

# 35<sup>th</sup> INTERNATIONAL COTTON CONFERENCE BREMEN 2021



## Presentation

Session: **Cotton Production and Ginning (T3)**

Title: **Lint Cleaner Feed Mechanisms Affect Fiber Length Uniformity Index**

Speaker: **Carlos B. Armijo**, USDA, Mesilla Park, NM, USA

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Conference Organization

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## **Lint Cleaner Feed Mechanisms Affect Fiber Length Uniformity Index**

**Carlos B. Armijo**

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### **ABSTRACT**

The objective of this project is to develop ginning methods that improve fiber length uniformity index to levels that are compatible with the newer and more efficient spinning technologies. Providing the textile industry with a longer and more uniform fiber to manufacture yarns more efficiently would expand market share and increase the demand for cotton products. Previous research showed that most of the decrease in fiber length uniformity occurs at the saw-type lint cleaner feed bar. Based on these results, an experiment was run to determine how conventional and experimental lint cleaning machines affect uniformity. The project includes 1) older conventional saw-type lint cleaners that retain the harmful feed bar (this is the most widely used lint cleaner), 2) newer commercially-available saw-type lint cleaners that alter the configuration of the damaging feed mechanism, and 3) experimental saw and roller gin coupled lint cleaners that eliminate the feed mechanism altogether. What follows are results of how these lint cleaner machines affect uniformity.

# Lint cleaner feed mechanisms affect fiber length uniformity

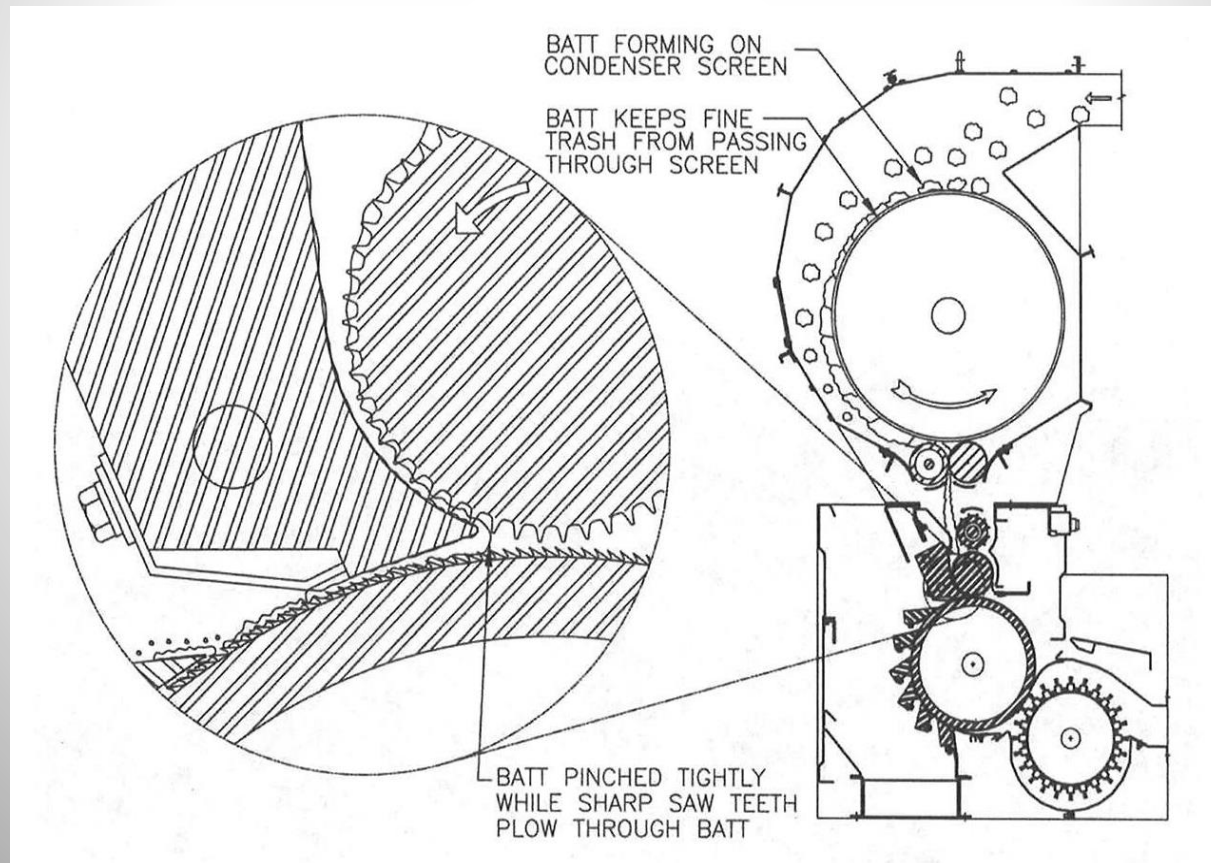
Carlos B. Armijo



# Problem Statement

- **There is a need to develop ginning methods that reduce fiber damage and improve fiber length properties, HVI length uniformity index in particular**
- **Improving uniformity would benefit ring spinners, and it may increase the use of more efficient technologies such as air-jet spinning**

