International Journal of Research
Available at https://edupediapublications.org/journals
e-ISSN: 2348-6848
p-ISSN: 2348-795X
Volume 05 Issue 17
July 2018

Fabrication of Wind Chill Food Preservation Refrigeration System

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Abstract

Our design concept aims to take on the problem of food stores spoiling in areas with poor access to electricity. The goals of our alternate food preservation unit are to not require an electricity grid, to be significantly less expensive than a modern refrigeration methods and to be able to be incorporated into the regions of poverty where it is most needed. The cooling mechanism is inspired by temperature regulation approaches seen in mammals and insects and is a new way of approaching issues in the food system.

In our process an intake structure passively draws in air warm ambient air and injects it via the venture effect it into a pipe. The second step delivers the air into the evaporation chamber, where the pipe is immersed in a fluid. The fluid evaporating from the around pipe cools the inside air and lastly the third step involves the cooled air entering the refrigeration chamber where food is stored.

1. **Keywords:** Air tube, Copper coil ,chamber

1. Introduction.

Evaporation cooling is dependent on the condition of the air and it is necessary to determine the weather condition that may be encountered to properly evaluate the possible effectiveness of evaporative cooler. On the other hand, the amount of water vapor that can be taken up and held by the air is not constant: it depends on two factors: the first is the temperature of the air, which determines the potential of the air to take up and hold vapor. The second involves the availability of water: if little or no water is present, the air will be unable to take up very much amount of water.
In rural areas of India, vegetarian food is often preserved in a clay pot refrigerator. The cooling space is smaller clay pot inserted within a larger clay pot. The

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annular space between the two pots is filled with sand are occupied by water. Convective and radiative heat transfer from hot and dry surrounding evaporates this water and brings about cooling of space in the inner pot where food is kept. This slows both the respiratory process and activities of micro-organism which are destructive activity during storage of food. The mathematical model of pot in pot refrigerator using Reynolds flow model is presented by A.W. Date. [

2. LITERATURE SURVEY

hohammed Abbah (Longmone, 2003)

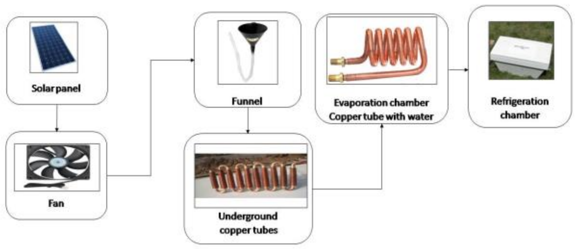
A teacher in Nigeria, developed a small scale storage pot-inpot system that uses two pots of slightly different size. The smaller pot is placed inside the large pot and the space between then is filled with sand. In Sudan, the Practical Action and the Women's Association for Earthenware Manufacturing have been experimenting with the storage design of Mohammed Abbah. The aim of the experiment was to discover how effective and economical the Zeer storage is in conserving foods. Zeer is the Arabic name for the large pots used. The results are shown in the following table (Longmone, 2003). As a result of the tests, the Women's Association for Earthenware Manufacturing started to produce and market the pots specifically for food preservation (Longmone, 2003).

Roy (1985)

The India Agricultural Research Institute develops a cooling system that can be built in any part of the country using locally available materials (Roy, 1985). The basic structure of the chamber can be built from bricks and river sand, with a cover made from cane or other plant materials and sacks or cloth. There must be a nearby source of water. Construction is fairly simple, first the floor is built from a single layer of bricks, and then a cavity wall is constructed of bricks around the outer edge of the floor with a gap of 75mm (3") between the inner wall and the outer wall. This cavity is then filled with sand. About 400 bricks are needed to build a chamber of the size shown below. A covering for the chamber is made with canes covered in sacking all mounted in a bamboo frame. The whole structure should be protected from sunlight by making a roof to provide shade. After construction of the walls and floor, the sand in the cavity is thoroughly saturated with water. Once the chamber is completely wet, a twice daily sprinkling of water is enough to maintain the moisture and temperature of the chamber.

3. Implementation:

Fabrication of wind chill food preservation refrigeration system



It works by passively drawing in warm ambient air through the funnel, which is fed into a pipe that's been buried underground. This already starts to cool down the air before it's fed into coiled cooper pipe that's been immersed in water in the evaporation chamber. The evaporation process is helped along by a small, solar-powered fan.

The water evaporating around pipe chills the air inside and this is then fed back underground before entering the refrigeration chamber.

