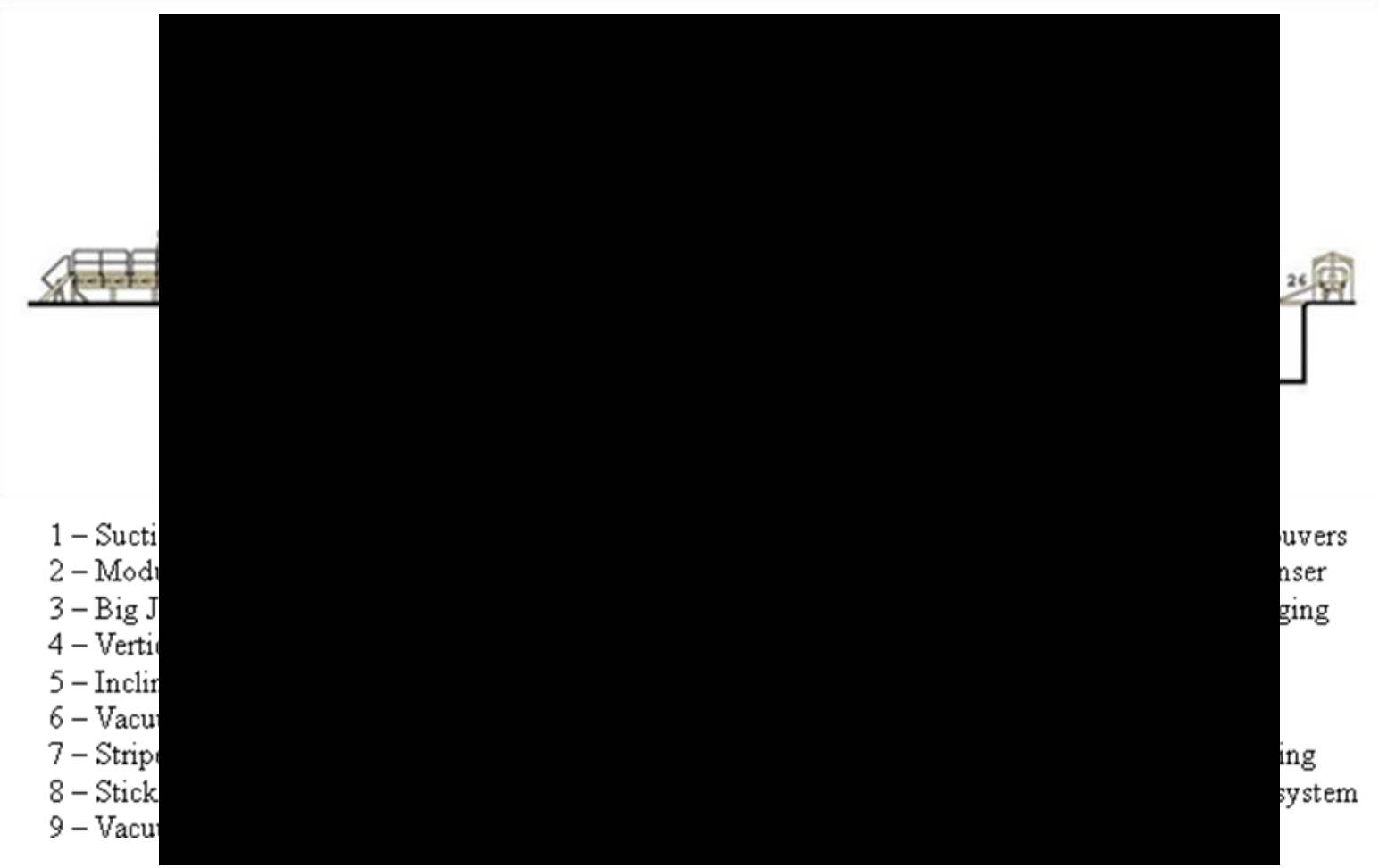
Ginning is an essential link between the grower and mill.

The layout, size, type, and technology of the gin depends mainly on the type of cotton grown, production and harvesting conditions, economic factors, as well customer requirements.

In essence, modern ginning is a combination of thermal, pneumatic, and mechanical processes.



Typical Layout of a modern saw gin



1 – Sucti
2 – Modu
3 – Big J
4 – Verti
5 – Inclin
6 – Vacu
7 – Stripe
8 – Stick
9 – Vacu

