Design, Fabrication and Testing of an Automated Mechanical Chile Destemmer

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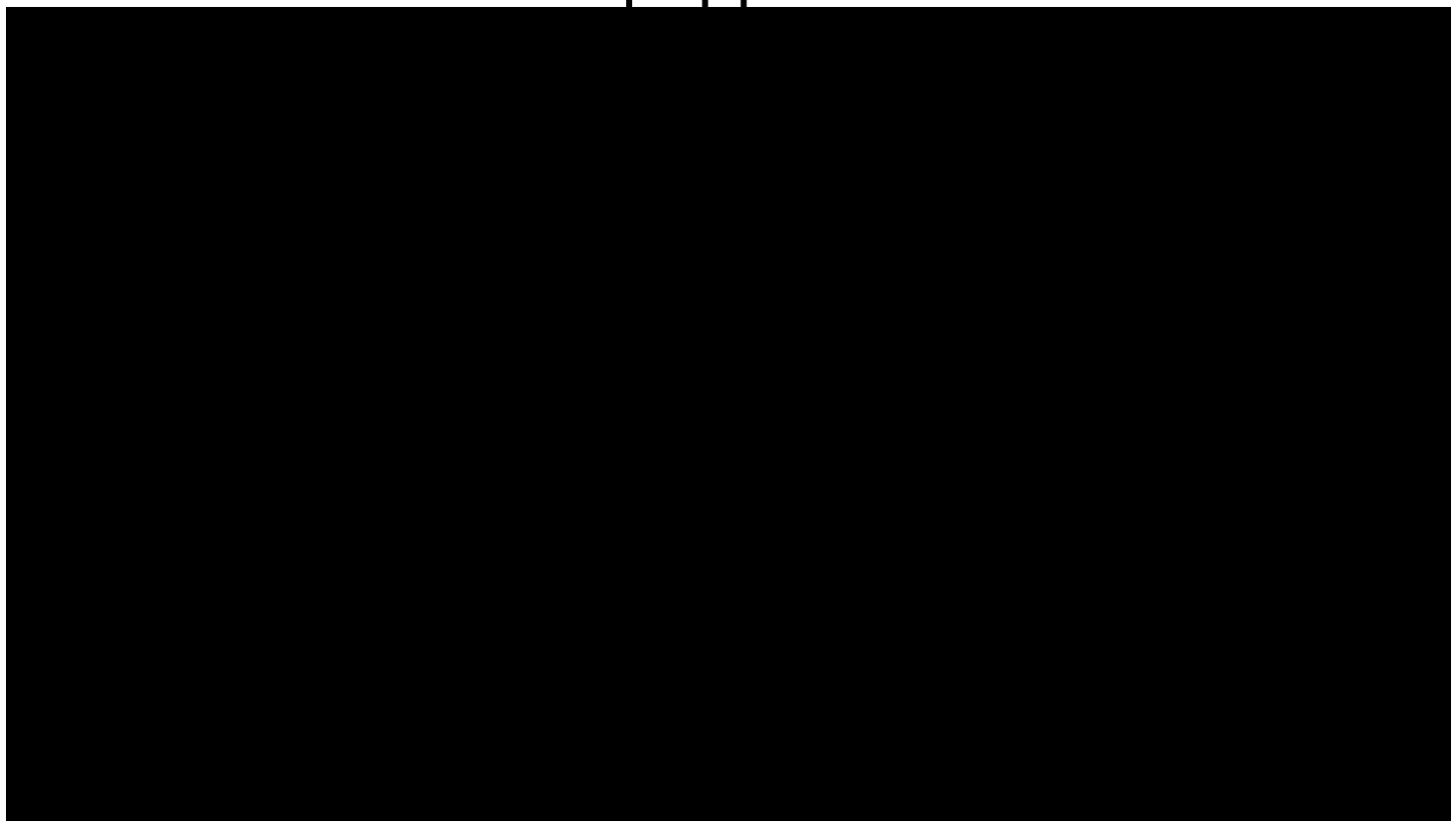
Mechanical Destemmer

Questions:

- What?
- Why?
- How?
- What is the current status?
- Where is it going?

What is a Mechanical Destemmer

A mechanical device that separates the stem from the pod of a fresh pepper



Why a Mechanical Destemmer

Current Harvesting Practice:

- Hand picked
- Stem left behind on the plant
- Transported to a cannery the same day
- Processed and canned within 24 hours

Why a Mechanical Destemmer

Issues Facing the Industry:

Example: New Mexico Chile Industry 1995 – current

Acreage: 40,000 to 10,000

Shortage of farm workers

Increasing competition from foreign markets

Drastic reduction in Jalapeno acreage

Similar issues in AZ and CA

Why a Mechanical Destemmer

Answer to the Problem:

Transition from manual harvest to mechanical harvest

Two Components to Achieve Transition:

a) Mechanical Harvester

b) Mechanical Destemmer

How to Destem Mechanically?

