

Development of Low Maintenance Desert Cooler

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Abstract: *In this research paper we have discussed the utilization of a cooler for air cooling as well as refrigeration. The purpose of this paper is to design modification of the existing design of, in which aspen pad frame, wire connection box, pipe water distribution system, fruit and vegetable box is made. All the modification done for easy maintenance of desert cooler and fruit and vegetable box made Keep Fresh vegetables for long time. The proposed model is experimentally validated by conducting a series of experiments in a controlled atmosphere inside a room for fruit and vegetable box. Box is loaded with fruits and vegetables. Also the number of trial is conducted for easy maintenance of desert cooler.*

Keywords: Aspen pad frame, wire connection box, Pipe water distribution system, Fruit and vegetable box

I. INTRODUCTION

India is a typical country in which most of the regions experience very high temperatures during the summer seasons. That is the temperature range between summer and winter seasons are very large. Hence, it is not a very pleasant experience and highly uncomfortable. Though cheaper methods of cooling down the hot temperatures during the summer do not have wide variety of option. Air conditioners have high initial and running costs, which cannot be afforded by all the people in a developing country like India. Air coolers are relatively cheap, but provide unsatisfactory results; there is a need for developing a cheaper room cooling system. Conventional air conditioning is one of the major contributors of CFCs into the atmosphere. An alternative type of cooling, which does not expel CFCs is highly desirable as one important step in the correction of this problem.

II. LITERATURE REVIEW

In this paper Ashok Kumar Sharma and Pawan Bishnoi describes that the methods of designing and manufacturing of desert cooler. A test setup is presented which was prepared to test the effectiveness of this developed cooler. The methodology of testing and test data are also presented.

A Modified Desert Cooler (MDC) was introduced that cools the air is therefore more effective than the traditional desert cooler. The modified desert cooler is developed for providing better cooling effect than conventional desert cooler. It also provides cold-pure water for drinking purpose comparatively at low cost than Refrigerator with the help of modifies Matka attached with it. It also decreased moisture content of the air coming through desert cooler upto some extent.

Poonia M.P. A et al. have produced a Cooler cum fridge that offers air cooling, cooling Drinking water and with storing vegetables and medication affecting the productivity of the hotter desert. It's an energy saver, Equipment that is useful.

A Desert Cooler performance was investigated by Khond Four distinct pad materials are used, i.e. stainless steel wire mesh, Khus, coconut coir, and wood fur. It was noted by them that in stainless steel wire mesh, the minimum water consumption was found and maximum cooling performance was found using wood wool.

III. PROBLEM STATEMENT

The desert cooler is need the one time maintenance when summer season is starts or if any problems occurs in desert cooler or cooler is under maintenance its require lots of efforts and time to dissembled the cooler and repair it .Whole system get unstable because all sides wall are bounded to each other and it. To overcome this problem we proposed the solution is given bellow.

IV. PROPOSED SOLUTION

1. Side walls are easily removable.
2. In this project we can remove only that side wall which requires taking under maintenance.
3. We remove a top container of regular cooler instead of it we place a pipe drain system which supplied water to cooling purpose.
4. We provide an extra facility to remove cooler motor and cooler pump for removal or maintenance purpose.
5. As compare to regular existing cooler we provide a more mechanically stable system.

V. DEVELOPMENT OF DESERT COOLER

5.1 Modified Component of Desert Cooler

Evaporative Pad Frame

The pads are where the air cooling occurs, as water delivered to the pads by the water pump evaporates under the air blown through the pads by the cooler motor. We have use aspen cooling pads are made up of synthetic fiber and wood, and looks like a grass. Aspen cooling pads are cheap and economical and the frame is made in such way that it can be easily fix in body frame.



Distributor

Water needs to be distributed properly to these cooling pads. This is done by cooling pumps and various pipes that interconnect the cooling pads. These cooling pads should always be in saturated state otherwise the water will evaporate away from these pads.



Wire Connection Box

The wire connection box is where the main power supply comes into the cooler. The incoming power supply is connected to a wire connection block, where individual wire leads feed power to the blower motor, water pump, and any other powered features in the cooler. There normally is not much repair needed at the wire connection box, except possibly to check the wiring connections and tighten any loose ones.



Fruits and Vegetables Tray/Box and frame

A fruit box is made to keep a vegetables and fruits fresh like refrigerator. We can easily keep and remove vegetables and fruits from the box. A vegetable and fruits are remains fresh for 3 to 4 days in this box. The frame is made in such that the fruit box can easily slide in To and Frow motion.



