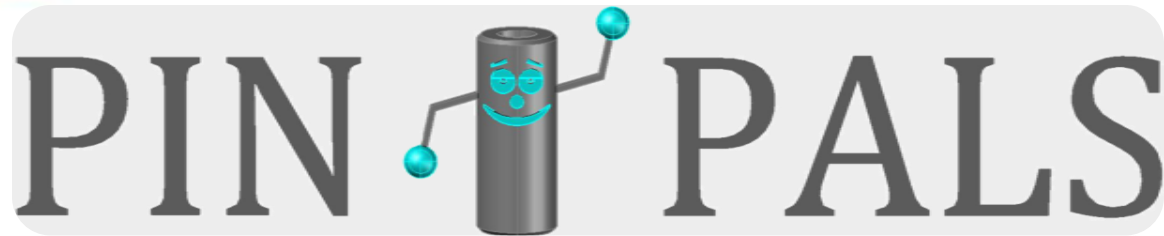


# IPRO 339

## Piston & Piston Pin Manufacturing Process Improvement



Sponsored by



# Who Is Burgess-Norton?



Burgess-Norton Manufacturing Company, has two product lines both of which produce highly engineered components serving key industrial markets. Burgess-Norton was founded in Geneva, IL in 1903, and built the core of its business on piston pins and has since then produced millions of units for all types of internal combustion engines for multiple automotive and truck customers.

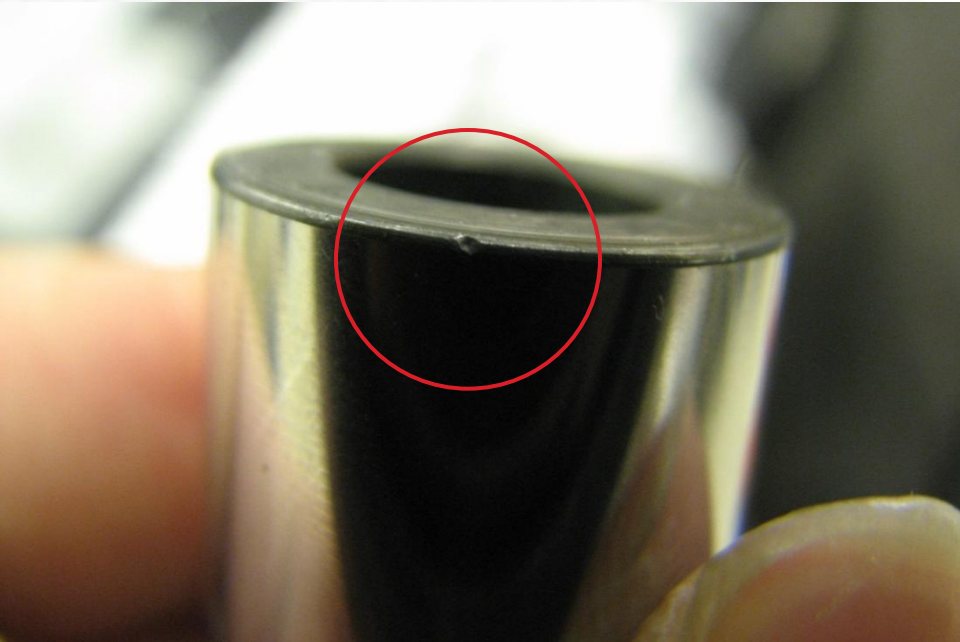
# Outline

- The Problem & Goal
- Team Obstacles
- Organization and Tasks
- Problem solving Approach
- Explored System
- Conclusion & Finalized Design
- What's Next
- Acknowledgments



# The Problem

- Develop a material handling solution
- Eliminate nick occurrences on the piston pin
- Design should be efficient and practical



# Goals

- Analyze current manufacturing processes and advise on improvements
- Attain real-world experience
- Provide Burgess-Norton with a material handling solution to reduce nick occurrences on piston pins