Cut or Snap the Stem?

Two methodologies:

a) Imaging followed by a cut (blade or water)

- expensive, data intensive

b) Completely mechanical

- less expensive, easier maintenance

Key Factors in Mechanical Approach

1. Feeder
2. Singulation
3. Pepper Orientation
4. Stem Alignment
5. Stem Detachment

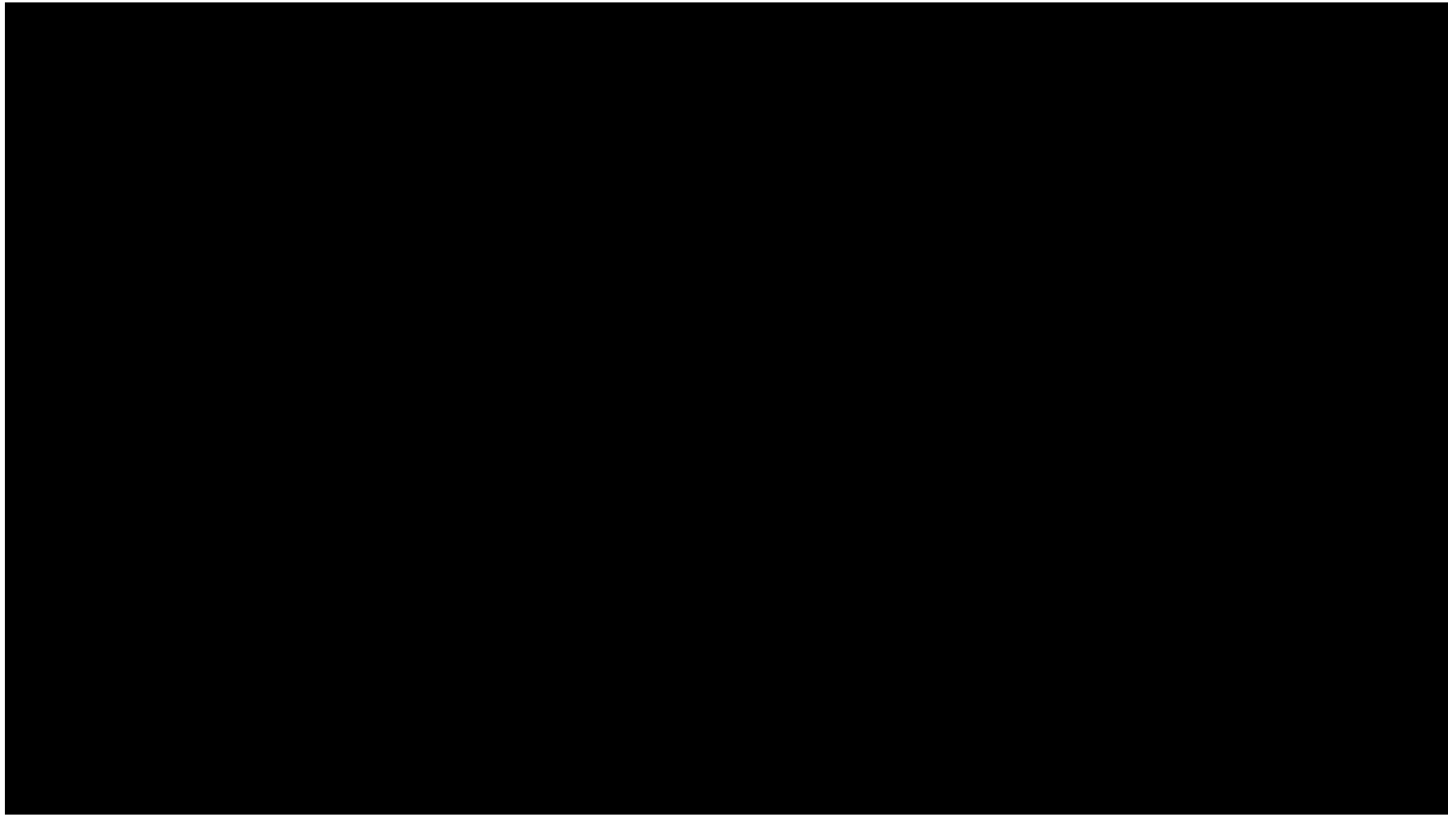
Step 5 is the most important factor

Stem Detachment

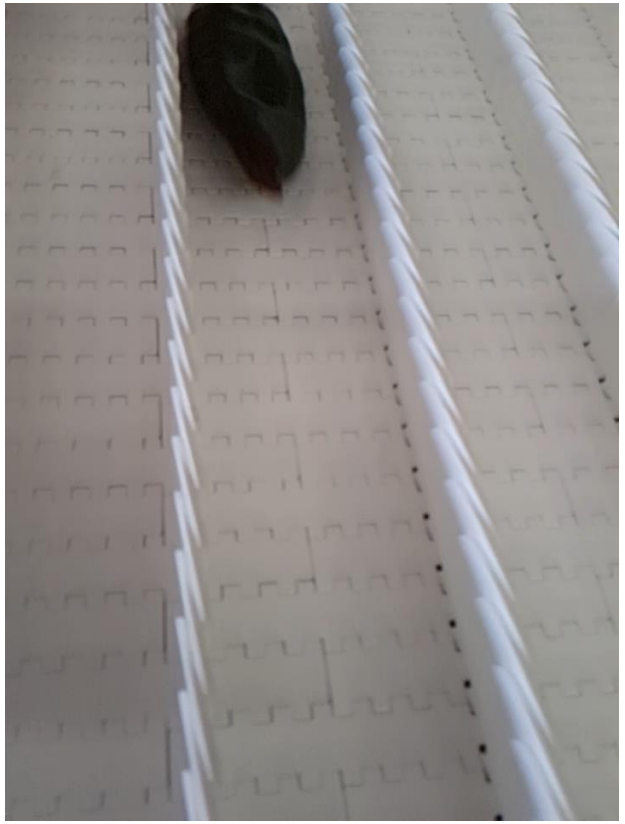
Stem Detachment

Stem Detachment

Pepper Orientation



