



USDA-ARS Gin Lab Update

Derek Whitelock

USDA-ARS Southwestern Cotton Ginning Research Laboratory, Las Cruces, NM

2021 Annual Meeting of the California Cotton Ginners and Growers Association

Tulare, CA & Virtual - 12 May 2021

USDA-ARS Labs Status

- Maximum telework status
- 25% normal capacity at facilities
- Time Sensitive Operations/Research
- No Travel



USDA-ARS Gin Labs



Southwestern Cotton Ginning Research Lab
Las Cruces, NM

Cotton Ginning Research Unit
Stoneville, MS



Cotton Production and Processing Unit
Lubbock, TX

Cotton Structure and Quality Research
New Orleans, LA



Collaborative Research VIPR™ Commercial Installations and Testing



Southeastern Gin, GA



Colored Material Removed
in 2020 at SE Gin



Spade COOP Gin, TX



Cotton Production and Processing Research Unit Lubbock, TX



- Greg Holt – Research Leader
- Mathew Pelletier
- John Wanjura

Next Generation Module Feeder Camera



Next Generation Module Feeder Camera



Live Camera Feed

Still Camera Feed

Automated image capture upon feeder bed pause

RFID Feeder Bridge to Track Potential Plastic Contamination Events



RFID Scanning Tower and Cameras to Record Unloading/Unwrapping Process

RFID Feeder Bridge to Track Potential Plastic Contamination Events

RFID scanning log shows date and time for each module processed

Camera captures unloading & unwrapping events that may cause contamination

Module feeder inspection system captures images of plastic caught on module feeder cylinders



Harvester Comparison: CP690 vs 9996

9996

Pro-16 row units - Basket type harvester



CP690

Pro-16 row - Round module builder



- Investigate fiber quality and foreign matter content differences
 - “Global” Harvesting System Differences - overall
 - Effects of sub-systems difference: Ground/spindle speeds, Pneumatic conveying systems, Module types
- Minimal differences between pickers on a global scale
- Analysis is underway looking at foreign matter differences and investigate sub-system effects

Other Projects

Single Node Inspection Systems

- “I don’t know if I have a problem, I don’t think we do...”
- Low-Cost Plastic Contamination Survey System
 - Survey depth of contamination problem
- Deploy to select commercial gins to help raise awareness



Module Wrap Performance Standard - Development

- Tama Group RMW patents expiring soon (2022 & 2023)
- Concern about marketing/use of poor performing wrap when patents expire
- Specify minimum material strength and performance levels for new wrap entering market
 - Laboratory testing, Extended field testing, Wrap color
- Goal – Complete for use use in fall 2021 ginning season



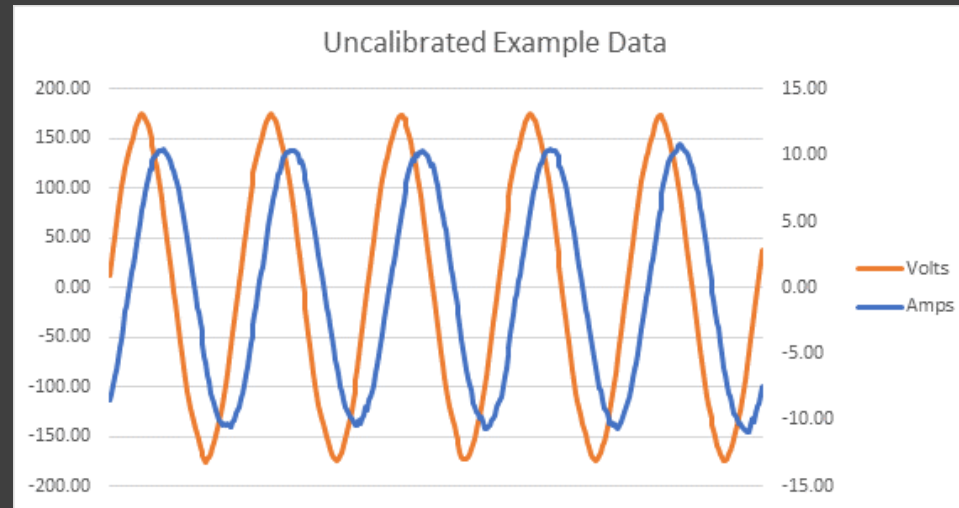
Cotton Ginning Research Unit Stoneville, MS



Three new researchers added to the Gin Lab staff in 2020.

