

Progress Report: March 24th 2014

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Background

RefriECO's DualCooler is an alternative to existing refrigeration systems such as the ever popular refrigeration cycle (using compressors, condensers, evaporators) and thermoelectric cooling systems. The system will utilize the cold outside air in parts of the world that are commonly subjected to much colder temperatures. The idea is derived off geothermal energy heating systems and based on HVAC central air conditioning systems. It will require a system of ducts through a building or structure that using fans and dampers can circulate and deliver cold air to refrigerators. Our project involves designing this refrigeration system and demonstrating it with the use of a mini fridge.

Schedule

This project consisted of three different modules taking into account the mechanical and electrical components in the design of the prototype.

Module 1 included:

- Interfacing the Arduino Uno with the fan, temperature sensors, LCD & pushbuttons and servo motors

Module 2 included:

- Building the physical fridge components by attaching ducts, dampers and filters
- Integrating the components from Module 1

Module 3 included:

- Final system testing
- Finishing and preparation of prototype

Finally we also had unit testing dispersed throughout the project in the Agile method. Every integration step required some amount of testing. As more and more components were added, the tests became a little more robust.

At this point we are behind schedule but that was to be expected as the deadlines we set were very ambitious. We were working to get our project done by the third week of March so that we would have

some buffer space in case we were delayed. The reason for the delay in the project was that we did not account for taking so many days to complete our report. We also ran into some issues ordering parts and the fact that the fridge we initially bought no longer works and we had to compensate for that delay as well. These issues consumed a lot of our time. Regardless, we are not significantly delayed as we did leave buffer room for our project.

As we continue to build our final prototype, we are continuing our research to find more ways to make our prototype better as well as make effective use of the components. We have also been taking measurements of the electronic components to create the complete circuit as well as for comparisons later to curb and optimize the power consumption. Finally most of the major design related documentation is complete and the wrap up documents remain and are currently being worked on.

Financial

So far, we have purchased most of the essential parts required for the testing and development of our project prototype. As shown in the expense breakdown in Table 1, our projected total cost came in a little under the \$250 grant that we have received from ESSEF fund. This is a result of underestimation on our part to foresee additional costs that could incur while testing the mechanical and electrical components. We are planning to spend another \$100 for a new fridge and few other additional parts, thus exceeding our initial expected budget.

Table 1: Table of Expenses to date

Component Type	Quantity	Expense (\$)
5 inch Duct Pipe	1	6.38
Pipe Insulation	1	16.49
5 inch Damper	1	11.99
Waterproof Temperature Sensor	1	10.50
One Wire Digital Temperature Sensor	1	6.30
IC LM335Z Temperature Sensor	2	5.00
LCD Shield 2 Pin	1	29.80
Servo Motor	1	11.25
2 Channel Relay Board	1	23.30
Mini Fridge	1	70.00
120mm PWM Fan	2	27.98
Total Expenditure		218.99

Remediation

Since we anticipated and planned for some sort of delay, we are not significantly crunched for time. Regardless, our team would like to conduct some thorough testing and have decided to split the project

amongst us. Two of us are currently working on the mechanical design and three of us as working on testing and integrating all the electronic components as well as designing the PCB design of the circuitry. One of the biggest unforeseen problems that we want to take into account is in case one of us is sick/injured due to some reason, we need to still be able to complete the project. For this reason, it is vital that most of the tasks are overlapped with someone else's in the team so that we can continue on and no time will be wasted on relearning. Our demo date is on the 25th of April, the last day, but it can only help in that our team can individually prepare for the presentation and the post mortem documents. Aside from that, most of us are busy with exams from April 10th to April 23rd.

The coming week will be dedicated to integrating the electronic components with the mini fridge prototype as well as testing.

Summary

As it stands, our prototype is well on its way to completion and under budget. We are slightly behind our very ambitious schedule but are confident that we can have a strong finish. We are getting more and more excited to display our wonderful product on April 25th.