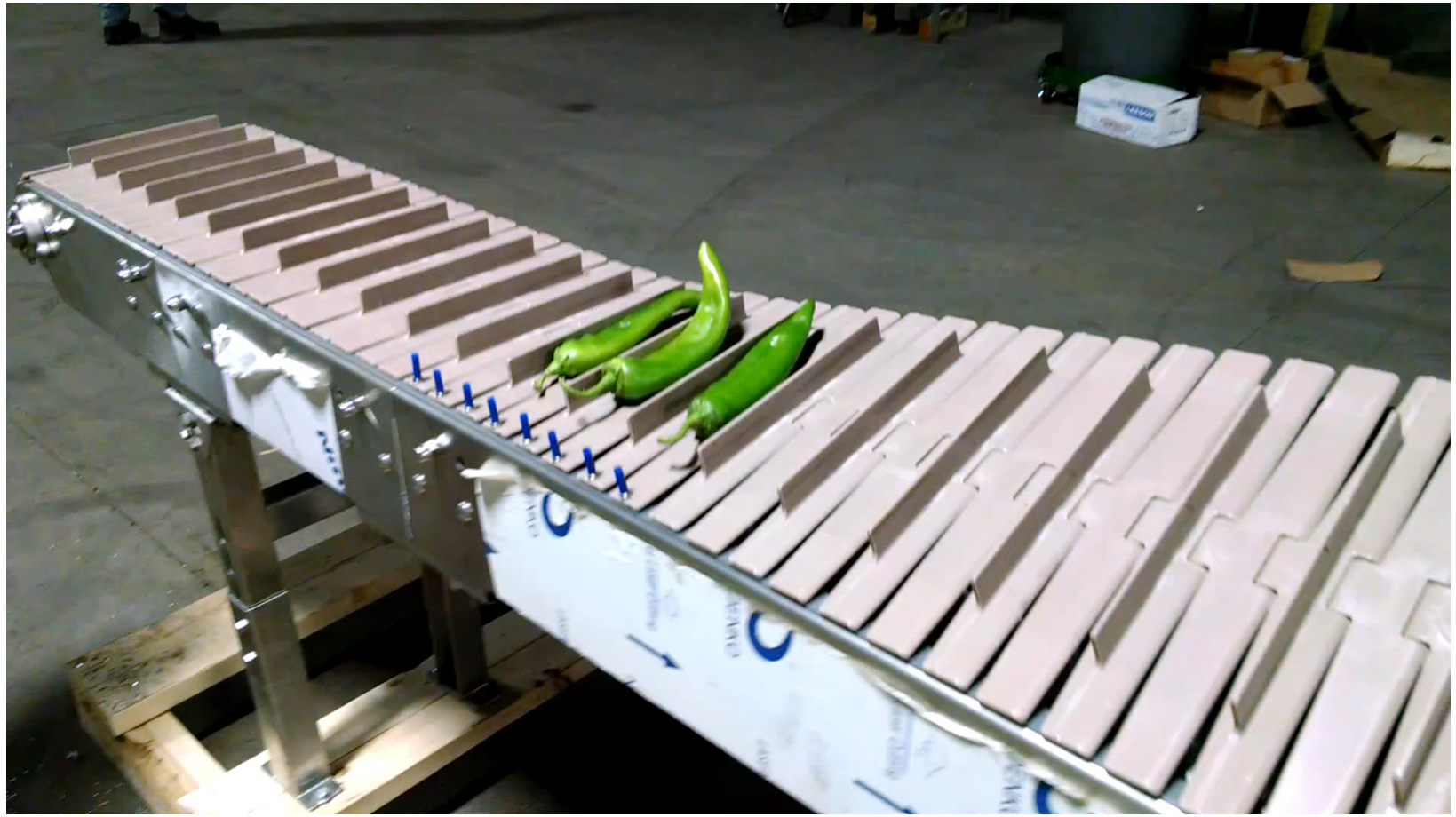
Orientation Capture & Pepper Transfer



Twisted Conveyor

Destemmer Assembly

Pepper Self-alignment



Complete Destemming Process

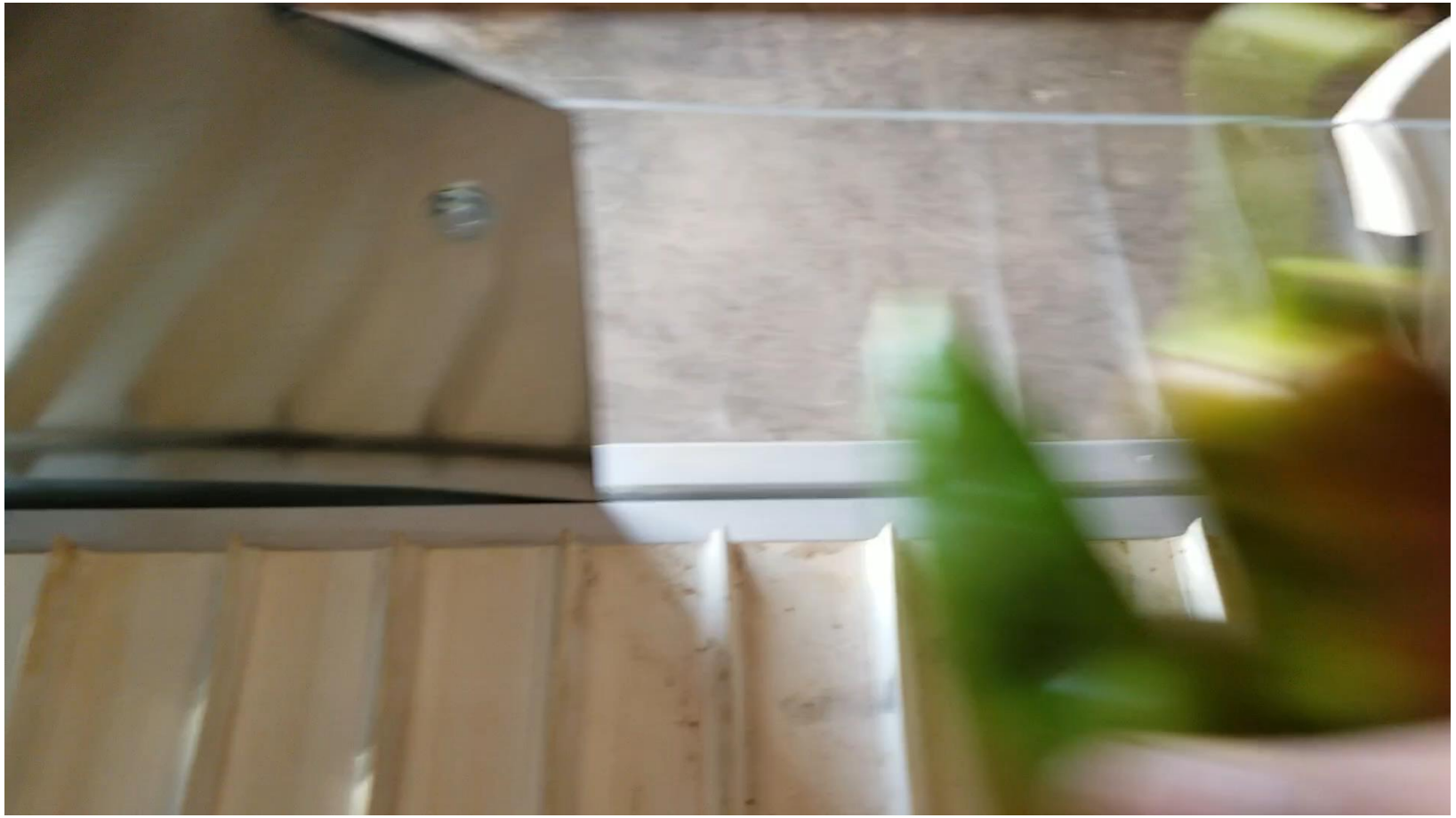
Destem with Pin Conveyor

Idea - Double Twisting Conveyor