Literature confirmed that the **feed bar** on the saw-type lint cleaner was one of the causes for reduced uniformity



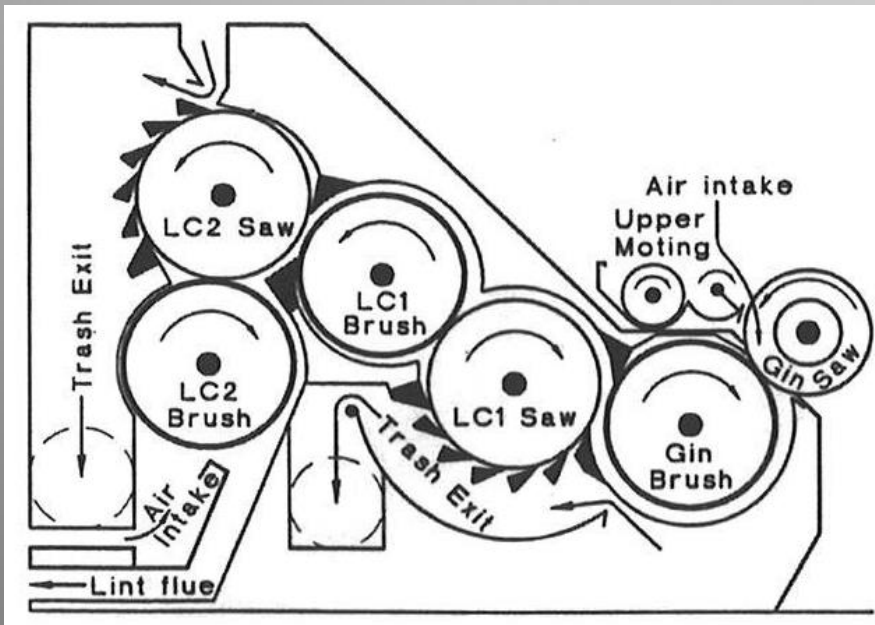
# Objective of Study

**Determine how fiber length uniformity is affected by different lint cleaner feed works technologies:**

- **Saw gin conventional controlled-batt (2 ea)**
- **Roller gin conventional pin-cylinder**
- **Saw gin coupled lint cleaner (experimental)**
- **Roller gin coupled lint cleaner (experimental)**
- **Batt-Less lint cleaner (Lummus Sentinel)**
- **Direct-Feed lint cleaner (Cherokee Regal)**

# Saw Gin Coupled Lint Cleaner

- Developed 30 years ago
- Main objective: eliminate pneumatic transport system to reduce energy costs (35% saving) and particulate emissions
- **Lesser objective was to reduce fiber damage**
- Eliminates condenser batt, feed works, feed plate
- Produces longer fiber, less short fiber



