Automated 50mL Bottle Filling Station

Cultivated Cocktails

Western Carolina University

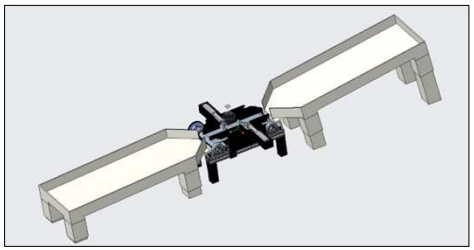
PROBLEM STATEMENT

- Sponsor is experiencing inconsistency in his company's filling process for their 50mL bottles due to not having a reliable method of completing the process.
- Sponsor wants to develop a consistent and reliable method of filling 50mL bottles with minimal human intervention.

#	Description
1	Fill bottles with 50 mL ± 2.25 mL of Spirits
2	Use only food grade materials
3	Must be able to account for varying viscosity liquids in filling process
4	Cannot exceed the area of a pallet. Vertical height unconstrained.

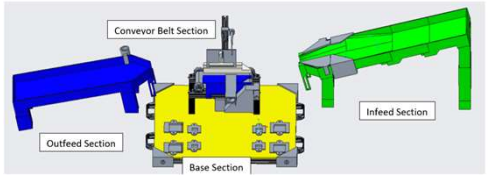
EARLY PROTOTYPE

An early CAD model of the automated bottle filling solution. This prototype includes several parts that are in the final design. Many parts were added/removed in the final design.



FINAL DESIGN, APPROACH, PLAN

Mechanical design



Infeed Section

- Holds 60 empty bottles
- Gravity feeds bottle onto conveyor belt
- Mostly 3D printed components

Conveyor Belt Section

- Bottles are filled with 50mL of spirits
- Filled bottles go onto outfeed section
- A mix of 3D printed components, extruded aluminum and electrical components

Outfeed Section

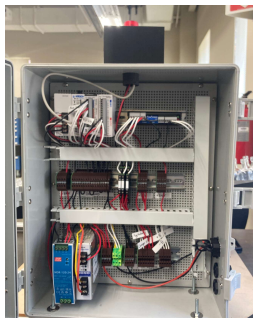
- Holds 60 filled bottles
- Mostly 3D printed components

Base Section

- Supports conveyor belt section and junction box
- Acts as guide for infeed and outfeed section

Electrical design

- Click Plus PLC as controller
- Relays for motor control
- Stepper driver for peristaltic stepper pump
- HMI for simple user interface
- 12VDC and 24VDC power supplies



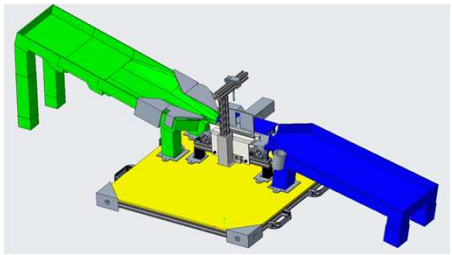
APPROACH

Create an automated bottle-filling station

- Designed to fit on standard 6-foot table
- Removable parts for ease-of-storage
- Design concept to be scalable for varied volumes

RESULTS

- The final CAD assembly



- Final design includes base section to hold junction box and all sections together

- All components assembled:

- This is the final design of the automated bottle-filling station as of 4/28/23

SUMMARY AND CONCLUSIONS

- Almost all requirements given by sponsor were accomplished
- Final touches will be needed to complete project fully
- The team has developed a functioning prototype that can fill sixty 50 mL ± 2.25 mL

FUTURE WORK

- HMI programming- finish addressing overall functions
- Debug Code- fix code errors and PLC assignments
- Bottle Arm Linear Actuator- shorter arm length or faster actuation time

TEAM & ACKNOWLEDGEMENTS

- Parker Woods (ET)
- Mitch Goldfarb (ET)
- Kennedy Harris (ME)
- Tanner Reese (EE)
- Alex Culver (ECET)
- Brett Banther
- Shawn Lyvers
- Taylor Howard

References

1. https://www.cultivated-cocktails.com/