Project Plan and Cost Estimate

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Abstract

This project explores the influence of water on erosion processes utilizing core samples. It encompasses a comprehensive literature review, meticulous experimental design, and the application of advanced equipment. Erosion assessment encompasses various parameters such as mass loss, surface roughness, sediment transport, and the implementation of sophisticated imaging techniques. The financial plan comprises costs associated with procuring samples, necessary supplies, specialized equipment, personnel, essential software, and unforeseen contingencies. This project endeavours to explain the complex mechanisms of water-induced erosion, thereby contributing to a deeper understanding in both environmental and infrastructure contexts. The overall objective is to strike a balance between comprehensiveness and cost-effectiveness.

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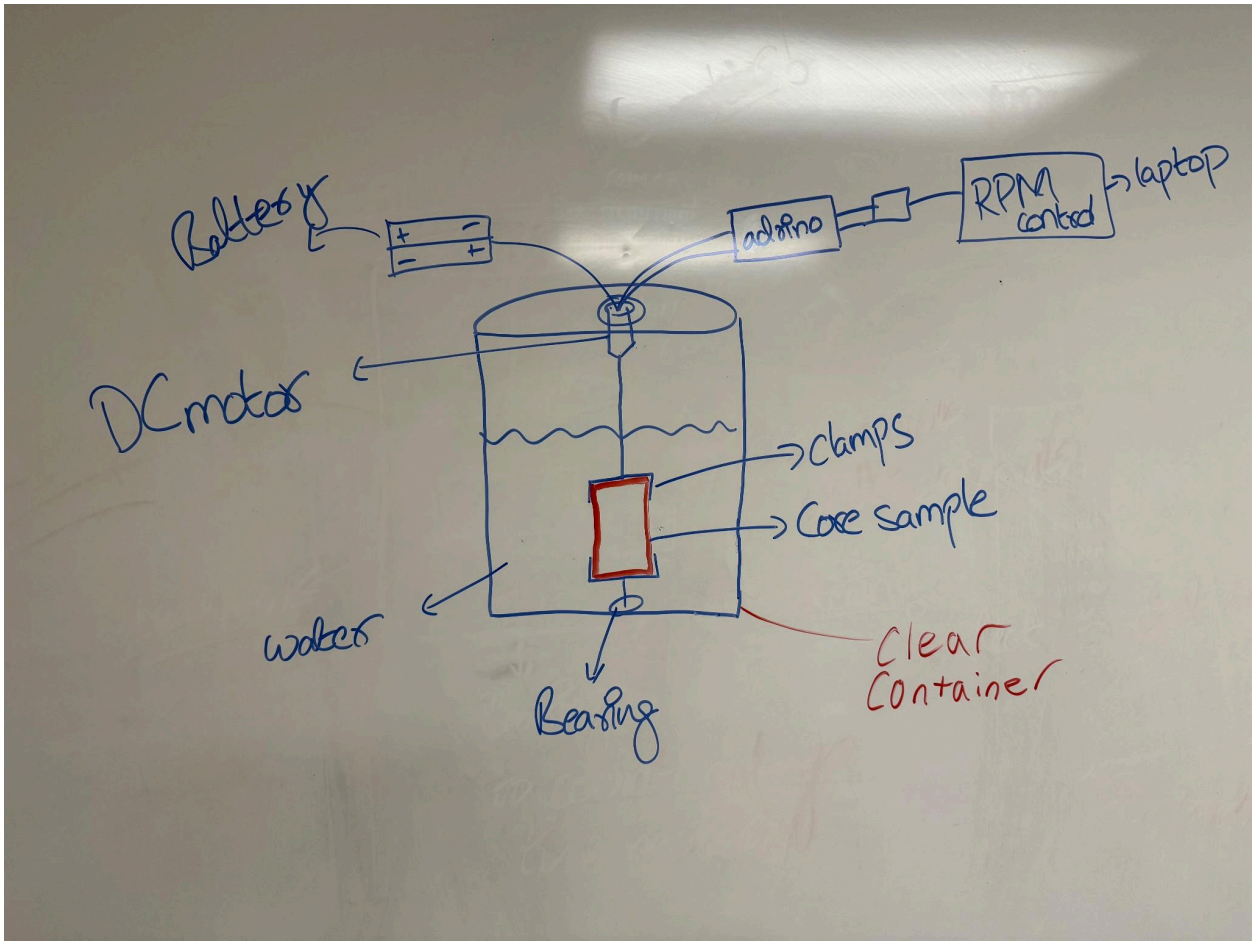
1 Introduction

The study of water-induced erosion in geological core samples is a complex and multidisciplinary endeavour, carrying significant implications within the realms of environmental science and engineering. This research project seeks to systematically probe the effects of water on geological core samples, with the overarching goal of contributing nuanced insights to inform sustainable environmental practices and enhance the precision of infrastructure planning. Subsequent sections of this document will expound upon the methodological framework, approaches, and financial considerations encapsulated within our project plan and cost estimate.

