

# Facing the Phenomenon of Electricity Interruption at Homes

## (Designing Equipment and Implements working by Charging)

**Dr/Ayman Mohamed Afifi**

Lecturer in High Institute of Applied Arts Six October City

Department of Industrial Design

**Abstract-** The researcher tackles the phenomenon of electricity interruption that is considered one of the most modern phenomena in the summer during the high temperature. From this respect, the researcher is interested in cooling air via designing the systems that can be charged by electricity and once the electricity is interrupted, it works for cooling air during the interruption and the most important problems is high temperature

**Index Terms-** Air Cooler, Hydro cooling, Fresh Air Cooling, A portable forced-Air Cooler ,Rechargeable Air Cooler

### I. INTRODUCTION

The Egyptian citizen is annoyed in his life as he is threatened by losing the most important daily service for which he is in a dire need that is facing the crises of the electricity interruption. In addition, it is expected that this crises will increase during summer - when the consumption is increased - for hours during the rush hours.

The Phenomenon of Electricity Interruption is one of the modern phenomenon in the Egyptian society which does not witness since many years. The reasons behind this interruption trace back to the lack of the ability of the stations especially during summer as result of high temperature as well as the over-consumption of the citizens and using the over-consuming systems such as Air-Conditioning and so on.

Moreover, this phenomenon is the result of the problem of lack of energy in general whether Gasoline or Gas or Solar, so we see now the queues of vehicles waiting for fuel's supplying. The problem of Gasoline or solar for vehicles can be beard but the lack of the fuels for Electricity Generation Stations affects the Egyptian Houses as the electricity runs the daily activities of the human being as it supports him with water and cold water as well as cold air in summer during the higher temperature as well as it provided people with the lightness that is necessary for continuing the daily activity and many other requirements. But some can bear the electricity interruption for one hour or more during the high temperature whereas the other does not bear such as the old people or the patients at homes or hospitals who have no ability to bear this problem for long time.

In this respect, the researcher finds that the industrial designer has a vital room in facing this phenomenon as the equipment and implements designing are highly connected to

electricity especially the house systems that are used vitally and can not be discarded as result of the environmental conditions and the high temperature. Thus, the researcher is interested in solving the problem of Air Cooling via designing the systems that can be recharged by electricity and once the electricity is interrupted, it works for air cooling during the electricity interruption .therefore the research is focusing the follow:

1)The problem of the research is represented in Electricity interruption at homes for long time especially during summer as result of the high temperature and the over-consumption of electricity by using the Air-conditioning, so this causes high pressure and overload on the main network of electricity. Consequently, the population faces two problems at homes, first: The loss of lightness and second: The high Temperature.

2) The Objective of this research aims at facing the problems resulting from the electricity interruption especially during summer by designing the equipment and implements that have the ability to solve the problem of high temperature (designing Air Cooler working by electric charger).

3) The Significance of the Research:

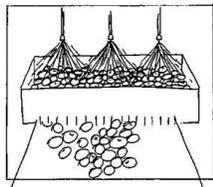
- a. The equipment and implements that are working by Charging help peoples to bear the problem of high temperature.
- b. They help also the patients at houses and hospitals to face the crises.
- c. This research opens the door for designers to create other equipment or implements work with electric charge. So the imports of similar air coolers will decrease in case of mass production.

4) The research follows up the descriptive methodology to illustrate the case of the research's problem.

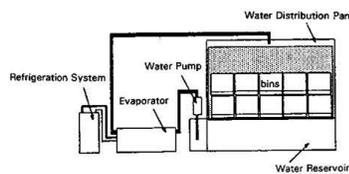
### II. THE PREVIOUS STUDIES

- 1) Hydro-cooling Hydro-cooling provides fast, uniform cooling for some commodities. The commodity as well its packaging materials must be tolerant of wetting, chlorine (used to sanitize the hydro-cooling water) and water beating damage (Mitchell in Kader,

1992). The simplest version of a hydro-cooler is a tank of cold water in which produce is immersed. The type shown below by pic No(1) shows a batch of produce with icy water as the produce moves along a conveyor. A batch-type hydro-cooler can be constructed to hold entire pallet-loads of produce (Thompson in Kader, 2002). Conveyors can be added to help control the time produce stays in contact with the cold water.



