Deliverable D

uOttawa

GNG 1103

Group D-1.4

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Abstract

The following report consists of the team's conclusion on the 3 most suitable and best conceptual designs of the THEC system based on our previous research and analysis. The main purpose is to arrive with a presentable conceptual design to the client and to highlight our remarks.

Introduction

During the past five weeks, our team has progressed in the design thinking process from the empathize stage to the end of the define stage. We are currently in the works to conclude the ideate phase and ultimately to come up with a final conceptual design for the prototype. To reiterate, the first client meeting allowed the identification of needs and the development of a problem statement. Furthermore, previous user and technical benchmarking, and a list of prioritized design criteria were elaborated. Now, in light of the second client meeting, a presentable conceptual design of the THEC will be developed. The system will be divided into 3 subsystems each with possible options/choices to form a variety of global concepts. The final product will consist of a combination of the best of the 3 defined subsystems.

Our 3 subsystems:

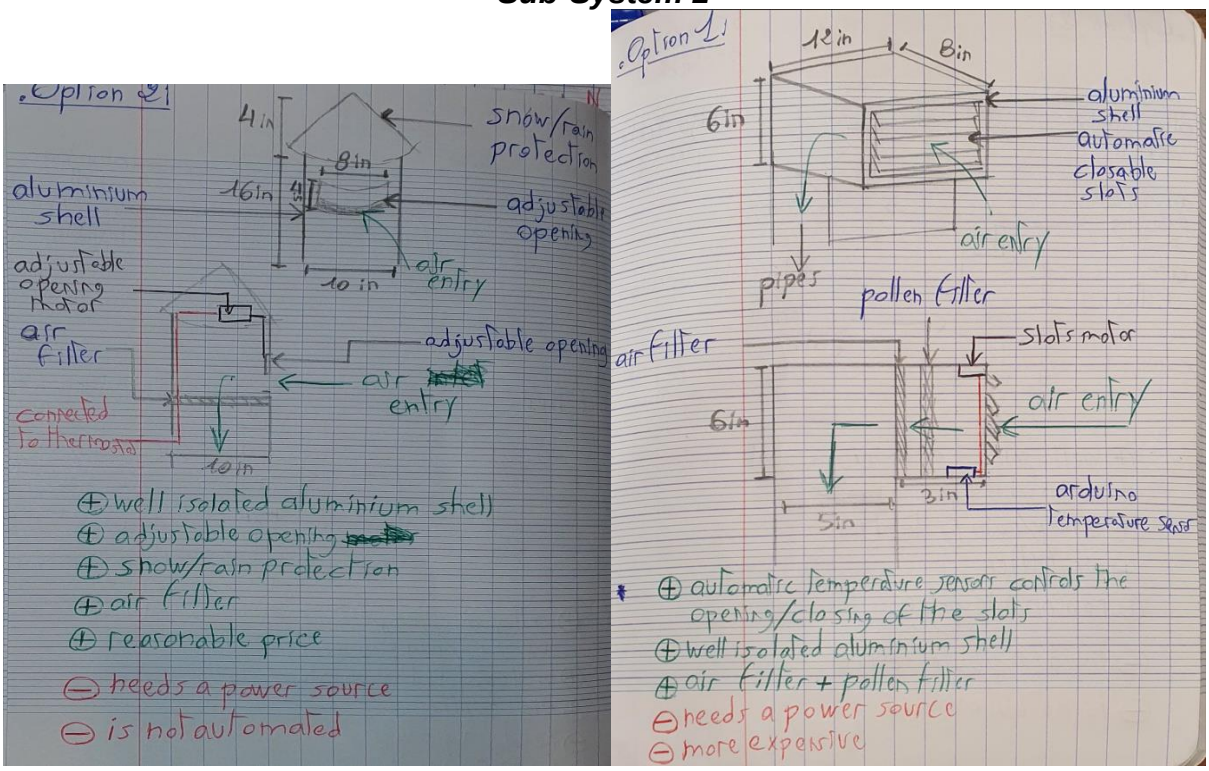
1. Subsystem 1: Air inlet
   Air inlets consist of an entry point for the fresh air from outside which is directly connected to the chamber box. It also flows out the contaminated air of the house. It is composed of filters, shutters and dampers.

