

2017 年臺灣國際科學展覽會 優勝作品專輯

作品編號 200023
參展科別 環境工程科
作品名稱 Powerless Shack Cooler
得獎獎項 四等獎

國 家 South Africa
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Abstract

Purpose of Project:

To save energy and to help the underprivileged with a cooler that uses no electricity to make their lives better.

Procedure/method followed:

STEP 1: Collected 28, used, 2 litre plastic bottles.

STEP 2: Chose the window with the best wind flow. Measured the size of the window and the room chosen.

STEP 3: A sturdy thick polystyrene board was cut to the size of the window. Holes were drilled to the rim size of the bottles spacing them according to the body size of the bottles.

STEP 4: Bottles were cut in half.

STEP 5: The bottle necks were slid through the holes with the necks open to the inside of the room and the bodies open to the outside.

STEP 6: Fixed a thermometer in the room and measured the temperature and recorded it.

STEP 7: Fixed the Powerless Shack Cooler with the necks of the bottles open to the inside and the bodies open to the outside of the room.

STEP 8: The temperature variation was checked and recorded every 30 minutes for 3 hours.

STEP 9: Another room of the same size and window was also chosen. Fixed a thermometer and temperature variation was checked and recorded every 30 minutes for 3 hours. This served as the control of the experiment.

Data/results:

The room temperature decreased over time inside the room where the Powerless Shack Cooler was installed onto the window. But the control room maintained the initial room temperature although slight fluctuations in the room temperature were observed over time.

Conclusion:

The hypothesis was supported.

As the air molecules moved through the bottles, it bounced off each other, and off the walls of the container, holding the air. A small volume of air passed at a high velocity. When the molecules moved faster the collision became more often. These collisions and the push increased air pressure.

When the container's space was getting smaller, the molecules picked up speed and the temperature went up. When the air was released out into the room, the volume suddenly expanded. The intermolecular spaces became larger; so less agitation and vibration of molecules took place. The molecules moved slowly. The room temperature reduced. Air inside the room became cooler. During the adiabatic expansion, air molecules used heat energy from the room and converted it into kinetic energy for faster movement.

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This study develops a very simple but useful device made of plastic bottles and Styrofoam for cooling the ambient air. The device is very simple but the student can explain the engineering fundamental of how the device is working. This powerless simple cooler can be made by anyone; hence it can help many people who live in tropical area and have no money to buy air conditioners. In addition, the powerless advantage is a plus to help protect the environment.