Double Twisting Conveyor

Pepper Coaster in Action

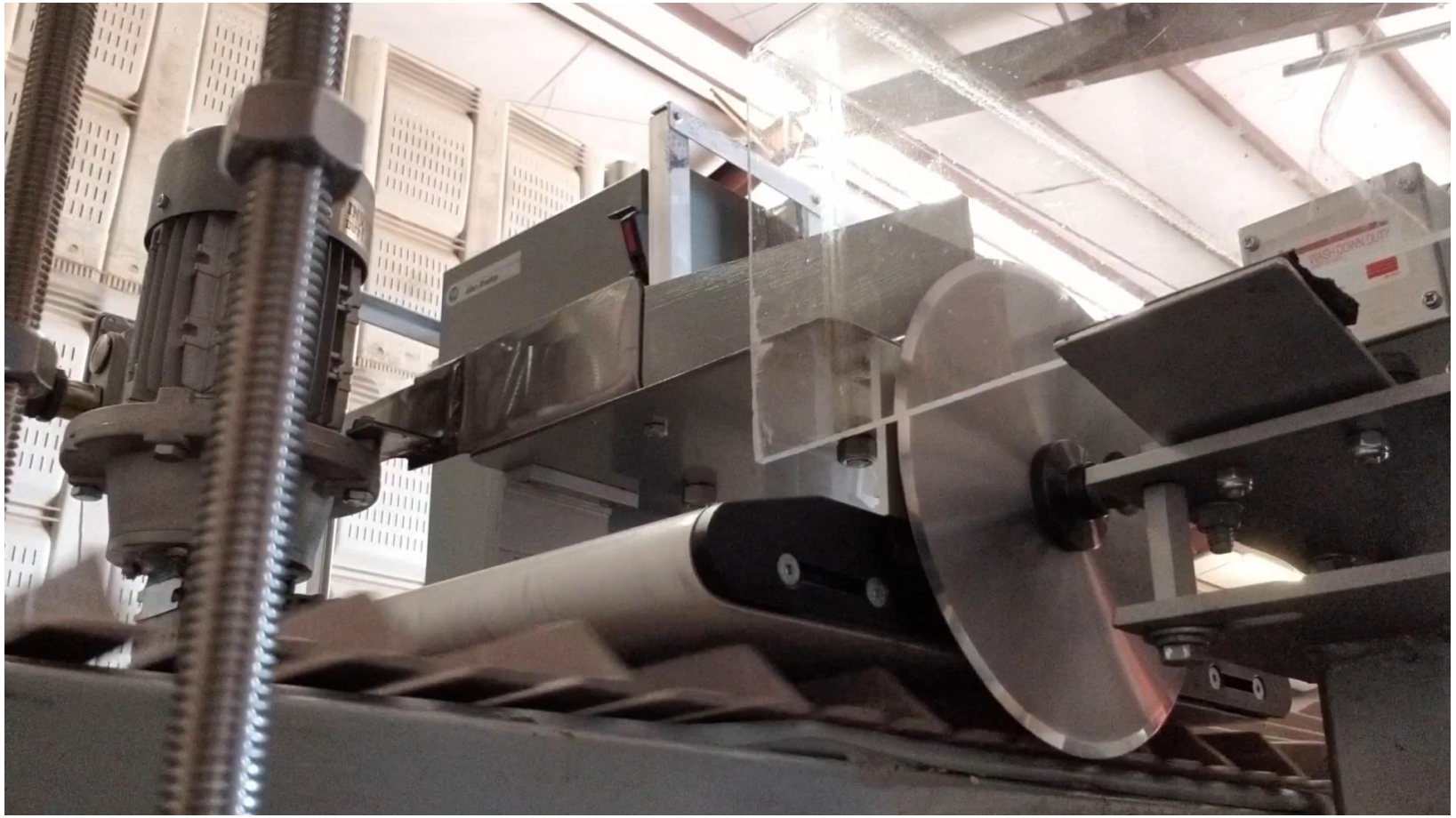
Pepper Coaster in Action



Jalapeno Destem

Stem Cut 1

Stem Cut 2



Performance

Throughput

- About 3000 lb per hour @ full speed (estimate)

