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Potable water production from surrounding air

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Abstract: The prevention of coronavirus outbreaks requires cleaning and refreshing the closed environment where people live and operate. As a result, new environmental control methods must be developed. Also, water shortages represent an urgent problem, mainly countries that are island states and countries that have long coastlines which don't have sufficient water resources such as lakes and rivers. This paper is an experimental, theoretical and numerical study of air purification and water generation by air conditioning and refrigeration equipment. The unit is based on a standard compressive cooling cycle principle. The experimental device will be established and tested in Basra city, south of Iraq, during September and August from 2020. The experimental device was tested for different days with different climatic conditions. Theoretical data has been completed by the (EES) program and the Numerical study by (ANSYS 2020R2) to verify and study more cases in a short time with no cost. The maximum production rate is 45.7 L/Day with the system's performance factor of COP Max=4.0, Min=2.3, and aver. =3.4. Therefore, the device can be used in coastal areas to meet water needs and provide a healthy environment.

1. Introduction

One of the pressing challenges in today's world is the lack of potable water. Although water covers more than two-thirds of the earth's surface, potable water used for drinking is scarce. Countries with island states and long coastlines that don't have adequate freshwater resources, such as lakes and rivers, face an acute water shortage. As a result, most of these countries get their water by desalinating seawater, a very costly solution. Similarly, desalination plants can fail. Therefore, alternative ways to produce water are urgently required to meet their water production needs. Many coastal areas have relatively high humidity (about 70-90 percent). Thus, with a dehumidifying device, gathering water from the air can meet the water needs for many people. **[1]. Habeebullah (2009) [2]** designed a chart for rapid prediction of water efficiency using any combination of ambient air temperature (25°C < Ta < 40°C) and relative humidity (30% < RH < 100%). Water yield due to air dehumidification was calculated using a model designed to compare surface efficiency with moist air transition. The daily variance in water yield (Jeddah/Saudi Arabia) showed that the relative humidity pattern was held to a minimum at midday. Maximum water yield was forecast for August (17.6 kg/m2/ day) at (2.25 m/s) air velocity. The average estimated water yield in August and February was (509 and 401 kg/m2). **Bogardi et al. (2012) [3]** investigated and showed that sustainability, fair distribution, and conservation of water resources must occur within integrated water management and governance, but implementation is problematic. Continuing global climate change, growing population, urbanization, and striving for better living conditions poses a challenge to planetary sustainability. **Magrini et al. (2015) [4]** studied A range of technologies to learn how to extract water from the atmosphere. New equipment can remove both water and air from the same evaporator. This (HVAC) system is being used in a dry, hot environment for demonstration purposes. Traditional (HVAC) systems and integrated AC systems should be compared in this way. **Tripathi et al. (2016) [5]** studied atmospheric water generation (AWG) under the same rules as refrigerators and climate control. This worked by changing barometric air pressure by pressurizing the air using a compressor and then passing the air through condenser pipes, decreasing the temperature to the dew point. **Bagheri (2018) [6]** investigated experimentally the performance and limitations of commercially available air water harvesting (AWH) systems. Results show the range of water harvesting rates and energy intensity varying from (1.02 kWh/L) for warm and humid to (6.23 kWh/L) for warm and humid climates. **Fares Mohamad et al. (2019) [7]** studied and designed a model of water desalination that works with HDH technology and has obtained a production of 1.71 kg/hr with a consumption capacity of 726 watts. Therefore, there has been a conclusion that these small units are a reliable way to desalinate water.

This study aims to construct, test, and simulate atmospheric water generation devices. The device will condense the water vapor in the atmosphere and purify it to be suitable for human use. The requirements are identified to ensure that the research effectively fulfils its intended purpose. First, this design's possibility of using water for drinking