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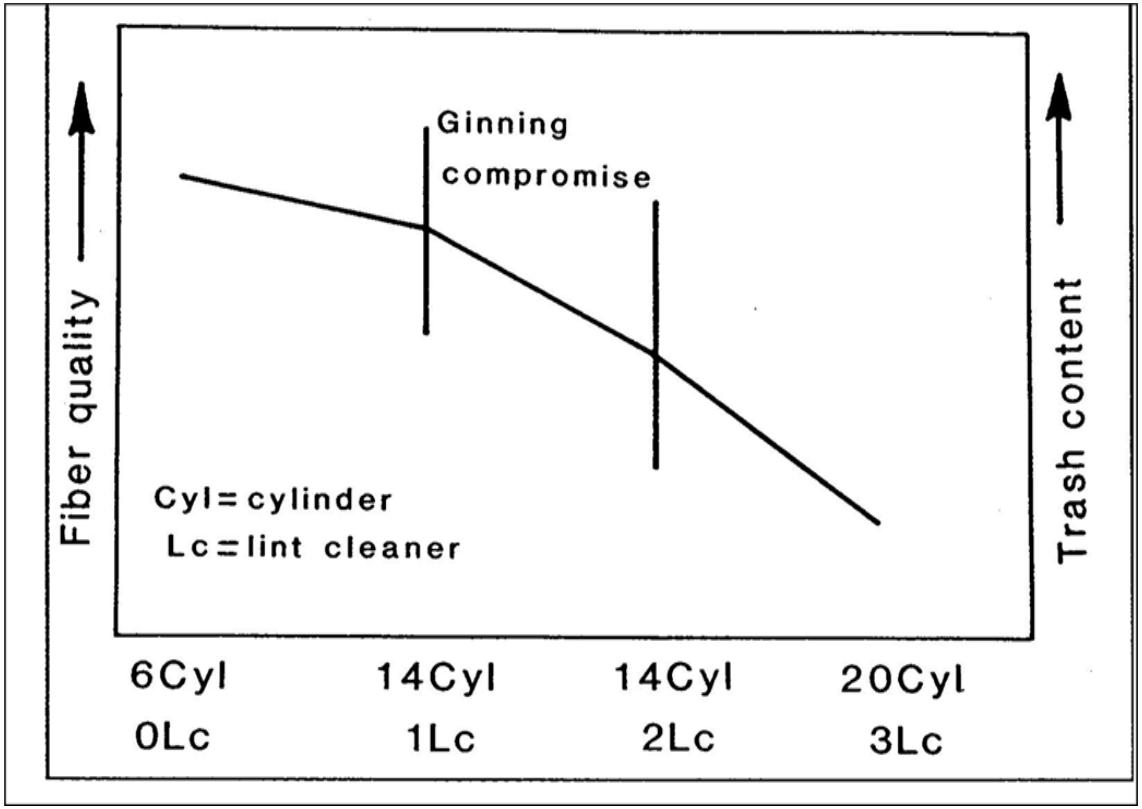
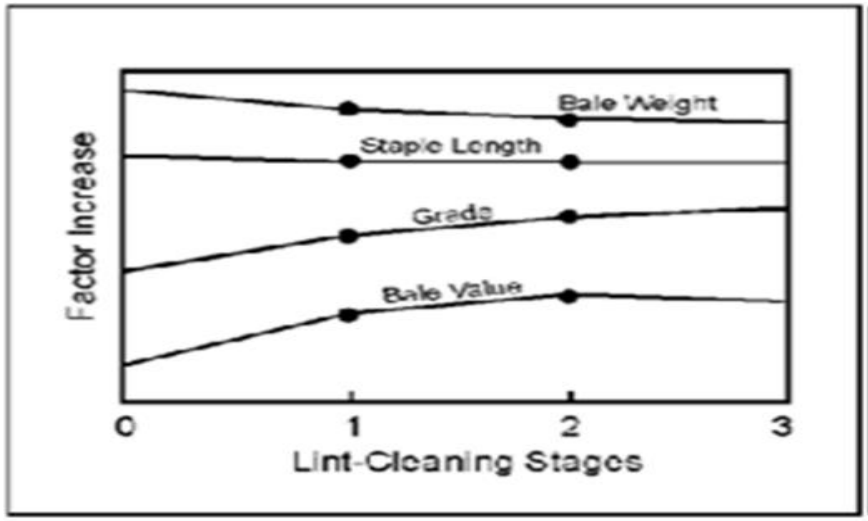
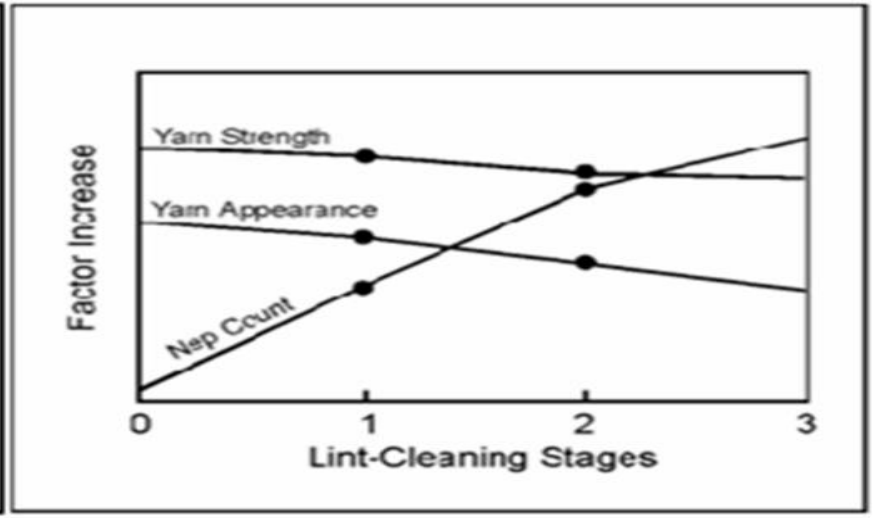
system

