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Design and Fabrication of Atmospheric Water Generator

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Abstract:

The Atmosphere contains water in the form of water vapor, moisture etc. Within that amount almost 35% of the water is wasted. This amount of water can be used with the help of an Atmospheric Water Generator. This device is capable of converting atmospheric moisture directly into usable and even drinking water. 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.

Keywords **—Condenser, Compressor, Refrigeration and water.**

I. INTRODUCTION

The Atmosphere contains water is in the form of water vapor, moisture etc. Within that amount almost 40% of the water is wasted. This amount of water can use with the help of an Atmospheric Water Generator. This device is capable of convert atmospheric moisture directly into usable and even drinking water. The device uses the principle of latent heat to converts 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 in that places. But resources of water are limited. In the past few years ago some projects have already been done to establish the concept of air condensation as well as generation of water.

So, this project will be helping to extend to the applications of such devices further in the near future. According to previous knowledge, we know that the temperature requires to condense water is known as dew point temperature. Here, the goal is to obtain the specific temperature practically or experimentally to condense water with the help of some electronics devices. This project consist of a bicycle-gear arrangement for running a condenser which is use create the environment of water condensing temperature or dew point, indeed conventional compressor and evaporator system could also be use condense water by simply exchanging the latent heat of coolant inside the evaporator. The condensed water will be collected used for drinking purpose and various other uses.

When approaching the problem of atmospheric water generation the first step is to beanalyse different methods of dehumidification. In this application we seek to harness this water from the atmosphere and utilize it for drinking. Three common methods of dehumidification stood out during preliminaryresearch; a temperature drop below the dew point (refrigeration condensing), pressure condensing, or a combination of the two.

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Along with this wet desiccation technique can also use for the above purpose.

II. LITERATURE SURVEY

Niewenhuis et al. [1], the paper Water generator water from air using liquid desiccant method, we observed that even though dehumidification by liquid desiccant method is new and possess a lot of potential theoretically but when the researchers made a prototype and tested it the results were not satisfactory. The device could produce only 72.1 mL of water per kWhr.

Anbarasu and Pavithra [2], the paper Vapour Compression Refrigeration System Generating Fresh Water from Humidity in the Air, we infer that even though dehumidifying unit using Vapour compression refrigeration system is more effective than the Peltier system but it lacks in the sense that it is not portable and it generates a lot of sound. And also this system is more costly.

Kabeela et al. [3], the paper Solar-based atmospheric water generator utilization of a fresh water recovery: A numerical study, we can in no way refuse to accept the fact that dehumidification unit using Peltier device is very portable and environment friendly. It has simple design and has high endurance capability. So this type of Atmospheric Water Generator is the device which can be implemented in extreme situations like during floods or in desert and rural areas. It has great advantages as it works like a renewable source of atmosphere water and doesn't need a heavy power source. Applying this system in a highly humid region almost 1 Liter of condensed water can be produced per hour during the day light, which is a very promising result.

Kim and Chung [4], Presented a paper on Transient thermal behavior of a water system driven by heat pump. Objective of this research is to identify and minimize heat losses in heat pump to robust heat pump water heater design. Finite volume method was applied to describe heat exchangers and consolidated parameter models were utilized to examine the compressor and hot water reservoir. The result of simulation showed that, the smaller size of the water reservoir had higher transient performance degradation and the larger size of the water present in tank caused additional heat loss due to storage of hot water over a time. Since hot water storage requires heat to maintain its temperature, causes consumption of additional heat power. Therefore, the reservoir size should be optimized in a design phase to minimize both performance degradation and heat losses.

White and Cleland [5], had presented a paper on heat pump for concurrent refrigeration and water warming. The objective of this research is to produce refrigeration and hot water, specifically required for food industry with optimization of specific parameters to make it practically feasible and costs compelling with low capital cost for New Zealand market. Refrigerant used is CO2. It is concluded that, combining operations in a single machine reduces energy costs by 33%. COP is also increased by 10% stands.

Aye and Wu [6], researched on drinking water sourced from air, its modeling and Computational simulation of a solar power driven atmospheric water generator. The primary objective of this study is setting up a heat pump powered by electricity generated by solar PV panels with measurement devices across system. They chose Kasaragod district in Kerala for research due to superior atmosphere to conduct experiment. Kasaragod is classified under hot and humid conditions throughout the year. The experiment was operated for complete one year, and reading of each

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day was noted. The maximum water extraction efficiency is 9.3% for the month of July and August.

