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Design and Development of Solar Powered 360degree Automatic Air Cooler

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Abstract: ***Evaporative coolers lower the temperature of air using the principle of evaporative cooling, unlike typical air conditioning systems which use vapor-compression refrigeration or absorption refrigerator. Evaporative cooling is the conversion of liquid water into vapor using the thermal energy in the air, resulting in a lower air temperature. The energy needed to evaporate the water is taken from the air in the form of sensible heat, which affects the temperature of the air, and converted into latent heat, the energy present in the water vapor component of the air, whilst the air remains at a constant enthalpy value. Vapor-compression refrigeration uses evaporative cooling, but the evaporated vapor is within a sealed system, and is then compressed ready to evaporate again, using energy to do so. Simple evaporative coolers water is evaporated into the environment, and not recovered. In an interior space cooling unit, the evaporated water is introduced into the space along with the now-cooled air; in an evaporative tower the evaporated water is carried off in the airflow exhaust. To Develop the Energy efficient, environment friendly direct evaporative air conditioning system having low operating cost suitable for hot and dry regions To Manufacture advanced 360-degree Rotating air cooler which rotates and provide air cooling in all directions. It can be used for domestic as well as Industrial applications. The temperature of dry air can be dropped significantly through the phase transition of liquid water to water vapor (evaporation). This can cool air using much less energy than refrigeration. In extremely dry climates, evaporative cooling of air has the added benefit of conditioning the air with more moisture for the comfort of building occupants.***

Keywords: Solar energy, Centrifugal fan, Cooling pad, Solar battery

I. INTRODUCTION

The air cooling is one of the earliest methods employed by men for conditioning their houses. Only in recent years, it has been put on sound footing thermodynamically. It is a process of adiabatic saturation of air when a spray of water is made to 360-degree into it without transfer of heat from or to the surroundings. The initial investment cost of such a system is low & the operation is simple & cheap. Simple 360 air cooling is achieved by direct contact of water particles & a moving air stream. If the water is circulated without a source of heat & cooling, dry air will become more humid & will drop in temperature. The air may be sufficiently cooled by 360 this process to results a considerable degree of summer comfort in climates of high dry-bulb temperatures associated with low relative humidity. The minimum outdoor temperature required for successful 360-degree cooling is above 35^0 C & another requirement is a relatively low 360-degree air cooler is upgraded version of conventional type of air coolers. By doing some modifications in normal air cooler, more efficiency can be obtained. The 360-degree air cooler distributes air in all direction which makes it efficient as cooling is provided till a particular radius. More area is covered by this air cooler and it will operate on both solar as well as AC supply. To Develop the Energy efficient, environment friendly direct evaporative air conditioning system having low operating cost suitable for hot and dry regions To Manufacture advanced 360 degree Rotating air cooler which rotates and provide air cooling in all directions. It can be used for domestic as well as Industrial applications. The temperature of dry air can be dropped significantly through the phase transition of liquid water to water vapor (evaporation). This can cool air using much less energy than refrigeration. In extremely dry climates, evaporative cooling of air has the added benefit of conditioning the air with more moisture for the comfort of building occupants.

A. Design And Material Selection

Some relevant factors were considered in the design and development of the crusher; such factors are cost of maintenance, power requirement and ease of replacement of various components and labor requirement. The machine is easy to maintain. The rectangular shaft impacts strong impact force on the crushing chamber to achieve crushing into desired granular size, materials fed into it. So, following are the components required to be designed,

1) Battery
2) Gear Pinion
3) Solar Panel
4) 7000& 10 Rpm DC motor
5) Blower Fan
6) Bearing
7) Water Pump
8) Drum
9) Water Tank
10) Micro Controller
11) Ultrasonic Sensor
12) Solar Charge Controller
13) Frame
14) Cooling Pad