Efficiency

> 90% for Jalapenos for stem pull

> 95% for Stem cut

Stem: Cut vs Pull

Stem pull: Whole pods

Stem Cut: Higher efficiency

Mechanical harvesting is likely to cause some damage to the structural integrity of the pods and stems

Cut may be a better option for mechanically harvested chile and jalapenos

New Chile Varieties

Conclusions

Mechanical pepper destemmer designed and fabricated

Pepper orientation issue resolved

Self-alignment of stems

Precise positioning of calyx and stem detachment

Feeder under fabrication

Acknowledgements

New Mexico Chile Association

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New Mexico Chile Commission

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Mr. Marvin Clary

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Destemming Approach

Pros:

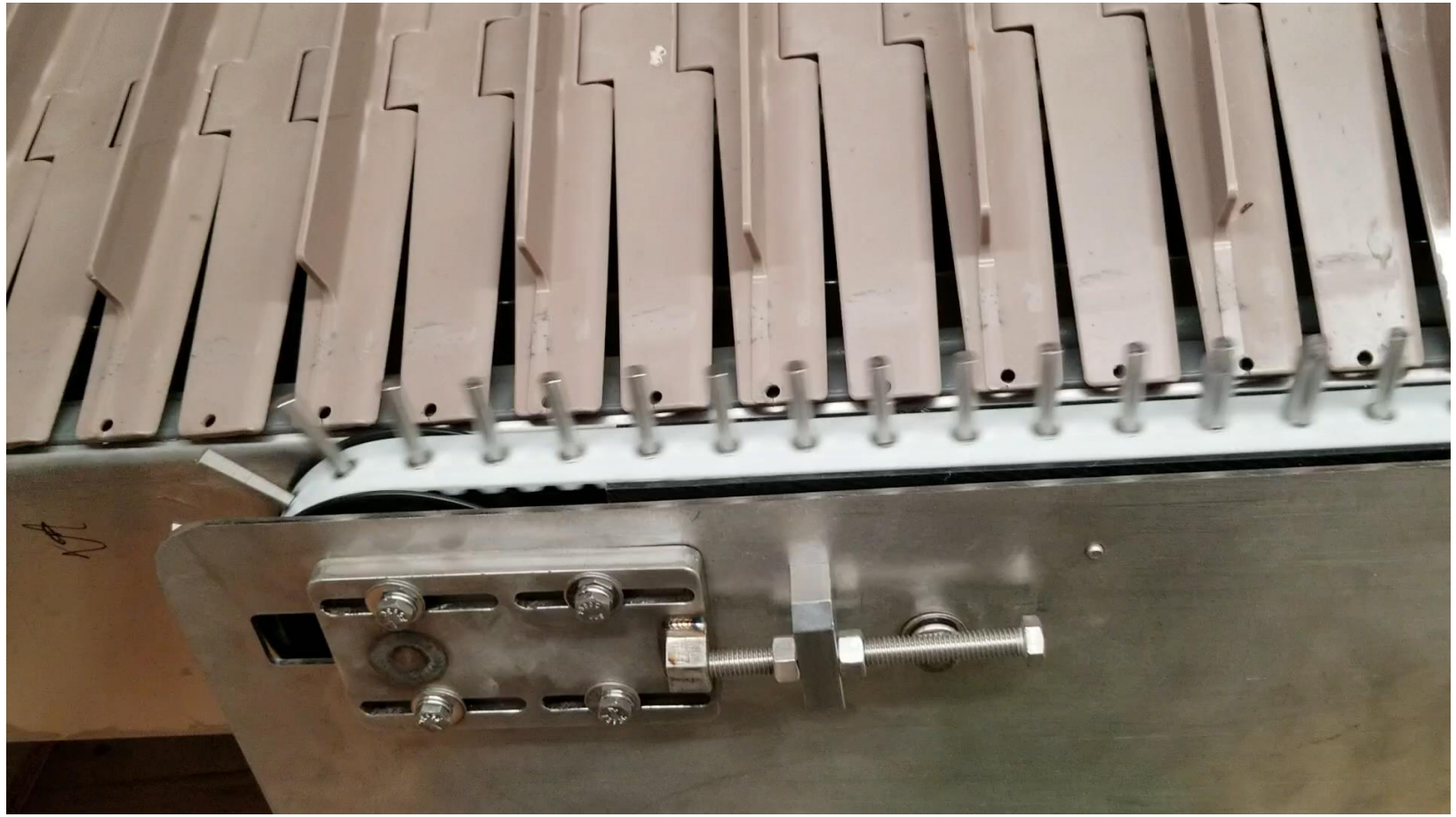
- Mechanical Stem Detachment
- Integrity of the Pod Preserved
- No Data Processing Equipment
- Simplicity

