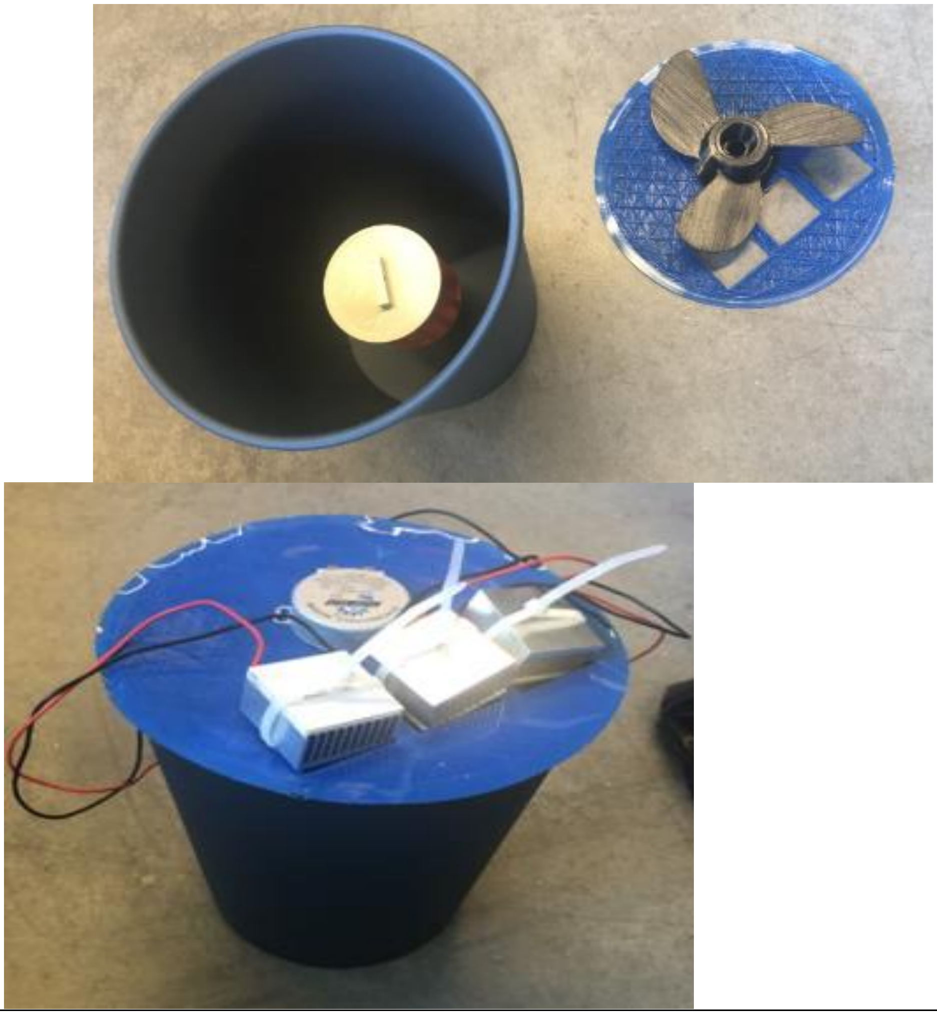
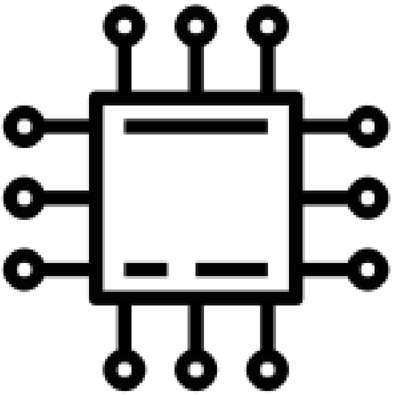
PROTOTYPE II



PRODUCT DEVELOPMENT PROCESS

	We developed our team through the contract meeting and then met with the client to get raw data as well as technical user bench marking to produce 13 design criteria. Then we broke the overall mandate down into multiple subsystems to what our system needed to do and then we individually brainstormed the subsystems and stated the pros and cons to determine which one was the best to choose from. Following this, we met as a team to decide on which subsystems had the most pros, worked the best, and was the cheapest and safest.
	Following this, we 3D printed miniature versions of parts of our design, such as the drain and plug, and the sample containment unit to gain a physical sense of how they look as well as to run tests. A series of 3D printing hardware issues prevented the ideal CAD models from being physically printed. Further 3D printing of the filtration system was done and the plug was purchased to finalize construction of the sample containment unit and drainage.
	We tested the speed of our motor, the cooling system circuitry, and if the drain and plug designs worked together. From there the circuit was assembled and the code was refined further. Soldering was done to increase the portability of the product. In our eyes, Design Day is an excellent opportunity to reflect and see how far we've progressed and the obstacles we have overcome.