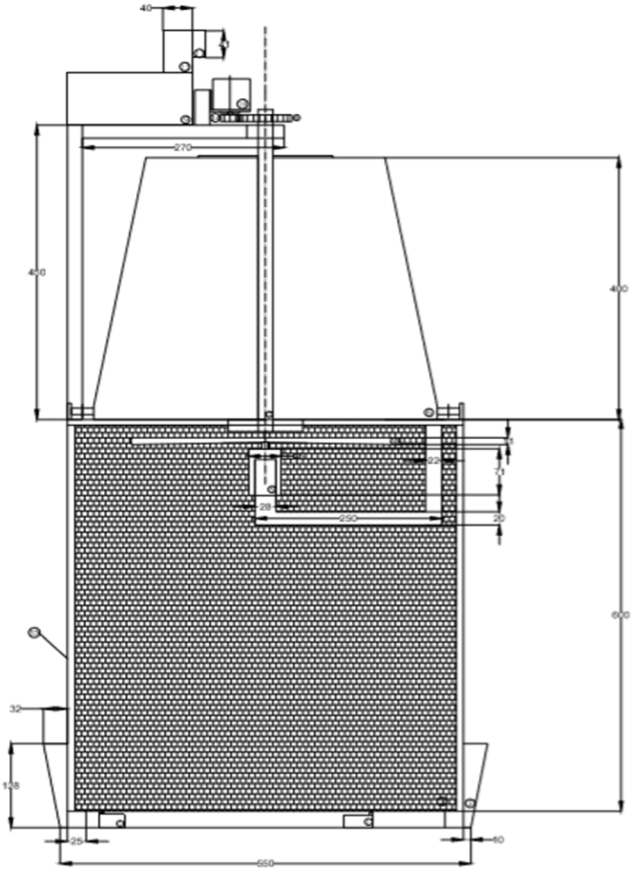

Fig. 1 Nomenclature of project

B. Design Of 360degree air cooler

The data that obtained from the discussion and research is used to finalize the specifications of grain machine; this included general size and performance. On the basis of detail collected from farmers, manufacturer and analyst the following objectives being set;

1) Designing a compact machine.
2) Decrease the cost of machine.
3) Decrease the labour requirement for harvesting.
4) Decrease the efforts required for harvesting.
5) Using proper collecting mechanism to increase the efficiency of harvesting.

So considering these points connected to harvesting an try is made to design and fabricate such equipment which will able to perform the operations more effective and also will results in low cost. The machines carry out two operations namely 'Harvestingand collecting'. There are two cutter blades; one is movable and another is stationery

II. WORKING PRINCIPLE

Solar energy conversion is done by using battery, inverter and charge controller. As sunlight falls on solar panel, which converts into electrical energy by photoelectric effect. This electrical energy stored in battery in the form of chemical energy. Charge controller is employed in between solar panel and battery which prevents overcharging and may protect against overvoltage, which can reduce battery performance or lifespan, and may pose a safety risk. The stored energy directly can use for DC loads or else need to be converted AC (alternate current) by the help of inverter. Below shown figure explains solar energy conversion. As the electrical energy supplied to the fan from inverter, it starts to produce airflow to the room at the same time water passed through the cooling pads. As AC blower is used for cooler, so need to convert DC load from the battery to AC load by the help of inverter. Inverter converts DC load to AC. Load, now AC power can be supplied to the blower. This blower is surrounded by cooling pads through which continuous water supply is provided. When the blower is switched on, blower sucks atmospheric air into the cabin through the cooling pads, mean time heat transfer occur between water and air, so the cool air enters into the room thus providing required thermal comfort conditions. Fan sucks the outside air through the cooling pads, so heat transfer occur between air and water. So the cool air enters into the room. Next thing is cooling cabin provided just below the air cooler section. This cabin built is up with cooling pads and ceramic slabs. Ceramic slabs are surrounded by cooling pads through continuous water supply is provided. This process leads to producing cooler environment in the cabin. So this cabin can be used for preservation of food

III. METHODOLOGY

Methodology is the systematic, Theoretical analysis of the methods applied to a study or to the theoretical analysis of the method and principles associated with branch of study.

1) Studying the present mechanism.
2) Field Survey
3) To identifying the potential problem.
4) Problem definition.
5) Literature review.
6) Design of Air cooler.
7) Calculation.
8) Analysis using FEM Method.
9) Fabrication.

IV. FUTURE SCOPE

"The crop cutter machine" provides wide range for future advancements. Some of these are as follows:

1) By just changing the teeth size we can use the crop cutter as lawn mower. We can make the crop cutter to work under the different crops as per the loads (Just we have to change the power and blade size).
2) By providing the curved collectors at sides of crop cutter to collect the cutting crops and also the bunch of crops is get tying together by using automation. And throw at backside of cutter.
3) In case to use the machine in case of sugarcane application we can provide more power at prime mover one spring in parallel,let us say 4 parallel springs can be used to increase the capacity.

