ATMOSPHERIC WATER GENERATION

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Abstract— we introduce an atmospheric water generator which works on the principle on thermo electric device. According to our studies we have an idea why should water can produce from air; finally, we notice that the water can produce from highly relative humidity air with moderate atmospheric temperature. It is highly applicable in sea and desert places. we introduce our machine which can either fixed on moving vehicles or stationary. In areas where water deficiency we can make water from atmosphere, but only difficulty was the amount of water generation capacity takes too much time.

Index Terms- Dew formation, humid air, Peltier module, water condensation

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1 Introduction

The atmospheric water generation is a device used to convert humid air into water. This is done by cooling the air to a very low temperature. In highly humid areas places like desert and sea, due to the lack of rain fall we can obtain water by condensing the water vapor in air. This device converts atmospheric moisture directly into drinking water form by condensing the latent heat of water vapor into water droplets. The Peltier module is used as thermoelectric device. The device uses the principle of latent heat to convert water vapour molecules into water droplets. In many countries like India, there are many places which are situated in temperate region; there are desert, rain forest areas and even flooded areas where atmospheric humidity is eminent. But resources of water are limited. In this project we use peltier device and it reduces compressor, condenser usages. This leads to reduce spacing and size of the equipment so we use this device. The temperature we set inside the equipment is dew point temperature. According to previous knowledge temperature required to condense water is known as dew point temperature.

2 WORKING PARTS

The main parts we used in our machine are Peltier module, heat sink cold sink, temperature controller and fan. The machine casing, we use as sheet metal and which is coated with lamination, the heat of the peltier module can control by using proper insulation. The working of the Peltier module is based on peltier effect that is bears the name of Jean-Charles Peltier, a French physicist who in 1834 discovered the calorific effect of an electrical current at the junction of two different metals. When a Current (I) is made to flow through the circuit, heat is evolved at the upper junction (T2) and absorbed at the lower junction (T1). The elements are arranged into array that is electrically connected in series but thermally connected in parallel. This array is then affixed to two ceramic substrates, one on each side of the element. When a voltage is applied, there is a tendency for conduction electrons to complete the atomic bonds. When conduction electrons do this, they leave "holes" which essentially are atoms within the crystal lattice that now have local positive charges. Electrons are then continually dropping in and being bumped out of the holes and moving on to the next available hole [2]. Peltier coefficient depends on the temperature and materials of a junction. If a voltage is applied to terminals T1 and T2, electric current (I) will flow in the circuit. As a result of the current flow, a slightly cooling effect will occur at thermocouple junction Note that this effect will be reversed whereby a change in the direction of electric current flow will reverse the direction of heat flow.

Heat sink is another one which is usually made of aluminium, is in contact with the hot side of a thermoelectric module. When the positive and negative module leads are connected to the respective positive and negative terminals of a Direct Current (D.C) power source, heat will be rejected by the module's hot side, the heat sink expedites the removal of heat. Heat sink typically is intermediates stages in the heat removal process whereby heat flows into a heat sink and then is transferred to an external medium. Common heat sinks include free convection, forced convection and fluid cooled. Here we use forced convection type so we use fan with fins. The cold side sink also made of aluminium is in contact with the cold side of a thermoelectric module, when the positive and negative module leads are connected to the respective positive and negative terminals of a direct current (D.C) power source, heat will be absorbed by the module's cold side. The hot side of a thermoelectric module is normally placed in contact with the object being cold for that we use small fin according to our calculations. The fan which is used end side of machine to absorb moisture air in the environment. The fan is mainly consisting of DC motor and impeller blades.

3 WORKING AND DESIGN

The working of our machine is by the high relative humidity with moderate temperature air is sucked by a fan which is placed at the other end of the machine on the passage of the air we place peltier module with heat and cold sink attached. The peltier modules produce cold and hot temperature of both sides. The cold side is place inside other on outside. The temperature controller device is connected to

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the peltier module in cold side to maintain a dew point temperature inside. According to our calculated temperature is put kept inside using temperature controller. The heat sink which has fan and fin which is worked as forced convection remove of excess heat. In cold side we use only a fin according to our calculations'. Based on our designtwater is collected at bottom portion using tubes. The 12V battery is used connect all the devices for power supply. If battery or solar panels can use for power supply the working of the machine.

