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# Liquid Desicant Air Conditiong by Using Renewable Source

Solar Energy as Renewable Source

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***Abstract*** *—Due to less conventional energy sources, there increases the demand for renewable energy resources. A solar techniques with capacity to severe the problem is a free absorbent system, where moisture is sucked from the air to be treated by face to face contact with the absorbent. The absorbent is again used, again in face to face touch with an external air stream, at comparatively less temperatures of the heat resource. This work gives a info of a liquid desiccant designed for giving cooling effect of air used for domestic purpose. This system is capable of using renewable source having SOLAR ENERGY, which can be made of curved or flat collectors and has ability to give both dehumidification and cooling. As required by the load effects can be vary having different ratios. Many cycle parameters have been considered, related to many different design options.*

***Keywords:*** *Renewable source, Air Conditioning, Regeneration, Absorption, Cooling, Dehumidifying, Dehumidifier, Liquid Desiccant, Cold Sinker, Hot Sinker.*

## 1. INTRODUCTION

### 1.1 AIM

*Hot air from atmosphere can cause less human comfort where people are present, which has many health related problems. To be more comfortable, people want a specific quantity of ambient humidity. An air-vapor cooling and condensing system would be one of them to maintain the humidity within a fixed chamber by using renewable source and liquid desiccant method.*

But it is not efficient as it wants surplus energy to reheat and for cooling purpose of the air to gain both combo temperature and moisture set-point. For air dehumidification process, it also can be obtained by adsorption/ absorption of moisture by a solid or liquid desiccant. Major advantage of this is that the latent

and the sensible heat can be processed separately and differently. The desiccant systems are more efficient in dealing with the latent load. Liquid desiccant have many benefits over solid desiccant.

### 1.2 OBJECTIVE

It is observed that air conditioning is done with the help of lithium chloride LiCl and water by using external heat, where they presented the direct or may be some times indirect regeneration in collectors open and cold storage having regenerated solution. Some researchers used in testing the organic absorbents, such as tri ethylene glycol or ethyl glycol to minimize the problem of erosion of metal and corrosion involved in inorganic salts. In many cases, the direct regeneration of the liquid desiccant by help of renewable source of energy, i.e. the sun was done by using a special type of collector (curved or flat).

Scientist noticed that the desiccant systems of cooling liquids for cooling purpose had good cooling experimented in the hot and humidity climates as in the Mediterranean countries and other countries where there were the problem of the lack to cool air. The system was worked since April 2003 {1} studied and tested a liquid desiccant system for cooling of air and dehumidification of air, where it includes a specific heat/mass exchanger (HME) made a design to use a liquid desiccant with the regenerator and the dehumidifier and to permit the mass and heat transfer between them with a less minimum thermal and external losses.

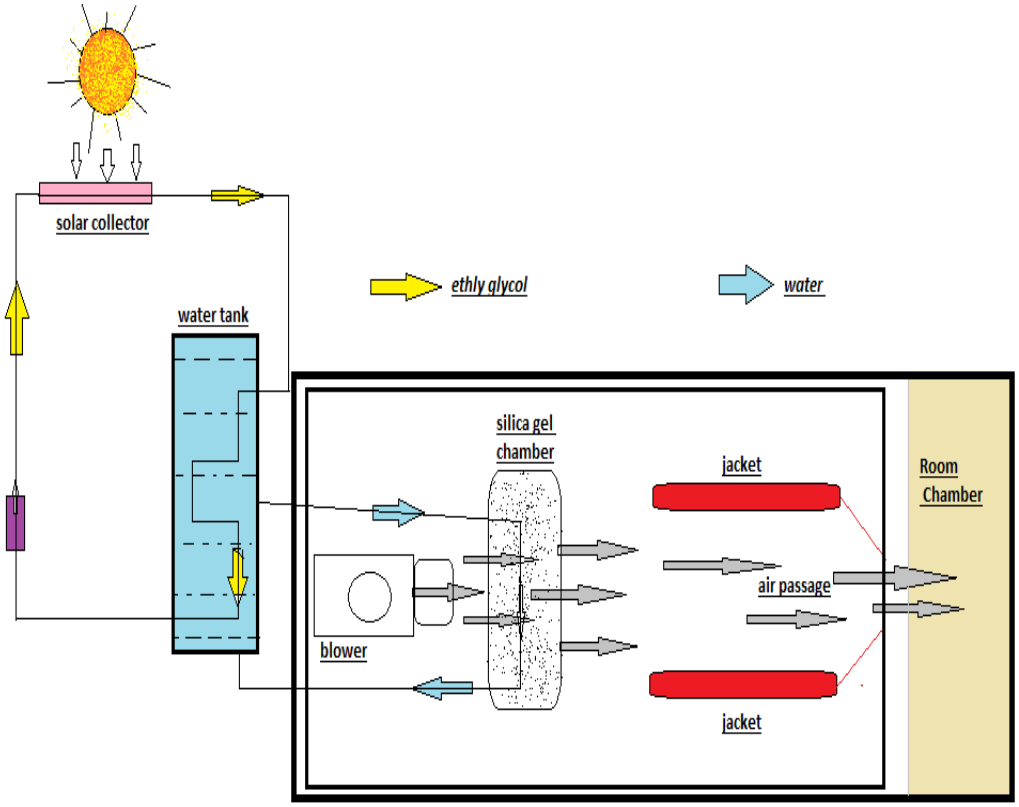
This paper aims at investigating and testing experimentally, the performance of cooled dehumidifier using silica get as a desiccant and a renewable solar energy as a heating source in the regeneration process. In this experiment we are using ethyl glycol, silica gel, water as chemical components and air blower, solar heat collector, pumps, pipes, tanks cooling jackets as physical components.