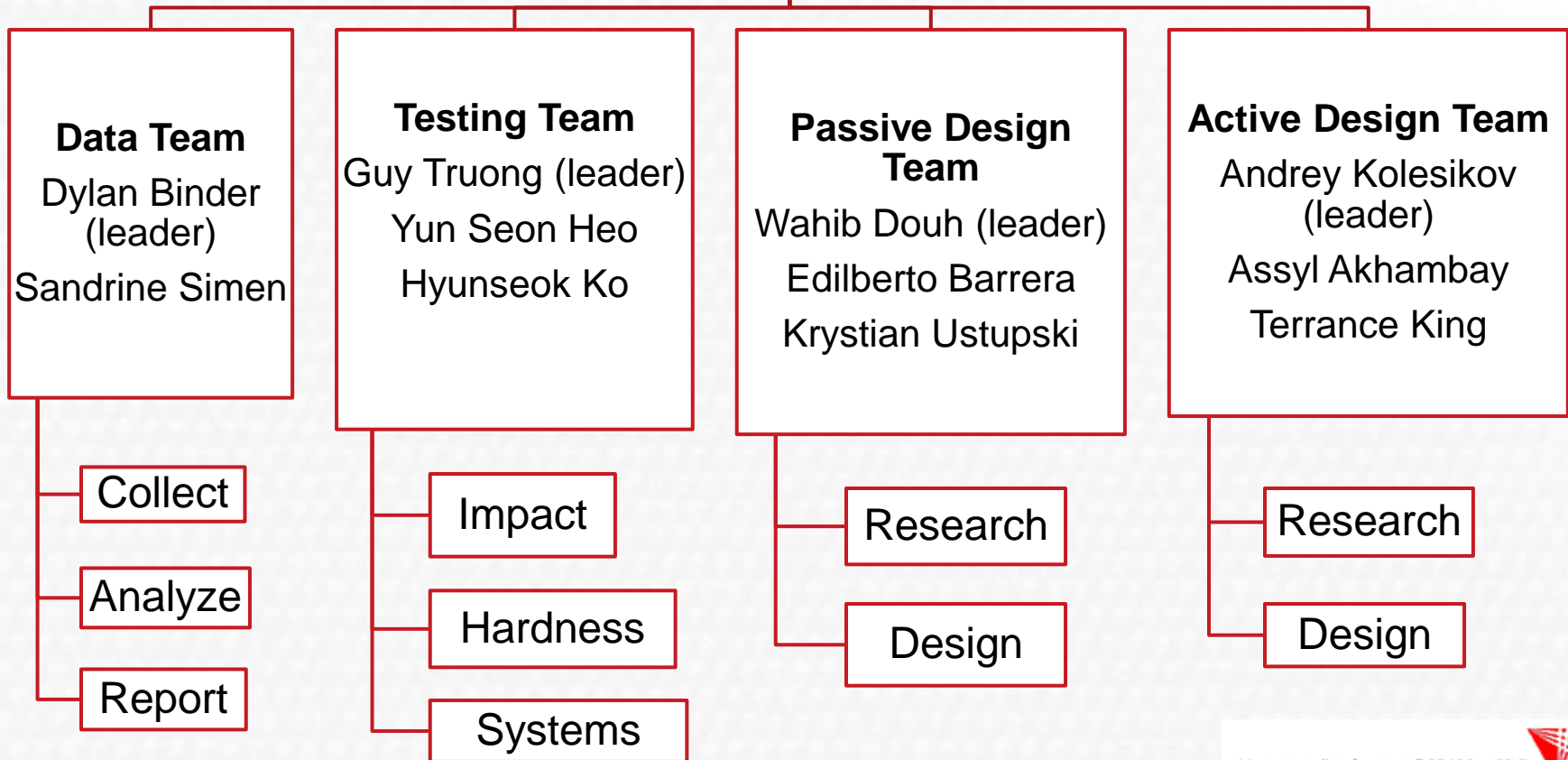
# Team Obstacles

- **Identify the cause of the problem**
- **Ethical Issues**
  - ☞ Confidentiality
  - ☞ Potential Job Losses
- **Time constraints**
- **Proximity**
- **Resolution of obstacles**
  - ☞ Ethics Bowl
  - ☞ Personal Assessment of Plant
  - ☞ Testing



# Organization and Tasks

**Team Leader – Collin Perle**



# Problem solving approach

## ■ Plant Visits

- Progressive visits in order to gain understanding of project development
- Testing
- Solution Development
- Follow-up visits to Burgess-Norton to gain feedback and resolve issues





# Testing/Analysis

## ■ Sample Testing

- Built testing apparatus
- Conducted impact testing
- Performed hardness testing



# Test Results

- **IMPACT TEST:** (With our own apparatus)

	After machining	After heat treating	
		19197	22161
	D=22.4mm, m=102.29g	D=20mm, m=90.38g	D=22 mm, m=104.43 g
E=mgh	0.0848 J	0.1687 J	0.1386 J
Trial 1	3 in	7-8 in	5 in
Trial 2	4 in	7-8 in	5 in
Trial 3	3 in	7-8 in	6 in
Avg	3.33 in	7.5 in	5.33 in

The impact energy required to nick pin is proportional to the critical drop height.

