

# Deliverable B – Needs Identification and Problem Statement

Group: B01 – Team 02

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## User Identification:

Client: The Client is Shane Clark, Owner of Beyond the Pale Brewing Company (BTP)

Users: BTP's Lab techs will be using this device. Head and assistant brewers may also be required to use this device from time to time.

## Needs Interpretation:

**Table 1 – Fermentation Tank System Need Identification**

User Statement	User Need
We need a way to measure specific gravity in a real-time way. Manual method is inefficient and costly	The device must be automated and display results as they are produced
We have a 3" fitting that is not being used.	The device must be compatible with a 3" fitting
We want data to be recorded and log on to a graph to see if the curve is what it needs to be	The device must record and log data to be saved for future reference
Data must be taken every between every couple of minutes to a maximum of an hour so we can fix any issues with the batch	The device must record data every couple of minutes
Once a sample is taken, the sample must be thrown out	The device must be a sample less system
Stir bars exist which can determine specific gravity, but we lose them when we empty the tanks	The device must not be free float in the tank
If it touches beer, it must be food safe	The device must be food grade
Fermentation lasts 2-3 weeks	The device must be able to withstand 2-3 weeks of continuous monitoring
We clean everything between batches	The device must be easily removable for cleaning
Temperature is particularly important to ensure proper taste	The device must be able to measure temperature.
We have a hired electrician and cables going everywhere which could accommodate design	The device must be hardwired

## Needs Statement:

From most important to less important:

1. **Safety:** The client has specified anything that will be in contact with their product will be food safe. This is to ensure the safety of their clients, to make sure that what they produce is safe for consumption. This device is also required to be safe for his staff to use as he follows official

workplace safety protocols. Consider priority since this device will be used by people working in a brewery and since product produce is food needs to be safe for consumption.

2. **Data/Accuracy:** Beyond the Pale is looking for a device to accurately measure the density of beer or wort also known as specific gravity in relation to time. Temperature is also important to accurately measure as that is how our client knows when to move forward in their processes. Our client currently measures their product by using the Plato gravity scale which is degrees Plato. They currently take measurements of temperature in degrees Celsius. The client needs the device to be able to run constantly for two to three weeks. During parts of their brewing process, they require readings up to every second. This ensures the quality and consistency of their product. The client needs to keep a logbook of all the readings that have been made. To later go back and remake that product accurately again.
3. **Time:** Currently the client’s process of taking the required measurements uses up to ten mins per reading ten times a day for one tank. With the client having 16 tanks to manage and record readings this takes up a lot of their employee’s time. They need the device to take readings quickly so ensure the time spent on one tank is depreciated. Allowing employees to focus on other important tasks.
4. **Physical needs:** The device must fit inside the current tanks that the client currently uses. The fittings of the tank are a 3-inch diameter hole or a 1 ½-inch diameter hole. To get an accurate reading the device needs to be placed close to the center of the tank roughly 6-8” high and 12” from the edge of the tank. To secure the device it will be clamped into place with gaskets to ensure it is sealed. The device will not free float as the risk of losing the device is too high. A display screen will show the current date and time with all applicable readings. The device will be easy to use and understood by all employees. All equipment that the client uses is cleaned after every use. The device will be easy to remove and install for cleaning.
5. **Cost:** Our client has specified that their budget to upgrade all the tanks with this device is \$25,000CAD. The device will need to lower costs by not needing a subscription-based platform. It will also lower the cost by not wasting beer. Currently the client takes samples of the beer to receive their required measurements. The device will be placed in the tanks removing the need to take samples of the product allowing them to get more out of one batch.

### Problem Statement:

Beyond the Pale needs a food-safe device that can accurately measure brewing metrics and log specific gravity vs time in a cost-effective, automated system.

### Benchmarking:

	Manual Hydrometer	Digital Hydrometer	Refractometer
<b>Accuracy</b>	0.001 g/cm <sup>3</sup>	0.001 g/cm <sup>3</sup>	±0.2 Plato
<b>Cost</b>	254.54 \$	2415 \$	254\$
<b>Re-usable device</b>	yes	yes	yes
<b>Need to take Samples</b>	110 – 430 ml samples	Min. 2 ml sample	100 µL
<b>Data Collection</b>	Manual	Wireless	Manual
<b>Requires Labour</b>	yes	yes	yes

## References

Manual Hydrometer:

<http://d163axztg8am2h.cloudfront.net/static/doc/18/76/f512db1ff41588a2def770fea80d.pdf>

Digital Hydrometer: <https://eepowersolutions.com/products/battery-testing-equipment/digital-hydrometers/sg-ultra-digital-battery-hydrometer-portable-battery-density-tester/>

Refractometer: <https://hannacan.com/digital-refractometer-for-beer-hi96841>