

# Project Plan and Cost Estimate

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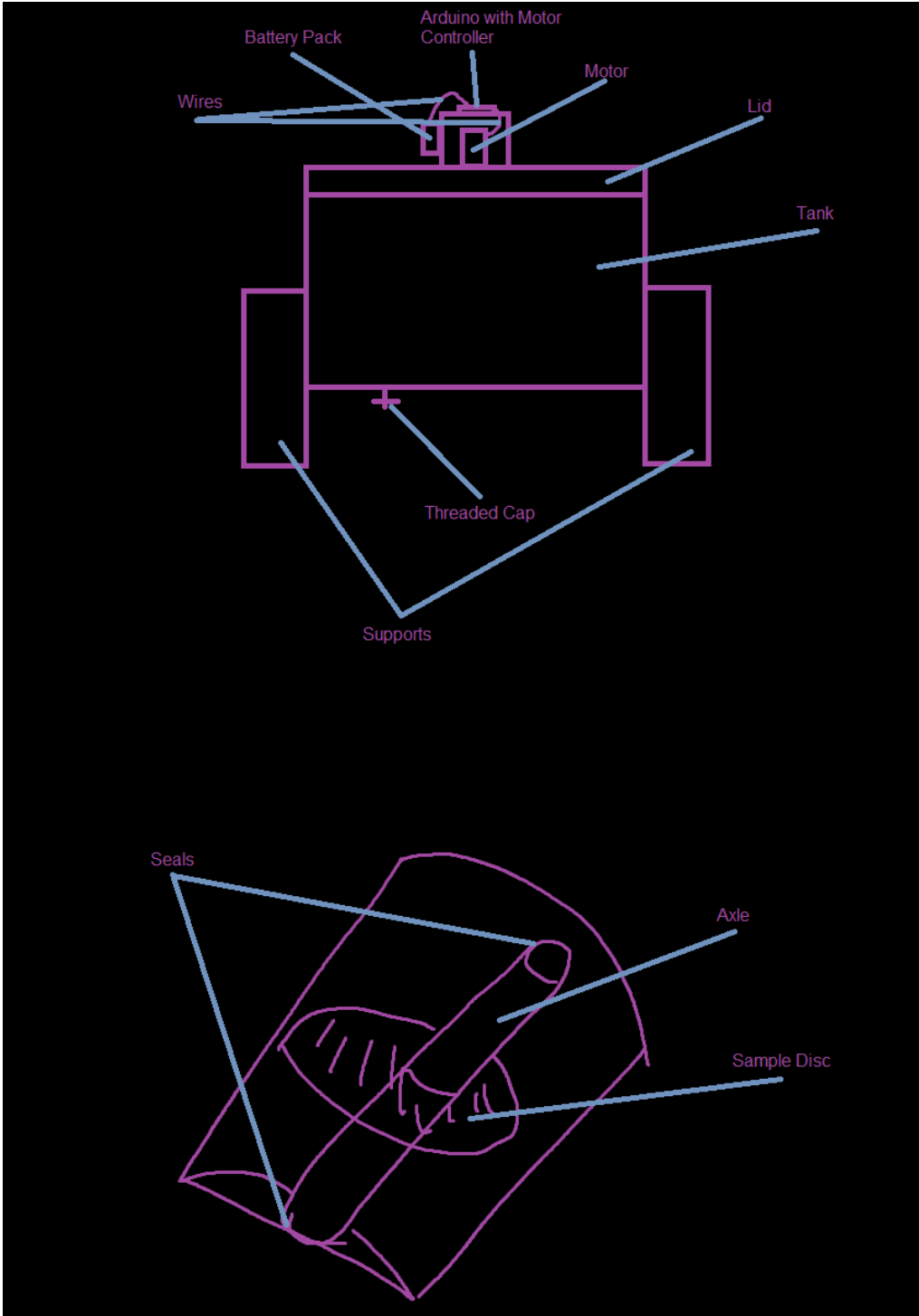
# Abstract

This is a document which explains the choice of materials for our design concept, based around the given budget for the project.

# Introduction

A design concept has been finalized by our team; this will present our budget plan for the final product. Using the design concept to look at parts which will be needed to create the prototype.

# Detailed Design



Design concept finalization: This is a vertical cylindrical tank, which will contain the system. The top of the housing contains the lid, which has the motor and arduino with a battery pack as well. The bottom contains the threaded cap in order

to keep the container closed and able to be refilled as well as draining the system to clean out the container.

The designed system will use a single motor that allows the material to be eroded to rotate or spin indefinitely. The motor is planned to be durable, and we choose a brushed motor since it prioritizes the rpm over torque and use water along with sand to stimulate the erosion.