- Joe Thomas as new Research Leader
- Cody Blake
- Sean Donohoe

Saw Gin Stand Energy Consumption

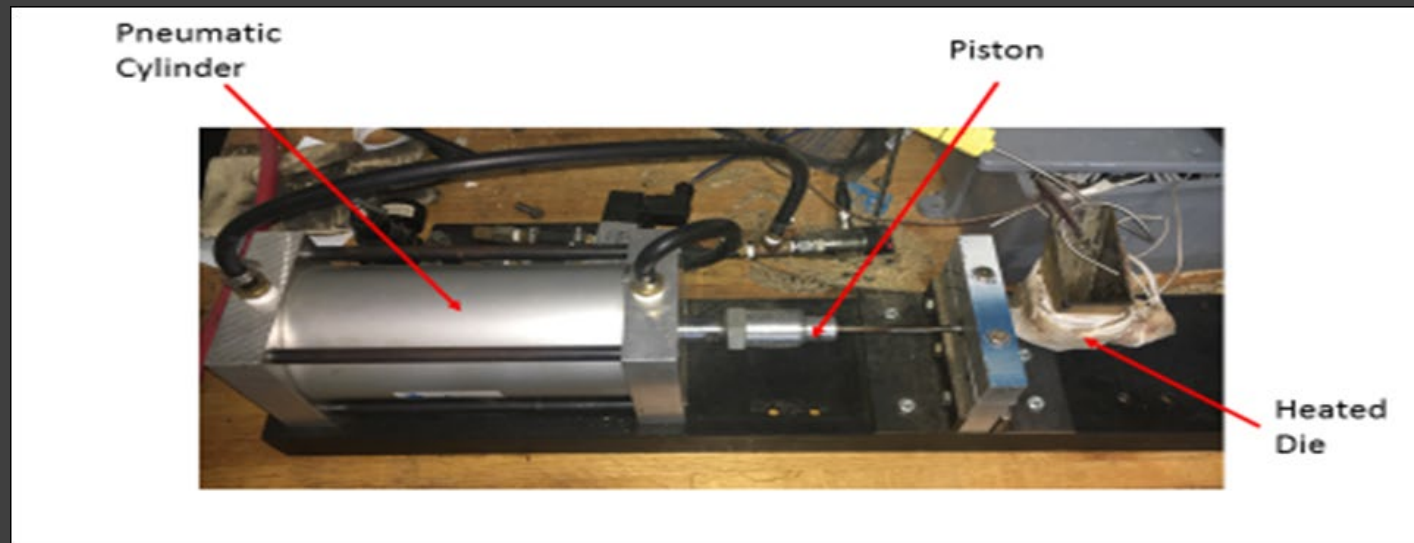


- Tool for cottonseed breeders during trait selection
- Funded by Cotton Incorporated



Gin Waste Bioproducts

- Feasibility study for methodology of uses and market potential
 - Use at the Gin for energy or sell to production facilities
- Single pelletizing pneumatic device
 - GWB as an additive or whole pellet physical properties
 - Energy consumption for production



UAV Field Contamination Detection



- Building annotated drone imagery database for AI study of field contamination
- Several classes
 - Bags
 - Bottles
 - General trash
 - Other
- Multispectral Imaging
- Funded by Cotton Inc.

