Project Deliverable D: Conceptual Design GNG 1103 Prof Knox

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Sub systems

We have broken down our design ideas to incorporate three different subsystems which are measured, analyzed and adjust. We did this to ensure that we can determine the best combination of all three subsystems. The first subsystem measure refers to how the CPM will be measured and what tools will be used to do this. The second subsystem analyze refers to how the data will be read for example what adjustment software will be used, like computers, Arduinos, databases, etc. The final subsystem adjustment refers to how the software will change the speeds of the conveyer or alter other things.

Chart of the solutions in each subsystem:

Measure

Tools:	Accuracy	Cost	Easy to Implement	Efficient
Laser Measurement	Very accurate	2.5	yes	Super efficient
Signal device	accurate	10	fair	efficient

Analyze

Tools:	Accuracy	Easy to implement	Easy to Use?	Efficient
Арр	accurate	hard	Very easy	Very efficient
Signal	accurate	fair	easy	Very efficient
Arduino	accurate	fair	easy	Very efficient
Laser tracker	Very accurate	fair	Very easy	Very efficient

Adjust

Tools: Accura	cy Easy to arrange	Easy to use?	Efficient
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арр	accurate	fair	Very easy	efficient
motor	accurate	Very easy	fair	efficient

Design Concepts:

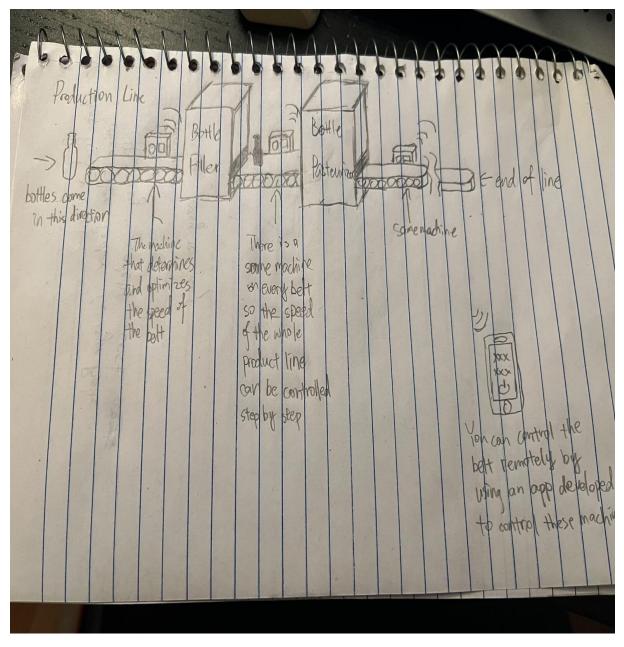
٠	Stations:
	Previous Filler Next Station Tachometers
System	Work Process:
	A Filler sensor -> Computer -> Filler A
	13 Previous/Next > sensor > Previous/Next B Station Speed detect
	Control pannel
•	VB: 110% than VA Control motor A Set VA
	if yes it no
	continue moter B speed up

There will be sensors detecting the speed between each station. If the speed is 10% faster than the previous section, the conveyors remain the same execution. However, if it doesn't reach the standard, the system would speed up the section automatically. Pros:

- System applies V-curve theory
- Convenient for users

Cons:

- Speed is uncapped when motor B speeds up
- Systems apply organized software. This takes a longer time to develop

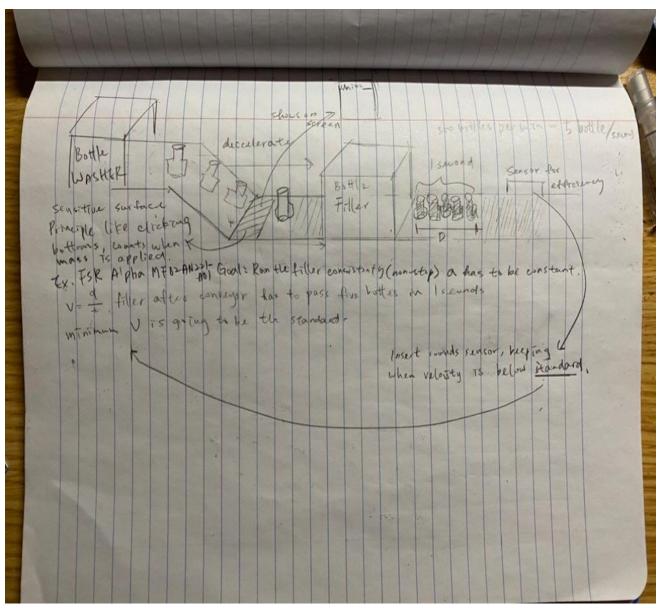


This system has a sensor between each section on the conveyor belt. Users can control the system remotely to arrange if speed is not optimal. Pros:

