



Company Information

Company Name	<i>Boomerang Water</i>	Date Submitted	<i>05/05/2022</i>
Project Title	<i>Design of an Expanded Filling Capability (BOOM_FILL)</i>	Planned Starting Semester	<i>Fall 2022</i>

Senior Design Project Description

Personnel

Typical teams will have 4-6 students, with engineering disciplines assigned based on the anticipated Scope of the Project.

Please provide your estimate of staffing in the below table. The Senior Design Committee will adjust as appropriate based on scope and discipline skills.

Discipline	Number	Discipline	Number
Mechanical	3	Electrical	2
Computer	1	Systems	

Company and Project Overview:

A Veteran-owned business, based in Davidson North Carolina, Boomerang Water is the world's first on-site, micro-bottling solution to economically replace plastic water bottles. We are committed to disrupting current water bottling practices to end single-use plastic and shipping. Our zero-waste system washes, sanitizes, filters, fills, and caps returnable glass or aluminum bottles with pure, premium water at the point of use to maximize freshness and keep source water local. 22 billion plastic water bottles are thrown away in the US every year. It will take over 1000 years for those bottles to biodegrade. Our system replaces the need for single-use plastics, eliminating waste and reducing carbon emissions.



INDUSTRIAL SOLUTIONS LABORATORY



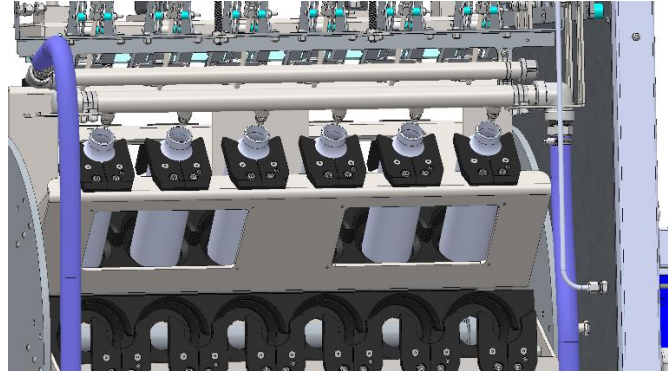
We hope to continue improving our system in ways that make it more feasible to implement world-wide. The current system utilizes a single passive manifold for dispensing water into the bottles. Filling volume is controlled by regulating the system pressure and the filling time. We hope to be able to modify the system so that each bottle can be filled independently and that flavor concentrates or other additives could be added to the bottles in a controlled manner.



This project is partially supported by a grant from the NC Manufacturing Extension partnership, an organization that helps to support business and job growth for NC companies. To learn more about the NC MEP, click on this link: <https://www.ncmep.org/>.

Project Requirements:

- I. Current Method:
Filling is performed in a passive method and no individual control for the level of each bottle is possible. Additives and concentrates are not currently injected as no system is in place for this function.



II. Project Scope:

A system that can individually control filling of 6 individual stations

- System should operate on either 24VDC or 230VAC.
- Able to fill each of the 6 stations equally.
- Integrate with existing Phoenix Contact PLC system.
- Minimize hardware usage for ease of troubleshooting and integration.
- Limited or no electronics within the process chamber (IP67 or higher acceptable). Storage and plumbing in process chamber are acceptable.
- All materials should be FDA or NSF compliant for food processing.

Secondary Scope:

A sub-system for filling that would dispense flavors/concentrates into the bottles. This can be either independent of the primary scope or combined into one system.

- Able to adjust concentration from control screen from 2ml-20ml per bottle.
- Should be able to be cleaned or flushed as required.
- Access to concentrate holding area should be accessible without steps/ladder.
- Excess concentrate cannot leak into the process chamber during filling.

Expected Deliverables/Results:

Complete drawing package that can be given to a machine shop for fabrication and assembly

- CAD drawings for each part (2-D Prints and 3-D Models)
- Bill of materials
- Assembly instructions
- Cost estimate for the complete system
- Complete build and integration of the system at the end of the SD II

Disposition of Deliverables at the End of the Project:



Students are graded based on their display and presentation of their team's work product. It is mandatory that they exhibit at the Expo, so if the work product was tested at the supporter's location, it must be returned to campus for the Expo. After the expo, the team and supporter should arrange the handover of the work product to the industry supporter. This handover must be concluded within 7 days of the Expo.

List here any specific skills, requirements, specific courses, knowledge needed or suggested (If none please state none):

- Machine Design
- Fluid Dynamics
- Sheet Metal Design
- PLCs/Ladder Logic
- CAD
- Travel required to Davidson facility