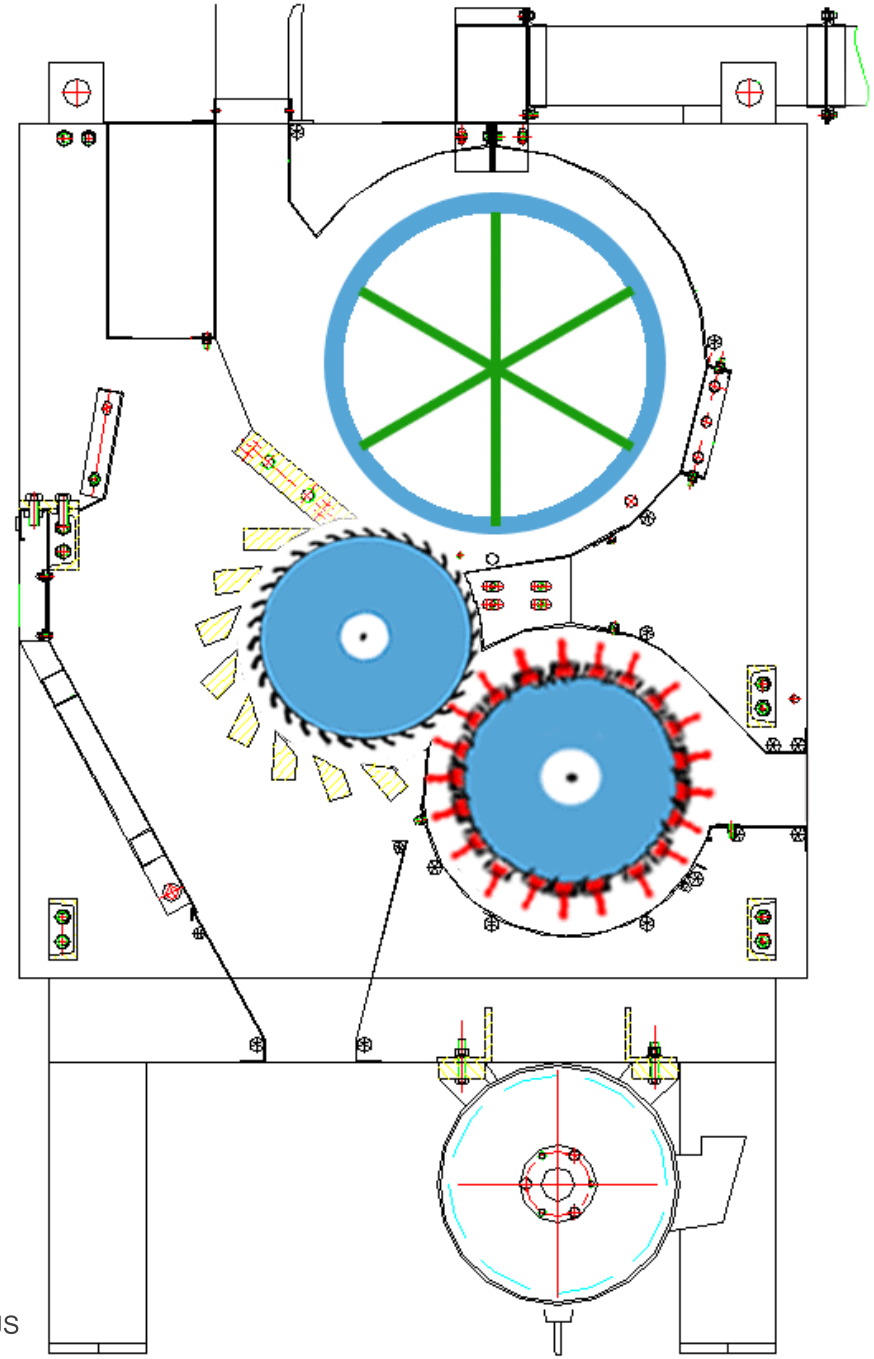
The quality of ginned cotton is directly related to the quality of seed cotton

What about lint turn out %?

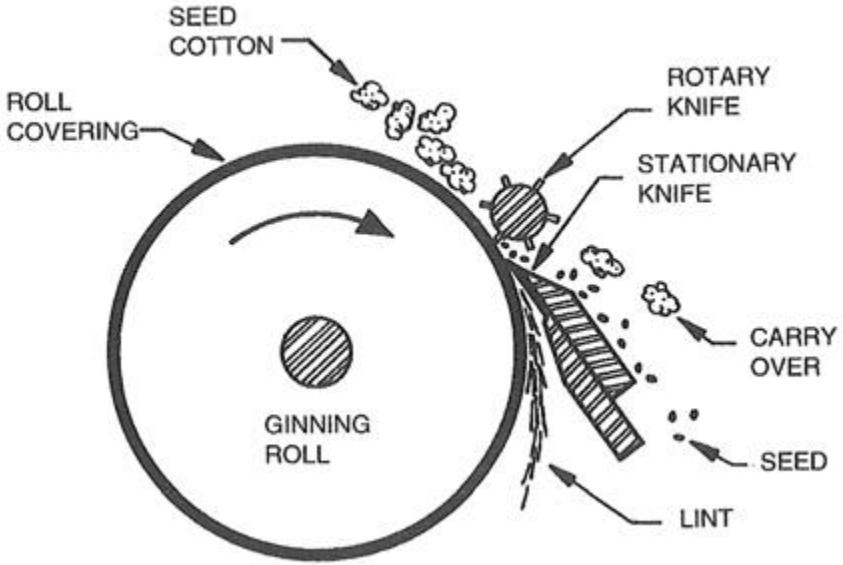








Roller


SEED
COTTON
ROLL
COVERING
ROTARY
KNIFE
STATIONARY
KNIFE
CARRY
OVER
GINNING
ROLL
SEED
LINT

Roller vs Saw

No differences in gin turnout.

Roller ginned cotton visually classified on average as Strict Middling with a leaf grade of 2. The fibre produced by saw gin classified as Good Middling with a leaf grade of 2.

UHML of roller ginned cotton on average 0.07 – 0.05 inch longer, with better uniformity and short fiber index.