# Roller Gin Coupled Lint Cleaner

- Developed 20 years ago for Pima cotton

- Conventional

bulk system

high loading rates

requires pneumatic transfer

low cost

- Coupled

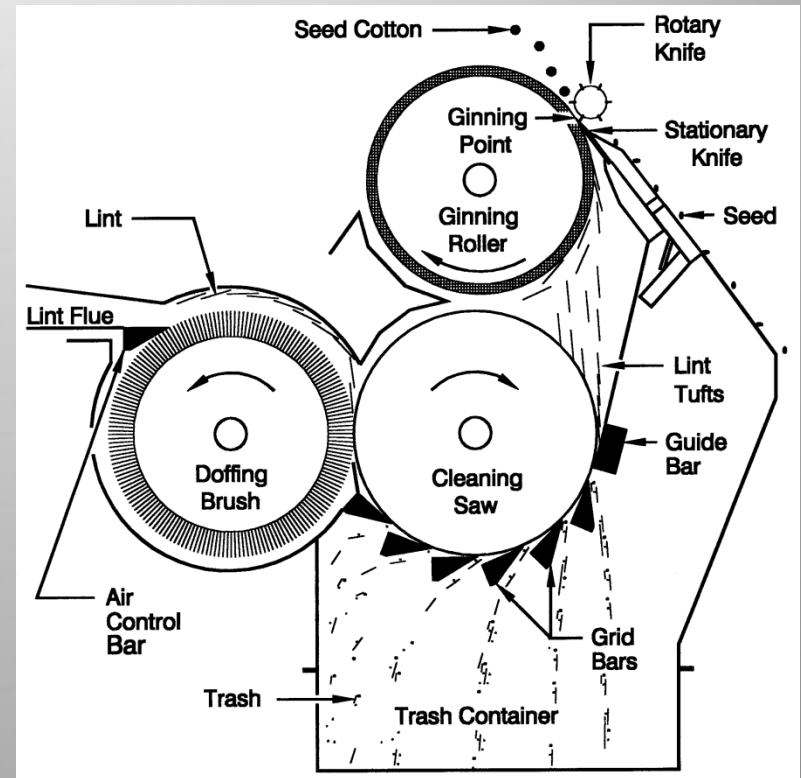
unit system

decreased loading rate

increased cleaning efficiency

eliminates pneumatic transfer

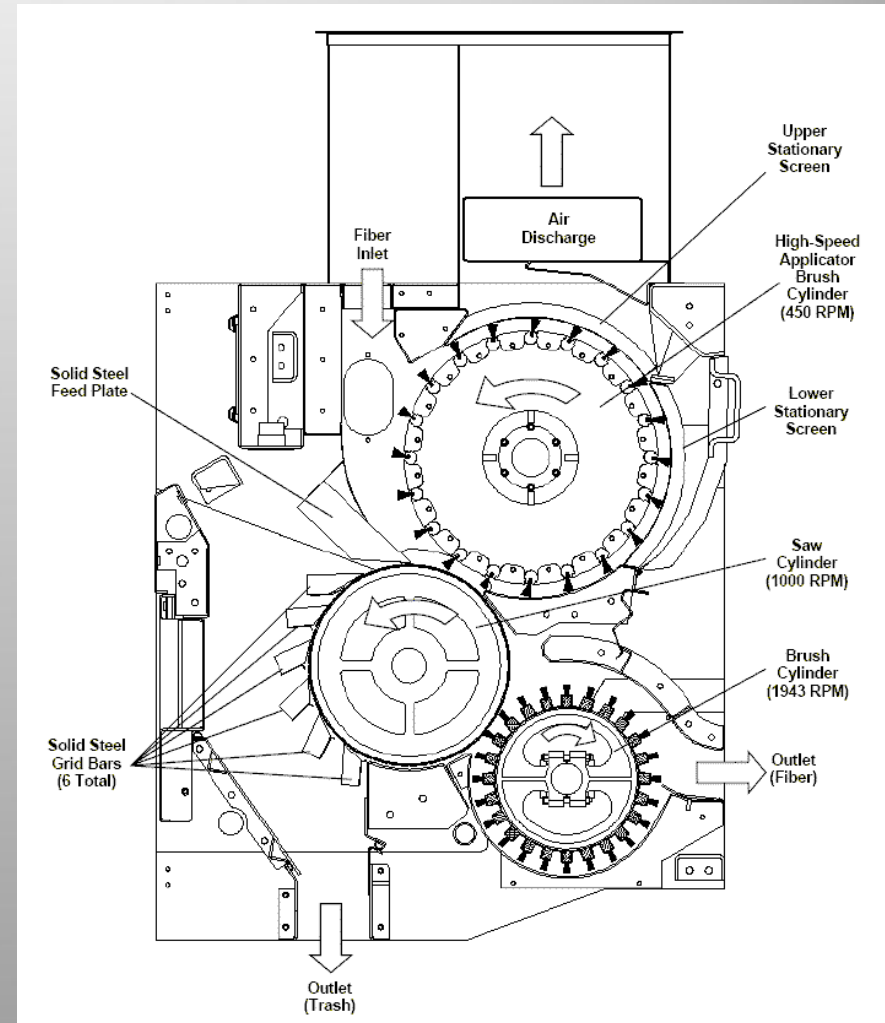
increased cost





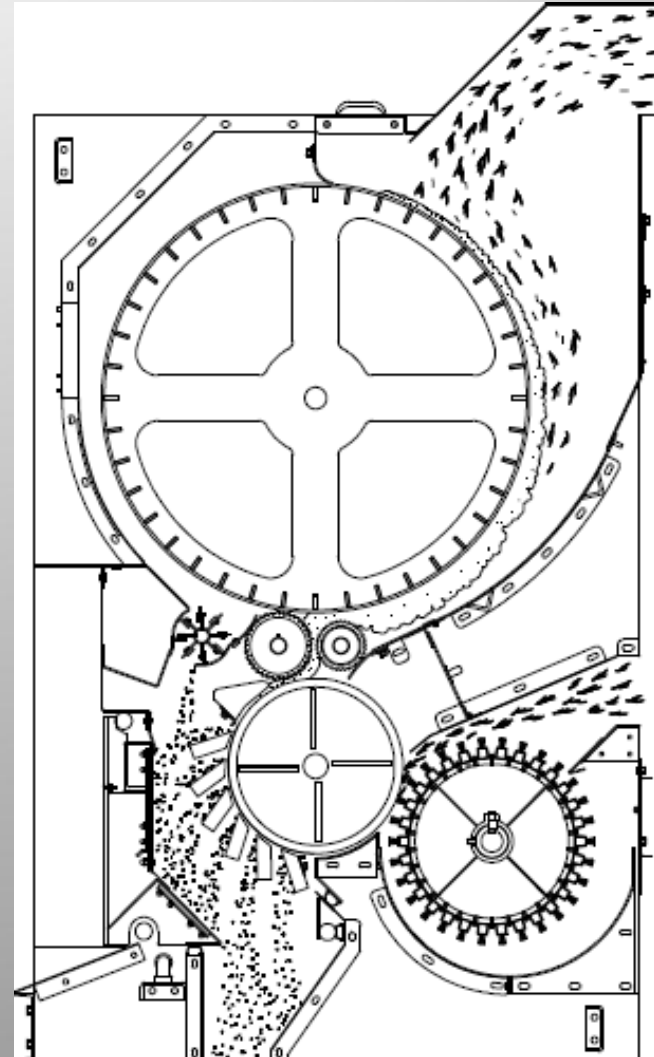
# Lummus Sentinel II Lint Cleaner (Batt-Less type)

- Individual fiber tufts applied directly to the saw, condenser batt eliminated
- Based on the Coupled Lint Cleaner
- Feed works eliminated, feed plate retained
- Improved uniformity in field tests
- No formal test published



# Cherokee Regal Lint Cleaner (Direct-Feed type)

- A rolling feed bar and splined roller removes the batt from the condenser drum
- Batt fed directly onto saw without changing direction
- An applicator bar ensures that the saw holds the lint
- No formal test published



# Formal Gin Test

## 7 Ginning and Lint Cleaning Treatments

- Roller gin + pin-cylinder conventional
- Roller gin + coupled
- Saw gin + controlled-batt conventional
- Saw gin + coupled lint cleaner
- Micro saw gin + controlled-batt conventional
- Micro saw gin + Batt-Less type (Sentinel)
