Solar-powered refrigerator

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A **solar-powered refrigerator** is a refrigerator which runs on energy directly provided by sun, and may include photovoltaic or solar thermal energy.

Solar-powered refrigerators are able to keep perishable goods such as meat and dairy cool in hot climates, and are used to keep much needed vaccines at their appropriate temperature to avoid spoilage.

Solar-powered refrigerators may be most commonly used in the developing world to help mitigate poverty and climate change.

Naval Special Warfare support technicians receive training on a solar-powered refrigerator.

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Rationale

There is environmental concern regarding conventional refrigeration technologies including contribution to ozone layer depletion and global warming. Refrigerators which contain ozone depleting and global warming substances such as chlorofluorocarbons (CFCs), in their insulation foam or their refrigerant cycle, are the most harmful. After CFCs were banned in the 1980s, they were replaced with substances such as hydrochlorofluorocarbons (HCFCs), which are ozone-depleting substances and hydrofluorocarbons (HFCs). Both are environmentally destructive as potential global warming chemicals. If a conventional refrigerator is inefficient or used inefficiently, it will also contribute more to global warming than a highly efficient refrigerator. The use of solar energy to power refrigeration strives to minimize the negative impacts refrigerators have on the environment.[1][2]

History

In 1878, at the Universal Exhibition in Paris, Augustin Mouchot displayed Mouchot's engine and won a Gold Medal in Class 54 for his works, most notably the production of ice using concentrated solar heat.

"In developed countries, plug-in refrigerators with backup generators store vaccines safely, but in developing countries, where electricity supplies can be unreliable, alternative refrigeration technologies are required".[3]

Solar fridges were introduced in the developing world to cut down on the use of kerosene or gas-powered absorption refrigerated coolers which are the most common alternatives. They are used for both vaccine storage and household applications in areas without reliable electrical supply because they have poor or no grid electricity at all.[2][4] They burn a liter of kerosene per day therefore requiring a constant supply of fuel which is costly and smelly, and are responsible for the production of large amounts of carbon dioxide.[3] They can also be difficult to adjust which can result in the freezing of medicine. The use of Kerosene as a fuel is now widely discouraged for three reasons: Recurrent cost of fuel, difficulty of maintaining accurate temperature and risk of causing fires.[4]

Technology

Traditionally solar-powered refrigerators and vaccine coolers use a combination of solar panels and lead batteries to store energy for cloudy days and at night in the absence of sunlight to keep their contents cool. These fridges are expensive and require heavy lead-acid batteries which tend to deteriorate, especially in hot climates, or are misused for other purposes.[3][4] In addition, the batteries require maintenance,[5] must be replaced approximately every three years, and must be disposed of as hazardous wastes possibly resulting in lead pollution.[3] These problems and the resulting higher costs have been an obstacle for the use of solar powered refrigerators in developing areas.[2][4]

In the mid-1990s NASA JSC began work on a solar powered refrigerator that used phase change material rather than battery to store "thermal energy" rather than "chemical energy." The resulting technology has been commercialized and is being used for storing food products and vaccines.

Use

Solar-powered refrigerators and other solar appliances are commonly used by individuals living off-the-grid. They provide a means for keeping food safe and preserved while avoiding a connection to utility-provided power. Solar refrigerators are also used in cottages and camps as an alternative to absorption refrigerators, as they can be safely left running year-round. Other uses include being used to keep medical supplies at proper temperatures in remote locations, and being used to temporarily store game at hunting camps. [6]

See also

- Renewable energy in developing countries
- SolarAid
- Solar power in South Asia
- UN-Energy

References

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