

# Air to Water Generator for IoT Based Olericulture

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**Abstract:** The water scarcity is beginning to be an important issue in today's period, but its more complicated in the arid regions where it rarely rains and the availability of fresh water is very low. There is a shortcoming of available water resources to meet the demands of water usage within a region. To overcome water scarcity, we need to find methods to harvest water from air, as air is renewable source. The areas close to water has a higher humidity percentage, in such regions by harvesting the water vapors present in the surrounding, water can be obtained. There are two kinds of methods for condensing water from air. In the first method, that is the cooling condensation method the temperature of the air is lowered to its dew point temperature. In the other method that is the desiccant method, the water molecules in the air are absorbed by the desiccants. The production of water depends on the atmosphere conditions. One of the important applications of the water is in agriculture. It is a very innovative concept used for agriculture as the water condensed from air directly goes to the roots of the plant when the soil moisture sensor indicates that the soil requires water.

**Keywords:** Peltier, EWA, AWG, Condenser, Latent heat.

## 1. Introduction

In the current era water issues have become a major problem, especially in the regions where there is inadequate rainfall and hardly any fresh water source, farmers are facing a lot of problem related to lack of water issues. Hence, there is a high demand to find new feasible, sustainable, other ways to get water for irrigation. One of the attention catching way to obtain water is to harvest humidity from air. A lot of new charges have been undertaken to use this way of obtaining water, and is expected to provide a solution or solve the problem of water scarcity.

There is a large amount of water in the atmosphere in the form of vapor or moisture. Within these amounts an approximate average of around 33% of water is extravagated. This extravagated amount of water can be used for implementing an AIR TO WATER GENERATOR, the water generated can be used for watering the crops in arid areas by sensing the moisture of the soil. The moisture of the soil can be

sensed using IoT and notifying the intended user.

In countries like India and others, there are a lot of places which come under temperate regions like deserts where the humidity in the atmospheric humidity is present to a notable degree and yet there are limited resources of water. In the former years few projects have been developed already to set up air condensation concept and peltier devices concept, like photovoltaic solar powered peltier devices used for providing water for saplings, plants etc. This project is also an extended application of the such devices that generate water. As told before the required temperature that condenses water is called as dew point temperature

We obtain the dew point temperature the condenses water with the help of devices. A water condensing surrounding is created using evaporator and compressor that condenses the water to its dew point by latent heat process and the collected water is stored or sent to the roots of the plant directly. The water that is collected can be used for various processes like irrigation, drinking and many more. proposed system will overcome the above problem. This concept will be helpful to extend the applications of such devices further in a near future.

## 2. Literature review

1. Environmental assessment of air to water machines: Greg M. Peters, Naomi J. Blackburn, Micheal Armedion developed & published this paper in march [2013]. The air to water generator which has a scheme to condense the atmospheric air and Purify the water vapour are being arcade as eco-friendly instead of the bottled water coolers which are used in offices. In this proposed system the approach was introductory life cycle assessment with performance blinkess for the use of water and energy and the issuance of Greek house gases. When the AWG has compared with normal water kept in the refrigerator and the traditional water cooler. When the AWG is compared with normal water kept in the refrigerator and the traditional water cooler.
2. A Project on Atmospheric Water Generator with the

Concept of Peltier Effect: This paper was published by Aditya Nandy, Sharmi Saha, Souradeep Ganguly and Sharmistha Chattopadhyay in June [2014]. The AIR TO WATER generator is a system that can transform the atmospheric weakness into directly usable or even for drinking purposes. This device uses the principle of latent heat for converting the water molecules to water droplets. The paper tells us about the system which consists of the latent heat units, cooling substances and air circulating units with photovoltaic cell units which has high current output which drives the cooling substances in the controlling unit which will be used to build a water condensing system which is based on the thermoelectric coolers. Thus it can be concluded that by using this system in the regions of high humidity, 1 litre of water is produced. This happens by the condensation method. A more sophisticated system can be designed that encounters high photovoltaic cells and has the ease to store the excess energy and use it at night. But the disadvantage of this unit is that it has high installation cost but that can be ruled out in the future for large scale implementation which meets the standards of BIS and WHO easily.

