CALIFORNIA SCIENCE & ENGINEERING FAIR
2018 PROJECT SUMMARY

Name(s)

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Project Number

38260

Project Title

Heat Transfer Optimization for Home Insulation

Abstract

Objectives/Goals

I became interested in learning about conduction, convection, and radiation in order to reduce the amount of energy to keep my house a comfortable temperature. If I reduce the emissivity of drywall inside the walls of my house, the walls insulate better and keep the inside of my house a comfortable temperature.

Methods/Materials

I created simulations in C# code of walls in various temperature regimes and found limiting radiation would limit the amount of heat transferred into the house. I then tested these results with an experiment consisting of a mock-up of a wall. I created three mock-up walls: a control with drywall, an experimental configuration with the interior faces of drywall painted silver, and an experimental configuration with aluminum foil laminated on the interior faces.

Results

The drywall that was laminated with aluminum foil had an R-value that was a factor of 2.6903 greater than the uncoated drywall and drywall coated with silver paint had an R-value that was a factor of 1.66 greater than uncoated drywall. In addition, the drywall laminated with aluminum was as insulating as pink fiberglass insulation.

Conclusions/Discussion

By making the drywall have a low emissivity, I was able to reduce the amount of heat transferred through the wall resulting in a more insulating wall. By reducing the amount of heat able to transfer through the wall it becomes easier to keep the inside room a stable temperature.

Summary Statement

By studing radiation, convection, and conduction from the interior to the exterior of a house, I designed and tested an improved method of insulating wall.

Help Received

I designed, built, programed, and performed the experiments myself. I used both the internet and textbooks on heat transfer to more fully understand the necessary calculations.