Project Deliverable C: Design Criteria and Target Specifications

GNG 1103 – Engineering Design

Faculty of Engineering – University of Ottawa

By: Zaineb Wadood, Rebecca Heller, Matthew Schroeder,

Benjamin Kelly, Cameron Caudle

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**Introduction:**

This deliverable focuses on the development of our project plan and a schedule for prototyping and testing the solution to our customer's needs. Furthermore, we will show our agenda by using tables, which will include the important dates, critical risks and contingency plan, cost of our materials and prototyping test plan. There will be three prototyping deliverables as listed below.

**Final Idea:**



Figure 1 visual sketch of erosion tester



Figure 2 CAD design of erosion tester

**Project Plan:**

| # | Task | Estimated Duration | Who is responsible |
| --- | --- | --- | --- |
| 1 | Collect Materials | 1 day | CameronZaineb MatthewBenjaminRebecca |
| 2 | Assembling Prototype 1(Deliverable F) | 2 days | CameronZaineb MatthewBenjaminRebecca |
| 3 | Analyzing Prototype 1 and Testing | 1 day | CameronZaineb MatthewBenjaminRebecca |
| 4 | Assembling Prototype 2(Deliverable G) | 2 days | CameronZaineb MatthewBenjaminRebecca |
| 5 | Building Wood frame | 1 day | Cameron Matthew Benjamin |
| 6 | Prototype 3(Deliverable H) | 2 days | CameronZaineb MatthewBenjaminRebecca |
| 7 | Fixing Final Prototype Post Testing (Final Touches) | 1 day | CameronZaineb MatthewBenjaminRebecca |
| 8 | Prototype Display | 1 day | Rebecca Zaineb |
| 9 | Design Day | 1 day | CameronZaineb MatthewBenjaminRebecca |
| 10 | Final Presentation(Deliverable I) | 1 day | CameronZaineb MatthewBenjaminRebecca |
| 11 | Final Report(Deliverable K) | 5 days | CameronZaineb MatthewBenjaminRebecca |

**Cost Spreadsheet:**

| Item# | Material | Element  | Quantity | Dimensions | Unit Cost | Total Cost | Getting from |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 1 | Sand | Abrasive | 1 cup | None | $0.00  | $0  |  |
| 2 | Acrylic | Tank | 1 | 350x350mm | $8 | $8 | Boreal Power System |
| 4 | Motor | Rotates Shaft | 1 | 78x100mmRPM at Nominal Voltage: 5600Stall Torque:5Nm | $50.00  | $50.00  | Boreal Power System |
| 5 | Stainless steel rod | Shaft | 1 |  | $8 | $8 | Boreal Power System |
| 6 | aluminum/rubber | Coupler | 1 | 40x30mm | $3 | $3 | Boreal Power System |
| 7 | Washers | Fasteners | 36 | M6 | $.02 | $0.7 | Boreal Power System |
| 8 | Screws | Fasteners | 36 | M6x16 | $0.10 | $3.50 | Boreal Power System |
| 9 | Water (in Liters) | Liquid | 5 | N/A | $0.00  | $0.00  |  |
| 10 |  | Power Supply | 1 | 24v DC42A | $15 | $15 | Boreal Power System |
| 11 | Arduino Board | Controls | 1 | ‎8x5.51x2.49 cm | $0.00  | $0.00  |  |
| 12 | Aluminum plate  | motor support |  |  |  |  |  |
|  |  |  |  |  |  |  |  |

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From Boreal Power System

**Total Cost:** $77.40

**Critical Risks:**

* Imbalance in shaft and sample components can lead to excessive vibrations
* Components breaking
* Not being able to source components
* Final design fails to erode sample
* Cost Overruns
* Functionality Issues (might not perform as expected)

**Contingency Plan:**

* Have spare components available
* Find a substitute that can supplement
* Use the backup idea, a styrofoam sample
* Look at the availability of components before using them
* Use a realistic material for the sample
* Re-evaluate the budget and see where we can cut costs
* To avoid functionality issues regular testing and user validation may be helpful

**Prototyping Test Plan:**

| Test ID | Test Objective(Why) | Description ofPrototype used and ofBasic Test Method(What) | Description ofResults to beRecorded andhow these resultswill be used(How) | Estimated Testduration andplanned startdate(When) |
| --- | --- | --- | --- | --- |
| 1.0Test the water tightness of the acrylic tank system | Make sure tank is waterproof  | Fill tank with water, and let it for an hour. | Qualitative | 1hour24/02/24 |
| 2.0Arduino control | PWM motor control functions  | Test to insure that arduino is producing correct PWM signals for motor drive circuitry | Qualitative | 30min29/02/24 |
| 2.1Arduino control | Emergency stop  | Test to make sure emergency stop functions, by cutting the power. | Qualitative | 10min29/02/24 |
| 3.0Motor lid assembly | Looking for excessive current draw and vibration | Initial operation of motor and stub shaft a low rpm (100rpm) | Qualitative  | 15-20min1/03/24 |
| 3.1Motor lid assembly | Looking for excessive current draw and vibration | Operation of motor and stub shaft max rpm | Qualitative  | 15-20min1/03/24 |
| 3.2Motor with sample shaft | Looking for excessive current draw and vibration | Operation of motor and shaft at low rpm (100rpm) without sample | Qualitative  | 15-20min1/03/24 |
| 3.3 Morot with sample shaft | Looking for excessive current draw and vibration | Operation of motor and shaft at max rpm without sample | Qualitative  | 15-20min1/03/24 |
| 3.4Morot with sample shaft and sample | Looking for excessive current draw and vibration | Operation of motor, shaft, and sample at nominal rpm with sample | Qualitative  | 15-20min1/03/24 |
| 4.0Erosion acceleration test | Looking for excessive current draw and vibration | Operation of motor and shaft at max rpm without sample | Qualitative  | 1 week10/03/24 |
| 5.0 |  |  |  |  |

**Conclusion:**

In conclusion, the project plan and schedule presented here aim to guide our team through the development of three prototypes to meet our client's needs. By breaking down the tasks, assigning responsibilities, outlining costs, and identifying potential risks with contingency plans, we aim to ensure a smooth progression towards our final goal.