# Explored Systems

## ❖ **Spring Box**

Level-controlling bin with adjusting bottom. Stores pins in bulk instead of orientated as desired

## ❖ **Ammo Box**

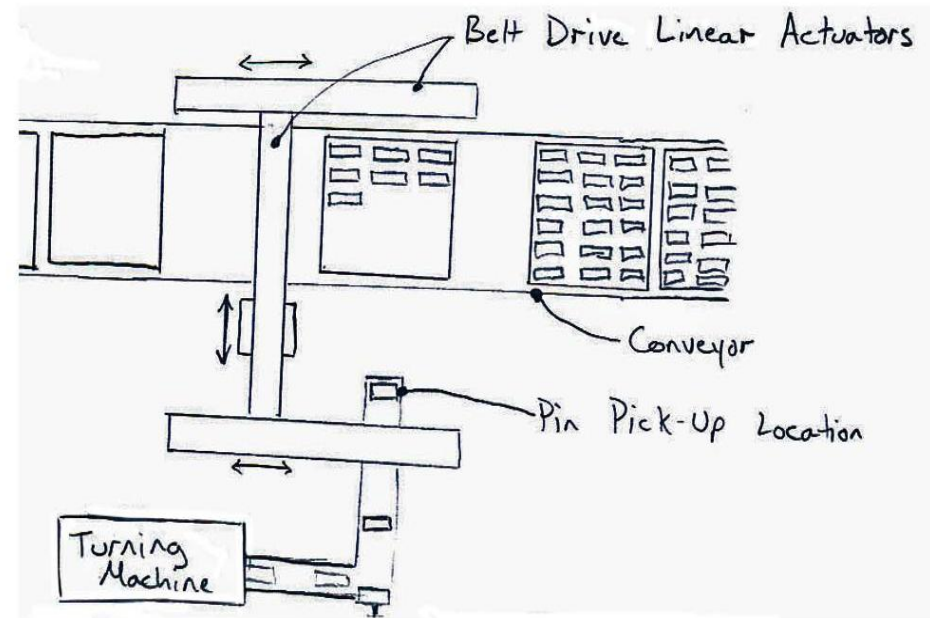
A box system that pins roll into from conveyor. Similar concept already utilized in the factory. Pins get stuck on exit

## ❖ **Conveyor System**

Factory-scale conveyor system. Requires extensive network of conveyors; expensive and complex