## Economics

Table 1. General Material and Components of the System

Artifact	Reference	Price	Quantity	Price
Single Brushed Motor	<a href="https://ca.robotshop.com/products/12v-50rpm-694-oz-in-brushed-dc-motor?srsId=AfmBOorjPFzNJggyTez9wErKS2-mBgDMx-GKYIbaoOp7ZR6uatqcTVvRNb4">https://ca.robotshop.com/products/12v-50rpm-694-oz-in-brushed-dc-motor?srsId=AfmBOorjPFzNJggyTez9wErKS2-mBgDMx-GKYIbaoOp7ZR6uatqcTVvRNb4</a>	\$18.04	1	\$18.04
Axle (PVC tube)	<a href="https://www.homedepot.ca/product/xirtec-pvc-1-2-inches-x-10-ft-schedule-40-plain-end-pipe/1000100828">https://www.homedepot.ca/product/xirtec-pvc-1-2-inches-x-10-ft-schedule-40-plain-end-pipe/1000100828</a>	\$12.98 for 10ft	1ft	\$12.98
Seals	<a href="https://www.canadiantire.ca/en/pdp/plumbshop-rubber-stem-o-ring-assorted-sizes-0630635p.0630635.html?ds_rl=1283573&amp;ds_rl=1283573&amp;gclid=Cj0KCQiAxOauBhCaARIsAEbUSQQTYpDriFNcee78iyJ9vcN3hQKk4ZUde8NSIYz4h4IB2a4seFqVSY8aAgeeEALw_wCB&amp;gclsrc=aw.ds#store=174">https://www.canadiantire.ca/en/pdp/plumbshop-rubber-stem-o-ring-assorted-sizes-0630635p.0630635.html?ds_rl=1283573&amp;ds_rl=1283573&amp;gclid=Cj0KCQiAxOauBhCaARIsAEbUSQQTYpDriFNcee78iyJ9vcN3hQKk4ZUde8NSIYz4h4IB2a4seFqVSY8aAgeeEALw_wCB&amp;gclsrc=aw.ds#store=174</a>	\$2.99	2	\$5.98
Plug	<a href="https://www.homedepot.ca/product/red-dot-1-2-in-nonmetallic-white-closure-plug-bag-of-4-units-/1000116577">https://www.homedepot.ca/product/red-dot-1-2-in-nonmetallic-white-closure-plug-bag-of-4-units-/1000116577</a>	\$3.65	1	\$3.65
Water	<a href="https://ottawa.ca/en/living-ottawa/water-utility-bills/rates-and-fees#section-b2c1d583-def5-4737-b7c2-08b858df8cc5">https://ottawa.ca/en/living-ottawa/water-utility-bills/rates-and-fees#section-b2c1d583-def5-4737-b7c2-08b858df8cc5</a>	\$0.90 per Litre	4	\$3.60
Sand	<a href="https://stouffville.schelllumber.com/p/play-sand-50lb227kg/PLAYSAND?srsId=AfmBOoqScCWRu_-XiYSleLb_roz5UyD_6vgGV3PRA-kTaMd82Khph2tM_w4">https://stouffville.schelllumber.com/p/play-sand-50lb227kg/PLAYSAND?srsId=AfmBOoqScCWRu_-XiYSleLb_roz5UyD_6vgGV3PRA-kTaMd82Khph2tM_w4</a>	\$6 per 22.7 kg	1 kg	\$6.00

Tank/ Recipient	<a href="https://www.walmart.ca/en/ip/113-l-3-gal-roughneck-tote-blue-blue/6000197852494?from=/search">https://www.walmart.ca/en/ip/113-l-3-gal-roughneck-tote-blue-blue/6000197852494?from=/search</a>	\$8.97	1	\$8.97
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Table 2. Electronic Components of the System (Temporary Materials)

Artifact	Reference	Price
Motor Driver/Controller	<a href="https://ca.robotshop.com/products/drv8838-single-brushed-dc-motor-driver">https://ca.robotshop.com/products/drv8838-single-brushed-dc-motor-driver</a>	\$6.24
Micro-processor/ controller	<a href="https://ca.robotshop.com/products/raspberry-pi-pico-h-microcontroller-board-based-on-rp2040-dual-core-processor">https://ca.robotshop.com/products/raspberry-pi-pico-h-microcontroller-board-based-on-rp2040-dual-core-processor</a>	\$9.71
Battery holder	<a href="https://ca.robotshop.com/products/battery-holder-4xaa-flat">https://ca.robotshop.com/products/battery-holder-4xaa-flat</a>	\$0.81
Batteries (4 pack)	<a href="https://ca.robotshop.com/products/tenergy-15v-alkaline-aa-batteries-4pk">https://ca.robotshop.com/products/tenergy-15v-alkaline-aa-batteries-4pk</a>	\$2.44
Wiring	<a href="https://ca.robotshop.com/products/elenco-22-gauge-red-25-ft">https://ca.robotshop.com/products/elenco-22-gauge-red-25-ft</a>	\$3.88

#### Software Equipment

- Arduino IDE software

**Total**  
**\$82.30 CAD**

## Test Plan

To test out our prototype, we have a detailed process in order to understand the capabilities of said prototype:

- Set up the prototype: plug in power and make a pre-check of all the systems within the prototype.
- Remove the lid, fill with a solution full of water and sand and place the sample disc onto the axle.
- Seal the lid, and make sure the motor is connected to the axle.
- Once the system is sealed and ready, run the Arduino code and make sure that the motor driver works as well.
- Once everything has been checked run the machine for an hour
- After the hour is over, turn off the machine, open the lid and remove the sample.
- Check the sample for volume size and compare it to the original volume.
- Remove the plug and let the solution drain out.

# Conclusion

Based on our prices we have found a budget which fits below the \$100 budget.