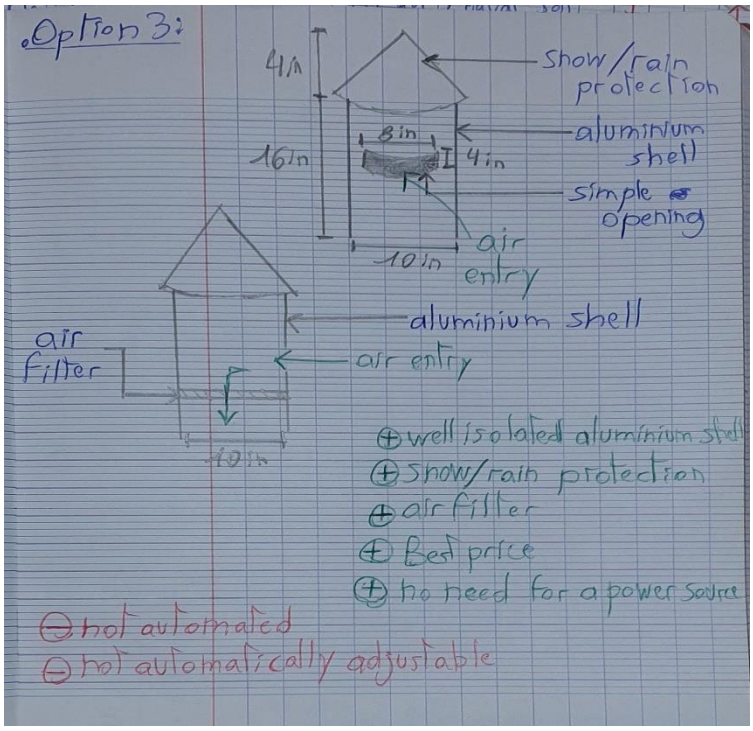
2. Subsystem 2: Chamber box and piping system
   The chamber box receives the incoming air and immerses in the water reserve. The box is connected via a piping network all the way to the furnace blower inside the house.

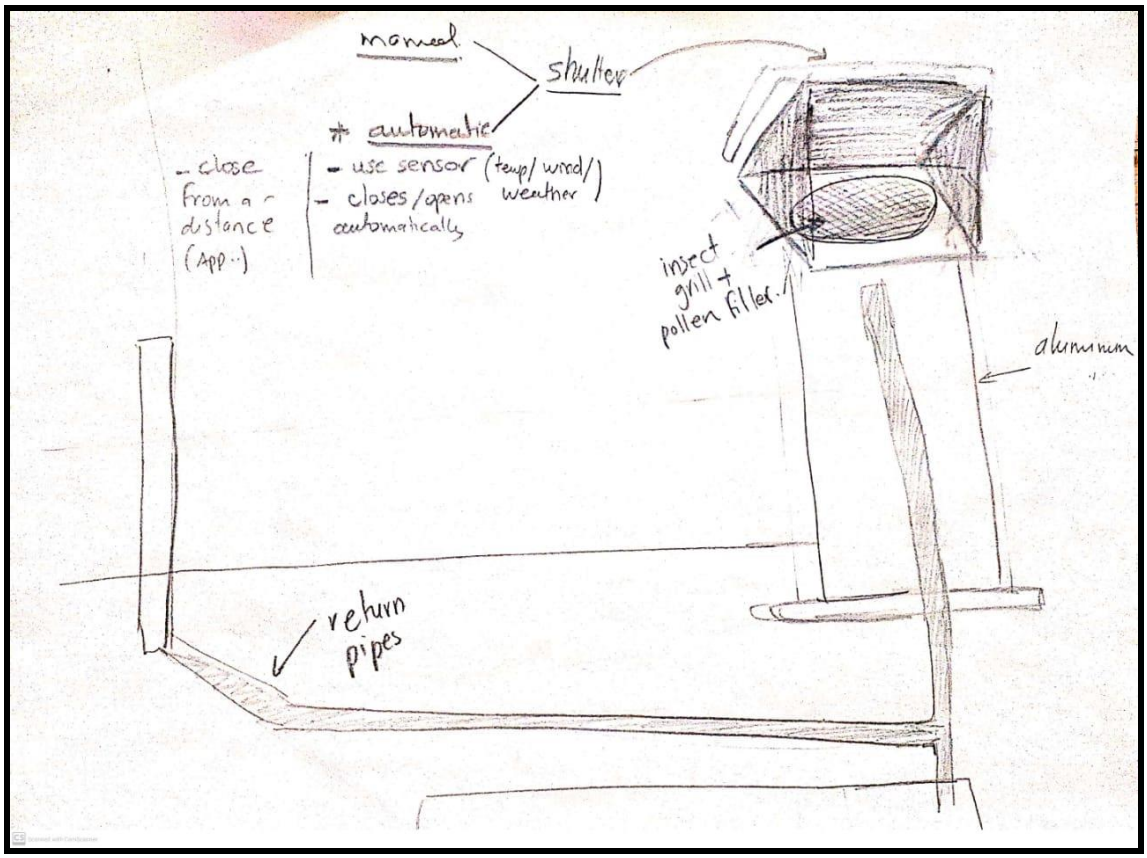
3. Subsystem 3: Furnace blower, distribution, and thermostat
   The furnace blower is responsible to flow out the incoming air through the house with a distribution system. It requires regulation with thermostats in order to achieve the desired temperature.