Annotation Tool Example

Type: bag

Next Image

Previous Image

Delete Selected

Boxes: 1

Pixels

Stats: {'small': 0, 'medium': 0, 'large': 1}

Images: 288

Current Image: 38

Folder: ./images/tr/subdivide

0 200 400 600 800 1000

0 250 500 750 1000 1250 1500 1750



High-Speed Roller Ginning Mid-South Cottons

- Optimize the High-Speed Roller Gin for Mid-South Upland cultivars
- Match saw gin stands in both meter-width capacity (bales per hour) and cost of operation
- Develop new roller packing materials to improve production and extend maintenance life



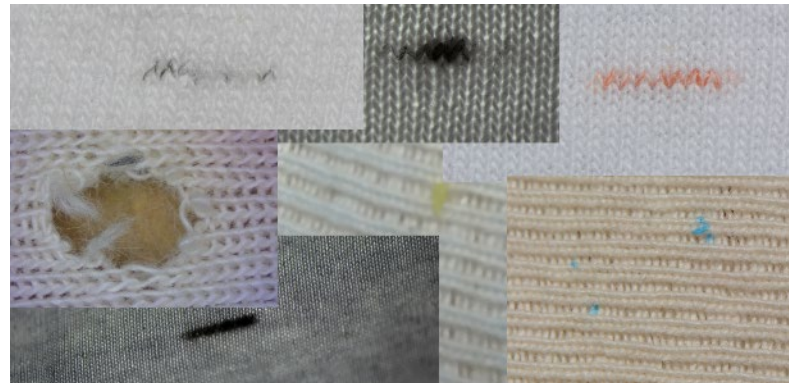
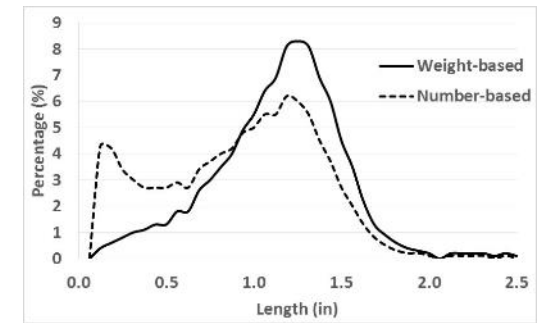
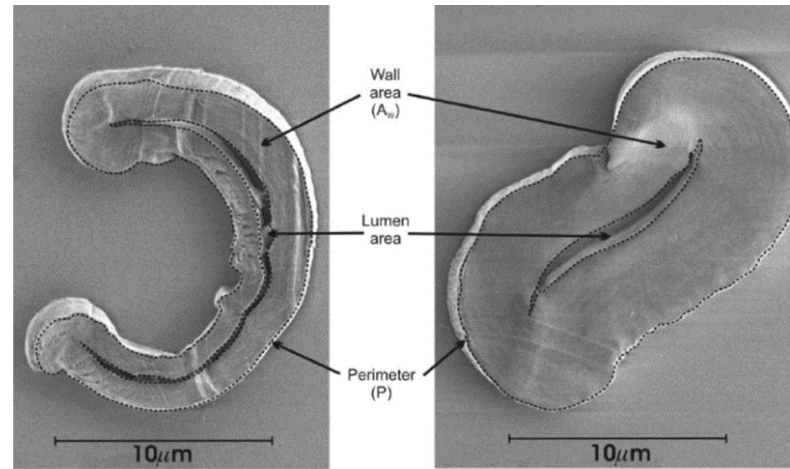
Cotton Structure & Quality Research Unit New Orleans, LA



- Chris Delhom

Current research....

- Develop real-time on-bale and seed-cotton fiber quality measurements to provide feedback to ginner and warehouses
- Contamination removal
- Fiber property measurement
- Reduce energy consumption
- Micro-fiber generation





“Lenny”

- Bale color, leaf, micronaire measurement
- CNC controlled 2-axis linear actuators
- Real-time information to ginners
- Information for bales arriving at warehouses



Improved warehouse organization
Reduce bale movements
Save energy - Reduce damage - Improve safety

