



Santee Basin Roomba

Autonomous Surface Vehicle for Microplastic Collection

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Project Sponsor

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Background: With an increase in use of plastic materials, the amount of macro environmental trash gyres throughout various waterways have increased drastically. Upon initial investigation, there is no current solution to cleaning the waterways of these trash items. After the initial design process, our efforts were redirected upon speaking to Doug Meyers of the Chesapeake Bay Foundation. This redirection went towards microplastics, which present themselves in many forms and can be found throughout the water column. Microplastics prove to be harmful in many respects to the aquatic environment. From fish consuming the microplastics to an increase in algae production, microplastics show a significant issue to the environment at large. This project aims at collecting and disposing of microplastics through an ultimately autonomous filtration system.

Objectives: The goal of this project is to design, build, and test a proof-of-concept system that could identify microplastics inside Santee Basin, collect and dispose of them without significant action from personnel with remote capabilities able to withstand a range of environmental conditions.

Results: A working prototype that is capable of autonomously traversing while filtering the water of microplastics to promote cleaner water to wildlife around the area of the Santee Basin. However, it was agreed by all parties that the realistic success of a project with this large of a scope will require more time than the allotted year. Students are still pursuing a working prototype, the initial planning and planning stages will be completed.

Important customer requirements that were determined through interviews with the customers mentioned above include ability to collect majority of microplastics, product endurance of 4 hours, stand-off distance of 100m, two man portability, survivability in all sea state conditions, low cost of parts, and watertightness.

The team has surveyed many possible microplastic collection designs and building materials. Three general formats were selected to choose between: a centrifuge collection design, a magnetic antibodies design, and a screen filter design. The screen filter design was selected as the most proven method to satisfy customer requirements.

The final product for this project is a working prototype from an initial design, designed to be attached to some water propulsion device, is shown below.

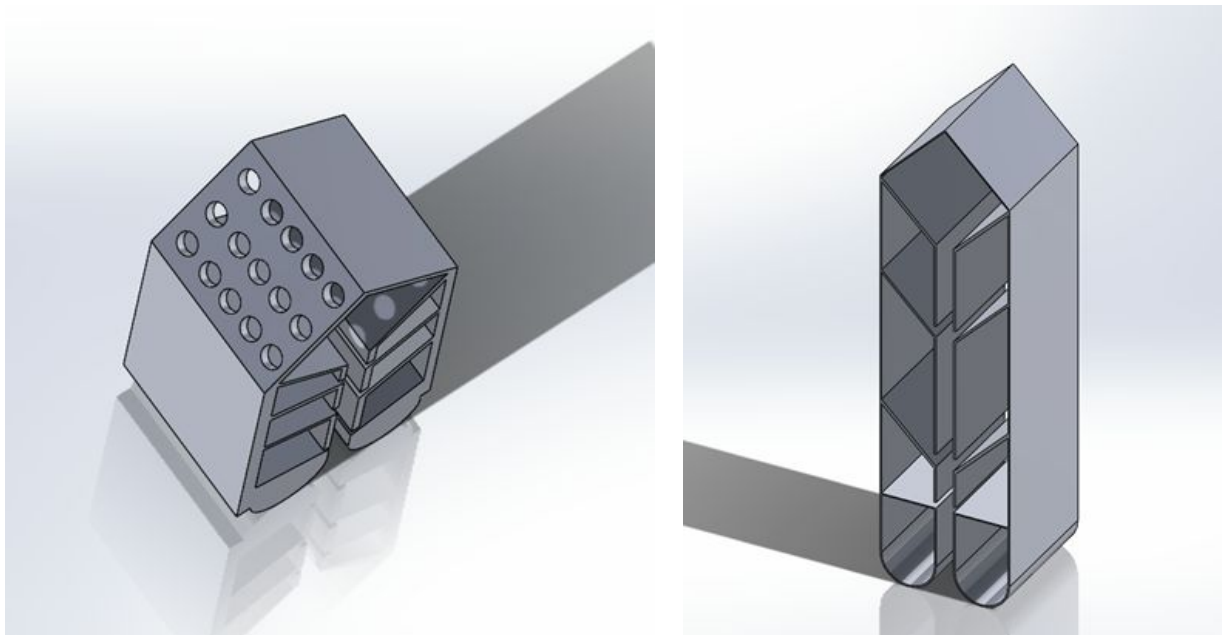


Figure 1: SolidWorks Model of the Screen Filter

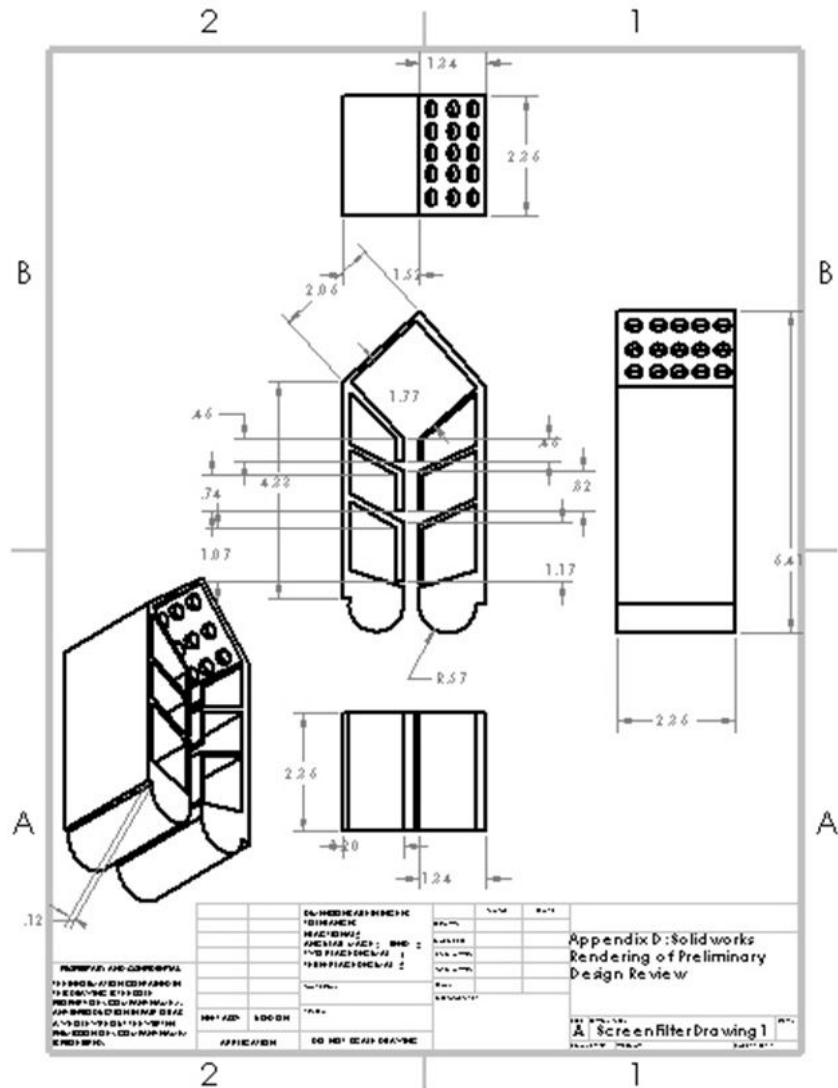


Figure 2: SolidWorks layout of the Screen Filter



Figure 3. Santee Basin Roomba Team