Development:

Sub-System 1

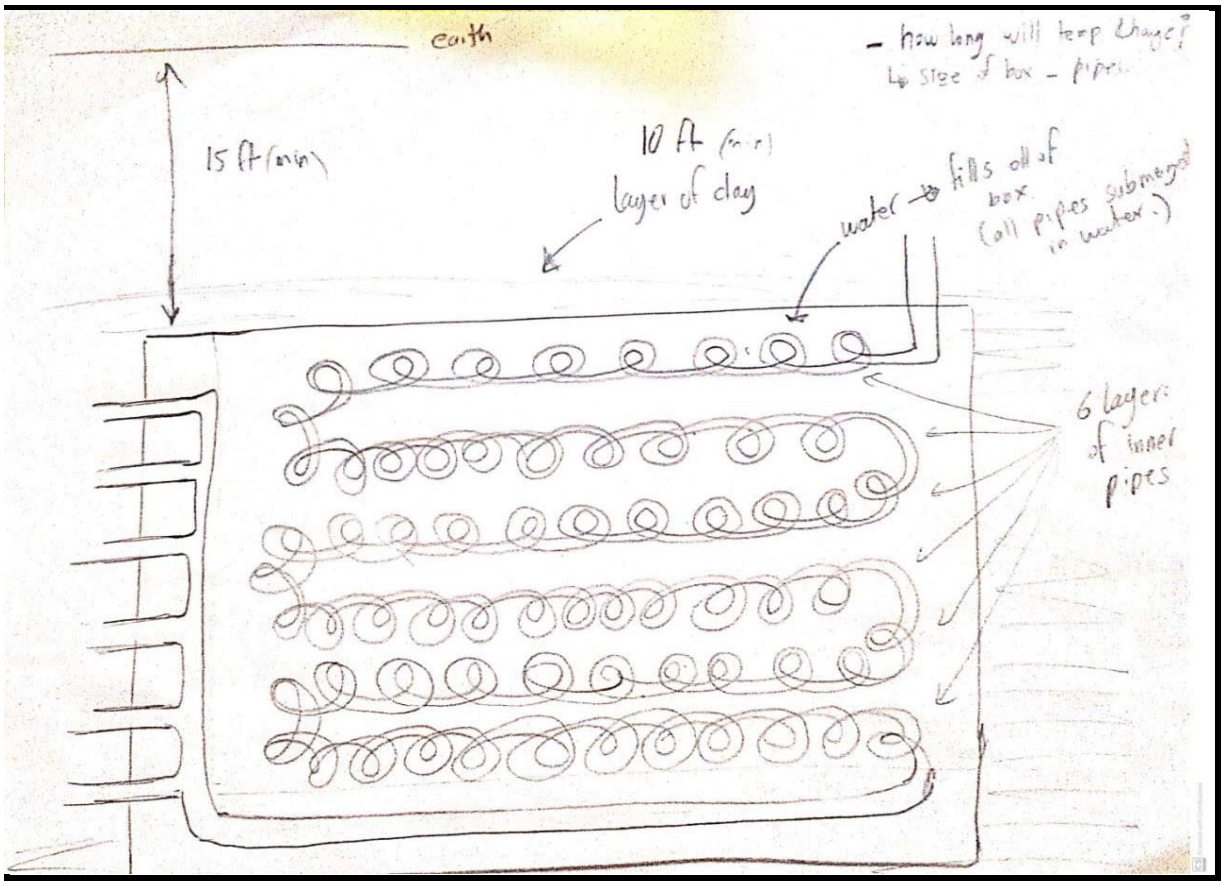


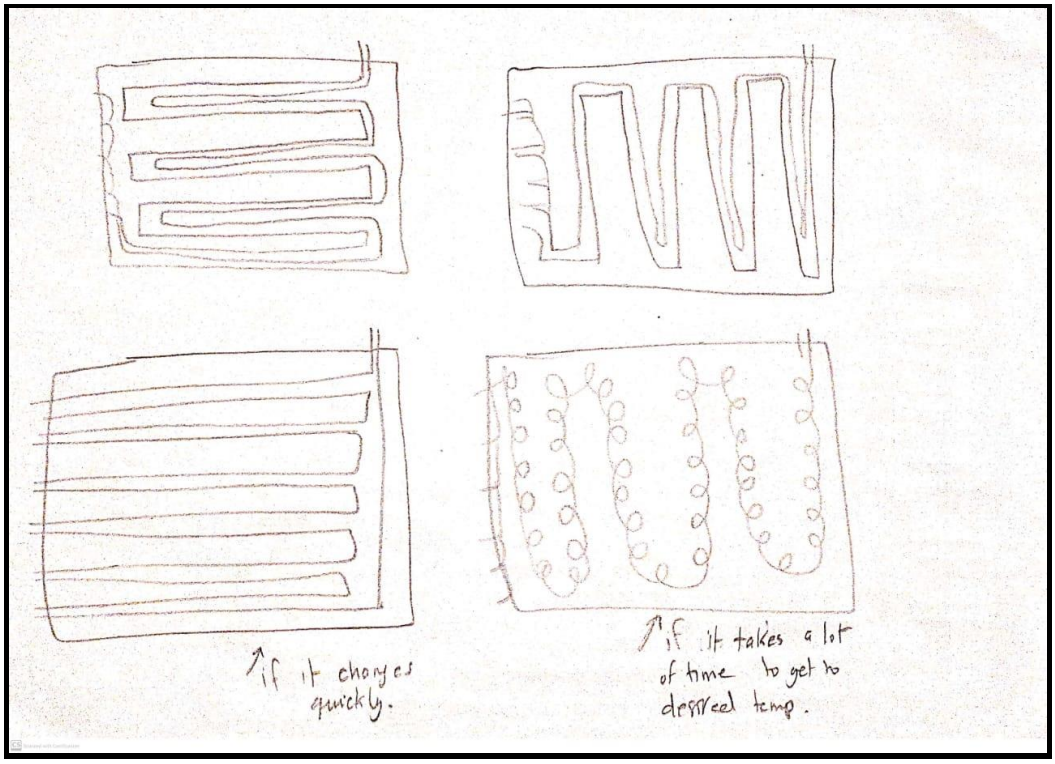


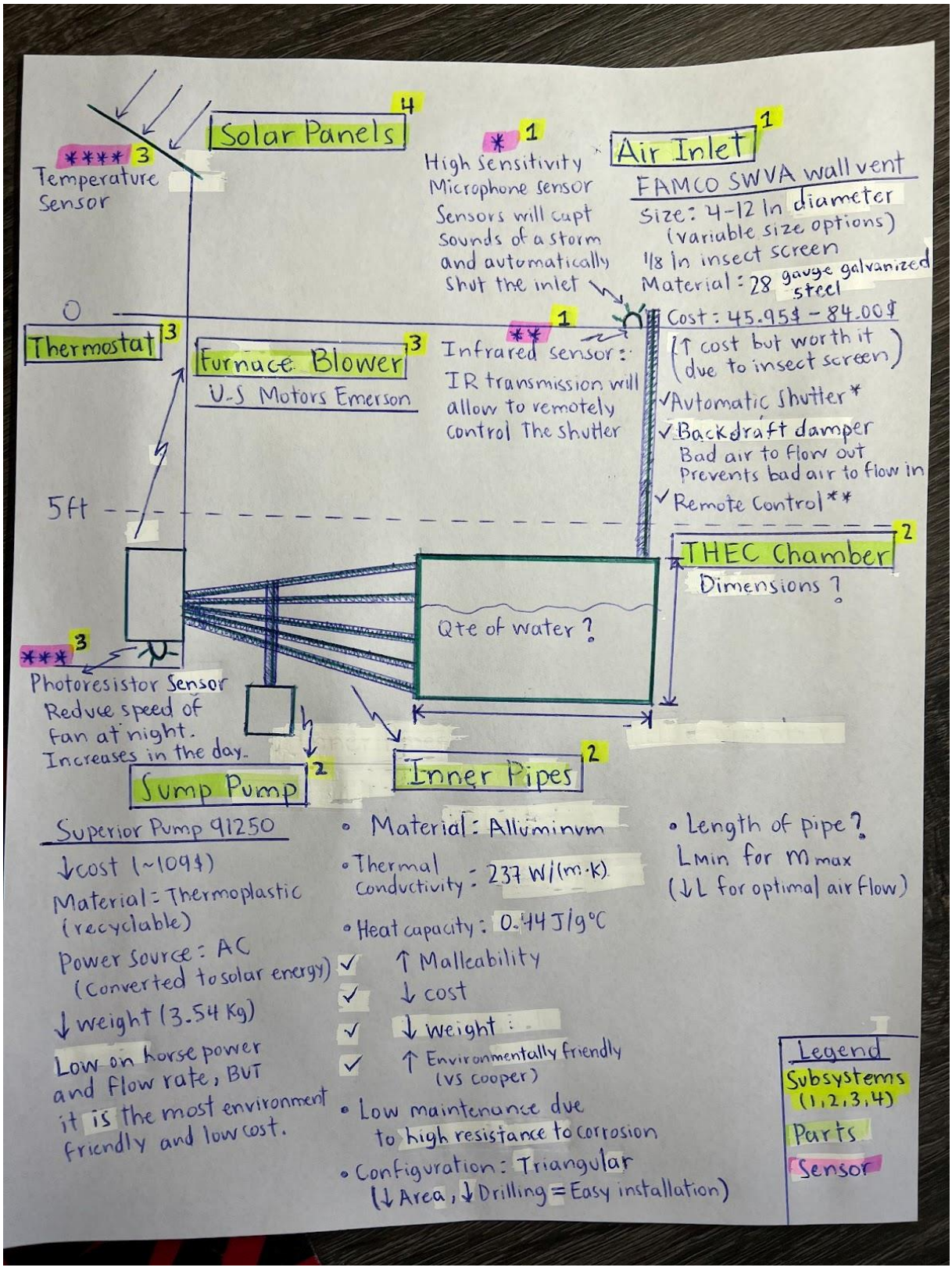


Option	advantages	disadvantages
1	-The opening/closing of the slots is automatically controlled by the arduino thermal sensor -The aluminum shell is well isolated -There is an air filter -There is a pollen filter	-needs a power source -more expensive
2	-The aluminum shell is well isolated -There is an air filter -Adjustable opening -Snow/rain filter -Reasonable price -Snow/rain protection -Best price -No need for a power source	-needs a power source -is not automated
3	-The aluminum shell is well isolated -There is an air filter	-is not automated -can't be adjusted
4	-The aluminum shell is well isolated -Can be both manual or automatic shutter via a thermal sensor -There is a pollen filter	-could need a power source

