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Atmospheric Water Generator

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ABSTRACT

An Atmospheric Water Generator is an appliance that employs dehumidification/condensing technology that extracts water from the humidity in the air. The water is then filtered and purified through several filters including carbon, and reverse osmosis, and UV sterilization lights. The result is pure drinking water from the air. An Atmospheric Water Generator Works on the same principle as a refrigerators and air conditioners i.e. on the principle of cooling through evaporation. The Atmospheric water generator works by converting atmospheric air to pressurized air using a Compressor and then this air is then passed through Condenser pipes which decreases it's temperature to dew point. The air condenses to liquid and is passed through a filtration system and it is then stored in a tank. The major aim or objective of our project is to provide safe and clean drinking water to those areas which are facing water shortage problems or where water transportation through regular means is expensive (especially rural areas). Our project hopes to reduce this problem by providing an atmospheric water generator that will run via bicycle-gear arrangement or stand-alone renewable source of energy i.e. either solar or wind.

I. INTRODUCTION

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 a Atmospheric Water Generator. This device is capable of converting atmospheric moisture directly into usable and even drinking water. The device uses the principle of latent heat to convert water vapor 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 the past few years some projects have already been done to establish the concept of air condensation as well as generation of water.

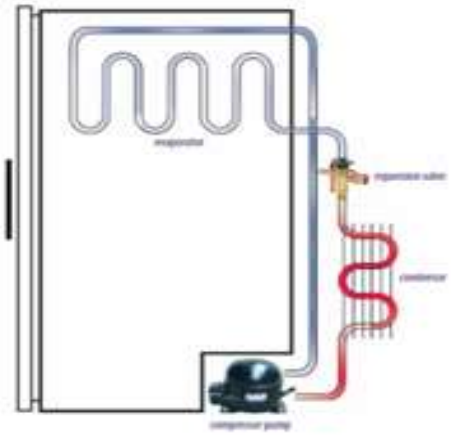
So, this project will be helping to extend the applications of such devices further in the near future. According to previous knowledge, we know that the temperature require to condense water is known as dew point temperature. Here, the goal is to obtain that specific temperature practically or experimentally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

WORKING PRINCIPLE

The Atmospheric Water Generator works on the same principle as a Refrigerator and Air Conditioner. **So, how does a refrigerator work?** 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 cool ammonia still draws heat from the warmer objects in the fridge, but not as much as the freezer section. The ammonia gas is drawn back into the compressor, where the entire cycle of pressurization, cooling and evaporation begins anew.