*Pic No(1)show shows a batch of produce with icy water as the produce moves*



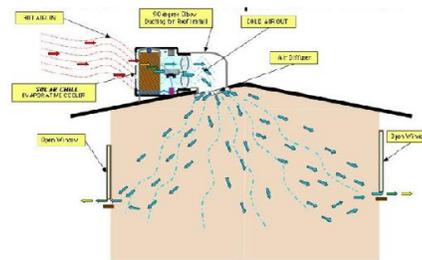
*along a conveyor*

2) The Fresh Air Cooling System Evaporative cooling uses a system of air flow called the Fresh Air System. In this system, fresh outside air is brought in through the cooler, where it is cooled and pushed through the building, then exhausted to the outside through screened windows or doors. This type of air circulation differs from traditional air conditioning, which uses re-circulated air, allowing the same inside air to revolve over and over again through the building, and unlike the the Fresh Air System, works best if it is sealed off from all outside air leakages and exchange. This causes stale and toxic air in your home or office! These problems are known as "sick building syndrome". The Fresh Air Cooling System, used by all evaporative coolers, is beneficial as compared to the re-circulation of the AC units, because evaporative coolers are designed to supply an entire exchange of all the buildings air every 2 to 3 minutes. Evaporative cooling greatly reduces environmental air-impurities; while AC units will continue to re-use the same polluted air, often causing problems with indoor air quality.

pic No (2) showing the diagram below to discover how the Fresh Air System works.

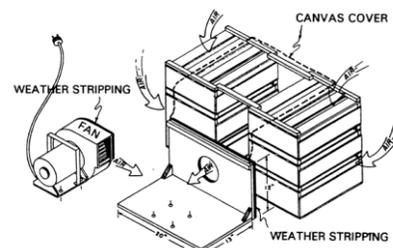
For this system to work well, the windows must be

partially opened to allow air to escape, which allows the freshly cooled air to enter. If the windows are closed, the exhaust and intake air will be restricted, and the building will become pressurized and not cool well. The intake of fresh cooled air will be blocked. Through the use of the SOLAR CHILL tm Evaporative Coolers, the diagram below shows how the cooling system works without the use of duct work. It is preferable to eliminate the ductwork and use the building as the ductwork instead. This is more energy efficient by reducing the friction to air flow that ductwork causes, and saves you the cost of the ducts!

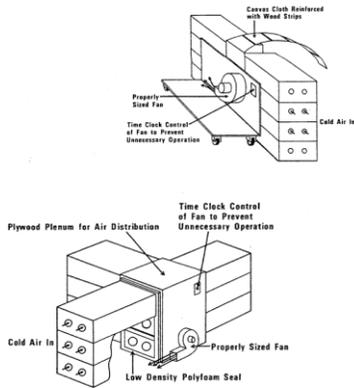


*pic No (2) showing the diagram to discover how the Fresh Air System works.*

3) A portable forced-air cooler can be constructed using a canvas or polyethylene sheet. The sheet is rolled over the top and down the back of the boxes to the floor, sealing off the unit and forcing air to be pulled through the vents (vent area should be at least 5% of the surface area of the (carton) of the cartons stacked against the cooler. This unit is designed to be used inside a refrigerated storage room. The fan unit is shown detached to illustrate how the air should flow within the cooler. For best results and minimum cost of operation, the warm exhaust air from the fan should be directed toward the return air inside the **cold room**. pic No (3-a,b) showing the 3 portable forced-air cooler diagrams



*pic No (3-a) showing the 1 portable forced-air cooler*



pic No (3-b) showing the 2 portable forced-air cooler diagrams

from the previous studies about the three kinds of cooling systems, the researcher noticed some points of difference and similarity in the way of everyone worked by and between the way of the cooler which the researcher designed but it is considered the first to have an important factor which is this suggested cooler working by charging in order to solve a problem greatly annoyed the Egyptian citizen how to adapt with arising of high temperature in case of the electric current Interruption.