## ❖ **Robot - Pick and Place**

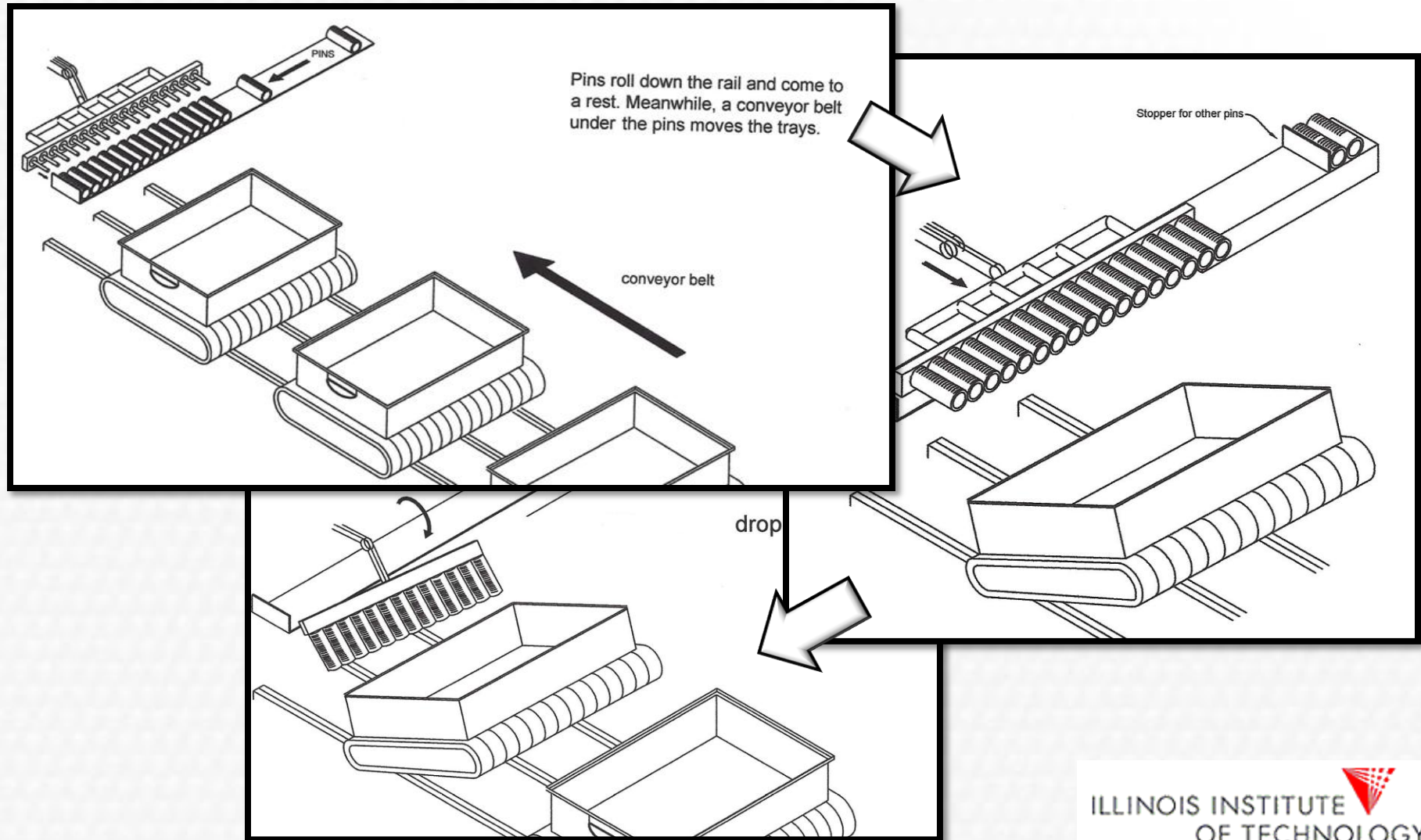
3-axis simple robotic pick and place system. High cost to accommodate each machine