RESOURCES USED IN DEVELOPMENT

Item	Purpose	Cost per Unit ($)	Qty.	Subtotal ($)
Arduino Uno Rev3	Controlling the sensor, motor, and cooling components	15.25	1	15.25
12V DC Motor	Rotate propellor to agitate water	4	1	4
Solderless Breadboard	Prototyping and constructing circuits	5.00	1	5.00
Printed circuit board	Connecting Arduino to sensors, motors, & cooling components	2.33	1	2.33
20cm male to male wires	Connect circuitry	0.10	10	1.00
N-channel power MOSFET	Allow power transfer	1.95	1	1.95
USB A to USB B Cable for Arduino Uno	Connecting computer to Arduino	0.20	1	0.20
AAA Battery	Power DC motor	1.00	3	3.00
220 ohm resistor	Set up circuitry	0.95	1	0.95
Waterproof temperature sensor	Measure temperature	4.33	1	4.33
Peltier plates	Remove thermal energy from water	4.00	3	12.00
Heat sinks	Remove thermal energy from Peltier plates	4.00	3	12.00
Battery pack	Connect battery to Arduino and motor	2.50	1	2.50
Plastic rod	Support motor with propellor to spin water	0.00	1	0.00
Propellor	Agitate water during erosion test	0.00	1	0.00
Coffee filter	Filter the eroded elements from the water	0.02	200	3.98

Scale	Measure weight of filter containing eroded material	13.99	1	13.99
Sample containment unit	Contain eroding material	0.00	1	0.00
Compartment separator with built in filter	Prevent water from draining out before test is complete	0.00	1	0.00
Water jug	Contain the setup of the system	4.99	1	4.99
Aluminum foil roll	Prevent heat entering the test setup by insulating	1.97	1	1.97
Bowl	Support filtration system & promote drainage	2.00	1	2.00
Strainer	Filter out larger-size particles	3.00	1	3.00
TOTAL: $92.43				

GRAPHICAL RESULTS

Assuming a linear relation of time to eroded material…

Test 1:

At time = 0, erosion = 0 grams.

Conditions: salt water (grams), room temperature water   °C.

At time = 2 hours, erosion =   grams.

Test 2:

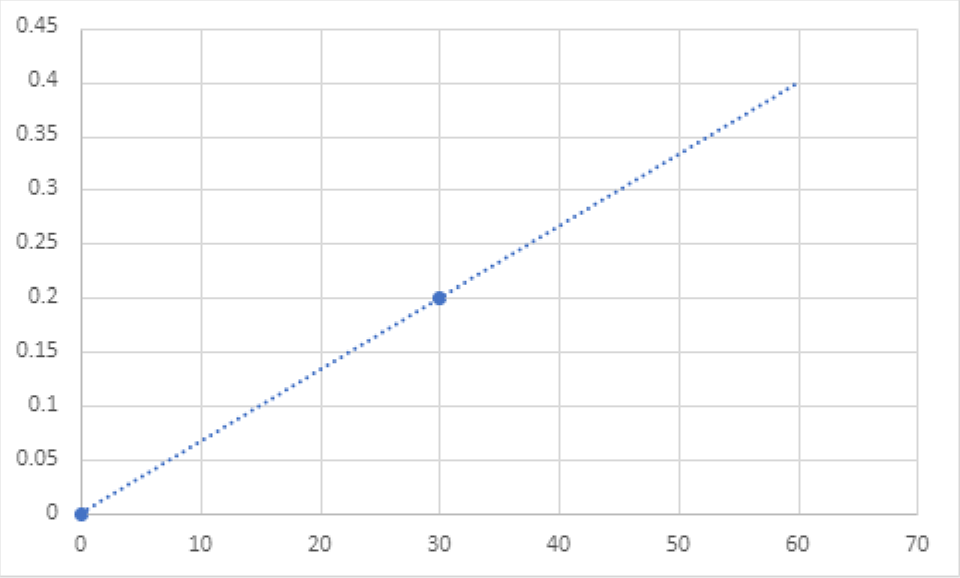
At time = 0, erosion = 0 grams.

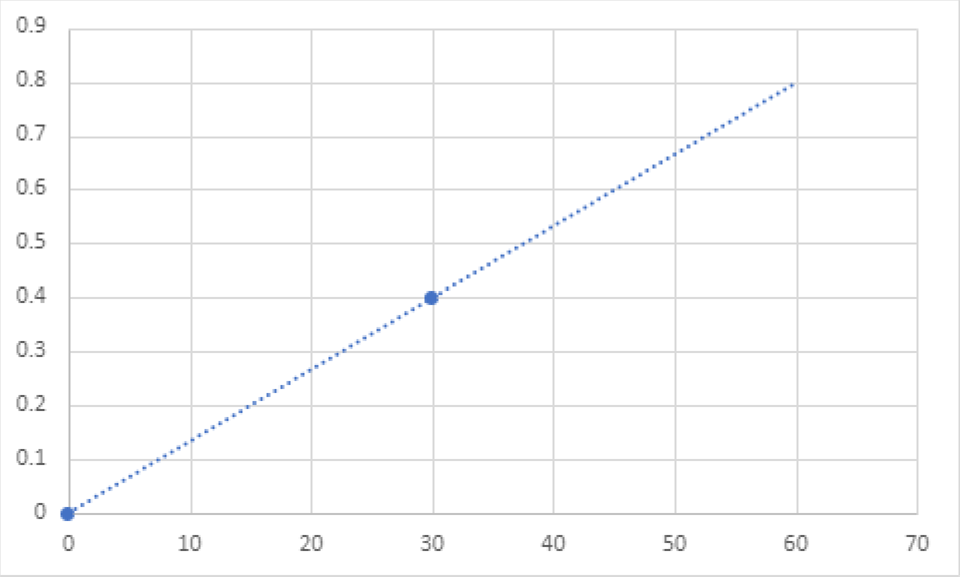
Conditions: tap water, cold water   °C -   °C.

At time = 2 hours, erosion =   grams.

DesignOTT Engineers Inc.

GRAPHICAL RESULTS


0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
0
10
20
30
40
50
60
70


0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0
10
20
30
40
50
60
70