4. Related Work:

The brief introduction of different modules used in this project is discussed below:

SOLAR PANEL:

Solar power systems employ photovoltaic cells to convert the radiant energy of sunlight directly into electrical energy. Photovoltaic solar cells are semiconductor devices which convert sunlight into electricity. Solar cells which utilize crystalline semiconductors, such as silicon, offer the advantages of high performance and reliability. Photovoltaic cells are silicon-base crystal wafers which produce a voltage between opposite surfaces when light strikes one of the surfaces, which surface has a current collecting grid thereon. The photons of the light are absorbed by photovoltaic cells and yield their energy to the valence electrons of the semiconductor and tear them from the bonds that maintain them joined to the cores of the atoms, promoting them to a superior energetic state called conduction band in which they can move easily through the semiconductor.

Typically, a plurality of solar cells are assembled and interconnected so as to form a physically-integrated module, and then a number of such modules are assembled together to form a solar panel. Several solar panels may be connected together to form a larger array. The individual photovoltaic cells in a module may be connected in series or parallel, typically by an internal wiring arrangement and similarly two or more modules in a panel may be connected in series or parallel, depending upon the voltage output desired. Solar cells are usually interconnected into series strips by electrically interconnecting a collector pad on the grid to the opposite surface of the adjacent cell in the strip. Photovoltaic cells are manufactured in a variety of configurations, but generally comprise a layered structure on a substrate. There are many different types of converging solar cell modules in which sunlight is converged by means of a lens system so that the total area of expensive solar cells can be reduced in order to reduce the cost of electric power generating systems using these solar cells. In order to most efficiently use the electrical power generated by a photovoltaic cell or photovoltaic array, it is desirable to maximize the power generated by the photovoltaic cell or photovoltaic array, despite varying weather conditions. Various sun tracking systems have been used to enhance the power generating efficiency of the converging solar cell module.

Copper tube:

Copper tube is one of the components that is needed in air conditioning and refrigerant system. The tube is used as a path for the refrigerant to flow between system components and to contain it from escaping to the atmosphere. Sizing, installation layout and fittings must be done properly to ensure that the system runs efficiently.

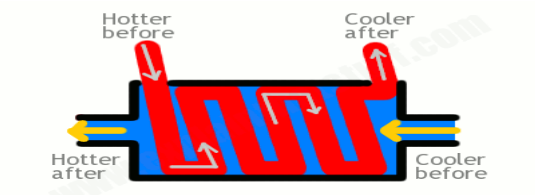
During installation, it is of utmost importance that moisture, dirt and other contaminants are prevented from entering the system. These foreign particles will affect the performance of the system and may even cause damage to some of the components.

During the production of the copper tube, the inside of the tube has been cleaned and dried before being sealed at both ends to ensure that it remains that way. You must check to make sure that the refrigerant that is going to be used does not react with the copper. Ammonia refrigerant will react with copper hence it should not be used. Instead, the stainless steel tubing type will have to be used.

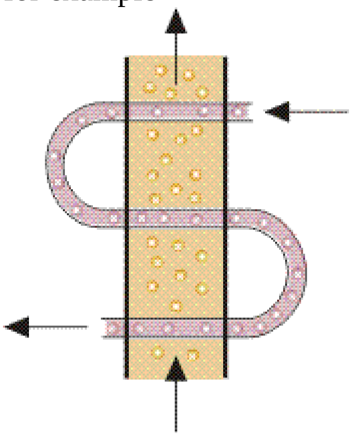
Heat Exhangers:

Heat exchangers are devices that transfer heat in order to achieve desired heating or cooling.
Copper and aluminum are used as heat sinks and heat pipes in electronic cooling applications. A heat sink is a passive component that cools semiconductor and optoelectronic de vices by dissipating heat into the surrounding air. Heat sinks have temperatures higher than their surrounding environments so that heat can be transferred into the air by convection, radiation, and conduction

Copper heat sinks are die-cast and bound together in plates. They spread heat quickly from the heat source to copper or aluminium fins and into the surrounding air.



In industrial heat exchangers, hybrids of the above flow types are often found. Examples of these are combined crossflow/counterflow heat exchangers and multi pass flow heat exchangers. (See for example



Exhaust fan:

e-ISSN: 2348-6848
p-ISSN: 2348-795X
Volume 05 Issue 17
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Exhaust fans work by sucking hot or humid air out of a small, localised area, allowing fresh air to enter from elsewhere (perhaps a doorway or vent) in order to replace it. The warm air that's drawn out using an **exhaust fan** is then pulled through a ducting system and expelled outside.

ACKNOWLEDGEMENT

We would like to thank all the authors of different research papers referred during writing this paper. It was very knowledge gaining and helpful for the further research to be done in future.

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