Southwestern Cotton Ginning Research Laboratory Las Cruces, NM

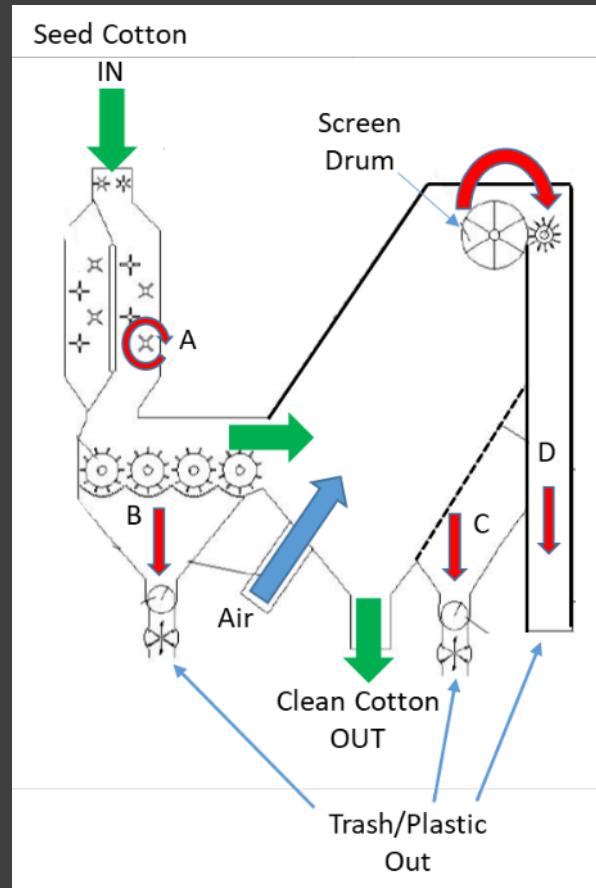


- Derek Whitelock – Research Leader
- Carlos Armijo
- Paul Funk

Goldenlion Contamination Cleaner



Handan Goldenlion Cotton Machinery Co.



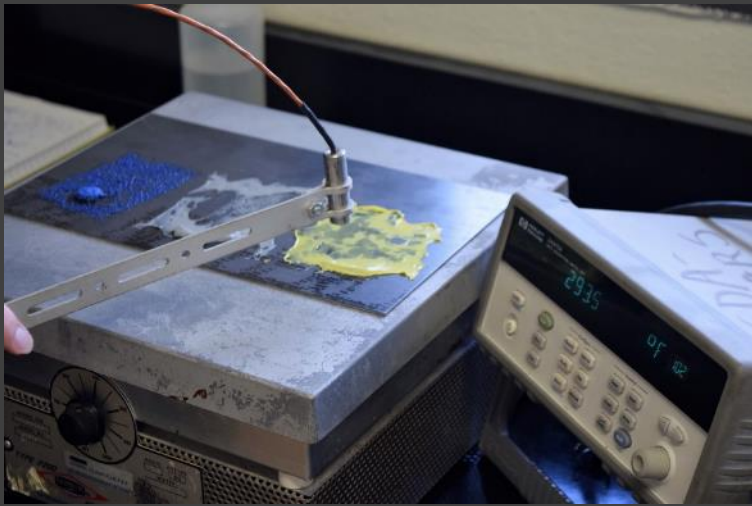
Full Fan Speed (17863 cfm)

Goldenlion Contamination Cleaner

- Goldenlion was more effective than conventional seed cotton cleaners
- Light weight RMW and shopping bags captured within the range of the manufacturer's claims
- Thicker, stiffer RMW was not effectively removed
- Investigating ways to improve performance



