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University of Ottawa

GNG 1103: Engineering Design

**Project Deliverable C: Design Criteria and Target Specifications**

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**Wrike Snapshot**

**https://www.wrike.com/open.htm?id=968842438**

1. **Abstract**

Projects need categorization and organization so all the needs and design criteria of the client are met. Therefore, during the user-client meeting, our client outlined specific criteria of what they were looking for. At this stage, we organized and analyzed all information into design criteria. So, through the following deliverable, these criteria and specifications are categorized into tables and defined for clarity. Furthermore, the criteria are benchmarked and rated by importance. This will allow our group, Before the Pale, to strategize our plans to meet the outlined criteria for our client and better visualize our project.

1. **Introduction**

The following deliverable analyzes different client needs that were established in Deliverable B. It covers the importance and functionality of different user criteria and needs. Through this process, the list of prioritized criteria is established to help us get to our desired finished product. Further emphasized by benchmarking, these user needs will allow us to have a conceptualized finished product.

1. **Needs and Design Criteria**

*Table 1.0: Needs Statement, Design Criteria, Functional/Non-Functional Needs*

|  |  |  |  |
| --- | --- | --- | --- |
| **Importance**  **(5>1)** | **Need** | **Design Criteria** | **Functional or Non-Functional** |
| 5 | Can be mounted inside but must be secured | Mounted securely in the brewing tank | Functional |
| 5 | Food safety | Food safe materials | Non-Functional |
| 5 | Make logging data more efficient  Samples not taken by hand, reduced waiting period | Data recording | Functional |
| 5 | Make all calculations and measurements done inside the  tank thus minimum loss of product | All measurements must happen within the tank | Functional |
| 5 | Easily removed from the tank and can withstand cleaning products | Easily removed from the tank | Functional |
| 4 | Data is stored in house, easily readable and saved for future use | Local data recording | Functional |
| 4 | Price is flexible (prototype cost limited) | Cost | Non-Functional |
| 4 | Low maintenance cost | Upkeep cost | Non-Functional |
| 4 | Battery pack system | Battery powered | Functional |
| 2 | Temperature monitoring system | Temperature monitoring | Functional |

1. **Benchmarking**

*Table 2.0: Metrics and Benchmarking Properties*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **#** | **Metric** | **RAPT Pill** | **TILT** | **iSpindle** |
| 1 | Mounted securely in the brewing tank | No | No | No |
| 2 | Food Safe | Yes | Yes | Maybe (project is open source thus it relies on the user) |
| 3 | Data Recording | Yes | Yes | Yes |
| 4 | All measurements must happen within the tank | Yes | Yes | Yes |
| 5 | Easily removed from the tank | No (sensor is free floating) | No (sensor is free floating) | No (sensor is free floating) |
| 6 | Local Data Recording | No | No (but is compatible with 3rd party apps like Google Sheets) | Yes (project is open source and can be configured for local data recording) |
| 7 | Cost | $79.99 CAD | $185.46 CAD | Variable (project is open source, thus part costs can vary) |
| 8 | Upkeep Cost | N/A (no upkeep except charging the device) | N/A (no upkeep except charging the device) | N/A (no upkeep except charging) |
| 9 | Battery Powered | Yes | Yes | Yes (open source so can be modified for larger batteries) |
| 10 | Temperature Monitoring | Yes | Yes | Yes |

*Table 2.1: Comparison of Importance Given by each Option*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **#** | **Metric** | **Importance (5>1)** | **RAPT Pill (5>1)** | **TILT (5>1)** | **iSpindle (5>1)** |
| 1 | Mounted securely in the brewing tank | 5 | 1 | 1 | 1 |
| 2 | Food Safe | 5 | 5 | 5 | 5 |
| 3 | Data Recording | 5 | 5 | 5 | 5 |
| 4 | All measurements must happen within the tank | 5 | 5 | 5 | 5 |
| 5 | Easily removed from the tank | 5 | 3 | 2 | 3 |
| 6 | Local Data Recording | 4 | 1 | 2 | 4 |
| 7 | Cost | 4 | 3 | 2 | 4 |
| 8 | Upkeep Cost | 4 | 5 | 5 | 5 |
| 9 | Battery Powered | 4 | 5 | 5 | 5 |
| 10 | Temperature Monitoring | 2 | 5 | 5 | 5 |
| **Total:** | | **43** | **38** | **37** | **42** |

To conclude, from the already available solutions, the iSpindle adheres the most to the design criteria and metrics we have made for this project.