- The system can accurately determine the speed of each section on the conveyor belt.
 - Convenient for users to control the system

Cons:

- Cost more money to insert sensors
- Complexity and app development takes large amount of time



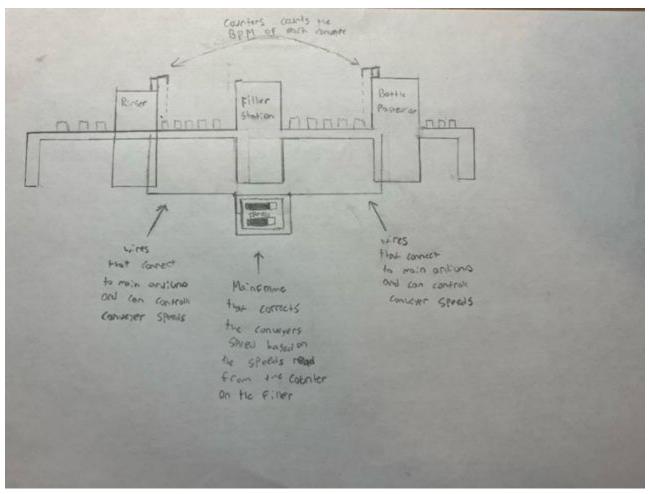
The system counts the unit of bottles when it lands on the sensitive area. After the filling station, a sensor would make noise if the speed of the conveyor belt is below standard speed(standard speed is (length of five bottles)m/second).

Pros:

- Easy for user to notice if the speed isn't reached
- Low cost and mobile system is not mandatory

Cons:

- Miscount bottles when the width of the conveyor fits multiple bottles are once
- Inconvenient for users to control the system when the user is not on sight



The core to determine the speed is the arduino. Stations have wires connecting to the arduino and giving the raw data. After calculation, the arduino displays the speed at that moment. Pros:

- Simple and easy for users to use
- Apply less complex software development compared to previous example

Cons:

- Unsure if the arduino is able to execute the product line for mill streets brewery
- Wires for arduino may break frequently

Chosen Design:

Measure: (How will you determine the CPM of the conveyer)

Subsytems to Consider: 1. Measuring (how the speed of the conveyor will be margund) 2. Analytical (what information will be analyted and sont to be seen by hormons) 3. Adjustiment/control (bard and the information from the analysis, what adjustments will be made to the conveyor yestern?) Subsidem, 1: Meaning System 1 cale 1 call JJJ =7 =7 Or an ile leternise the premalived distance specel. Porer later tracker A later tracks can lock on to ballle cashy. Y= E. The, hed at different nucles can be determined

Analyze: (How will you use this data?)

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Based on the laser system, the status will show on the app we design. In the range which the client demands, 3% OEE would show green light and if the system is not at optimal in a particular section, red lights will display on the app.

Adjust: (How will you adjust the system to improve its efficiency.)

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Discussion about why we chose this design and our process to get there:

During our brainstorming phase we generated many different ideas for each subsystem. It was very important that these subsystems would work and would be possible for us to incorporate into our design. Firstly we each generated some different concepts for each subsystem and listed them in a chart with their pros and cons. This helped us to figure out which design would be the most effective in each subsystem. We then determined which subsystems would work well with each other because some of the subsystems couldn't work together very well. For example we couldn't incorporate an app with a system that used arduinos as doing that would cause extra complications in the code and add unnecessary costs to our design. After we determined what subsystem components would work well with each other we developed 5 different ideas all similar but different in their own ways. We then gathered and discussed what benefits and takeaways each system had and which would work the best with our design criteria, metrics and target specifications. We chose the laser + app system because it would allow for the most automation and while being simple but effective. The laser allows for the most accurate and simple measuring technique as it does not require tachometers and other complex measuring devices. The addition of visuals (red and green lights) that display if the system is working efficiently make this design synergize really well and allow for the workers to know when the system needs to be adjusted. The app also synergizes with this really well as it allows

for the user to just run a process to quickly change the speeds of the conveyors allowing for quick adjustments meaning less delays in the product line. In conclusion the synergy, effectiveness, and accuracy of each of the subsystems that make up the Laser + App design are what makes it the best design by far.

References and Wrike

Wrike SnapShot:

https://www.wrike.com/frontend/ganttchart/index.html?snapshotId=IMmobpG4FroEJVdkMzGIAc HrzgELkIoU%7CIE2DSNZVHA2DELSTGIYA