Project Deliverable C: Design Criteria and Target Specifications

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1. Introduction

This deliverable consists of doing the second step of design thinking process which is problem definition. We will define a prioritized list that will include functional and non-functional constraints that must be taken into consideration in our design. Furthermore, we will have to update our client's needs by using research skills to determine technical benchmarking data and identify missing technical specifications or refine poorly defined ones.

2. Design Criteria

Based on the team's list of interpreted needs, teams will define a list of prioritized design criteria, including functional and non-functional requirements, as well as constraints (and metrics, where appropriate).

Most to Least important:

2.1. Easily replaced, installed, and maintained

- Functional requirements: yes
- Non-functional requirements: yes
- Constraints: cost, size, weight
- Metrics: $$, lbs, meters
-

2.2. Allows for process to remain organic

- Functional requirements: yes
- Non-functional requirements: yes
- Constraints: must remain organic

2.3. Cost efficient

- Functional requirements: quality materials for fraction of price
- Non-functional requirements:
- Constraints: max material cost for prototype: $100

2.4. Full measurement of dust

- Functional requirements: yes
- Non-functional requirements
- Constraints: as close to accurate but not exact
- Metrics: density, kg

2.5. Can't delay brewing process

- Functional requirements: yes, quick pace
- Non-functional requirements:
- Constraints: timely, min, hrs

3. Benchmarking Data

	Blue Level Sensor RH/RHX	VEGAPULS 69	Level Sensor LBV300	LoRa Level Monitoring XL[4]
Company	Blue Level Technologies	VEGA	SICK Sensor Intelligence	Terabee
Cost	???	3500 USD	850 USD	???
Ambient Temperature	-40 to 70 °C	-40 to 80 °C	-50 to 70 °C	-20 to 65 °C (Terabee LoRA Level Monitoring XL Specification Sheet, 2021
Material of device	Aluminum	Plastic horn antenna and aluminum jacketed lens	Stainless steel and aluminum	Polycarbonate, ABS

Safety feature	Automatic shut off feature	N/A	N/A	Battery feature would cause for it to be changed
Sensitivity and range	5lbs/ft^3 to 10lbs/ft^3	Range of 150m	Particle size < 10mm Material density > 0.008g/ cm^3	Range of 60m
Easy Installation	A single 4 ¾ inch hole in centre of roof will accommodate body of senser.	Mount 200mm away from silo wall making sure it is perfectly level.	It is connected to roof of silo and sensor is slowly lowered until fully extended and floating in tank.	No cables needed, placed at the top of the silo
Method of Calculating Level	Uses propellor system	Uses laser system	Uses vibrating level switch	Uses infrared Time-of- Flight

[4](Terabee LoRA Level Monitoring XL Specification Sheet, 2021)

4. Specifications

Specifications	Importance (Weight)	Blue Level Sensor RH/RHX	VEGAPULS 69	Level Sensor LBV300	LoRa Level Monitoring XL[4]
Cost	2	1	2	3	1
Ambient Temperature	1	2	1	2	3
Material of device	1	2	1	2	3
Safety feature	2	3	1	1	2
Sensitivity and range	3	1	2	3	2
Easy Installation	3	1	2	1	3
Method of Calculating Level	2	3	3	2	1
Total		24	26	28	29

Through the benchmarking data shown in the above graphs, it is clear that all products currently on the market share a similar total value to the customer. We will be able to use this information to better meet the specifications outlined below.

4.1. Design Specifications

4.1.1. Functional Requirements

Specifications	Relation (=,< or >)	Value	Units	Verification Method
Replaced & Installed Easily				Analysis, Test
• Time to Install	<	2	hrs	Test, Final Check
• Ease for Workers	<	N/A	N/A	Test, Final Check
Maintenance & Easy Access				Analysis, Test
• Size	<	Unknown	meters	Analysis
• Weight	<	Unknown	lbs	Analysis, Final Test
Full Measurement of Dust (Density)	<	Unknown	kg	Analysis, Test

4.1.2. Non-Functional Requirements & Constraints

Specifications	Relation (=,< or >)	Value	Units	Verification Method
Cost	<	10,000-20,000	$	Estimate, Final Check
Can't Delay Brewing Process (Process must take)	<= Current	Yes	Time	Estimate, Test
Allows for Process to Remain Organic	=	Yes	N/A	Analysis, Test
Safety (for Employees & Consumer)	=	Yes	N/A	Test
Reliability	=	Yes	N/A	Test
Cost of Model	<	100	$	Estimate, Budget, Final Check

5. Project Planning

https://www.wrike.com/frontend/ganttchart/index.html?snapshotId=nPlPihngVLFQdVH4oADhoSHtGDKjqeXR%7CIE2DSNZVHA2DELSTGIYA

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