University of Ottawa

GNG 1103B: Engineering Design

Project Deliverable C: Design Criteria and Target Specifications

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1. Introduction

In this deliverable, we will be first ranking and grouping the needs of our client and finding what are the most important points to reach in our product's design. Next we will be finding technical benchmarking to similar products out right now to see what we need to keep our product competitive with the industry standard. After this we will further define which of these products strike the best balances between the needs of our user. Finally, we will then show a list with the target specifications for our product and what needs to be achieved to reach the customers goals.

2. Needs and Design Criteria

Table 1.0: Needs Statement, Design Criterion, Functional/Non-functional needs

Importance (5>1)	Need	Design Criteria	Functional or non functional
2	Low cost	Cost ($)	functional
5	Monitor beer for fermentation.	Measure specific gravity (plato)	functional
5	Needs to deliver data every 10 seconds.	Measure rapidly (seconds)	functional
4	Needs to be easily removed for cleaning.	Easily mounted and detachable mean while staying stable.	functional
3	Food safe.	Meet government food regulations.	functional

3. Benchmarking

Table 2.0: Metrics and Benchmarking Properties

#	Device	Purpose	Advantages	Parameters
1	Endress+Hauser's Fermentation Monitor QWX43	-Incorporates a piezoelectric tuning fork and various sensors. -Sensors monitor	-Rounded structure eliminates gas bubble accumulation on the sensor surface and improves measurement stability and reliability.	-Density (20 °C) g/cm^3 -Density (15.6 °C) g/cm^3 -Dry mass, original wort

		density and viscosity to control quality and estimate filtration times.	-Can wirelessly connect to the cloud for monitoring in the control center and on a phone via the Netilion Value app. -Cut on-site labor and manual sample expenses. -Utilize autonomous remote alerts for optimal fermentation levels to optimize tank occupancy. -The sanitary design enables tank-integrated cleaning. -Automatic batch and value generation, storage, and retrieval.	%mass -Dry mass, extract %mass -Original wort Plato -Extract Plato -Extract (Balling) Plato -Residual extract (Balling) Plato -Alcohol %mass -Alcohol (Vol) %Vol -Alcohol (Balling) %Vol -Real degree of fermentation % -Degree of fermentation (Balling) % -Fermentable sugars %mass -Non-fermentable sugars %mass -Concentration CO2 %mass

2	Anton Paar Fermentation Monitor 5100	-Uses refractive index measurement directly in the tank to monitor alcoholic fermentation during	-There is no need for time-consuming manual sampling and preparation of the wort.	-Original extract [°Plato] -Apparent extract density [°Plato]

		the creation of beer, wine, or spirits. -Enable brewers to improve quality and profitability by dramatically improving fermentation-process control.	-Incorrect temperature management, growth deviations, and so on are identified to assure fermentation consistency and higher end-product homogeneity. -All cleaning operations are carried out in the tank.	-Alcohol [%w/w] -Alcohol 20 °C [%v/v] -Real extract [°Plato] -Real degree of fermentation [%] -Fermentation speed [Alcohol 20 °C increase in %v/v per hour]
3	Precision Fermentation BrewMonitor® System	-User-friendly comparative analyses allow you to instantly check yeast viability. -Expand quality control methods to enhance results, save time, and also save money.	-Web browser: HTML 5-compliant and JavaScript-capable -A multi-sensor array transmits real-time data to the cloud. -Cleaning that is automated -Access fermentation status from any web-enabled PC, tablet, or phone at any time. -Automatically generated email and/or SMS notifications based on specified criteria, informing of anomalies -Completely cloud-based; no programme to install -Batch-to-Batch Quality Analysis simplifies the process of ensuring consistency and improving the quality of your operational procedures.	-Dissolved Oxygen -pH -Gravity -Pressure -Fluid Temperature -Ambient Temperature -Conductivity

4	ABER Yeast Monitor	-The probe can be inserted directly into the sidewall of the cylindrical vessel above the cone, or in a pumped pipe loop that circulates the tank's contents. -The vessel's output will be proportional to the volume of biomass present surrounding the probe and may be calibrated to any desired unit of measurement, most frequently cells/ml. -The signal is then sent to a proper data logging system, where it may be profiled for each specific fermentation.	-After pitching, the initial concentration in the fermentor] -The stage of cell development; this might have a negative impact on the eventual product's quality. -A desired peak cell concentration; this number might be used to trigger cooling or a vessel transfer. -The progression of yeast flocculation upon chilling	-Resolution: 0.1 pF/cm -Approx: Yeast or Animal Cells 0.05g/L or 1 x105 Cells/ml -The relationship of these capacitance values to biomass levels depends upon the cell type and line.
5	QuantiPerm FERMENTATION MONITOR (FMS)	-Is capable of continually monitoring several bioprocesses. -Can multiplex up to twelve fermentations into a single measuring instrument at the same time. -The control system will send one bioprocess at a time to the flow meter, reporting the rate of gas evolution.	-Can perform real-time calculations for a variety of metabolic metrics of relevance, including CER, OUR, extract/nutrient intake, biomass growth respiratory coefficients, and so on. -In real time, all parameters are tracked and reported. -Consistent technical and customer support -A straightforward and durable design	-Contains a valve matrix and a high accuracy flow meter -Can monitor metabolism in aerobic bioprocesses, determining oxygen absorption rates and CO2 evolution rates for each fermenter, for example. -Continuously measure off gas flow rates (biogas, CO2, etc.) in numerous fermentations that are

			-Continuously monitor and track the evolution rate of CO2 (or other biogas), O2 uptake rate, and nutrient intake (extract attenuation) -There is no need to alter your processes. The systems will keep track of how your procedures are doing.	running concurrently.

4. Target Specifications

Table 3.0: Functional Requirements

#	Design Specifications	Value	Units	Importance (5>1)	Reasoning
1	Weight	<10	kg	5	This measuring device needs to be removed and cleaned once & a while, suggested load around shoulder height is 10 kg.
2	Dimensions	Max of 6x6x6	inches	4	Ports to install the measurer are only 3 inches, and to install a device inside the tank, one needs to minimize space within the tank to not take away from the volume of beer that can be made.

3	Time to learn device	1	day	3	Product should be made simple enough that the user can quickly apply the device and start using the device.
4	Software outputs	26	Platos	2	No need for readings to go higher than 26 plato as it is unlawful to brew beer that high.
5	Software Interface	2	outputs	2	Prefer to have two separate displays. One with numbers, and the second with a graph.

5. Conclusion

In conclusion we have clearly defined design criteria to make our client happy, we have ranked these different parts of design criteria into a list of what is most important to implement to the highest standard our budget allows. We have looked at the competition's product to see what is the standard to reach into these criteria. And we have come up with quantifiable definitions for what our product has to reach.

6. Bibliography

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