1. **Target Specifications**

*Table 3.0: Functional Requirements*

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **#** | **Design Specifications** | **Relation** | **Value** | **Units** | **Importance (5>1)** | **Verification Method** |
| *Functional Requirements* | | | | | | |
| 1 | Mounted securely in the brewing tank | = | Yes | N/A | 5 | Analysis |
| 2 | Data recording | = | Yes | N/A | 5 | Test |
| 3 | All measurements must happen within the tank | = | Yes | N/A | 5 | Analysis |
| 4 | Easily removed from the tank | = | Yes | N/A | 5 | Analysis |
| 5 | Local data recording | = | Yes | N/A | 4 | Test |
| 6 | Battery powered | = | Yes | N/A | 4 | Test |
| 7 | Temperature monitoring | = | Yes | Degrees Celsius or Fahrenheit | 2 | Test |

*Table 3.1: Constraints*

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **#** | **Design Specifications** | **Relation** | **Value** | **Units** | **Importance (5>1)** | **Verification Method** |
| *Constraints* | | | | | | |
| 1 | Cost (Prototype cost) | < | 1500 (100) | Dollars | 4 | N/A |
| 2 | Cannot use any material we want, must be food grade. | = | Yes | N/A | 2 | Analysis |
| 3 | Device cannot be small or free floating in water/ must be attached. | = | Yes | N/A | 2 | Analysis |
| 4 | Cannot be permanent, should be removable for cleaning. | = | Yes | N/A | 3 | Analysis |
| 5 | Must be strong enough to withstand pressure within tank | = | Yes | N/A | 3 | Test |

*Table 3.2: Non-Functional Requirements*

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **#** | **Design Specifications** | **Relation** | **Value** | **Units** | **Importance (5>1)** | **Verification Method** |
| *Non-Functional Requirements* | | | | | | |
| 1 | Food Safety | = | Yes | N/A | 5 | Food safety labels and must be in accordance with the food safety laws in Ontario |
| 2 | Prototype cost | < | 100 | Dollars | 4 | Sale pitch to client with estimated costs |
| 3 | Upkeep costs and maintenance | < | Yes (minimal) | Dollars | 4 | Minimal subscriptions and in house cleaning and maintenance |

1. **Reflection**

Meeting with the client provided us with a lot of insight into what our client’s needs and wants are. We were able to ask questions and conclude that our client is looking for a device that is mounted to the tank, yet easily removable. Functionally it is able to record data locally, but also provide measurements in real time electronically. The device must adhere to strict food safety materials guidelines and be able to withstand high pressure since it would be within the tank most of the time. Additionally, our client is hoping to see other useful features such as a battery pack for unexpected power loss or ability to monitor temperature. All that must fit within our provided budget.

Through this deliverable, we were able to record all needs and wants of our client and prioritize them. We also did research into what is already available on the market, to see what competition offers. In this process, we have realized that most options available do not offer a mount, which our client really wants. We also were not sure about using third party applications, but the client requested that all is done locally. We also found a few design routes for our devices. After the client meeting, we assumed that measurement of specific gravity can occur only during the fermentation process, but it can also happen while it is inflow at 56-70 degrees Celsius.

By identifying our client’s priorities such as functionally over aesthetics and performing a benchmarking process, we were able to collect enough information to start thinking about our prototype design.

1. **Conclusion**

In conclusion, in this deliverable, different client needs, and design criteria are assessed and covered. Through this process, we broke down all criteria to functional, non-functional and the ones that serve as constraints to our project. Each design criteria were then individually assessed and ranked on its importance to the client. After all design criteria were established, we performed benchmarking to compare different options available on the market such as RAPT Pill, TILT, and iSpindle. Through this process, we established that iSpindle was the one that covered the most design criteria that we set, but none of the options offered a secure mount to the tank as our client requested. We are confident that with the information collected and analyzed, we are prepared to put together a prototype that would meet our client’s needs.