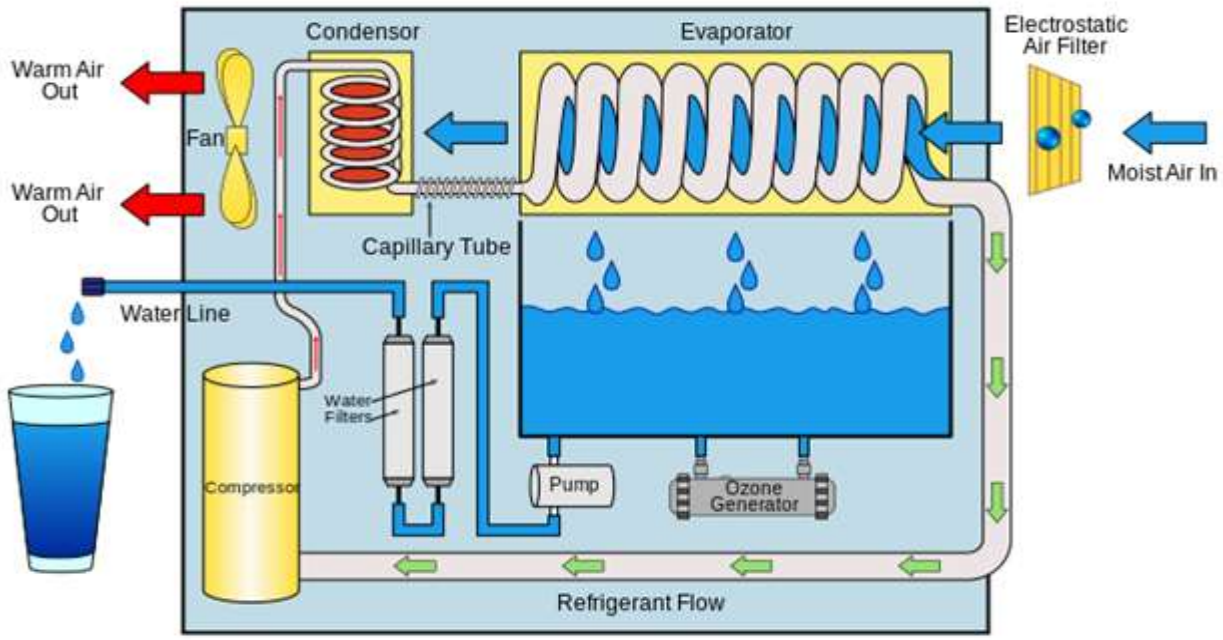


OPERATION:

In a cooling atmospheric water generator, a compressor circulates refrigerant through a condenser and then an evaporator coil which cools the air surrounding it. This lowers the air temperature to its dew point, causing water to condense. A controlled-speed fan pushes filtered air over the coil. The resulting water is then passed into a holding tank with purification and filtration system to help keep the water pure and reduce the risk posed by viruses and bacteria which may be collected from the ambient air on the evaporator coil by the condensing water.

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 (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.