2 *Erosion Simulation and Modeling System 1*



3 Description:

Introducing the Core Sampling System, a high-tech tool designed specifically for erosion analysis on core samples. The system's central component is a clear, cylindrical chamber filled with water, allowing for easy observation of geological processes. The sampling mechanism uses water as a medium, providing greater precision and real-time viewing of sedimentary patterns. This feature enhances the understanding of erosion dynamics and improves the accuracy of analysis. In addition, a fan motor built into the lid generates currents that simulate natural erosion forces. The adjustable RPM settings on the motor allow researchers to control the intensity of the water flow, making it possible to study a wide range of erosion scenarios. The transparent chamber offers a clear view of the core samples as they are subjected to erosion, enabling researchers to observe changes in sediment structure and texture over time. The real-time visualization facilitates capturing valuable data and gaining insights into the erosion process.

4. Components:

- **Clear, Cylindrical Chamber:** The machine is anchored with the aid of a transparent, cylindrical chamber packed with water, strategically designed to facilitate a complete statement of geological techniques.
- **Sampling Mechanism:** At the coronary heart of the machine lies a sampling mechanism making use of water as a medium. This revolutionary method no longer guarantees more precision in the analysis however it also permits real-time statements of sedimentary styles.
- **Stepper Motor Integration:** An essential component that is incorporated into the machine's lid is a Stepper motor. This motor rotates the core sample in our erosion testing. A cheap stepper motor doesn’t provide as much torque as many cheap dc motors but it does provide the most fine control of any motor.
- **Adjustable RPM Settings:** The fan motor is geared up with adjustable RPM settings, affording researchers the potential to meticulously manage the depth of water flow. This feature complements the adaptability of the system, allowing for the study of a diverse spectrum of erosion situations.
- **Transparent Chamber for Observation:** The transparent nature of the chamber affords an unobstructed view of middle samples as they undergo erosion. This visual right of entry is instrumental in allowing researchers to have a look at alterations in sediment structure and texture through the years.
- **Real-time Visualization Capability:** The machine's architecture helps actual-time visualization, a feature that proves instrumental in shooting dynamic facts for the duration of the erosion technique. This real-time aspect extensively contributes to the purchase of precious insights into the intricacies of abrasion dynamics

5. Cost Breakdown of Small Prototype

Container:

$28.99

Brand, Pekky

Material, Plastic

Product Dimensions, 33L x 23.7W x 19.8H Centimeters

Capacity, 12 quarts/11.356235352L

Closure type, Latch

Shape, Rectangular

Number of Items, 1

Sealant:

$11.74

Brand, DAP

Arduino Uno board with connecting Usb:

$23.99

Brand, Elegoo (Arduino brand is way too expensive)

Model name, EL-CB-001

Bread Board:

Current price $6.00
Breadboard - 830 contacts

Jumper cables:

Current price
$7.50

Breadboard Jumper Wire Pack (200mm&100mm)

Ball bearing:

$10.98

Freud 7/8-Inch Router Bit Ball Bearing

Stepper Motor:

$35.44

Nema 23 Stepper Motor Bipolar 1.8 Degree 2.8A 1.26Nm(178.5oz. in) 56mm Length for CNC Robot

Stepper Motor Driver:

$28.43

DM542 2-Phase Stepper Motor Driver 57/86 Series Stepping CNC Motor

Batteries:

$18.49

4 Duracell 9v batteries

6. Conclusion

As a result, our research on water-induced erosion in geological core samples brings a significant scientific and practical contribution to the field of environmental science and engineering. The implementation of our project plan which is based on a thorough literature review, well-designed experiments and advanced analytical techniques provides the necessary ground for a successful study to have a major contribution in unravelling the mechanisms of soil erosion that are water driven.

The cost estimate is a prescribed, transparent document which clearly defines the financial needs of this research project, taking into account fiscal responsibility along with scientific accuracy. This project looks at cases where knowledge gaps exist, researching to fill these knowledge gaps and initiate informed decision-making in environmental management and engineering practices, which are expected to offer solutions to water erosion. To be in line with sustainable development goals, our research works towards the changes, which should be done in both natural and built environments.

7. References

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