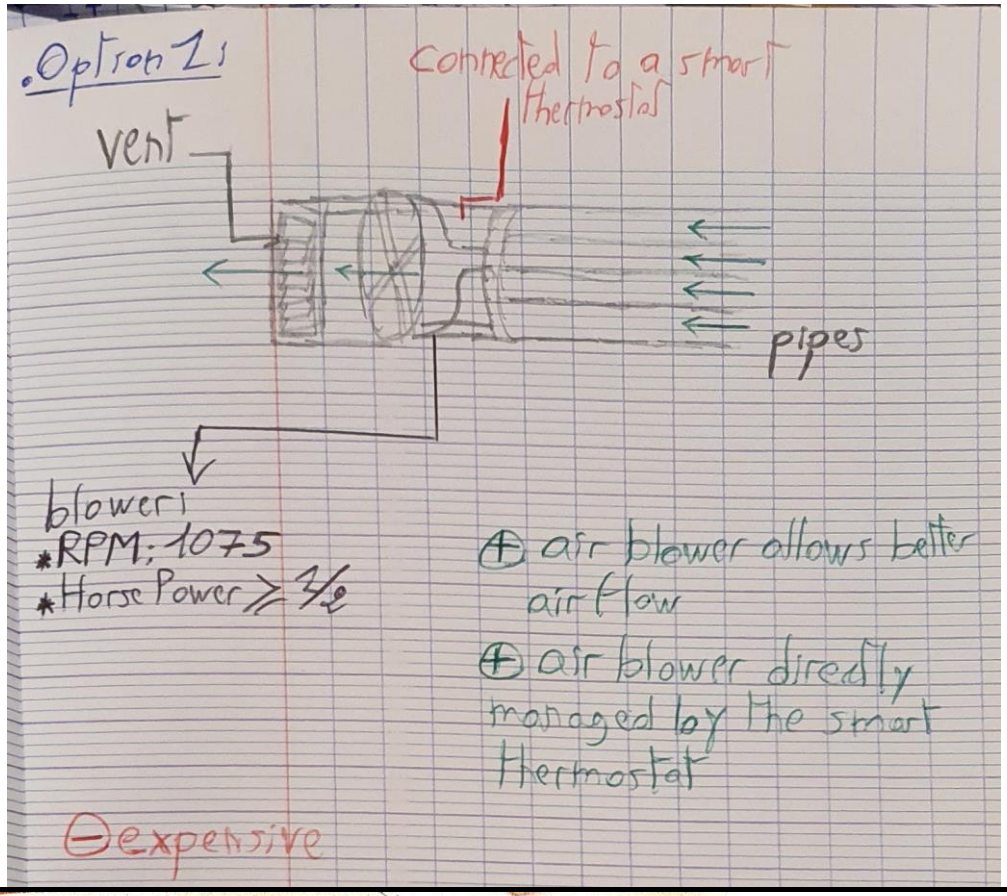
Subsystem 2

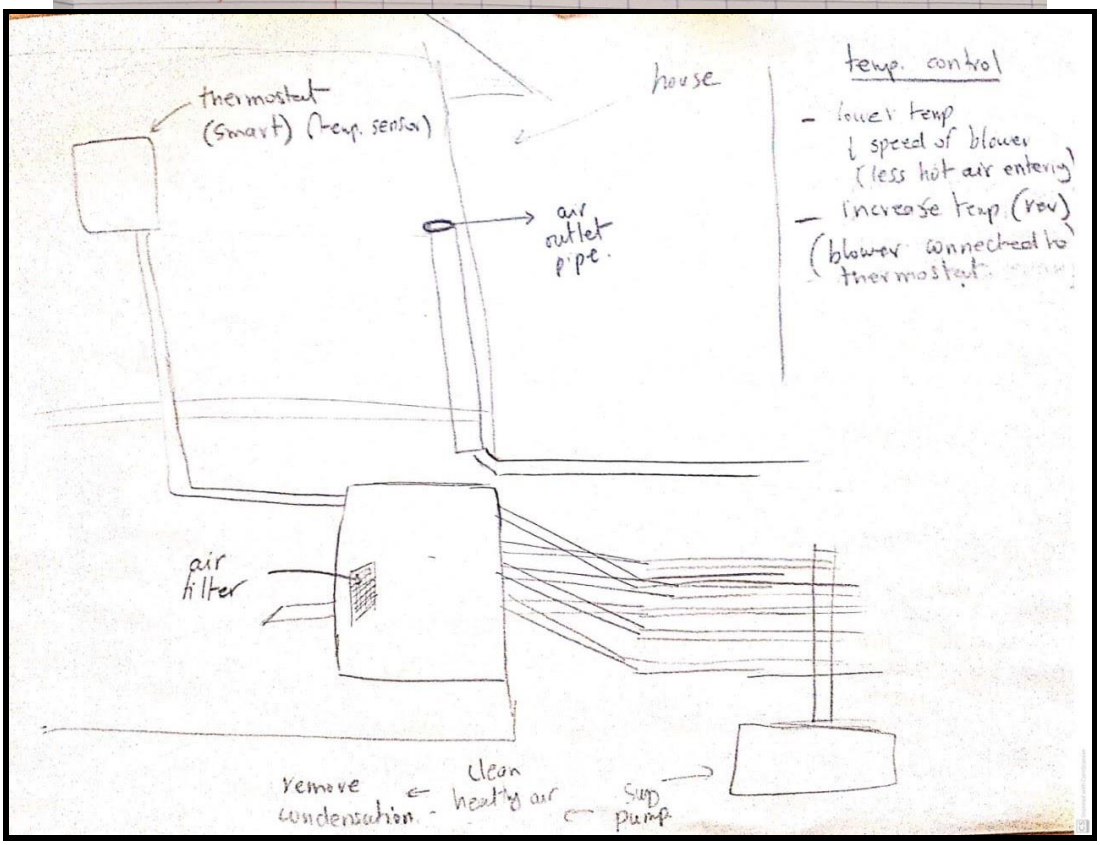

earth
- how long will temp change?
15 ft (min)
10 ft (min)
layer of clay
water
fills all of box
(all pipes submerged in water.)
6 layers of inner pipes


if it changes quickly.
if it takes a lot of time to get to desired temp.

