Prototype I and Customer Feedback

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Abstract

This document details the first developed prototype and the test plan for the second prototype.

Introduction

This document outlines the development of the first prototype, the design principles used, how these principles correlate to the developed product, how these design principles are fulfilled, and the analysis of the resulting prototype. In addition, this document also includes a test plan intended for the next prototype based on the insights of the first prototype, and a robust design of the concept of the plan that we will implement.

Prototype

The first prototype focuses on best intimating the conditions necessary for degradation. Before any other objective, we need to figure out if our setup can indeed cause meaningful degradation. In our product design, we intend to use a motor to apply force to our part against our abrasive agents of water and sand. To best imitate these settings, we used a simple waterproof cup as our container which will be filled with a mixture of gravel and sand from the pavement, tap water, and the spun part. The motor of the system will be replaced with a makeshift crank. The prototype is designed to be as low cost as possible while still functioning.

Proof of the Concept:

Analysis

Many of the components are built as cheaply as possible to reduce costs and time spent developing, but attempts to capture the main concept of how spun parts will degrade within the system. Some differences to be note between the prototype and the intended product are:

- The durability of the actual spun part.
- The size difference between the prototype and the intended product.
- The speed, torque, and controllability of a motor.
- The operating duration and lifetime of the prototype as compared to the intended product.

Overall, the prototype mainly tests the use of abrasives to mimic water degradation.

Further Research

Further tests should focus on how far we can push the degradation of the system as well as the control. We can do this by first acquiring multiple spun parts, buying the motor and associated control electronics, and then test by increasing the speed of the motor step by step until either we have hit the maximum of the motor or ran out of testing material. In addition to this, we should vary the amount of abrasives used and the diameter of the spun parts to simulate different test conditions. These tests will provide higher quality data on the degradation capabilities of our system but will also explore the flexibility and control of our system which is crucial to performing repeatable and accurate experiments. Ideally, these tests should be done as soon as the second prototype so we can pivot to a different concept if the design falls through.

Conclusion

The prototype is designed to simulate the water degradation on a limited budget. To this extent, the design succeeds to demonstrate the degradation abilities of abrasives but does not account for certain qualities such as the power output and controllability of a motor in addition to the system's operating lifetime. Further testing should focus on these aspects of the systems as they are the basis for accurate and repeatable experiments.