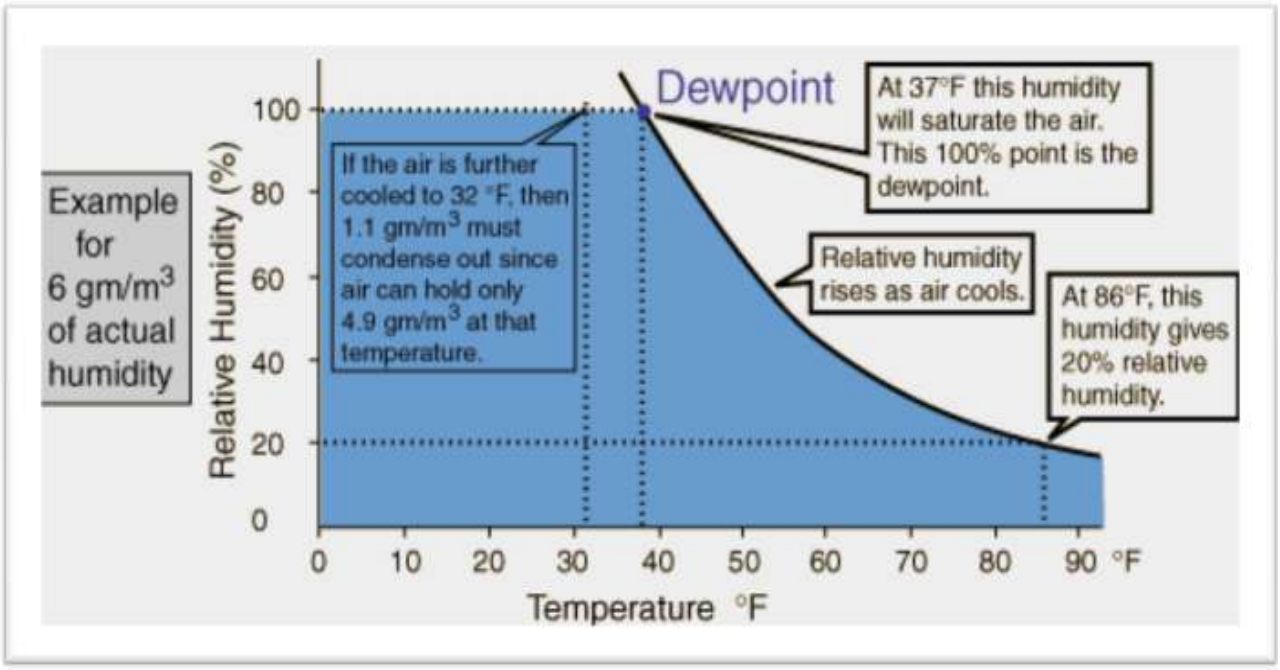


HUMIDITY AND TEMPERATURE RELATION

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, generally calculated in relation to saturation vapor density. The relative humidity is expressed as a percentage, so the maximum is 100 %. The formula for relative humidity is:

Relative humidity % =Moisture in the air now / Maximum possible moisture air can hold at the current temperature (x100)

Hence more the humidity in air and cooler the surrounding temperature, the more will be the water output. This can be shown through graph:



PROJECT COMPONENTS

- **COMPRESSOR:**

  An **air compressor** is a device that converts power (using an electric motor, diesel or gasoline engine, etc.) into potential energy stored in pressurized air (i.e., compressed air). By one of several methods, an air compressor forces more and more air into a storage tank, increasing the pressure. When tank pressure reaches its upper limit the air compressor shuts off. The compressed air, then, is held in the tank until called into use. The energy contained in the compressed air can be used for a variety of applications, utilizing the kinetic energy of the air as it is released and the tank depressurizes. When tank pressure reaches its lower limit, the air compressor turns on again and re-pressurizes the tank.

- **CYCLE FRAME:**

  The cycle frame consists of a cycle gear connected to the parts through belts.

- **CONDENSOR:**

  In systems involving heat transfer, a **condenser** is a device or unit used to condense a substance from its gaseous to its liquid state, by cooling it. In so doing, the latent heat is given up by the substance, and will transfer to the condenser coolant. Condensers are typically heat exchangers which have various designs and come in many sizes ranging from rather small (hand-held) to very large industrial-scale units used in plant processes.

- **BATTERY:**

  An electric **battery** is a device consisting of one or more electrochemical cells with external connections provided to power electrical devices.

- **CHARGE CONTROLLER:**

  A **charge controller**, **charge regulator** or **battery regulator** limits the rate at which electric current is added to or drawn from electric batteries. It prevents overcharging and may protect against overvoltage, which can reduce battery performance or lifespan, and may pose a safety risk. It may also prevent completely draining

("deep discharging") a battery, or perform controlled discharges, depending on the battery technology, to protect battery life.

- **GENERATOR:**

  In electricity generation, a generator is a device that converts mechanical energy to electrical energy for use in an external circuit.

- **RECTIFIER:**

  A **rectifier** is an electrical device that converts alternating current (AC), which periodically reverses direction, to direct current (DC), which flows in only one direction. The process is known as **rectification**.

- **V-BELTS:**

  It is now the basic belt for power transmission. They provide the best combination of traction, speed of movement, load of the bearings, and long service life.

- **MISCELLANEOUS MATERIALS**

PROJECT SIGNIFICANCE

- It can help solve the problem of water scarcity.
- It works via bicycle-gear arrangement rather than relying on conventional source.
- It is portable and can be used almost anywhere.
- It saves money in terms of electricity consumption and also is a more viable option than ordering a water tank from the municipal corporation.

APPLICATIONS

There are hardly any chances to refuse that this device is portable for its simple design and endurance capability. So, the Atmospheric Water Generator is the device which can be implemented for extreme situation, to use during flood, in desert areas, and in rural areas. It has great advantages as it works like a renewable source of atmosphere water and doesn't need a heavy power source. Many company like 'Watermaker India ltd', 'Aerowater', etc. have already this type of device for domestic purpose. It can be implemented for Industrial development where the water is a matter of crisis.

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