Step by step Procedure for Development of Desert Cooler

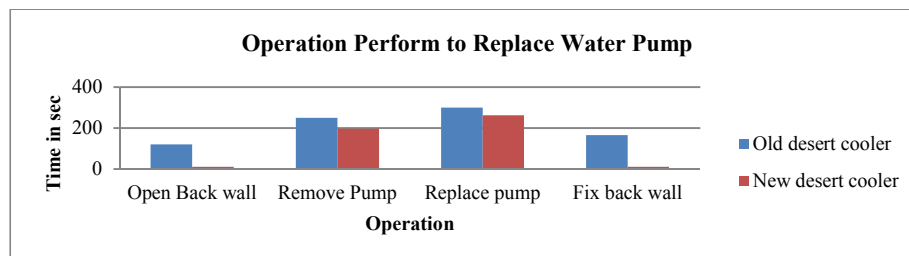
1. Problem Statement
2. Group Discussion
3. Design of Project Model
4. Material Selection
5. Body Construction
6. Made frame for aspen pad
7. Fix aspen pad frame to Body of desert cooler
8. Make door on back side using aspen pad frame
9. Take pipes and cut into required dimensions
10. Make 3mm hole on it at distance of 2 inches
11. Reduce 1 ¼ inch pipe into ½ inch with Reducer
12. Make assembly of Pipes and water pump
13. Make frame for Electric connection box
14. Make connection box
15. Make electric connection and fix switch board into connection box
16. Made frame for fruit and vegetable tray
17. Place vegetable box on frame
18. Make roof cover and fix over roof of desert cooler

VI. RESULT AND DISCUSSION

As per the name of our project “Development of Low Maintenance of Desert Cooler” it is seen that the maintenance time and cost is reduce.

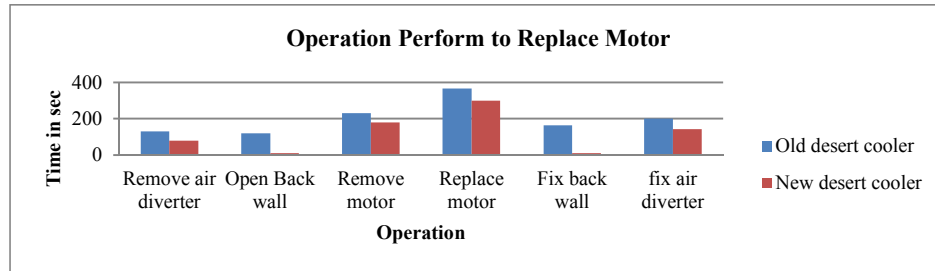
Operation Perform to Replace Water Pump

If any fault occurs in desert cooler water pump or any trash get stuck into the water pump we have to replace or repair it. In existing desert cooler time require to replace water pump 14-15 min and this time will be reduce to half in new desert cooler as shown in Chart



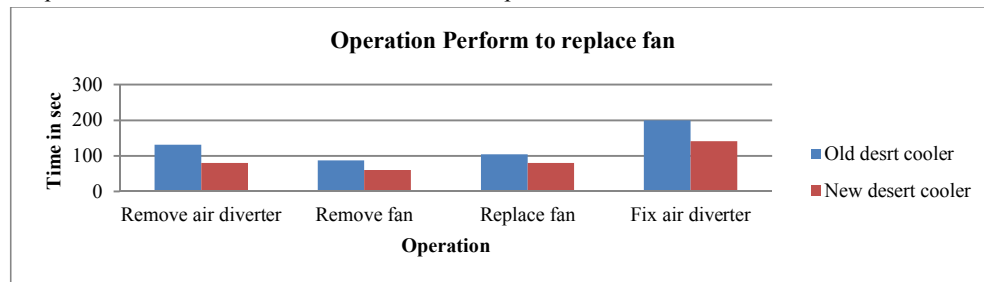
Operation Perform to Replace Motor

This type of operation performs when motor get damaged or short circuit occurs in motor wiring or in motor winding. In old/existing desert cooler to replace motor requires 20-21 minutes and in new desert cooler require 12-13 minutes.



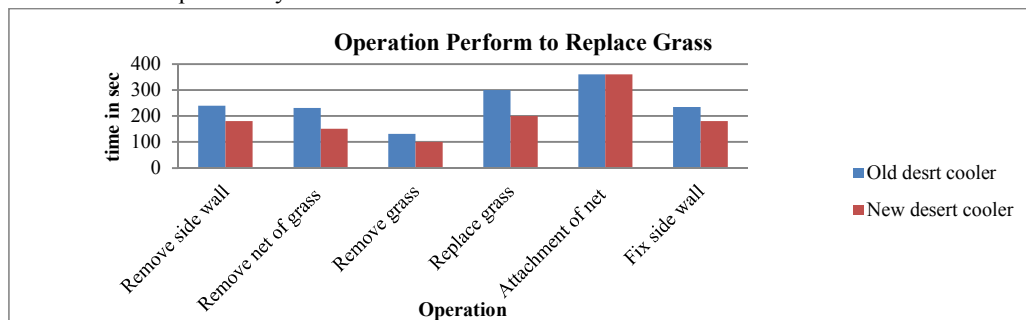
Operation Perform to Replace Fan

In new desert cooler if motor fan get damaged or fins get break down we do not have to remove front entire body frame of desert cooler we have to only remove air diverter by losing the nut and bolt. In existing desert cooler to remove and replace fan required lot of time but in modified cooler this operation done within 5-6 minutes.