3. Water harvesting for young trees using peltier modules: M.A. Munoz-Garcia published this paper in April [2013]. For tree transplanted into open field from nursery, a less amount of soil moisture is enough to root successfully in the open field, especially in dry-climate areas. Since it does not contain large amount of water or purified for successful root, the small amount of water can be obtained from air. By reducing the surface temperature less than the dew point temperature of air the water is obtained. The temperature of a surface can be reduced by applying the thermoelectric effect, with Peltier modules powered by electricity. A solar photovoltaic module is used that produces electricity, the produced electricity is stored in battery, the electricity is used in a moment when air humidity and temperature is at its best to increase the water condensation to maximum with minimum energy consumption. The objective of the system is to survive the young plants during drier climate, to boost the young plants during their growth exclusive irrigation is performed.
4. Extraction of water from atmospheric air (EWA): The devices that worked based on EWA technology is known as air water generators. Water makers are the leading manufacturer of air water generator in India. An important application of EWA in agriculture is the Air drop irrigation. Air drop irrigation is an innovative concept used for drip irrigation. In India the technology is not well established. The world's first air water station is located in India. There are mainly two methods for harvesting air humidity. In cooling condensation method air is lowered to dew point temperature. In the desiccant method, desiccants absorb the water molecules in the air. Variation in the atmospheric conditions will cause to change in production of water. We

can use any form of energy for this technology. The technology includes no waste formation and chemical reactions so the technology is environmentally friendly. In Air drop irrigation the Device extracts water from driest air for delivering it directly to plant root. It is a very simple principle. The principle uses the fact that there is high temperature in the arid areas, and the soil is cooler. He invented a device, in which the air containing the humidity is pushed to the ground through pipes. The humidity condenses on the internal walls of the pipes. The waterdrops are sent directly to the roots. The device produces 11.5ml of water per cubic metre.

5. Air to water Generator (AWG): In the form of moisture and vapour the atmosphere contain water. According to survey about 30% of the water is in air itself. With the help of devices like Atmospheric water generator this atmospheric moisture is converted into usable water and even for drinking. To convert water vapour molecules into water droplets the device uses the principle of latent heat. Humidity is high in coastal areas, So AWG is more required and preferred in those areas. It is efficient in areas where percentage of humidity is low. The temperature should be reduced to dew point; Dew point is the temperature at which air is converted into water. To create the environment of dew point, draft fan, heat sink, casing and thermoelectric peltier (TEC) couple is used. Finding the dew point is the main objective of this paper.
6. Extraction of water from Ambient air by using Thermoelectric Modules: This paper was Published by Madhira Srikanth Reddy, Rapolu Kumaraswami, Bandi Karthik Reddy, Bageliker Ananth Sai, Shaik Gulam Abul Hasan in 2017. Depending on the temperature of air and humidity, the water vapour holding capacities of air varies. Holding capacity of water vapour is more in warm air. With the help of filter and centrifugal fan ambient air is sucked into the nozzle. Nozzle decreases the temperature and pressure of the air when it passes through it. About 2°C cool water is sent through the copper coil. The coil is used to absorb air temperature, thus reduced temperature of air is obtained. The Peltier device which has many types of models are more efficient than TEC1 and those can be used, as their project objectifies at producing water from the air and keeping this at best use.
7. Assessment of Atmospheric Water Generator for Rural and Remote India. This paper was published by SD Das in 2018. In this paper, current national scenario on drinking water and its challenges are analysed for rural and remote areas of India. Alternative water source namely atmospheric water has been assessed and atmospheric water generator (AWG) technology requirements have been reviewed for "Har Ghar Jal" program. Finally, AWG technological challenges for meeting the requirements have been identified and solution space for the challenges have been defined. The assessment suggests AWG technology would be able to meet all

technological challenges for “Har Ghar Jal” targets and AWG has negligible effect on environment. AWG machines which extract water form humid air can be made affordable for rural market using frugal technology and adopting advertising or IoT business models. Technology commercialization also requires understanding of patent landscape dominating Indian market. Indian patent search revealed 26 patents related to extraction of water from humid air since 1999 out of which 15 are industrial, 2 institutional and 9 individual applicants, with latest application in 2016.

### 3. Conclusion

New weather patterns appeared in our There is lot of weather changes happening in the current era compared to the previous centuries, which leads to a unpredictable patters of weather. Hence humans have to adopt accordingly by managing the natural resources properly and to preserve it for the future generations. Water is the main natural resource without which nobody can survive and the water scarcity is the main problem faced these days. Hence, there is serious need to find or develop methods to generate water.

The system focuses on producing water from air, by condensing the air to its dew point and the water produced is sent to the roots of the plants directly by sensing the moisture of the soil, which indeed solves the irrigation problem in the areas with inadequate rainfall. 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. In India about 50% of the population mainly farmers are affected by water scarcity problems as there is no rainfall and no source of water for the crops. But the EWA technology is not well established in our country. Indian climatic conditions are very suitable for this technology. So, we wipe out the water scarcity problems in India through the establishment of this technology.

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