Bundle strength of roller ginned cotton on average stronger by 0.07 $gtex^{-1}$

Roller ginned fibre had on average 54 to 84 neps g^{-1} fewer fibrous neps.

No real differences in seed coat neps

Roller ginned cotton more trash, dust and VFM

But is this enough to compensate for the increased production costs?

Progress through seed cotton cleaning stages

Module Storage

Unwrapping Round Modules

Gins forced to adapt their module feeding systems with techniques and machinery to feed RM into the gin.

- The system used by a gin is dependent on the number of modules handled, the cost of implementing the system, and the preferences of gin management.
- Modules are fed in different orientations (parallel, perpendicular or vertical).
- Plastic is removed by either manual or semi-automated systems
- Use cutting line where possible
- Irrespective of the system used, all have safety concerns, still require well trained staff, and invariably can't keep up with processing requirements.
- Plastic?

https://www.cotton.org/journal/2023-27/2/90.cfm?csSearch=133274_1

What are the critical areas?

- Certification and Calibration of all Moisture Measuring Equipment
- Certification and Calibration of Weighbridge, Bale Scales and Test Weights
- Fire Bales
- Sample Size
- Training
- Contamination
- Bale size
- Safety

Weight Measurement

- Weigh bridges must be certified annually by the appropriate State Authority or State-approved service provider.
- Bale scales must be calibrated and certified annually by a qualified service provider.
-Bale scales are verified at least once per shift with certified check weights.
-Certified Bale weights require independent verification every five years.
-Records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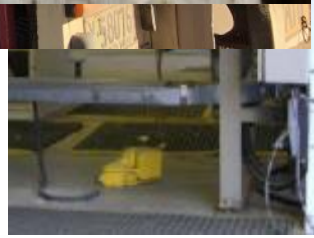


Fire Bales

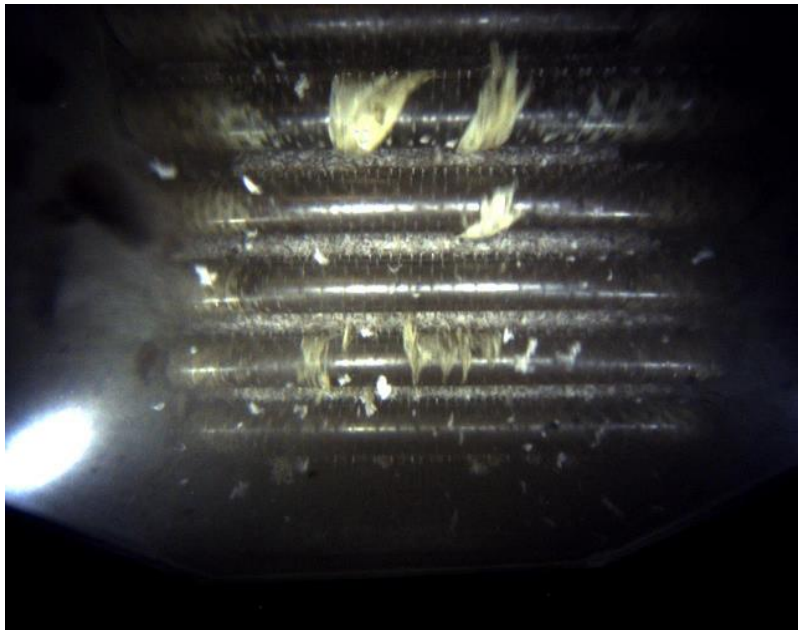
-Documented Fire Bale Procedure.
-Receivers must be notified of bales that are suspected to be ‘fire’ bales.
-Minimum requirement is removing two bales before and two bales after the suspected bale.
-Bales must be segregated for a minimum of 14 days before release.
-Fire bales must be identified with red tags which are left on the bales when leaving the gin.
-Fire bales should be stored in a demarcated area and accessible by a fire hydrant or hose.
-Bales must be further segregated at the receiving warehouse.

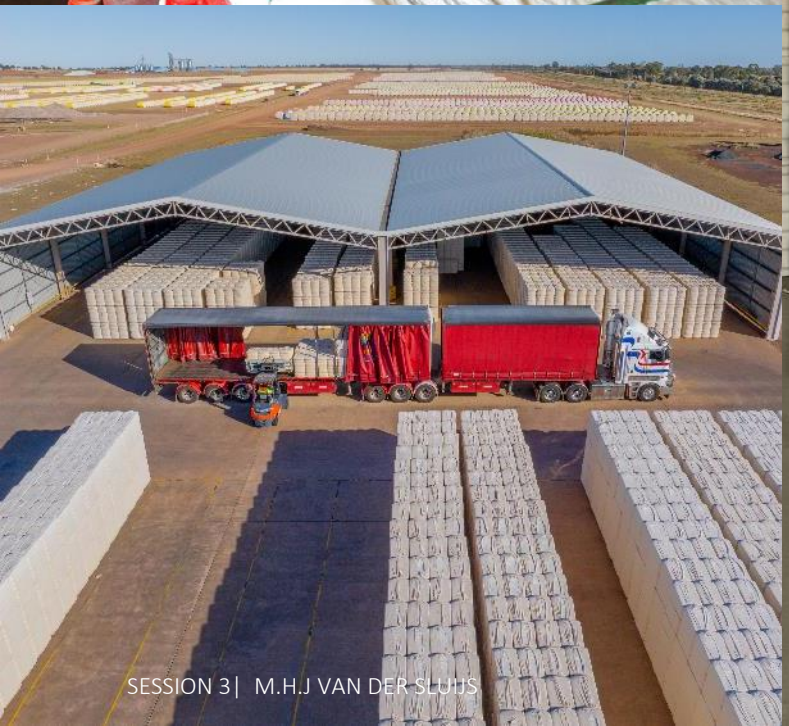
Sampling

-A single sample from each side of the bale
Samples must have the following minimum dimensions:
Face 120 mm x 220 mm
Height 140 mm
Weight 200 grams
-Samples must not have holes from bolts in the press.
-Each sample requires an identification tag.
Sample rolls must meet the following requirements:
Plastic Type Must be Virgin no Recycled
Length 800 - 900 mm
Diameter 400 - 500 mm
Weight maximum of 13 kg
Capacity maximum of 60 samples;
unless end of gin run