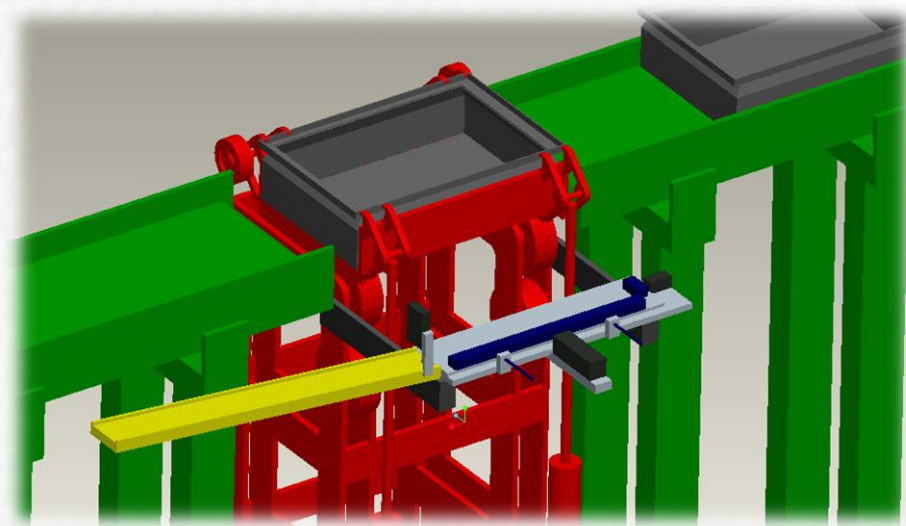
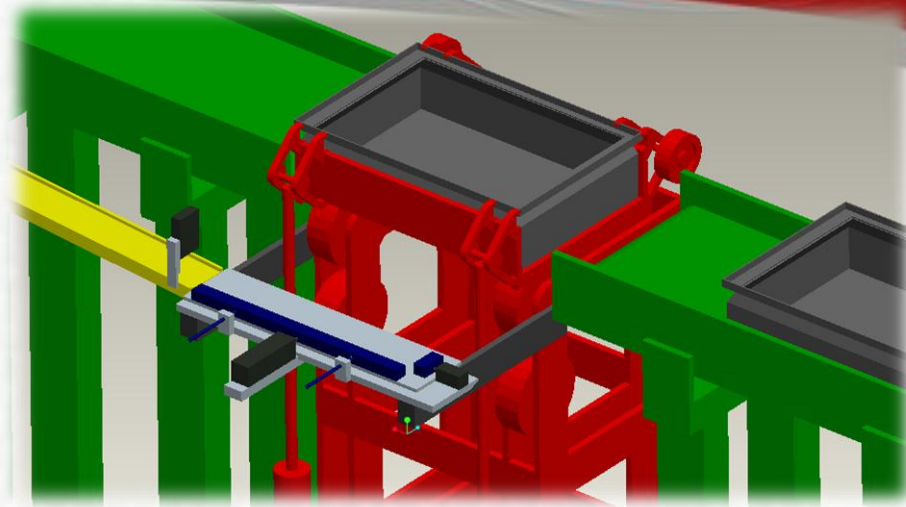
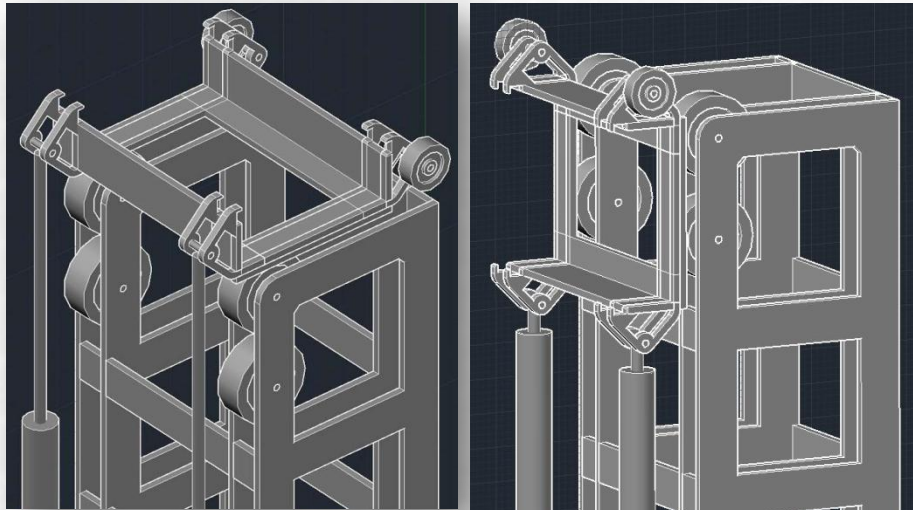
# Explored system

