Curing Chamber Project – Planning Phase V1

**Brainstorming**

For the brainstorming phase I set out to think of multiple ways that I could design this system. For the base components of all three I knew there needed to be a chamber (almost always a fridge), some way to control humidity, some way to control temperature, and a way to communicate with the user. Brainstorming for each of these categories a list of all possible ways was created below.

*Chamber*

* Fridge based (Slightly cold base temperature)
* Freezer based (Too cold base temperature)
* Wine cooler based (Higher base temperatures, expensive)

*Humidity control*

* Humidifier with external controller (May over humidify chamber)
* Humidifier and dehumidifier with external controller (Allow for more precise humidity control)
* Salt blocks (Imprecise but cheaper control)
* Water trays (Cheapest but most imprecise control)

*Temperature control*

* Inside chamber OEM control (May operate at more imprecise or out of needed temperature range)
* External chamber controller (Allows for temperature control at possible life span shortening)
* Replacement of chamber thermostat in fridge (May be more expensive and complicated procedure)

*Communication*

* Bluetooth data transfer
* Transfer over WIFI
* Send data to screen for viewing via cable

Looking at all the possible production methods and some research three ideas prevailed. Firstly, a fridge-based chamber with a humidifier and external temperature controller. Secondly, a wine cooler with an added humidifier. And finally, a fridge with a humidifier dehumidifier, and replacement on chamber thermostat. Communication was not outlined in any of the ideas as it varies from later data. The final decision being a fridge with a humidifier and external control.

**Deciding on Build or Make**

From defining possible methods of creating the curing chamber, some research was to find materials that could work. Specifically for the controllers there were many ways of achieving this task. Splitting it into two categories I defined the controllers as designed and prebuilt. An example of the prebuilt controllers would be thermostat modules, and Inkbird style controllers (the Inkbird controllers being a specific external controller for fridges and humidifiers). Looking at costs it was decided that it would be cheaper to make my own external controller module than buying a premade controller (given that they ran around 80-100 dollars for both a humidity and temperature controller). Having decided on that I went in on designing a controller for the curing chamber.

**Circuit Planning**

To start with circuit planning there needed to be an outlined bill of materials. These would be parts that would be necessary for the project to run. Going through this I outlined all the necessary materials and their functions below.

|  |  |
| --- | --- |
| BOM | |
| Microcontroller | Can read data and cause change |
| Humidity sensor | Can read humidity data |
| Temperature sensor | Can read temperature data |
| Switches | Controls current to appliances |
| Display | Shows data for the users |
| Power source | Provides power to the controller and appliances |
| Appliances | Appliances that act as curing chamber |

From here I went to find devices that fit these use cases. For the microcontroller there were only a few possible systems that were common for personal use which would be the STM32 controllers, the ESP32 controllers, and Arduino controllers. For this the STM32 and ESP32 would be much cheaper overall, but as I had an Arduino on hand, I decided to reuse old parts to mitigate the cost. Next for the humidity and temperature sensors there are many sensors that are already capable of reading both. Given that I had already locked into the Arduino system, I decided on going with the DHT22 as it provided accuracy within a few percent for both readings. For switches given that it would have to be able to stop power to the fridge given temperature readings some sort of transistor or relay was necessary. Given that there were multiple devices and the possibility of expanding and adding more later I decided on a multichannel solid-state relay which could handle switching 120V AC. Finally for the power source and appliances I had already decided on lightweight and cheap versions of a humidifier and a compact fridge that would power themselves, and the previously chosen Arduino is capable of running the 5V DC current necessary to power everything else.