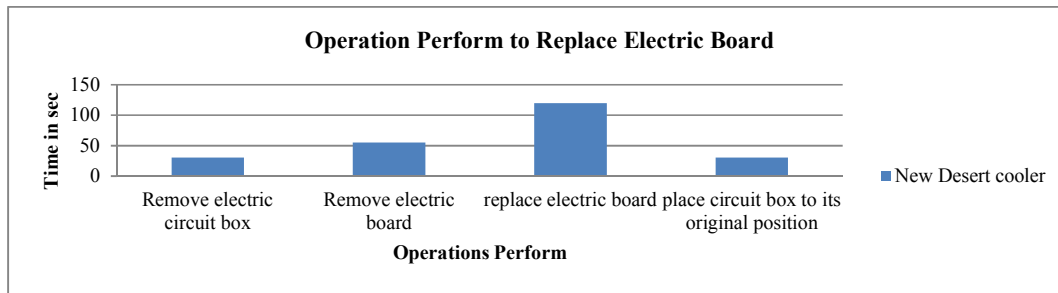
Operation Perform to Replace Grass (Aspen pad)

As summer season starts we have to do the maintenance of cooler. Firstly we have needed to replace grass. So we modified the aspen pad frame so that it can be remove easily and grass is replaced easily. Existing cooler take 20-25 minutes and modified desert cooler required only 10-15 minutes for one frame.



Operation Perform to Replace Electric Board

In case if electric button get damage or wiring of electric board is short circuited then we have go under maintenance of electric board. In case of old/existing cooler to replace electric supply board we have to remove whole wiring of desert cooler and after that electric board get off from cooler and then we have to replace it with new electric board requires ½ hours to ¾ hour for this operation. to overcome this situation we have introduce electric circuit box in which all equipment and wiring are placed and electric board is also attached to this box. In any case if electric board goes under maintenance we do not have to remove whole wiring we have to just take off electric circuit box and remove the board from it. It required only 5-10 minutes only.



Performance of Fruits and Vegetables Box

Dry fruits box is loaded with apples and the freshness of the stuff stored is observed daily. The fan of the cooler is kept on during day night time and the pump of the cooler is kept on the water stored in the tank water is pumped in to the top and circulated through cooler pad. The water and air get cooled naturally by coming in contact with surrounding air. After the observation it is seen that the fruit stored in box is remains fresh after 2-3 days.

VII. CONCLUSION

From different operation perform during trial we can say that the maintenance of desert cooler is so easy and not that much time consuming compares to existing models. Also from above result and discussion we conclude that the time required for maintenance of desert cooler is considerably reduced.

VIII. FUTURE SCOPE

The desert cooler cools air by evaporation process, but the main drawback of desert cooler is that it increases the humidity of incoming air. To overcome the problem people move to an air conditioner, but the AC is very expensive and it consumes large amount of power. Thus it is not affordable to the common man. To overcome this problem you can add humidity sensor inside desert cooler.

REFERENCES

- [1]. International Journal of Science and Engineering Applications (IJSEA) Volume 2 Issue 1, 2013, ISSN - 2319-7560
- [2]. Kothare, C. B. and Borkar, N. B. 2011. Modified desert cooler (MDC). International Journal of Engineering and Technology. 3 (2), 166-172.
- [3]. Dr. J.P Yadav. Int. Journal of Engineering Research and Application www.ijera.com ISSN : 2248-9622, Vol. 7, Issue 6, (Part -4) June 2017, pp.14-20
- [4]. Mr. Pawan Chandak , Ms. Patki and Mr. Kulkarni, Review on performance parameters and its evaluation of evaporative air cooler. 2019 JETIR April 2019, Volume 6, Issue 4
- [5]. Khond, V. W. 2011. Experimental investigation of desert cooler performance using four different cooling pad materials. American Journal of Scientific and Industrial Research. 418-421.
- [6]. Bhupendra Sahare ,Chhavikant Sahu , “ Design and Development Of a Cooler Used Air Cooler and Refrigeration”. International Journal of Recent Technology and Engineering (IJRTE) ISSN: 2277-3878, Volume-8 Issue-5, January 2020
- [7]. Poonia M.P., Bhardwaj A., Upender P., Jethoo A.S. 2011. Design and development of energy efficient multi-utility desert cooler. Universal Journal of Environmental Research and Technology. 1, 39-44
- [8]. Gilani, N. and Shariaty-Niassar, M. 2009. An investigation of indirect evaporative coolers (IEC) with respect to thermal comfort criteria. Iranian Journal of Chemical Engineering. 6(2), 14-28. 9.
- [9]. Navon, R. and Arkin, H. 1994. Feasibility of direct indirect evaporative cooling for residences, based on studies with a desert cooler. Building and Environment, 29 (3), 393-399.