## ■ Pan Conveyor



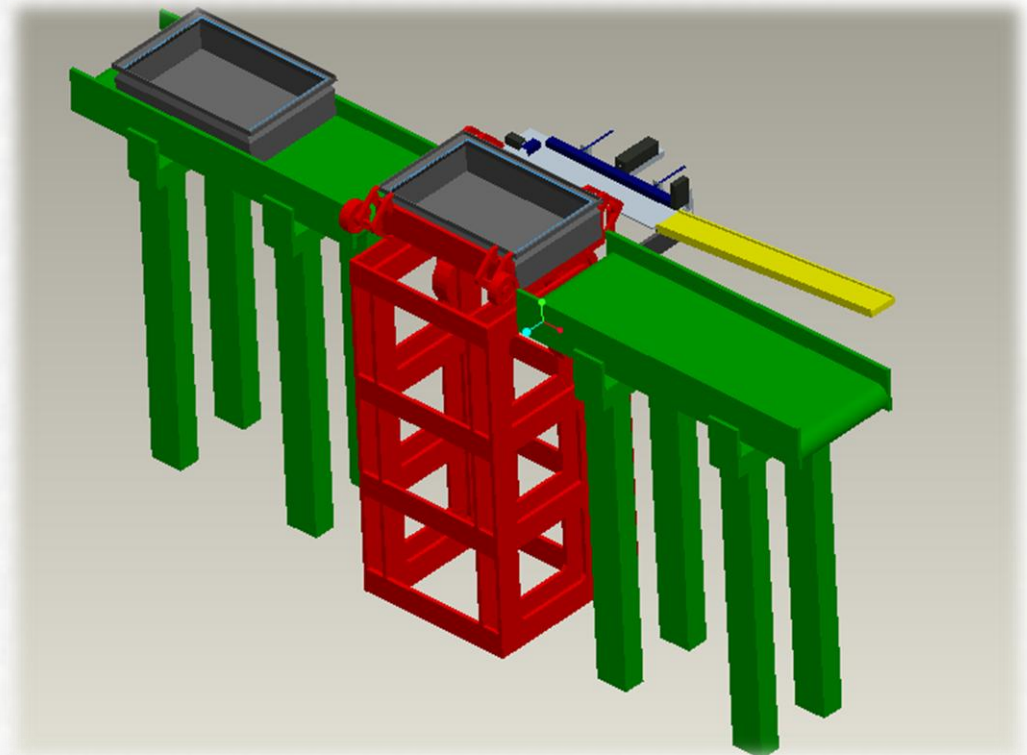
# Conclusion & Finalized Design

- Pins are automatically loaded into bins, one full row at a time.
- Metal bins are fed to loader by conveyor. Bin is fixed into a grip, lowered and tilted to allow for quick filling using a shelf with pins that are pushed into the bin by a hydraulic press.



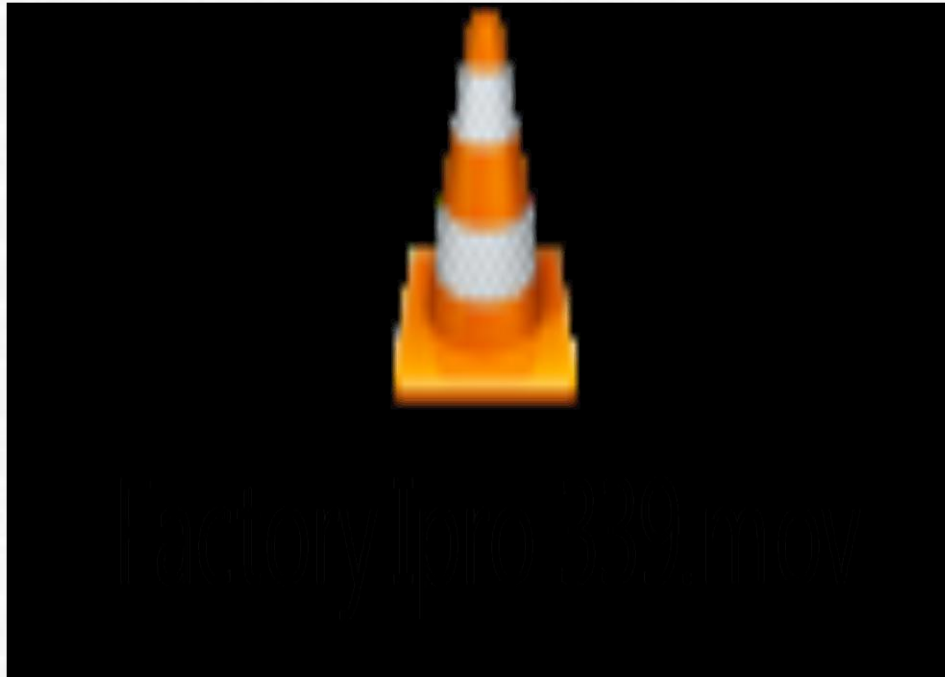
# Conclusion & Finalized Design

- Efficient use of motion
- Accommodates all pin sizes
- Gang Loading of Pins
- Estimated Cost
  - \$8500 per unit





# Conclusion & Finalized Design



# What's Next

- Implementing the system at Burgess Norton
- Pin unloading system (next semester!)



# Questions?

**Special thanks to Professor Lewis,  
Burgess-Norton and IPRO office**