Deliverable C: Empathize – Design Criteria and Target Specifications

Defining Design Criteria

In the previous deliverable, the team produced a list of client needs along with a prioritization system, as well as sorting them into functional and non-functional needs. The following figures display the results.

Client Needs	Prioritization
Product will be aesthetically pleasing	**3**
Product will display longevity	**2**
Product will increase overall process efficiency by a minimum of 2%	**1**
Product will be accessible offline	**2**
Product will be able to output operating speeds for all components of the process	**1**
Product will be able to provide information pertaining to the current efficiency level of their process	**3**
Product will require low maintenance from user	**1**
Product will determine efficiency statistics of the process using the V-curve theory	**1**
Product will be safe to operate	**1**

Note: prioritization range from 1-5: The highest priority being 1, whilst 5 being the lowest.

Functional Needs	Non-Function Needs
Product will increase overall process efficiency by a minimum of 2%	Product will be aesthetically pleasing
Product will be accessible offline	Product will display longevity
Product will be able to output operating speeds for all components of the process	Product will be safe to operate
Product will be able to provide information pertaining to the current efficiency level of their process	--
Product will determine efficiency statistics of the process using the V-curve theory	--

The team was also able to identify various metrics from their rewatch of the first client meeting. The most important measurable attribute to be considered in this design is the increased efficiency. In the meeting, the client expressed interest in the product's ability to increase the overall process efficiency by a minimum of 2%. To reach this goal, the client states he will provide the team with data on the current conveyors and systems, which the team patiently awaits.

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The client also expressed the need for the system to have three separate sections for cans, bottles, and kegs. In the process, the units of operation the team must use, according to the client, are cpm (cans per minute), bpm (bottles per minute), and kph (kegs per hour). Additionally, the brewery has three distinct can and keg sizes that must be taken into consideration. These can sizes consist of 355 ml, 440 ml, and 473 ml, and the keg sizes are 50 l, 30 l, and 20 l.

Another metric that the team must consider is the current operating speed of each filler station. The filler is described by the client as the bottleneck of the system and is the slowest batch process in the line. Therefore, when using V-curve theory to determine the speeds for all other systems and conveyors, it is important that they revolve around the filler station operating speed. The filler stations for each line are as follows: can line (180-375 cpm), bottle line (300 bpm), and keg line (16-30 kph).

Finally, the team must consider how different packaging sizes can affect the overall speed and efficiency of the process. The can line system consists of packaging sizes of 4 pack, 6 pack, 12 pack, and 15 pack, while the bottle line consists of 6 pack, 12 pack, and 24 pack options.

In terms of constraints, the team must take into consideration the quantity of data provided by the client. As of the time of this deliverable, the client has yet to provide the professor or team with the data outlined in the first meeting as promised. Current operating speeds, widths, and conditions for conveyors and systems across the lines; the number of conveyor lines between each system; and the system's maximum throughput are examples of such data. If the team never receives the required data, the functionality of the product may alter as necessary.

Technical Benchmarking

For technical benchmarking the team will be looking at 2 existing conveyor control systems. The two that the team will be looking at the are ABB Ability™ Beer Maker and LineView™ Solutions.

1. LineView™ Solutions

LineView™ Solutions offers a conveyor control system that can increase overall equipment efficiency up to 10% using line balance optimisation. This more than satisfies the users need since we are seeking only an increase of 2%. A few other desirable features that LineView™ Solutions offers, are line balance monitoring, real time feedback, intuitive user interface, and self-configuration. LineView™ Solutions contains many of the requirements the team is seeking and is used by many reputable companies which is the team considers this a good product to conduct benchmarking on. The team will focus on LineView™ Solutions' ability to increase efficiency by 10% and its user interface.

2. ABB Ability™ Beer Maker

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ABB Ability™ Beer Maker advertises that their product as, “a brewery-specific control solution to support safety and quality improvements in breweries, boost productivity and raise operational efficiency”. Some of the features that it offers are diagnostic functions, high level automation, and comprehensive cleaning-in-place support. ABB Ability™ Beer Maker allows connectivity of all the brewery processes to provide reporting, dashboarding and analytical solutions. ABB Ability™ Beer Maker is our second technical benchmark since it advertises features that we are seeking. The team will focus on ABB Ability™ Beer Maker’s ability to have full control of the brewery and its ability to provide insights on where improvements in efficiency can be made.

3. Brewmaxx

Brewmaxx is a software that is used in the field of automation as well as information and control technology. It allows brewing processes to be controlled and inspected. It connects different processes strategically to “manage a brewery more efficiently and economically”. Brewmaxx offers alterations of the process without having to temporarily stop production. Brewmaxx will be a good product for the team to benchmark with since it is more focused on programming aspect of the brewery control system.

Target Specifications

The client wants to meet the target of a 2% overall efficiency increase from each process. In terms of more specific specifications, the team can’t currently provide more detail, as stated in the constraints section of this deliverable. To combat this issue, the team plans to speak with the professor before the following deliverable D is due, and, if needed, reach out to the client directly. The second client meeting is tentatively scheduled for Wednesday, February 15th, at which the team plans to ask follow-up questions about the project and request the required data if it has not already been provided.

In addition, the client requests that the programme be user-friendly and easy to use. The user should be able to learn how to operate the programme in a short amount of time and without much difficulty or confusion. In terms of specifications, the user should be capable of learning the product's capabilities within roughly 15 minutes at most.

Finally, the interface should consist of a variety of inputs and outputs. In terms of input, the client will need to enter the given filler and conveyor speeds, and the programme should output the current and ideal speeds for the rest of the systems, along with efficiency statistics to help the user improve the line.

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Reflection

The client meeting significantly impacted the development of the design criteria and specifications. In terms of relative importance, priority was assigned to the specific, urgent needs that the user required. The fundamental aspect of the product is that the production line speed will be set using the V-curve theory, where the filler station will be an independent system to analyse the efficiency of the current system. The clients will be looking at the throughput of the entire line, and an overall efficiency increase of 2% is expected. Speed data from the conveyers needs to be inputted into the system to provide a full analysis of the entire line, including the can, bottle, and keg lines. The clients also heavily emphasised the ability of the system to be easy to operate and provide efficient feedback for different stations in the line. In terms of ease of use, the users are looking to be able to adapt to the system quickly; furthermore, the interface should be simplistic and aesthetically pleasing. Moreover, the system will need to identify areas that are not running at optimal rates and be able to provide sufficient recommendations with respect to the optimization of the line.

In terms of updated needs, the team will increase its efforts to develop the product to be versatile and applicable for the preventative maintenance schedule that is in place. The system will need to be able to account for new or different pieces of equipment added across the lines. Depending on the information given by the client, some areas in the line will have converging and diverging pathways because of having different numbers of lanes and lane sizes throughout the line. Furthermore, Millstreet Brewery is a company that is consistently innovating, which means that new products with different technical specifications will have to be accounted for (can size, specific wrap material, etc.). In terms of maintenance, the client emphasised how important it is to decrease the number of times the line runs into a problem and is stopped and increase the efficiency of recovering the line back to optimal speed. To address this issue, the client should be able to easily input a filler speed, and the system should be able to recognise a station that is not working optimally for that speed so that adjustments can be made at that piece of equipment.

References

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