Contamination

- Training
- Record
- Pictures
- Signage
- Sensor’s ?
- Sticky Cotton Protocols





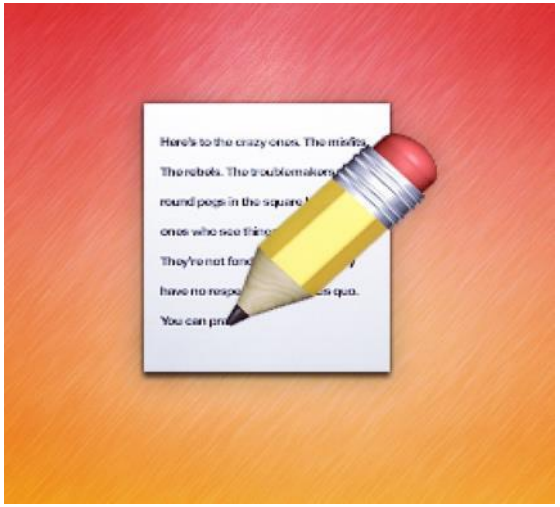
Bale dimensions, size & weight of utmost importance

Bales

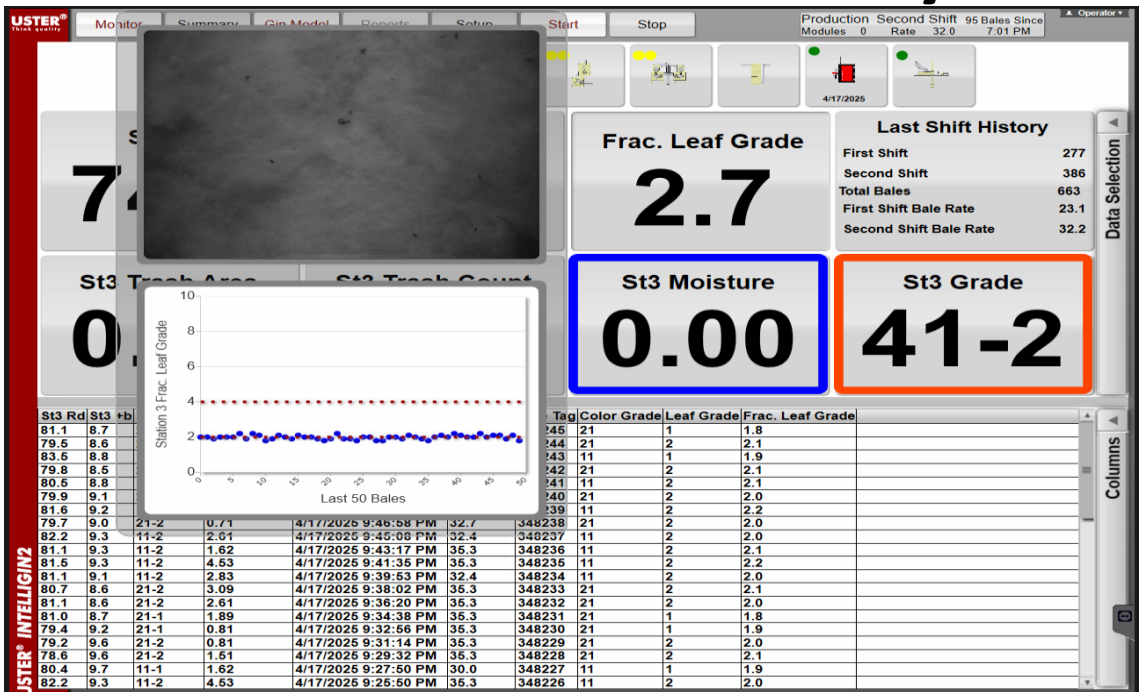
- HD or UD?
- Wrap?
- Ties?
- Size?
-Weight?

