CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
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Project Number
J2204

Project Title
The Effect of Light Bulb Type on Energy Consumption, Brightness of Light Emitted, Heat Output, and Operational Cost

Abstract

Objectives/Goals
The objective of this investigation is to discover which energy efficient light bulb is the most suitable replacement for a standard household 60-watt incandescent light bulb.

Methods/Materials
Materials collected for this experiment were (12) 60-watt equivalent light bulb test samples, photographic light meter (w/incident and spot meter attachments), ATD-701 Infrared Thermometer, Kill-A-Watt energy consumption monitor, and analog dial thermometer. A controlled environment test box was constructed to contain the light and heat emitted from the light bulbs. It was created from six pieces of black foam core, a coat hanger, two Styrofoam plates, and black duct tape. The Styrofoam plates hung from a coat hanger in the middle of the box, directly in front of the light bulb. This was used when determining the indirect brightness of the light emitted from each bulb. Each sample was tested individually for a period of 40 minutes for direct and indirect brightness, energy consumption, and heat output. Annual operational cost was calculated using the current average kWh rate provided by PG&E.

Results
The results of the data collected showed that the Seesmart Household LED used the least amount of energy at 4.5 watts, which was less than one-tenth the energy needed to illuminate an incandescent light bulb. The charted data proved the Evolux (Cool White) LED to be the brightest light bulb, when tested both for indirect and direct luminosity. The heat output testing proved that the Evolux (Warm White) LED was the coolest, reaching 91.2˚F after thirty minutes. Finally, the Seesmart Household LED resulted in being the least expensive to use for 8 hours each day over the course of a year, costing only $2.31 per year.

Conclusions/Discussion
Much was learned from this experiment. LEDs and CFLs can save electricity, as well as money. Although LEDs prevailed in all tests, it is necessary to note that there is not one clear winner. Halogen bulbs, though comparable to incandescents, reached the highest temperature of all the bulbs tested. LEDs and CFLs do not get as hot and have lower energy consumption requirements, making them a viable alternative for incandescent light bulbs. Ultimately, although there is no single winner, with all the energy efficient bulbs on the market, there is little reason to use a standard 60-watt incandescent. Reducing your carbon footprint is as simple as changing a light bulb.

Summary Statement
Testing new forms of light bulbs, to find a suitable and energy efficient replacement for the 60-watt incandescent household light bulb.

Help Received
Father let me borrow his light meter and taught me how to use it; Mother purchased a digital thermometer, printer paper and ink.