CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)
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Project Number
S1012

Project Title
Reducing the Amount of Electricity Used by Computers Utilizing Green Technologies

Abstract

Objectives/Goals
With the energy crisis and environmental concerns in mind, I started a project last year to see if I could reduce the amount of energy used by computers that come from environmentally harmful sources and where possible, use green technologies. I achieved that goal last year but there were issues that made the product less than commercially viable. I decided that this year, my goals would be to resolve the issues, make it more efficient and still not use any wall supplied electricity. Those general issues included the following: (1)Ability to fit into a smaller space (2)Reduce the risk of condensation from the TEC. To make the cooling system more efficient, I wanted to address the following: (1)Better thermal interface material (2)More efficient TEGs (3)Better heat dissipation than aluminum fins (4) Better engineering

Methods/Materials
I created a variety of prototypes for this project and after each prototype, I performed an evaluation and made a list of issues that I wanted to resolve or improve. For the final configuration, I rearranged and condensed the size of the computer components to create a separate "cooling chamber". I installed an insulated wall to prevent the heat from going back into the main chamber. I used heat pipes to move the heat out of the main chamber and embedded the heat pipes in aluminum blocks to get better heat transfer. I placed two TEGs on the aluminum block in the cooling chamber and placed a vapor chamber on top to conduct the heat away and create a greater heat differential. I wired the TEGs serially and also connected a fan to create more airflow.

Results
My component testing verified the effectiveness of my thermal interface material, vapor chamber, heat pipes embedded in the aluminum block, new TEGs and insulation. This allowed me to design my final configuration. I ran the final configuration of the cooling system with the computer for over two hours, until it hit equilibrium, and the computer ran well and without any issues.

Conclusions/Discussion
Besides creating a computer cooling system that still didn?t need any wall supplied electricity, I achieved all the other goals I had set for this project and made a significant step towards making this a viable and implementable technology.

Summary Statement
Reducing the amount of electricity used by computers by creating a cooling system that does not use any wall supplied electricity

Help Received
My father helped with some of the machining and assembly of the cooling system and helped proof my documentation and board