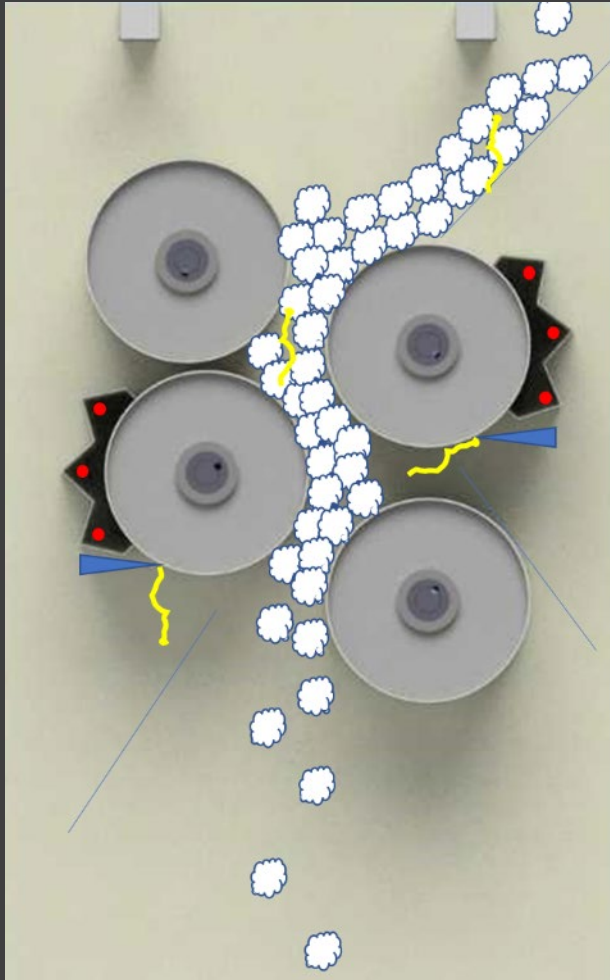
Passive Thermal Plastic Removal



At about 100° C (200° F)
Plastic melts & sticks
Cotton is unharmed



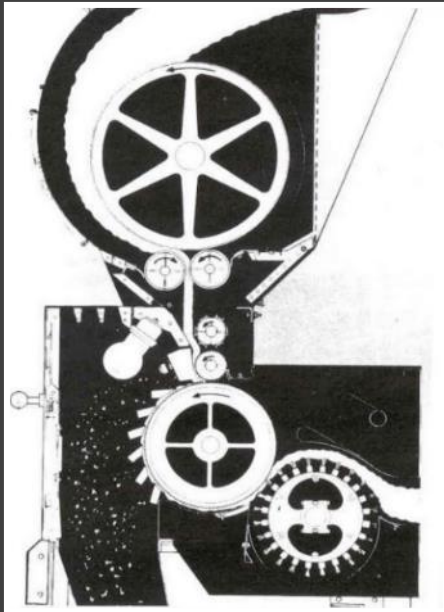
Passive Thermal Plastic Removal



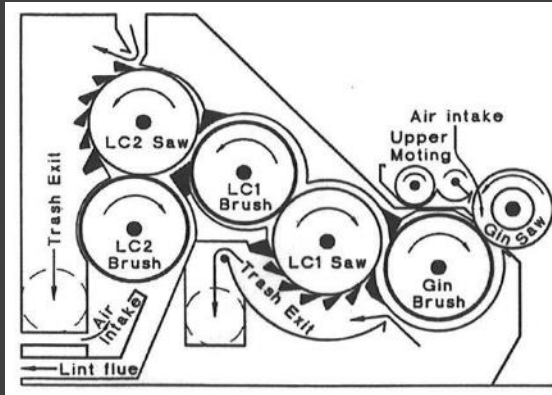
Concept



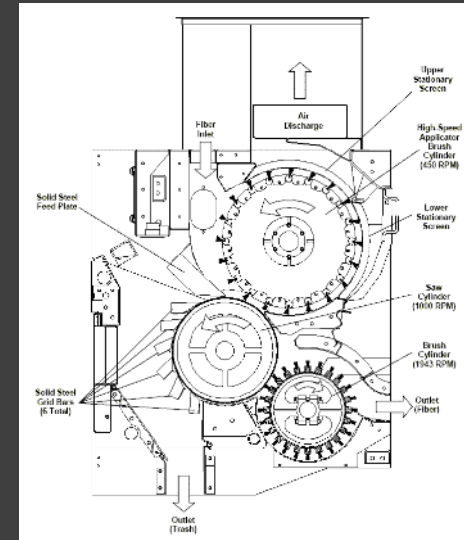
Improving Fiber Length Uniformity



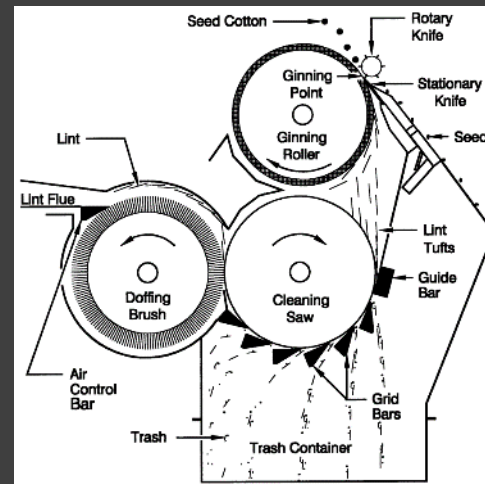
Controlled-batt lint cleaner



