Cultivated Cocktails Heat Shrinking Tool

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School of Engineering + Technology

Original Objectives

- Create an automated or semi-automated process to contract the preformed tubing around the cap and bottleneck.
- Design the system so it can be easily implemented into the current space with other systems at cultivated cocktails.

Requirements

- Maximum envelope of 40”x48”
- Meet or exceed 800 bottles/day rate
- Coil must reach 100C temperature
- Maximum weight of 4000 lbs
- Utilizes microcontrollers
- Pneumatically or electronically driven
- Utilizes a maximum air pressure of 100PSI
- Accommodate 4 most common bottle sizes
- Can be safely operated
- Must run on standard voltage

Concepts

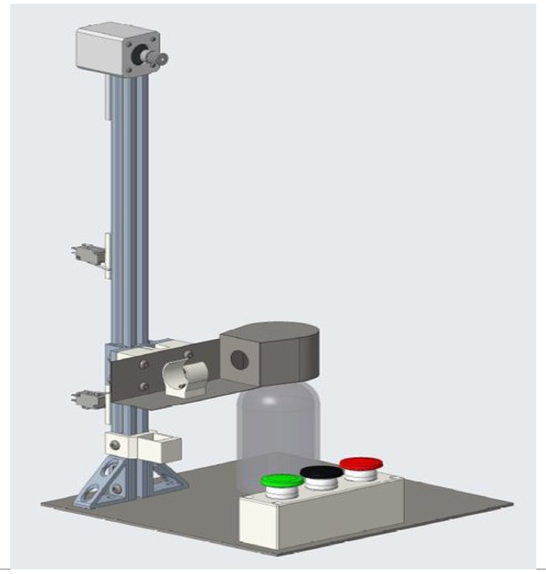
- Concepts included an enclosed heating element that would function similarly to a car’s heating system, a heated element that would revolve until the wrap was fully adhered to the bottle, and finally a wand that would feature a heat diffuser to evenly distribute heat across the surface of the PVC wrap.
- The Heat Diffusing Wand was determined to be the best fit by a requirement matrix the team worked through.

Problem Statement

Cultivated Cocktails currently has a time consuming and unergonomic method of heat shrinking their safety seals to the top of their liquor bottles. They assigned capstone students to build a machine to semi-automate the process of heat shrinking the safety seal to the bottle.

Final Design

- With the requirements in mind, the team compiled the best scoring designs from each section into one cohesive design.
- Using a master locating plate, interchangeable inserts were made for Cultivated Cocktail’s four most commonly used bottles, all ranging in height and width.
- To detect the different size bottles, limit switches are used and can be relocated based on which bottle is being used. There is large benefit of utilizing limit switches as opposed to embedding predetermined heights into the microcontroller’s code. If Cultivated Cocktails wanted to add a new bottle, instead of going into the program code, they would simply move the limit switch to correspond to the new bottle height.
- There are three operator push-buttons that each provide important and necessary actions.
  - Cycle: This will send the heating carriage through 1 cycle.
  - E-Stop: If anything goes wrong, the operator can press the E-Stop to cease all movement.
  - Reset: This will send the heating carriage back up to the upper limit and hold until the “cycle” button is pressed.



Results

- Since the heating elements multiple features can vastly change the results of the effectiveness of the seal, the team completed testing to determine what inputs had the desired result.
- Changing one variable at a time, it was determined that 225ºC on high air flow for 4 seconds was the perfect application settings.
- Including travel time, there should be a bottle being finished every 10 seconds, producing a final rate of 2,880 bottles in an 8 hour work day.
- With a few changes that number could be improved. Specifically, if the limit switches were connected to a single piece, the travel time would be decreased, increasing the throughput.

Summary

- Due to change of scope, objectives were changed. Cultivated Cocktails acquired a machine that overlapped with objectives.
- The result is a sleek and small design that meets all modified objectives and requirements.

Team & Acknowledgements

- **Team Members:**
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- **Sponsor:**
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