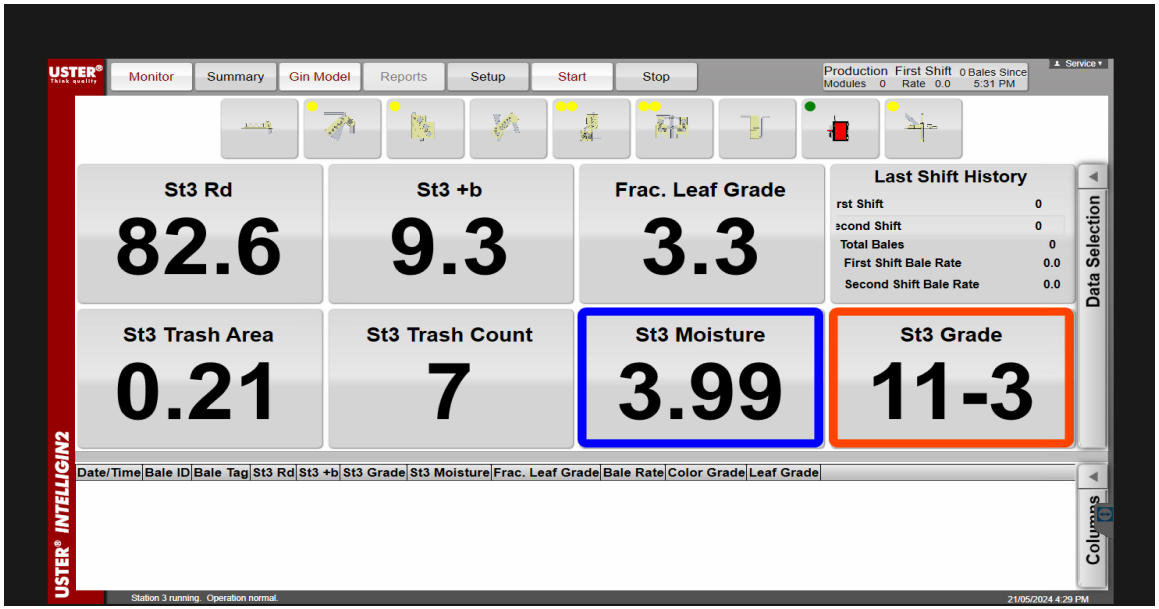
OHSE

- Formalized OHSMS in place
- Machine Guarding
- Safe Work Permits
- PPE
- Training & Induction
- EPA License
- Local Government Permits
- SDS
- Storage



In-Line Quality Measurement





Seed

Visible Mechanical Damage of Seed

Became more apparent with the advent of mechanical planters, harvesters & gins.

1. Harvesters (spindle)

✓ Increase in fan speed

✓High Speeds

✓Conveying

✓Impact of seed cotton against the top of the basket

➢10-15% damage commonplace

2. Ginning

✓Seed cotton cleaning

✓Gin stand

➢Total of 6% commonplace

Conclusions of Studies

1. Method of determining VMD is not perfect
   - Tedious
   - Subjective
   - Expensive

But it provides a good indication

2. The results achieved by earlier trials still hold true.

- 10-15% damage during harvesting
  - Spindle more aggressive?
- 6% during ginning
  - Moisture Content (both too wet & dry problematic)
  - Agitator

3. Other

- Variety
- Fibre Quality

Residual Lint

The amount of lint remaining on the seed after ginning.

Important to determine efficiency of ginning.

Can be ascertained either visually or by laboratory analysis.

Aim for 8.5%

Mote/Moss

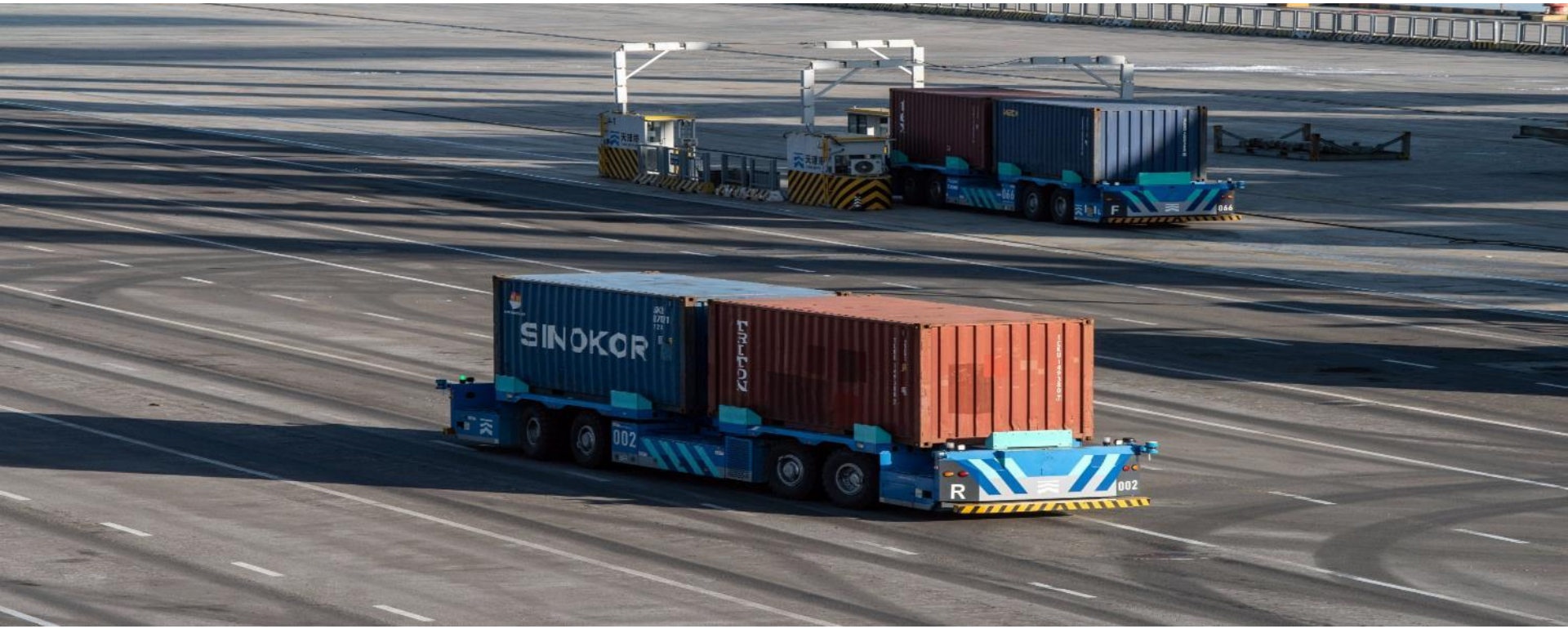
Gin Trash

Gin Trash Usage

- Composting & return to field or sell
- Animal feedstock
- Energy Source
- Other https://www.cotton.org/journal/2024-28/2/upload/Engineering-017-Alege_final.pdf