III. METHODOLOGY

The method description is meant to bring clarification to the means and methods used regarding the execution of the project in which the product was developed. The product development process will be divided into steps and described, see Fig. 1. The process described is no existing documented development process but is rather a merge of several product development processes used by the different project members. The main structure of the product development can be compared to the stage-gate model in the sense that the work conducted was more controlled by the deliverables than the actual actions at each stage. The deliverables were primary and the way they were produced secondary**.**

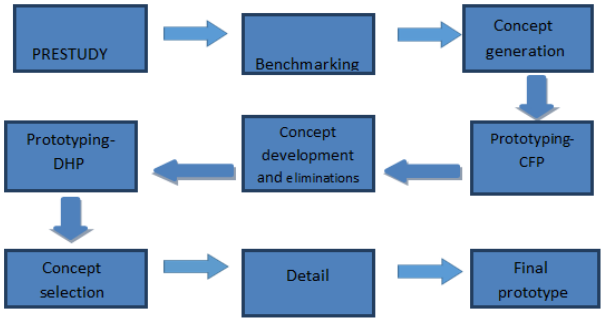

Fig. 1 Schematic diagram of the Product Development Process

The project was initiated with an exploration phase. In this initial phase the main objective was the exploration of the scientific scope relevant to the product being developed. This knowledge was attained foremost by two means. The first of these was the initial restudy including the selection and review of related literature, study on master and doctoral and internet searches on related topics. Some more practical and applicable information was also continuously attained mainly from academic personal and industrial technical staff. The second part of the prestudy phase was the benchmarking process, which was presumed to delaminate less suitable technologies and be evidence for the applicability of more suiting ones.

IV. WORKING PRINCIPLE

The Atmospheric Water Generator works on the same principle as a Refrigerator and Air Conditioner. Refrigerators and air conditioners both work on the principle of cooling through evaporation.

The refrigeration process begins with the compressor. Ammonia gas is compressed until it becomes very hot from the increased pressure. This heated gas flows through the coils behind the refrigerator, which allow excess heat to be released into the surrounding air. Eventually the ammonia cools down to the point where it becomes a liquid. This liquid form of ammonia is then forced through a device called an expansion valve. Since this evaporation occurs at -27 degrees F (-32 degrees Celsius), the ammonia draws heat from the surrounding area. Cold material, such as the evaporating ammonia gas tend to take heat from warmer materials. As the evaporating ammonia gas absorbs more heat, its temperature rises. Coils surrounding the lower refrigerator compartment are not as compact.

The rate at which water can be produced depends on relative humidity and ambient air temperature and size of the compressor. Atmospheric water generators become more effective as relative humidity and air temperature increase. As a rule of thumb, cooling condensation atmospheric water generators do not work efficiently when the temperature falls below 18.3°C

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(65°F) or the relative humidity drops below 30%. This means they are relatively inefficient when located inside air-conditioned offices.

The cost-effectiveness of an AWG depends on the capacity of the machine, local humidity and temperature conditions and the cost to power the unit. Water is often condensed from the air in the air conditioners when the ambient air is humid and hot in coastal tropical regions. This water can be conveniently used for drinking purpose. The amount of water vapor at any time is usually less than that required to saturate the air. The Relative Humidity is a percent of saturation humidity shown in Fig. 2.

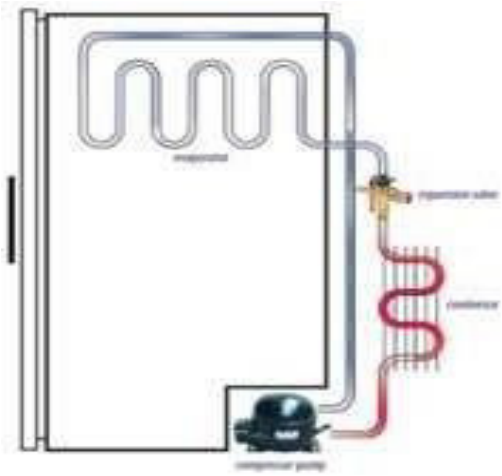

Fig. 2 Schematic Representation of Refrigerant Flow

Here condenser is placed on roof of the frame. That is connected to the silica gel and evaporate, and compressor. The condenser is connected all the side of the frame by pin joint. The assembly is show in Fig. 3.

The assembly of various components like Condenser, Compressor, Evaporator, Reverse Osmosis, Water Storage Tank, and Dc Fan is shown in Fig. 4.

Fig. 3 Assembly of Condenser

Fig. 4 Proposed AWG

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V. CONCLUSIONS

New weather patterns appeared in our world in the past century, and that caused lots of confusion for humans who used to expect only one weather pattern per season in certain areas. However, this is not the case in the current days, which means that people have to change their behaviors in so many ways if they want to have a good life quality for the future generations. However, it is obvious that finding sustainable alternatives of the traditional natural sources is one of the most important issues that should be studied and developed, whether for energy source, or water sources.

Applying this system in a highly humid region almost 300 Milliliter of condensed water can be produced per hour during the day light, this is a promising result.

Finally, in this report we talked about way of harvesting water from thin air, and these ideas mentioned above can solve the poorer arid areas water problems with cheap prices inventions that they can buy or maybe produce their selves. We can produce an unlimited supply of water without environmental pollution for the current water scarcity problem. Air water is a renewable source of water so the technology is a secured source for the future.

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