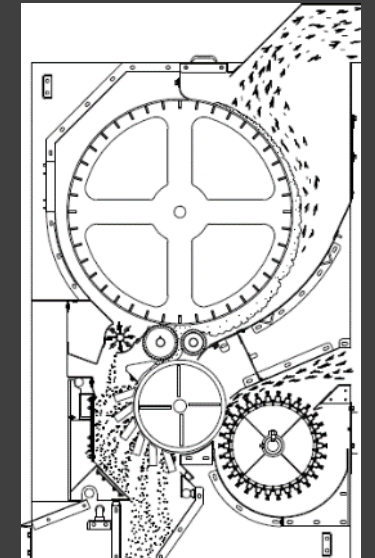
Saw gin coupled lint cleaner



Lummus Sentinel



Roller gin coupled lint cleaner



Cherokee Regal

Five different lint cleaner technologies
Las Cruces, Stoneville, & Georgia

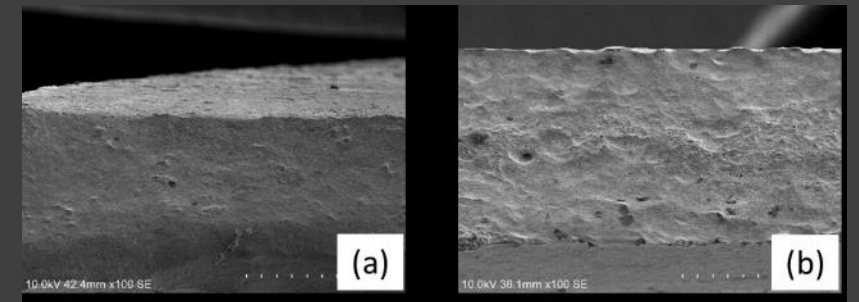
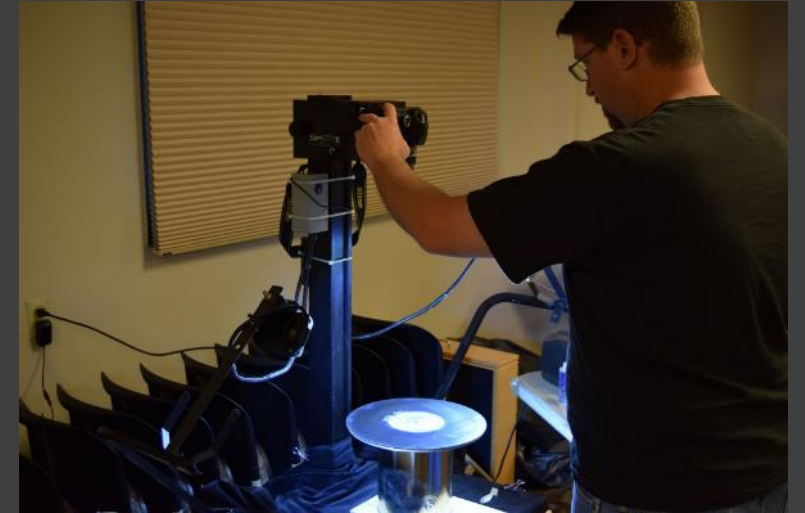
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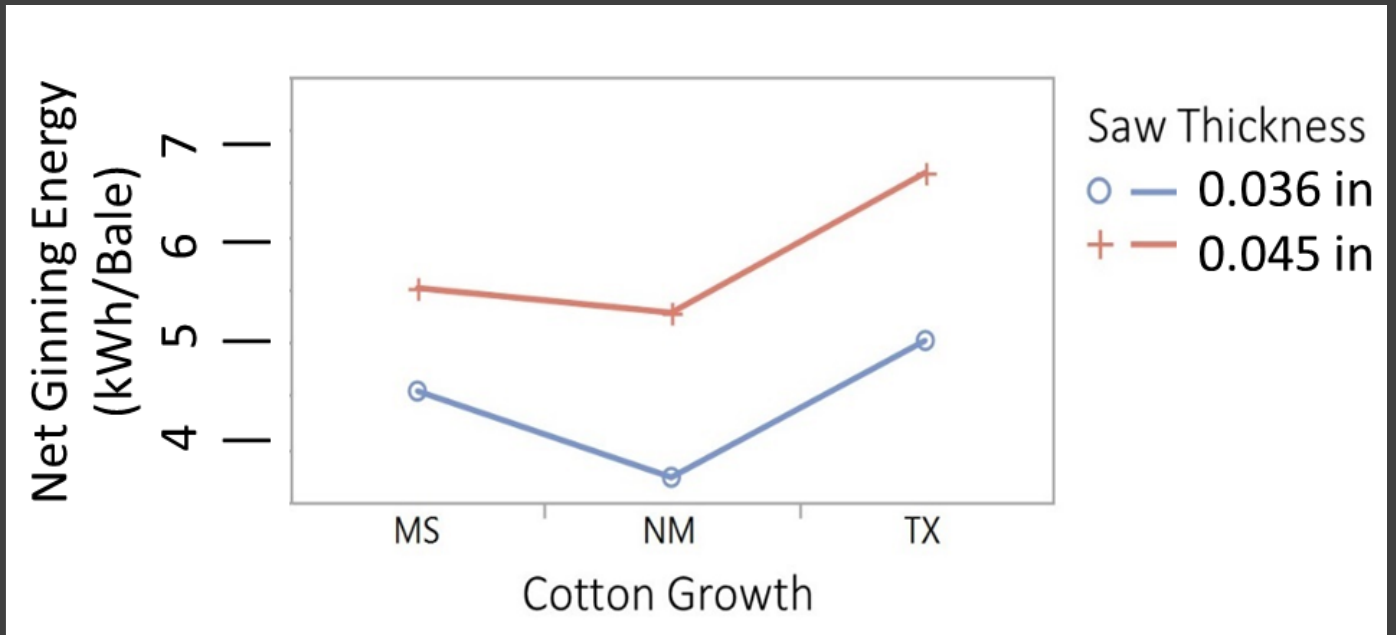
Cryogenic Gin Saw Treatment

