Project Deliverable H: Prototype III and Customer Feedback

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1.0 Introduction

We are currently at the stage of developing our final prototype of our design process. This final prototype will be a new and improved version of the previous prototypes. There are changes made in this final prototype compared to the previous prototypes that have been documented in this deliverable. Because of these changes, we have also updated our prototyping test plan and bill of materials which are given in this deliverable. At the pace we are going, we will be able to finish the final prototype and test it before Design Day.

2.0 Client Evaluation

The client said that there's a possibility of changing the project location from the farm to her house. Keeping that in mind, the dimensions of our project must be suitable. The dimensions of our project are (2x2x2)m, a relatively small size that can fit anywhere. Furthermore, the client said she might not be able to provide electricity. Hence, we must take into account ways in which we can power the air pump and that will require installing a battery.

3.0 Final Prototype

With our final prototype, we finalized on implementing two air pumps instead of one into our hydroponics system so that all 4 reservoirs can circulate the nutrients better. Even though our initial plan was to power the system with a solar panel, we realized that buying one won't be a good idea due to budget constraints. We also changed the number of reservoirs we were planning on building from 6 to 4 because of the change in size for the greenhouse. We also changed the amount of plants per reservoir from 8 to 6. Another design change we made was removing the piping system making it so that refilling the water in the reservoirs is manual. We also decided to change the hole for the air pump tubing to the top of the reservoir instead of the side.

We have used the drill press a lot to make holes into our bin lids so that they can hold the planters. We have also filed the holes after we drilled them to make the holes bigger so that the planters can fit better. To drill and file the hole into the size that we need, we traced the planters to give us a guideline.

Figure 1. Top view of the bins with the planters

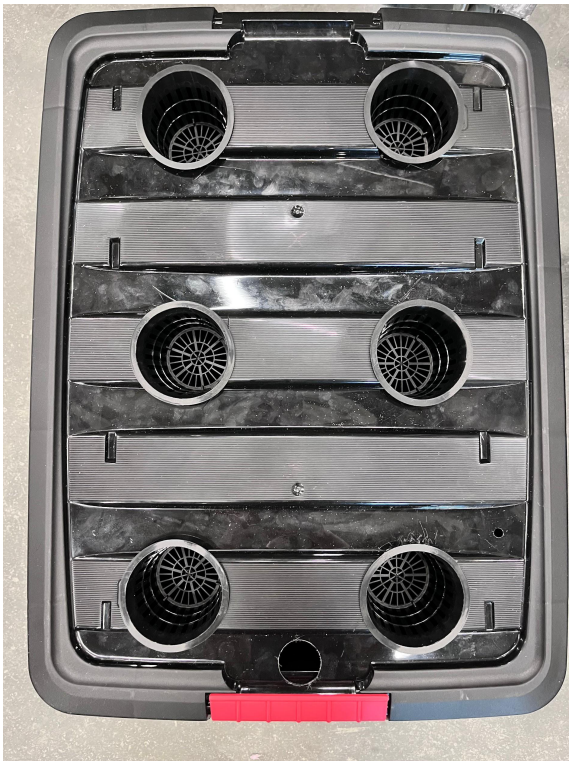

Figure 2. Top view of the bins with the planters fit in

Figure 3. Side view of the lid with the planters fit in

Figure 4. Top view of the lid with the planters and the air pump tube fit in

4.0 Changes from Previous Prototype

Prototyping Test Plan (Updated)

Test ID	Test Objective (why)	Description of Prototype used and Basic Test Method (what)	Description of Results to be Recorded and how these results will be used (how)	Estimated Test duration and planned start date (when)
1	Easily accessible, fitted planters	Reviewing and changing hole/drill measurements for the planters to ensure the right fit to easily take out and put in plants.	Check if the plant and its roots fit perfectly through the holes. If not, we may need to get new planters and redrill them.	1 hour 20/03/2023
2	Air pump works to circulate nutrients and water	Add the nutrient solution and water in the reservoir in regular intervals.	Check if the bubbles generated ensure the flow of nutrients and water. The amount of nutrients and water in the reservoir should decrease at regular intervals. If not, change the nutrient solution.	1 hour 24/03/2023
3	Air bubbles being generated in the reservoir	Use an air pump connected to an airstone to provide oxygen to the plants.	Check if the air pump is working and if the airstone is producing air bubbles. If not, make adjustments to the air pump and/or airstone.	30 minutes 23/03/2023

Bill of Materials (Updated)

Item Name	Unit of measurement	Quantity	Unit Cost ($)	Extended cost ($)	Link
Wood Pallets	48*40*6.5 (in.)	24	Free	0.00	N/A
Bins for planter (6-pack)	22.0*16.5*13.1 (in.), plastic, 53 qt.	1	127.99	127.99	https://www.amazon.ca
Planters	3 in. diameter,	1	24.89	24.89	https://www.amazon.ca

(50-pack)	2.5 in. height				
Growing medium (25 L)	N/A	1	57.52	57.52	https://www.amazon.ca
Air pump and stone kit (4 valves)	254 GPH, 7W	2	71.99	143.98	https://www.amazon.ca
Airline tubing (8 ft)	3/16 in. diameter, vinyl	4	2.97	11.88	https://www.amazon.ca
Extension cord	25 ft., 13 amps	1	25.99	25.99	https://www.amazon.ca
Nutrient solution (1 qt)	N/A	1	39.99	39.99	https://www.amazon.ca
Product Subtotal				432.24	
+ **Shipping**				19.99	
+ **Tax**				56.19	
Total Product Cost				508.42	

5.0 Next Steps

We have already finished drilling the holes and adjusting their sizes to make them suitable for the plant pots to fit in. We have also completed two of the prototyping test plans which involve seeing if the air pump works and if the plant pots fit in. Our next step is to buy another air pump in order to accommodate the hydroponics system better and find ways to power the air pumps without constant electricity supply. Once we have finished buying the remaining materials, we will set up the hydroponic system with all the materials, and test all of its aspects once again.

6.0 Wrike Link

https://www.wrike.com/frontend/ganttchart/index.html?snapshotId=0l3tk9EOzLmZtyrCZW0iIvqcu18iNAvz%7CIE2DSNZVHA2DELSTGIYA

7.0 Conclusion

To conclude, our rigorous testing on the prototype has changed our product mostly in design aspects, for things such as the amount of plant holes due to the logistics of cutting them. Also, certain technical aspects such as the solar panel had to be revised and removed due to budget constraints. Overall, our product has stayed mostly the same over the 2 weeks of design, with a few key changes to realize the product we had in mind in the beginning of the conception.

8.0 References

Amazon.ca: Low prices – fast shipping – millions of items. Amazon.ca: Low Prices – Fast Shipping – Millions of Items. (n.d.). Retrieved March 25, 2023, from https://www.amazon.ca/

Client's evaluation

Smith, T. (2022, December 28). *DIY Solar Pond aeration: Pond aeration: Solar aeration*. HIBLOW USA. Retrieved March 25, 2023, from https://www.hiblow-usa.com/2021/06/07/diy-solar-pond-aeration/