## 2) Experimental Set-up:

Mainly solar energy is used as renewable source which is used for heating and evaporating purpose of moisture from air by using liquid desiccant system. Here solar heat is transfer to ethyl glycol and from ethyl glycol heat is transfer to water. This hot water is used for the evaporating purpose of the moisture .

### 2.1) Process

As shown in figure: 1, from starting there is loop of pipe in which Ethyl Glycol is filled up. This ethyl glycol is made to move from solar collector in which it becomes hot fluid means it is converted to hot temperature fluid from less temperature fluid by the help of renewable source of energy that is solar energy. After that it passes through the pipe which carries it to water tank kept below at ground level. This pipe continues through the water tank and then it passes through pump again which helps the ethyl glycol to again go to height to solar collector which has again lower temperature.




***Schematic Diagram of Liquid Desiccant AC***

The blower is kept at before the silica gel chamber from which the atmospheric air is supplied to the silica gel chamber having some pressure. This atmospheric air has some moisture contents. As shown in figure: 1, after passing through the silica gel chamber this moisture is removed out by liquid desiccant in our case that is silica gel. This moisture is evaporates when pipe of hot temperature passes from the silica gel chamber as discuss earlier. Now finally we get some pressured air having no moisture contents after passing through silica gel chamber.

This high temperature water passes from other loop of pipe having passage from the silica gel chamber. This high temperature water pipe through silica gel chamber helps silica gel to evaporate the moisture absorbed by silica gel when atmospheric air is passed through it as shown in figure: 1. Then after passing the pipe of water which has at higher temperature earlier from silica gel chamber, it becomes water pipe whose temperature has been lowered due to evaporation process is carried within the chamber. Then this water at lower temperature again enters in water tank through pipe and due to density difference the cooler temperature water is at bottom and hotter temperature is at top in water tank

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Then this dry pressured air is passed through the Cooling jackets. The cooling jackets are the physical component in which dry ice that is solid carbon dioxide or fully chilled water is filled up. As shown in figure: 1, the dry air having comparatively high temperature is passed between this cooling jacket after which dry air becomes cool as the temperature is lowered by cooling jackets by surface contact of jackets and air. Then the air is passed from nozzle shaped components and realized to the room chamber where cooling effect or comparatively lower temperature of air needed as shown in figure: 1.

So finally we gets the comparatively lower temperature dry air in room chamber by Liquid Desiccant-Silica Gel and Renewable Source of Energy- Solar Energy.

**2.2)MODELING & ANALYSIS USING SOFTWARE For Process:**

For modeling purpose we are using Solid works Software in which we are modeling machine assembly using proper dimension of design.· Our solid works model useful for easy understanding of actual working of machine. Though which we are able to convert into the physical model.· SOLIDWORKS is a solid modeling computer-aided design (CAD) and computer-aided engineering (CAE) program that runs on Microsoft Windows.· The SOLIDWORKS mission statement: "To provide engineers and design teams with complete, intuitive 3D solutions so they can transform innovation into business success."· Parameters refer to constraints whose values determine the shape or geometry of the model or assembly. Parameters can be either numeric parameters, such as line lengths or circle diameters, or geometric parameters, such as tangent, parallel, concentric, horizontal or vertical, etc.· Features refer to the building blocks of the part. They are the shapes and operations that construct the part. Shape-based features typically begin with a 2D or 3D sketch of shapes such as bosses, holes, slots, etc. This shape is then extruded or cut to add or remove material from the part. Operation-based features are not sketch-based, and include features such as fillets, chamfers, shells, applying draft to the faces of a part, etc.

**2.3)TESTING THE PROTOTYPE**

Room Conditions : 35.6 degree centigrade

| Time | Temp at cold side inlet (Centigrade) | Temp of air at cold sink outlet(Centigrade) |
|---|---|---|
| 5 min | -1.2 | 34.4 |
| 15 mins | -1.0 | 32.0 |
| 30 mins | 1.5 | 29.7 |
| 45 mins | 1.0 | 26 |
| 60 mins | 2.0 | 24 |

**Comparison between existing VCR and our Solar AC prototype**

| Existing VCR AC | Solar AC |
|---|---|
| Material:<br><br>Copper, Tin, Steel alloys, iron,<br><br>Steel blades, Rigid plastic, | Material:<br><br>Aluminum , copper,<br><br>PVC, polystyrene plastic, rubber |
| Method:<br><br>The standard VCR system is used to generate cooling effect at 230V | Method:<br><br>Here peltier effect & solar energy is used to generate cooling effect at 12V |
| Tools and equipment:<br><br>Compressor, Condenser, Evaporator, Expansion Valve, Pipes, Blower, wiring, AC supply | Tools and equipment:<br><br>CPU Fan, heat sink, duct, wiring, battery eliminator, variable voltage supplier, DC supply |

## 3) Conclusion

As seen here in this paper, method is used to get the cool dry air from atmospheric air by using cooling jackets and by using renewable source and liquid desiccant system. Thus at very comparatively low cost we will get the cooling effect in room chamber by using renewable source of energy and by using liquid desiccant system even eliminating compressor, condenser and evaporator.

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