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Easy Freeze : The Zero-Waste Cooler

As the weather grew hotter during the past months, my family bought multiple electric fans to plug into the sockets of every room in the house. The AC is turned on to the max, offering us continuous comfort. However, many villages in countries like the Philippines, Haiti, Yemen, and more encounter temperatures higher than that of us in New Jersey for longer periods of time. These areas, on top of being close to the equator, are affected by global warming and climate change due to social, political, and geographical issues. Furthermore, not everyone can afford or has access to the electricity necessary to power fans and AC units. To provide a solution, I present Easy Freeze, a simple cooling system that can provide relief to families in need.

An example of an efficient and continuous self-cooling device is the Stirling cryogenerator, a motor that helps cool down space equipment, such as infrared cameras, that must survive incredibly warm conditions. The device will be developed in a method that learns from the Stirling cryogenerator and is based on the 2nd Law of Thermodynamics and the Joule-Thompson Effect. By the 2nd Law, entropy is constantly increasing and energy spreads out thinner over time, nevertheless can be locally decreased, like how fridges go through cyclical processes compress gases to add pressure to a constant volume. Moreover, by the Joule-Thompson Effect, when gases expand quickly from a “high pressure to low pressure at a constant enthalpy” (Weisend) they cool down because the decrease in pressure causes a reduction

in the molecules' speed. Therefore, household items with a small mouth and a large body or bottom would make up the main structure, forming the high to low pressure area that will cool the gas. This takes care of the energy source needed to move the heat away from the affected heated area.

An article by Global Citizen stated, "Unless the world generates more sustainable forms of cooling systems, colder rooms could mean worse climate change," something we are all contributing to. As people continue to purchase AC units due to warm weather, it means bad news for the environment, because the freon gas used in most cooling systems depletes the ozone layer. The use of refrigerants is expensive, and the cheaper solutions are usually made out of non-environmentally friendly or non-renewable sources. Consequently, in order to be as close to zero-waste as possible, Easy Freeze will be constructed out of reusable and recycled materials that don't have to be replaced regularly: empty plastic bottles, cardboard cores of paper rolls, or old vases. These can be covered in insulators like cellulose or cotton to increase and maintain the cooling rate.

In the future, the Easy Freeze can be expanded on to cool down not only people but their food as well. Taking into account the environmentally friendly materials and sources, the success of the product could lead to "mass-manufacturing" by the people in need themselves. By creating kits with materials and instructions, it will allow citizens from all over the world can make use of a safer alternative to fans and ACs.

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