

Toaster Fire Prevention System

Contributor: Charles E. Fosha Jr.
Affiliation: University of Colorado at Colorado Springs
Address: Electrical and Computer Engineering
1867 Austin Bluffs Parkway # 202
Colo Spgs, CO 80918
Phone: (719) 548-0602
Fax: (719) 548-9127
Email: cfosha@zonev.uccs.edu

Type: Design Problem
Time: Six Weeks
Location: Classroom/Home

Summary

Toaster ovens have been known to start a fire in a home. While many heating devices such as hand held hair dryers have a temperature sensitive switch to prevent overheating, sometimes foods placed in a toaster oven will catch fire before the temperature switch pops open the oven door. The task will be to design a device to include in a new toaster oven to prevent the occurrence of fires. The device should be non-destructive. That is it should detect the fire or the conditions of the fire before it starts and turn off the heating element.

ABET Descriptors

Engr Sci Content: Electrical
Type: Component
Elements: Analysis, synthesis, manufacture, testing, evaluation.
Features: Design methodology, creativity
Constraints: Safety, space, economics
Effort: Team

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You will be working with a team of two other product engineers. You are given a toaster oven and a slice of bread. Set the scale to the darkest level and toast the bread. Once the toaster cycle is complete, repeat with the same bread. Watch closely for the fire to start. Observe any particular conditions that you could use to predict the occurrence of a fire. Quickly turn the toaster off and extinguish the fire. Fanning or blowing will usually do the trick.

Wait for the toaster to cool. Disassemble the toaster to the point you need to investigate the construction. You will need to design a system to prevent the disastrous results of the experiment you just conducted.

Research the number of house fires caused by a faulty toaster oven. Find any information available on legal liability or product recall.

Write a report on your design effort. The report should include the following:

1. A description of the problem and the results of your investigation.
2. The design of the device that could be added to this toaster oven to prevent fires.
3. Engineering drawings of the device and how it interfaces with the toaster.
4. Manufacturing costs.
5. Marketing plan for this device.
6. A patent pending disclosure.

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Engineering Notes:

Objectives/Comments:

This is a study in product design. You might have a fire extinguisher handy but if the students are observant, the fire will go out very quickly.

Expected Outcomes:

Try to watch the teams and be sure that all students participate. Since some library work is required, obtaining a balance of work between the team members may not be possible. Since this is an appliance that all students have probably used without problems, you might see some students surprised at the results of the experiment.

Discussion/Follow Up:

Have the groups give a presentation on their product investigation. Once all the presentations have been made, let the students decide which one is probably the best design. Discuss how this design flaw could have got through the product engineers at the manufacturing company. Shouldn't they have tested this fire possibility?