Issues 1 -Autonomous Vehicles (AV's)

- Modules delivered to the gin are unloaded and placed in module rows and thereafter transported to the feeder bay by a moon buggy or front-end loader. Both these vehicles are very large, cumbersome, and dangerous. The ginned lint bales are transported from the gin to the bale pad or warehouse by forklifts. At the same time, the trash which is removed is dumped into a truck to be transported to a designated area where the trash is stored.
- The use of AVs would partially or entirely replace the human driver navigating a vehicle from an origin to a destination while avoiding road hazards and responding to traffic conditions thereby providing a safer environment.



2.- Unmanned Arial Vehicles (UAV)

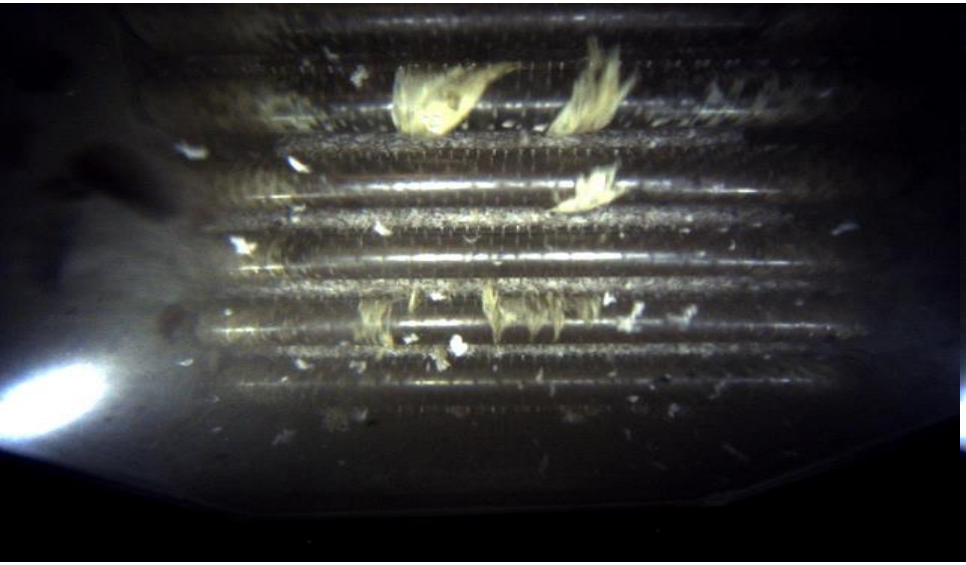
- The use of unmanned aerial vehicles (UAVs) is a novel, fast emerging practice in agriculture assisting growers in various applications including seeding, spraying, soil analysis & crop monitoring. As UAV have become more affordable and with access to more reliable internet their use in the ginning sector should be evaluated. Areas where UAV could be used include module yards in terms of allocation, placement and stocktake of modules by identifying them by their RFID tags, monitoring assessing module yards for heat spikes/hot spots.
- Similarly, bale stacks and trash piles can also be monitored as well as general smoke detection.

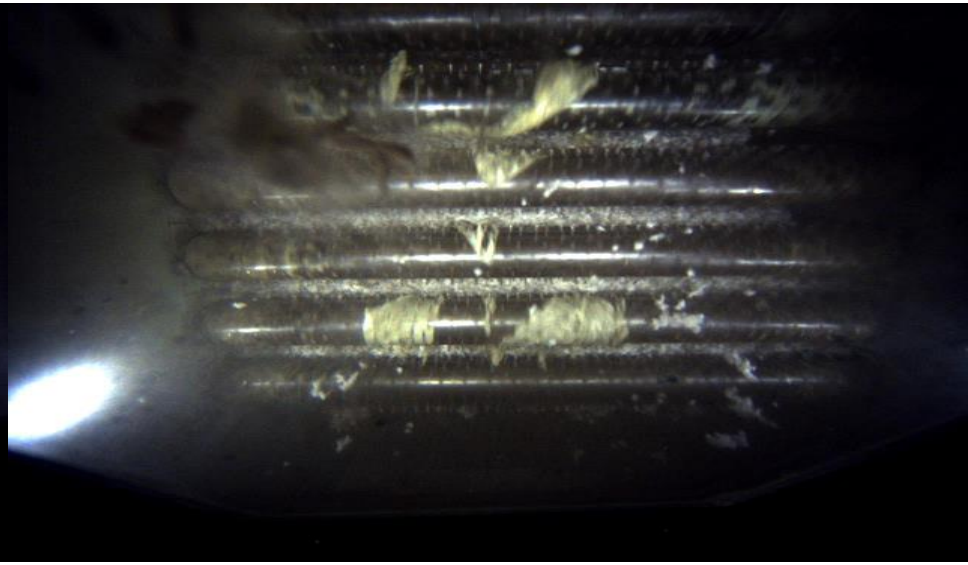
3.- Unwrapping Round Modules

- The adoption of John Deere harvesters with on-board module building capacity that produce round modules covered with an engineered polyethylene film has been rapid and has forced gins to adapt their module feeding systems with techniques and machinery to feed these round modules into the gin.
- The system used by a gin is dependent on the number of round modules handled by the gin, the cost of implementing the system, and the preferences of gin management. Modules are fed in different orientations, and the plastic is removed with either manual or semi-automated systems.
- Irrespective of the system used, all have safety concerns, still require well trained staff, and invariably can’t keep up with processing requirements.