### III. METHODOLOGY

The solution from the Point of view of the researcher

Under the shadow of this crises, the researcher finds that the industrial designer plays a vital role to relieve the dangerous harms to which the citizen is exposing during the electricity interruption due to the high temperature through designing Air cooler working by electric charger in order to be stored in batteries that have the ability to run the cooler during the electricity interruption to solve the problem of the air-conditioning stop. at the beginning the researcher can make a design as it is shown in pic. No. (4).



Pic. No. (4) Shows the proposed design for the cooler

The design works with a fan with an electric engine connector to DC put into a cooling room working for cooling air from inside to outside. The pic. (No 5-a-b) shows the phases of performing the design by using wood firstly.



(5-a)



(5-b)

Pic. No. (5-a-b) shows the phases of performing the design by wood.

After The wooden model, the researcher can perform the design by the materials and the appropriate dimensions as well as the design is provided with lighting units to be used in emergency as it is shown in the Pic. No. 6 – 7.



*Pic. No. (6-a) shows the design in its end form  
from inside*



*Pic. No. (7-a) shows the design in its end form  
from the front*

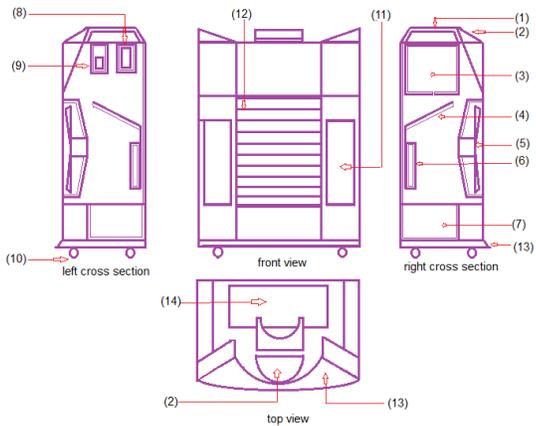


*Pic. No. (6-b) shows the design in its end form  
from outside*



*Pic. No. (7-b) shows the design in its end form  
from the top*

After representing prototype design for air cooler from all its possible aspects, the researcher would like to represent pattern to clear the technical details which shows how it works as shown in diagram number (8) .



Pic No (8 ) illustration showing the cooler

*Technical details*

- |                                 |                            |
|---------------------------------|----------------------------|
| 1-cooler handling place         | 9-transformer (220AC-6VDC) |
| 2-panel control                 | 10-polyamid wheel          |
| 3-top drilled ice box           | 11- led lamp               |
| 4-fabric to wet with fall water | 12-swing PE slides         |
| 5-fan and DC motor              | 13-artilon frame           |
| 6-ice box case                  | 14-ice box cover           |
| 7-cold water box                |                            |
| 8-battery (6V -4.5A)            |                            |

The researcher has designed Polley measures (questionnaire form)

To test a random group about ten consumers to determine the air cooler validity for mass production after developing.

From good to excellent were the results which showed how the random consumers accept the cooler and thy recommended with developing and producing the cooler at one of the factories specialized in home electric systems.

IV. RESULTS AND RECOMMENDATIONS

After examining similar systems ,previous studies and finishing the prototype , the results showed that :

- 1) The air cooler achieved its purpose and so it makes us able to adapt with high temperature in summer during electric current Interruption.
- 2) The design with this system is ready for mass-production after developing it .

After performing the design and his success in achieving the objective, the researcher decides to recommend by the following.

Recommendations:

- 1) The researcher recommends designing the tools and systems that are working by electric charger to face the problem.
- 2) The researcher recommends with developing and producing the cooler at one of the factories specialized in home electric systems.