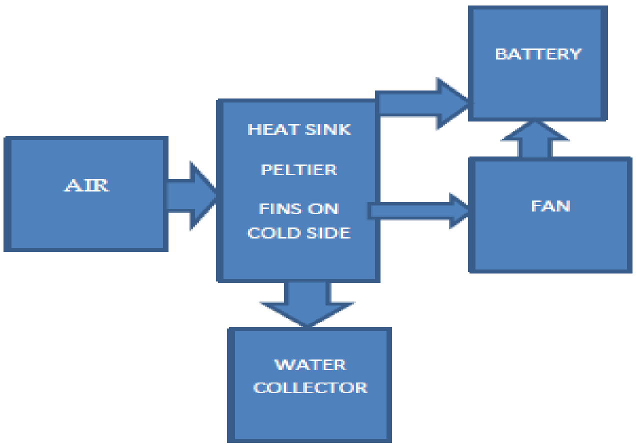

Fig 1 schematic diagram of the system

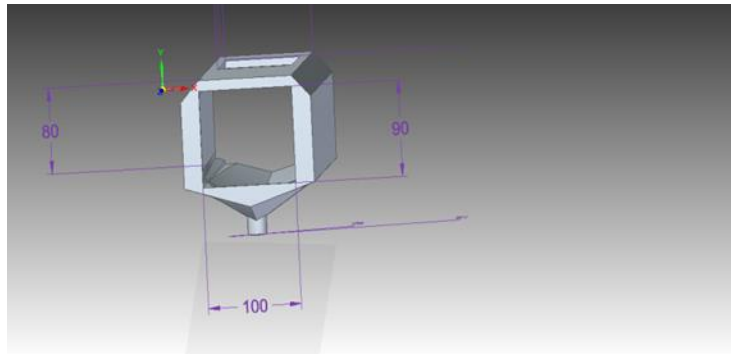

Fig 3 end view

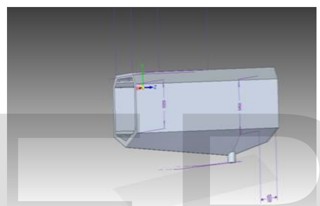

Fig 4 side view

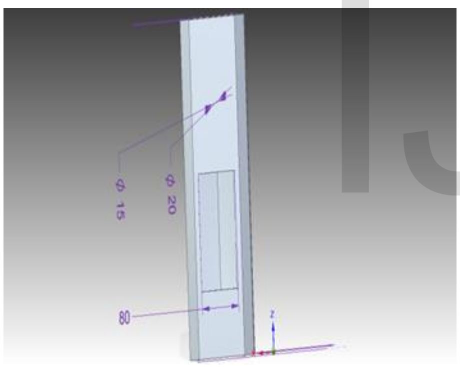

Fig 2 top view

casing in fig 2 we assembled the heat sink, peltier module and the fin in the cold side with proper casing and install on the top of our casing. The fig c shows the back side of the casing where the fan is fitted to suck the air inside the device. The back side is provided with net type covering to escape air from inlet. The fig d shows the side view where we can see a tube to collect the water from the casing we kept a bottle for water received from the tube. The matter of the performance is to be accomplished The figures b, c, d shows the design of our when this device is kept within a comparatively humid environment and air is pushed towards the cooler side of TEC device, so that the water vapour gains its latent heat, required for the dew point temperature and thus water condensation takes place; this process can be enhanced if same hot air is passed through the cold side of TEC, so that water droplets doesn't form ice and generation of water takes place.

It is imperative to keep in mind the purpose of the assembly, so the technique to be used is as important as the selection of the proper device

4 EQUATIONS

$$Assuming\ 6, fins/cm, air\ velocity(m/(min)) = 180$$

$$the\ relative\ humidity\ if\ temperature\ 35°C is 91 Kj/Kg\ and 5°C$$

$$by\ pass\ factor, .204 = ((td2 - td1))/(td3 - td4)$$

$$from\ above\ equation\ we\ can\ we\ the\ temp\ for\ dew\ point\ temp$$

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$assuming\ apperent\ dew\ point\ temperature$

$$cooling\ load = m(h1 - h2).$$

$$mass\ flow\ rate = \rho * a * v.$$

5 ADVANTAGES OF PELTIER OVER OTHER DEVICES

. Advantages of this device over conventional device: There are lot of advantages of TEC over the conventional refrigeration system

• No moving part, so maintenance is required less frequently.
• No use of chlorofluorocarbons.
• Flexible shape (form factor); in particular, they can have a very small size. Ideal for modern technology tr..
• Controllable via changing the input voltage/current very easily.
• Draw comparatively low current than a compressor based refrigeration system.

6 CONCLUSION

By applying this system to a densely humid region we can extract more amount of water from atmosphere .The design is more convenient for water collection. Using solar cell we can store energy at day light and use in night. The design is so simple such that the device can be carried to anywhere .The equipment is very helpful for explorers, mountaineers fishermen etc. The concept of this system can also be used as a better alternative in refrigeration against conventional systems. At the current climatic conditions as global warming increases and the water resources over the world diminishes, so this equipment is extremely helpful to mankind.

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