- Las Cruces & Lubbock Gin Labs, Lummus Corporation, New Mexico State University
- Deep Cryogenic Treatment to improve their wear
- Measuring saw wear
 - 3,000 gin saws – 8 saw mandrels
 - Weight, Thickness, Broken teeth & Tooth area
- 2019 Season – 1st replication
- 2020 Season – 2nd replication
- **2021 Season - TBD**

- NMSU
 - Treated saw properties
 - Electron Microscope - Electrical Conductivity



Saw Thickness vs Net Ginning Energy



High-Capacity Roller Gin Reclaimer

- Capacity to match high speed roller ginning
- Collaboration with Lummus Corporation
- Testing 2 prototypes
- Conventional
 - Small amount of seed loss
 - Very large lint loss
- Experimental
 - Higher cylinder speed = more lint loss
 - Lower cylinder speed = more seed loss
- 700 Feeder - best overall performance

Further Testing

- **Series Reclaimers**
- Commercial gin



Conventional



Modified 3-Saw



700 Feeder

Economic Analysis of High-Speed Roller Ginning

Cost comparison among saw ginning and conventional & high-speed roller ginning

- Ag Economics at **New Mexico State University**
- 63 data points from 2013 to 2020
 - Audit reports
 - High-speed data limited
- More data needed for full comparison
 - Survey



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Other Projects

- Comparison of Full- and Model-sized Saw and Roller Gin Stands



- Sticky Cotton Investigations
 - Seed Cotton
 - Stickiness measurements
 - Spray bacterial culture
 - Detection before ginning





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