- Micro saw gin + Direct-Feed lint cleaner (Regal)

# Formal Gin Test

## 4 Cultivars

- **Dyna-Gro 3385 B2XF**  
picker harvested, Las Cruces, NM
- **NexGen 4545 B2XF**  
picker harvested, Las Cruces, NM
- **FiberMax 1830 GLT**  
stripper harvested, Lubbock, TX
- **Phytogen 444 WRF**  
picker harvested, Stoneville, MS

# S/C Moisture at Gin Stand

Ginning and Lint Cleaning Treatment	%
Roller + Pin-Cylinder Conventional – NM	5.90
Roller + Coupled – NM	6.07
Saw + Controlled-Batt Conventional – NM	6.05
Saw + Coupled – NM	5.70
Saw + Controlled-Batt Conventional – MS	7.52
Saw + Batt-Less (Sentinel) – MS	7.45
Saw + Direct-Feed (Regal) – GA	7.76

# HVI Color Grade

Ginning and Lint Cleaning Treatment	Grade
Roller + Pin-Cylinder Conventional (NM)	31
Roller + Coupled (NM)	21
Saw + Controlled-Batt Conventional (NM)	21
Saw + Coupled (NM)	21
Saw + Controlled-Batt Conventional (MS)	12
Saw + Batt-Less (Sentinel) (MS)	12
Saw + Direct-Feed (Regal) (GA)	11

# HVI Staple Length

Ginning and Lint Cleaning Treatment	1/32 inch
Roller + Pin-Cylinder Conventional (NM)	40.6
Roller + Coupled (NM)	40.8
Saw + Controlled-Batt Conventional (NM)	39.3
Saw + Coupled (NM)	39.9
Saw + Controlled-Batt Conventional (MS)	39.4
Saw + Batt-Less (Sentinel) (MS)	39.6
Saw + Direct-Feed (Regal) (GA)	39.7