Cons:

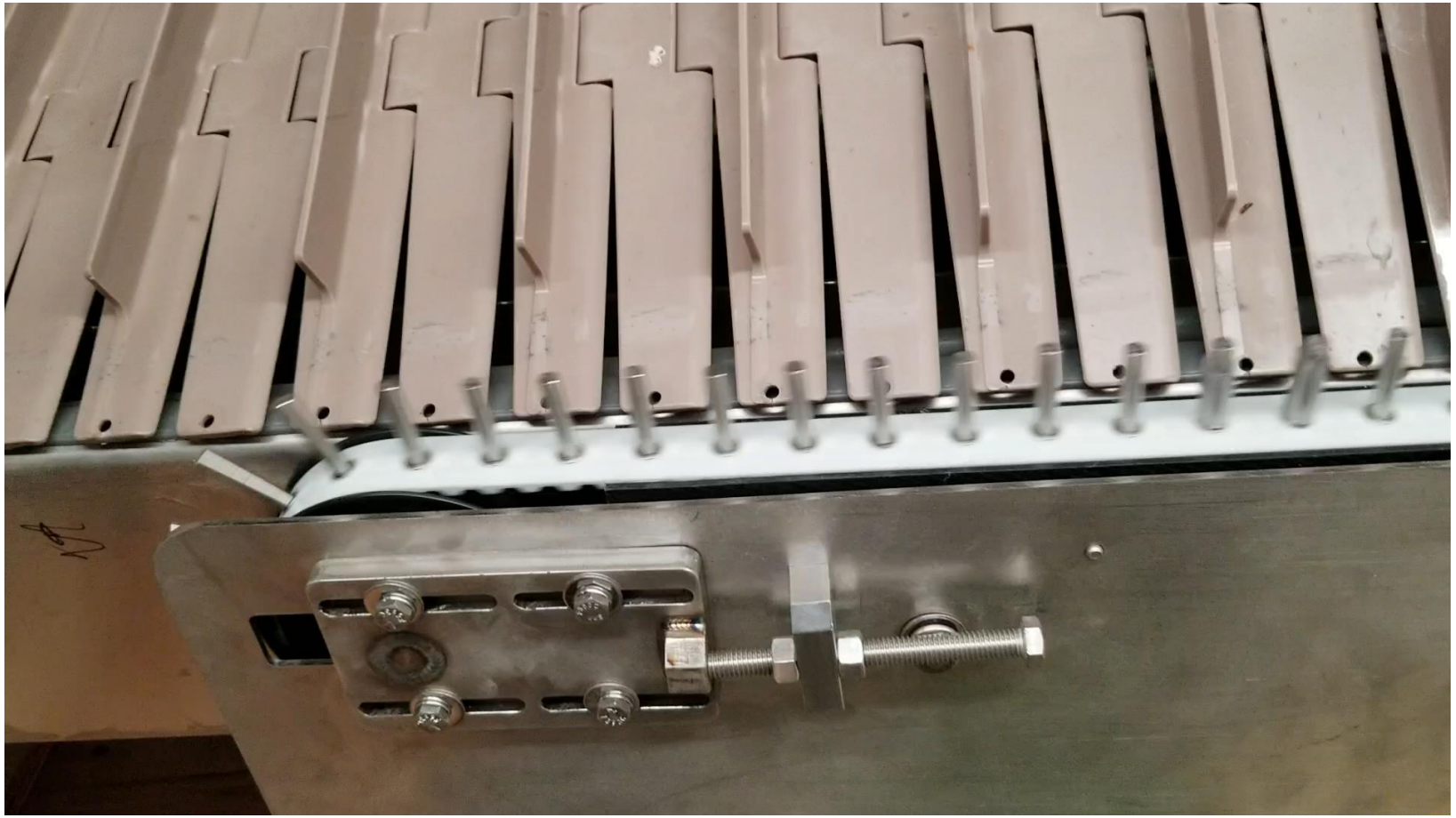
- Slow Orientation
- Less Throughput

Destemmer-Pin Conveyor

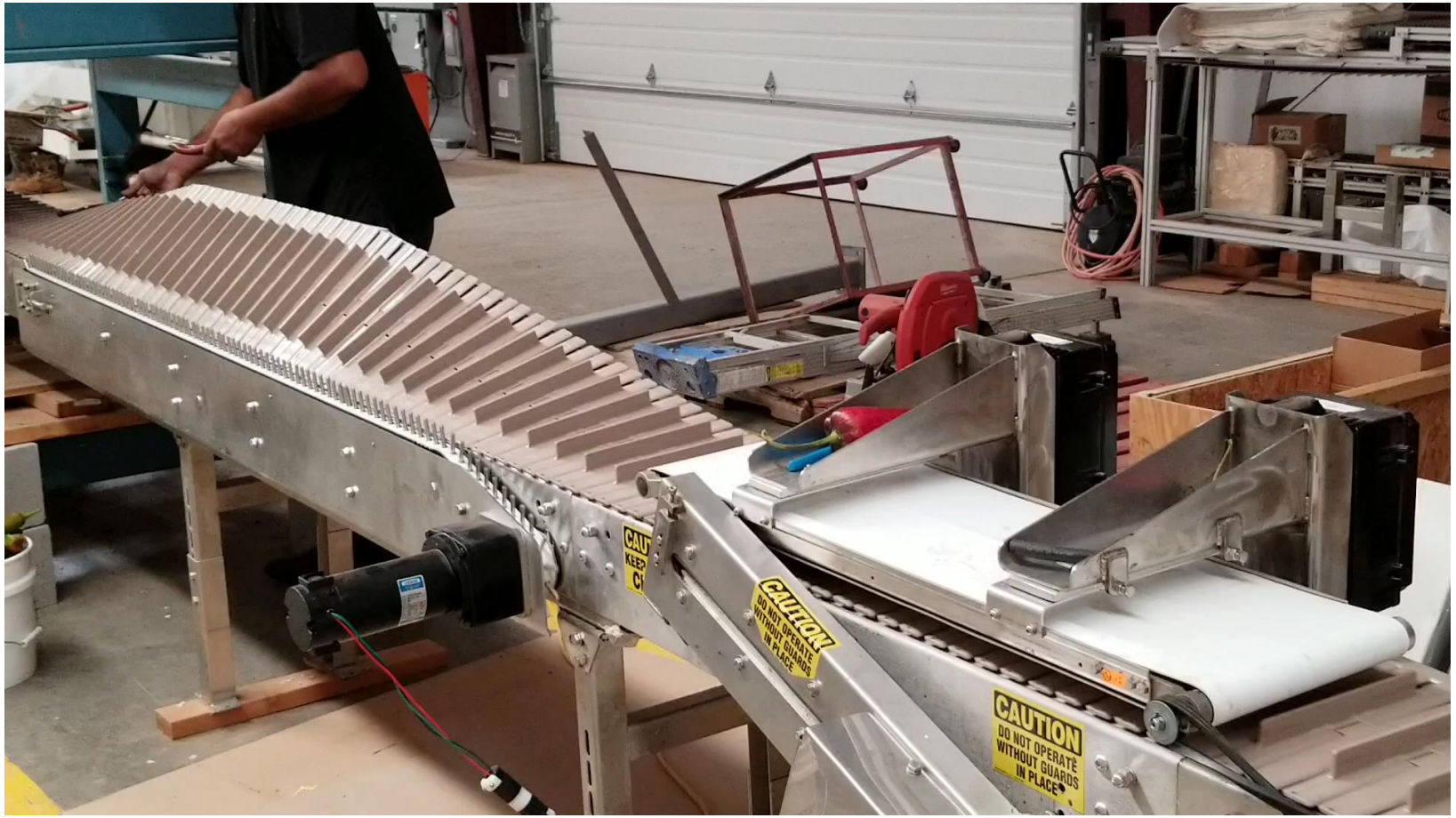
Pin Conveyor in Motion



Destemmer in Action 1



Destemmer in Action 2



Advancements due to the Pin Conveyor

- Vast improvement in the stem detachment quality

  No stem Breakage at the calyx

- Flexibility to tailor inter-pin gap

- Elimination of the need to orient chile

- Elimination of the Stem-jam

Curry Farms