Bulk Cap Loading Elevator and Inspection System
<table>
<thead>
<tr>
<th>Team Members</th>
<th>Advisor: Dr. Alexander</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anas AlJunaidi</td>
<td>Mechanical Engineering</td>
</tr>
<tr>
<td>Joe Pickett</td>
<td>Mechanical Engineering</td>
</tr>
<tr>
<td>Alex Quintana</td>
<td>Mechatronic Engineering</td>
</tr>
<tr>
<td>Patricia Rodriguez</td>
<td>Mechanical Engineering</td>
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<tr>
<td>Sam Warmerdam</td>
<td>Mechatronic Engineering</td>
</tr>
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Background

- Started as a Future Farmers of America project.
- 40% increase in 2013, expected to continue in 2014
- Currently 30-40 thousand jars a month
Project Justification: Bulk Cap Loading System

Need:
• Capping machine only holds enough lids to run continuously for 10 minutes.

Goal:
• Increase capacity and reduce necessary interaction.
Project Justification: Inspection System

Need:
• System has approximately a 10% defect rate.

Goal:
• Automate the removal of defects to reduce the burden on personnel.
Engineering Specifications

Overall system
• FDA approved
• Water/alcohol resistant
• Line capacity: 12.5 units/min

Cap loading system
• Controlled filling 50 - 60 lids

Inspection system
• Reject cross threaded lids - 99.9% for 20 hours
Design Solution: Bulk Cap Loading System
Fabrication: Bulk Cap Loading System

Purchased:

- Electronic control components
- Elevator: Recreate would be more expensive
- Casters: Welded
- New belt
## Testing: Bulk Cap Loading System

<table>
<thead>
<tr>
<th>Must Do</th>
<th>Target</th>
<th>Met</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operate continuously without a break for 2 shifts</td>
<td>20 hours</td>
<td>Testing</td>
</tr>
<tr>
<td>Run at current line capacity</td>
<td>12.5 units/minute</td>
<td>⭐</td>
</tr>
<tr>
<td>Limited jams under normal operating conditions</td>
<td>Less than 1 every 20 hours</td>
<td>Testing</td>
</tr>
<tr>
<td>Design in sponsor specified footprint</td>
<td>46in x 46in</td>
<td>⭐</td>
</tr>
</tbody>
</table>
Design Solution: Inspection System
Design Solution: Inspection System
Design Solution: Inspection System
Fabrication: Inspection System

Customized system:
- Datum plate
- Micro switch
- Rejection gate
- Board
- Solenoid
- Optimal break beam sensor
Testing: Inspection System

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<th>Must do - Quantitative</th>
<th>Target</th>
<th>Met</th>
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<tr>
<td>Operate continuously without a break for 2 shifts</td>
<td>20 hours</td>
<td>★★★</td>
</tr>
<tr>
<td>Must be able to run current line capacity</td>
<td>12.5 units/minute</td>
<td>★★★</td>
</tr>
<tr>
<td>Reject jars with cross threaded lids</td>
<td>99.9%</td>
<td>★★★</td>
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Final Budget

• Finished $343 under budget
• Donated parts
• Labor Cost-$140,346
Reflection

Problems encountered:

• Belt and elevator jamming
• Excessive rejection rail friction

Solutions
Conclusion

CSU Chico Tech Shop:
- Scott Vani
- Steve Eckert
- Dave Gislon