

Penny Pitcher - Glycol Chiller Fermentation

Janine Batongmalaki, Abhishek Dhital, Connor Glasgow, Elmer Rivera-Molina, Joshua Venter

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Executive Summary

The Glycol-chilled fermentation system is one that aids in the fermentation stage of brewing beer.

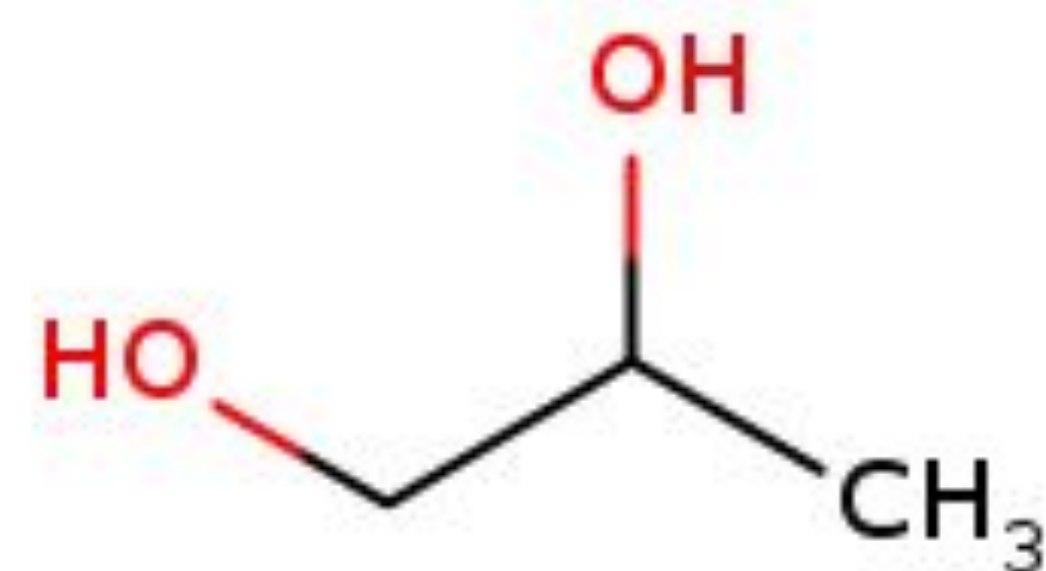
During the fermentation stage of brewing, the reactions going on within the wort create heat. To deal with this heat, brewers can manually 'ice' the wort. This is cheap and effective but requires human oversight, making the process of manually icing wort non-scalable. With a Glycol-chilled fermentation system, the human component of the fermentation process is substituted with this system.

With our project, users will be able to perform the fermentation process without having to manually babysit the wort. Users can set a desired temperature to maintain, and our system will reach that temperature and keep the fermenting wort at that temperature.

Background

A glycol chiller is a small air conditioner that uses the refrigerant glycol to cool a container to a desired level. It is often used to cool wort as a part of the fermentation process of beer or other alcoholic beverages.

Many homebrewers purchase their own glycol chiller for personal use. However, commercial glycol chillers are very expensive and offer only minimal standard features. Having not very many options too choose at an affordable price, our team has designed our own glycol chiller with hopes that it will serve the public as an improved and more affordable alternative for their personal use.



Conceptual Design Phase

Key Functional Specifications:

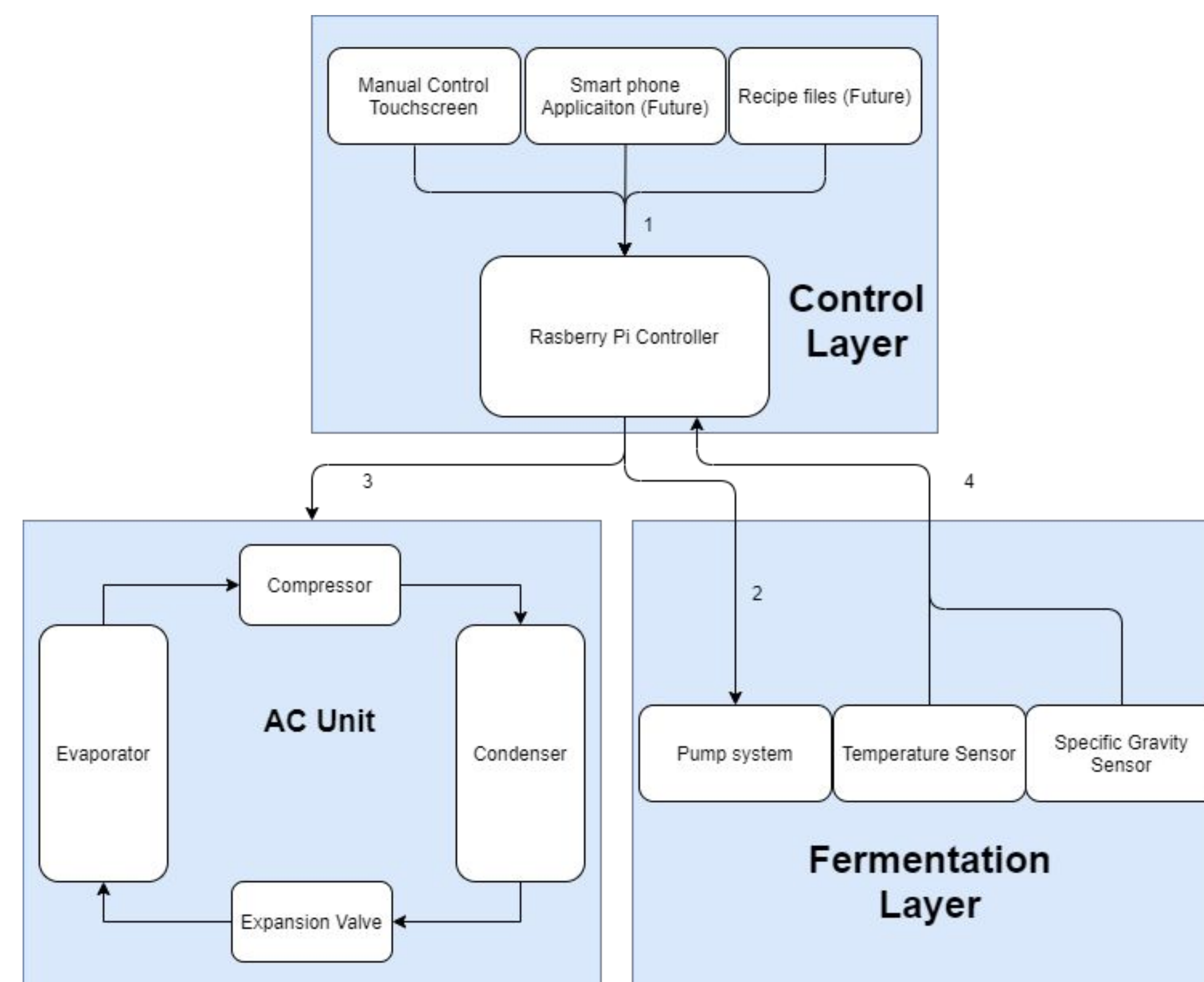
- The user will be able to interact with the system to manually adjust the temperature settings.
- The system will retrieve temperature and specific gravity readings.
- The system will be able to maintain the desired temperature reading.

Based on the above, we analyzed our design options. For temperature control, we considered a design that combines the use of an Air Conditioner unit for cooling and a wireless tilt hydrometer to retrieve our desired measurement readings. Through software integration via touchscreen display, the user would be able to set up a desired temperature for the fermentation, and the AC would make temperature adjustments accordingly to the current readings of the hydrometer.

We opted for this design largely due to its affordability for our project purposes and practical use of tearing down an AC unit to use its parts to directly cool a fermentation.

Detailed Design Phase

Our Glycol Chiller contains three layers. The **Glycol Management Layer** (AC Unit) that regulates the temperature of our glycol-water mixture, The **Fermentation Management Layer** that keeps track of our fermentation temperature and specific gravity readings. Finally, the **Control Layer** regulates the functionality of the overall system and communicates with the other two layers.



Prototype & Test

Pictured to the right is the prototype of our Glycol Chiller system. We were able to test its primary function to cool a fermentation, using water in its place.

The cooler contains the glycol-water mixture that is cooled with the AC Unit, and that mixture is pumped through coils placed in the container next to it to cool the fermentation to its user-desired temperature.



Conclusions

Our team has designed and built a functional glycol chiller system. We were able to achieve several of our planned requirements, including the key features of a glycol chiller system to measure the temperature and specific gravity of a fermentation and have it adjust the temperature according to what the user desires through manual touchscreen controls. With this, we have laid out a foundation for the project to build onto its future plans.

Future plans include having semi-automated controls via a mobile application, and transition to a fully automated system with recipe readings. As the project currently stands, it is on track to achieve the end-goal of our client having a fully automated glycol chiller system.

From this experience, our team has gained valuable insight on project development from conceptual design to prototype delivery. We are thankful for the UTA CSE department for sponsoring our project, and also to our client, Dr. Conly and his home brewery, "Los Dioses de la Cerveza," for providing us with this project opportunity.

References

1. Smith, Matt. "Glycol Chiller Build." <https://backdeckbrewing.wordpress.com/2017/09/05/glycol-chiller-build/>