V. CONCLUSIONS

From the present investigation it is evident that for drip type 360-degree air cooling the performance characteristics cooling the performance characteristics can be related to the variables like and thickness and the atmospheric conditions such as humidity control and comfort. It is also possible to determine the parameters but location and one need to optimize the design parameters for corresponding outdoor conditions. This device gives more output compared to other coolers available in market and will provide cooling in all directions unlike others, hence it will be more efficient than other types of coolers and will operate on solar as well as AC supply. The cooler can cool down the air temperature up to 23.5^0 C with bower fan rotation speed of 7000 RPM.

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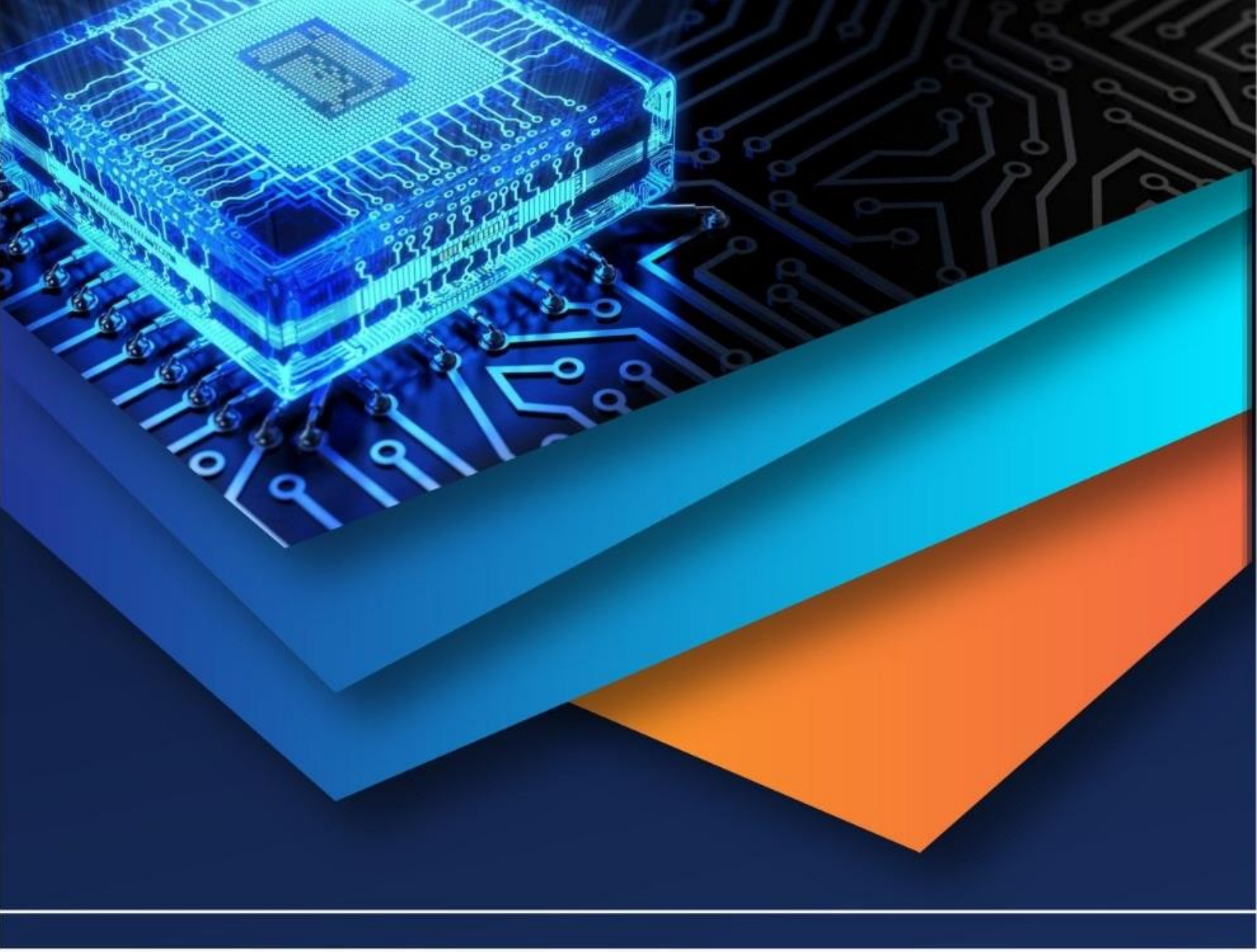

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