# HVI Micronaire

Ginning and Lint Cleaning Treatment	Reading
Roller + Pin-Cylinder Conventional (NM)	3.94
Roller + Coupled (NM)	3.86
Saw + Controlled-Batt Conventional (NM)	3.76
Saw + Coupled (NM)	3.77
Saw + Controlled-Batt Conventional (MS)	3.73
Saw + Batt-Less (Sentinel) (MS)	3.70
Saw + Direct-Feed (Regal) (GA)	3.97



# HVI Strength

Ginning and Lint Cleaning Treatment	g/tex
Roller + Pin-Cylinder Conventional (NM)	31.6
Roller + Coupled (NM)	31.0
Saw + Controlled-Batt Conventional (NM)	32.9
Saw + Coupled (NM)	32.4
Saw + Controlled-Batt Conventional (MS)	31.6
Saw + Batt-Less (Sentinel) (MS)	32.0
Saw + Direct-Feed (Regal) (GA)	32.3

# HVI Leaf Grade

Ginning and Lint Cleaning Treatment	Grade
Roller + Pin-Cylinder Conventional (NM)	3.17
Roller + Coupled (NM)	2.88
Saw + Controlled-Batt Conventional (NM)	2.25
Saw + Coupled (NM)	1.79
Saw + Controlled-Batt Conventional (MS)	2.67
Saw + Batt-Less (Sentinel) (MS)	2.83
Saw + Direct-Feed (Regal) (GA)	2.50

# AFIS Visible Foreign Matter

Ginning and Lint Cleaning Treatment	%
Roller + Pin-Cylinder Conventional (NM)	2.09
Roller + Coupled (NM)	1.83
Saw + Controlled-Batt Conventional (NM)	1.15
Saw + Coupled (NM)	0.88
Saw + Controlled-Batt Conventional (MS)	1.32
Saw + Batt-Less (Sentinel) (MS)	1.40
Saw + Direct-Feed (Regal) (GA)	1.57

# AFIS Nep Count

Ginning and Lint Cleaning Treatment	Per gram
Roller + Pin-Cylinder Conventional (NM)	246
Roller + Coupled (NM)	228
Saw + Controlled-Batt Conventional (NM)	379
Saw + Coupled (NM)	334
Saw + Controlled-Batt Conventional (MS)	285
Saw + Batt-Less (Sentinel) (MS)	272
Saw + Direct-Feed (Regal) (GA)	314

# AFIS Seed Coat Nep Count

Ginning and Lint Cleaning Treatment	Cnt/g
Roller + Pin-Cylinder Conventional (NM)	49.4
Roller + Coupled (NM)	37.9
Saw + Controlled-Batt Conventional (NM)	27.6
Saw + Coupled (NM)	26.0
Saw + Controlled-Batt Conventional (MS)	18.8
Saw + Batt-Less (Sentinel) (MS)	19.5
Saw + Direct-Feed (Regal) (GA)	27.1

# AFIS Short Fiber (by wt.)

Ginning and Lint Cleaning Treatment	%
Roller + Pin-Cylinder Conventional (NM)	9.54
Roller + Coupled (NM)	9.85
Saw + Controlled-Batt Conventional (NM)	12.6
Saw + Coupled (NM)	10.7
Saw + Controlled-Batt Conventional (MS)	8.91
Saw + Batt-Less (Sentinel) (MS)	8.68
Saw + Direct-Feed (Regal) (GA)	8.85

# HVI Length Uniformity Index

Ginning and Lint Cleaning Treatment	%
Roller + Pin-Cylinder Conventional (NM)	84.5
Roller + Coupled (NM)	84.8
Saw + Controlled-Batt Conventional (NM)	82.5
Saw + Coupled (NM)	83.4
Saw + Controlled-Batt Conventional (MS)	83.1
Saw + Batt-Less (Sentinel) (MS)	83.2
Saw + Direct-Feed (Regal) (GA)	85.1

# Future Work

- **Rerun the test with better treatment control**
  - **New direct-feed lint cleaner (Regal) will be installed at Stoneville Gin Lab**
  - **Saw gin coupled lint cleaner will be modified for better sampling locations**
  - **Samples will also be taken before lint cleaning**
- **Possibly use high-speed video to further our understanding of the lint cleaners**



# Acknowledgment

**Cotton Incorporated**



*The End*