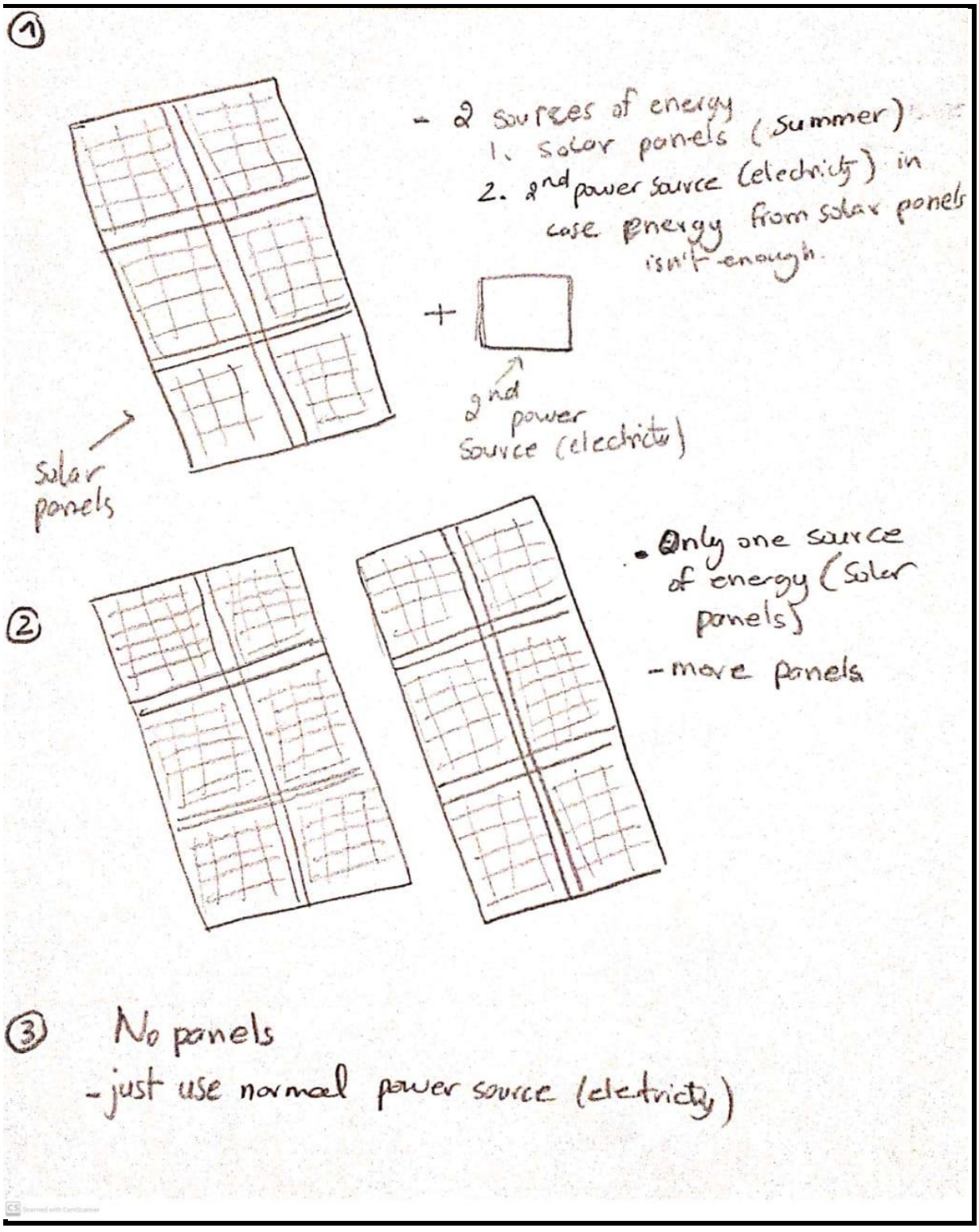

Solar Panels 4
**** 3
Temperature Sensor
* 1
High Sensitivity Microphone sensor
Sensors will capt sounds of a storm and automatically shut the inlet
Air Inlet 1
FAMCO SWVA wall vent
Size: 4-12 In diameter (variable size options)
1/8 in insect screen
Material: 28 gauge galvanized steel
Cost: 45.95$ - 84.00$
(↑ cost but worth it due to insect screen)
Thermostat 3
Furnace Blower 3
U-S Motors Emerson
** 1
Infrared sensor:
IR transmission will allow to remotely control The shutter
✓Automatic Shutter*
✓Backdraft damper
Bad air to flow out
Prevents bad air to flow in
✓Remote Control**
5ft
THEC Chamber 2
Dimensions ?
Qte of water ?
*** 3
Photoresistor Sensor
Reduce speed of fan at night.
Increases in the day.
Sump Pump 2
Inner Pipes 2
Superior Pump 91250
↓cost (~109$)
Material: Thermoplastic (recyclable)
Power Source: AC (Converted to solar energy)
↓weight (3.54 Kg)
Low on horse power and flow rate, BUT it is the most environment friendly and low cost.
• Material: Alluminum
• Thermal Conductivity: 237 W/(m·K)
• Heat capacity: 0.44 J/g°C
✓ ↑ Malleability
✓ ↓ cost
✓ ↓ weight
✓ ↑ Environmentally friendly (vs cooper)
• Low maintenance due to high resistance to corrosion
• Configuration: Triangular
(↓Area, ↓Drilling = Easy installation)
• Length of pipe ?
Lmin for m max
(↓L for optimal air flow)
Legend
Subsystems (1,2,3,4)
Parts
Sensor

Sub-System 3


.Option 1:
connected to a smart thermostat
vent
pipes
blower:
*RPM: 1075
*Horse Power ≥ 3/4
⊕ air blower allows better air flow
⊕ air blower directly managed by the smart thermostat
⊖ expensive


thermostat (Smart) (temp. sensor)
house
air outlet pipe
air filter
temp. control
- lower temp ↓ speed of blower (less hot air entering)
- increase temp (rev) (blower connected to thermostat)
remove condensation
clean healthy air
sump pump

Sub-System 4:


1
- 2 sources of energy
1. solar panels (summer)
2. 2nd power source (electricity) in case energy from solar panels isn't enough.
+
2nd power source (electricity)
solar panels
2
• Only one source of energy (solar panels)
- move panels
3
No panels
- just use normal power source (electricity)

Conclusion

3 possible systems:

With the subsystems formed we have created three possible overall systems:

1. Containing option 2 from subsystem 1, option 1 (horizontal coils) from subsystem 2 and option 1 (Full programmable/Smart device) from subsystem 3. For power we would use a combination of solar panels and alternative power sources.
2. Containing option 1 from subsystem 1, option 5 (vertical coils) from subsystem 2 and option 1 (Day or night programmable) from subsystem 3. This would use only solar panels as a power source.
3. Containing option 3 from subsystem 1, option 2 (horizontal normal pipes) from subsystem 2 and option 1 (Day basis programmable) from subsystem 3. This would use a general power source.

# System	**Benefits**	**Drawbacks**
1	Subsystem 1: -The aluminum shell is well isolated -There is an air filter -Adjustable opening -Snow/rain filter -Reasonable price -Snow/rain protection -Best price -No need for a power source -subsystem 2's design will have a lesser cost Subsystem 3: -good airflow -fully programmable	Subsystem 1: -needs a power source -is not automated - subsystem 2 will create less area for the air Subsystem 3: -Costly
2	Subsystem 1: -The opening/closing of the slots is automatically controlled by the arduino thermal sensor -The aluminum shell is well isolated -There is an air filter -subsystem 2's design will allow for a greater area for the air Subsystem 3: -good airflow	Subsystem 1: -needs a power source -more expensive -subsystem 2's design will have a greater cost Subsystem 3: -Semi Costly

	-day/night, every day programmable	
3	Subsystem 1: -The aluminum shell is well isolated -There is an air filter -subsystem 2's design will have a lesser cost Subsystem 3: -good airflow -daily programmable	Subsystem 1: -is not automated -can't be adjusted - subsystem 2 will create less area for the air Subsystem 3: -Semi costly

Our Best Global Concept:

Out of the three systems created, system 1 is the best overall system that we will work with and develop towards the final product. Overall this design combined the best of all the subsystems created and thus should create the most effective team design. Though we will work forward with this design, we will keep our other designs in mind as we move forward, with the potential to pull ideas from other designs to strengthen the main system.