4.- Plastic Detection & Elimination

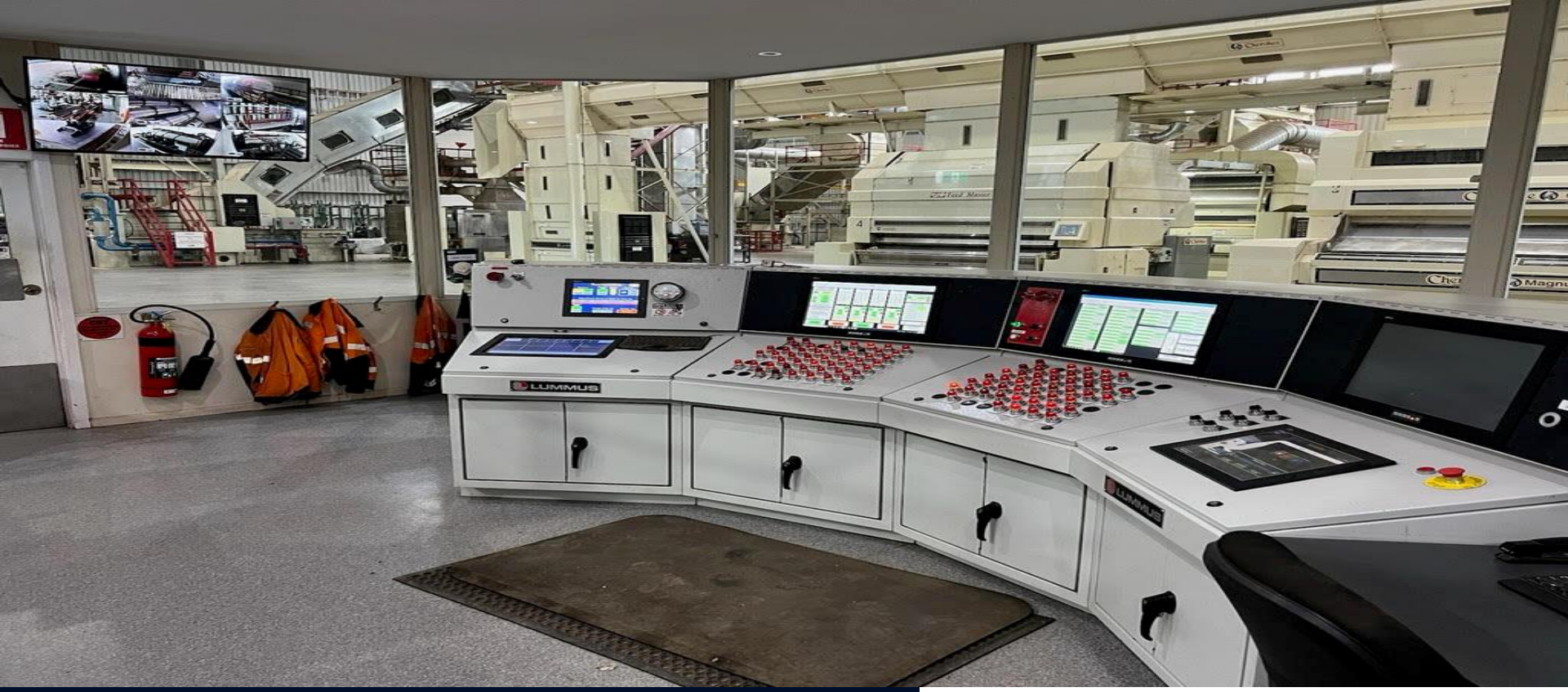
- Each round module presented to the gin is covered with 23 meters of engineered polyethylene film which weighs 3.8 kg. The amount of plastic wrap presented to the gin during a growing season is thus astronomical and very difficult to manage. The first, and most, logical step to address the problem of contamination, is to prevent/avoid or minimize the contamination entering the production process, particularly during growing and harvesting, through the appropriate farm management and associated practices. However, problems infield and during loading and transportation can result in damaged and contaminated modules delivered to the gin.
- Hence contamination detection and removal systems are required as a final step in preventing plastic entering the gin as plastic contamination from module wrap in lint bales is a major concern for the global cotton industry.





5.- Automation & Artificial Intelligence (AI)

- The cotton gins in Australia are amongst the biggest and most productive in the world, producing a bale of cotton every 45 seconds. With this production rate and the variable nature of cotton delivered to the gin comes the requirement of highly, skilled, and trained ginners and the need for gin process controls to provide on-line measurement of important parameters, including moisture and fibre quality but also airflow, motor speeds, quality, power, gas usage etc.
- Due to a shortage of people entering the industry and limited training opportunities process control is becoming more critical with AI seen as an opportunity to make decisions from learning and intelligence to maximize chances of achieving defined goals



Thank you

Marinus (René) van der Sluijs (MSc, MBA, PhD)
Principal Consultant

Textile **T**echnical **S**ervices

t + 61 408 885 211

e renevandersluijs@gmail.com

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TEXTILE TECHNICAL SERVICES