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Design and Prototype of an Atmospheric Water Generator (AWG) Using Solar Energy: An Input for a Possible Water Source

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Abstract:

Water scarcity is a significant broad issue, worsened by causes such as climate change, pollution, and rising populations. Traditional water supplies are insufficient to fulfill the demands posed by increasing populations, with detriments to well-being and repercussions to economic growth. In response, emerging technologies such as Atmospheric or Air Water Generator (AWG) systems have developed to be potential alternatives. These machines use ambient moisture to generate water that is safe to drink through condensation and the process of filtering. However, its efficacy is dependent on factors such as relative humidity (RH) and temperature.

This study provides a detailed overview of the literature on Atmospheric Water Generator technology, diving into its operating processes, the impact of various factors on water production, and its numerous uses. It also suggests the development of a prototype of Solar Atmospheric Water Generator (SAWG) that utilizes solar energy as a sustainable water substitute. The study used an experimental design method to create a prototype that uses solar energy for water production. Data analysis includes analyzing thermostat settings, testing water stability, and taking into consideration environmental implications.

The project aims to build the framework for future developments in Atmospheric Water Generator technology, with the ultimate goal of providing a long-term solution to worldwide problems on water scarcity. By delving into the complexities of AtmosphericWater Generator systems and creating a prototype SAWG, this study aims to contribute to the continuing discussion about water sustainability and resilience in the face of changing environmental circumstances.

The study includes comprehensive information on atmospheric conditions of Mexico, Pampanga, design parameters, and pilot test results for a solar-powered atmospheric water generator (SAWG). These include tables with temperature, humidity, and dew point readings, as well as computations for determining the dew point temperature and absolute humidity. The design includes air compressors, controls for thermostats, pumps, copper coils, insulating material, filtration, storage tanks, timers, and other components. Over five days of pilot testing, the water production results were consistent.

The overview of studies emphasizes the possible use of SAWGs related to the Philippines' high humidity levels. It acknowledges efficient prototype concepts and continuous water production, but observes irregular outcomes, possibly related to launching settings. This result underlines the necessity of expanding up the prototype, test it in elevated regions, investigate heat exchanger utilization, and ensure potable water generation.

In conclusion, solar atmospheric water producers show considerable potential as a long-term solution to global water crisis concerns. Continued research and development can improve the efficiency, adaptability, and reliability of SAWGs, making them a vital component of future water resource management approaches. SAWGs have the ability to offer clean, safe drinking water to underserved populations by using renewable energy and complex materials, therefore contributing to a more environmentally friendly and resilient future for everyone.

Keywords ***—Atmospheric Water Generator, Prototype, Solar Energy, Vapor to Water Conversion, Self-sustaining Water Source***

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I. INTRODUCTION

Water is essential to all mankind. It is a need that cannot be replaced by any means. Several circumstances challenge the sufficiency of water like global warming, pollution, and overpopulation. The source of water that exists is simply not enough to sustain life for the next generation. Both surface and underground water are being consumed at a rapid rate to the point that some areas no longer have access to any water resource leading to various complications in their health and daily living. That is why multiple attempts and solutions must be created in order to come up with a way to produce a sustainable source of water that may be utilized on a daily basis or in the presence of disasters.

The global water crisis affects billions of people, prompting exploration into unconventional means like Atmospheric or Air Water Generator (AWG) systems. It implies a series of processes in order to convert vapor present in the air to potable water. This machine condenses atmospheric moisture and extracts water particles which pass through a filtration system. An atmospheric water generator greatly relies on relative humidity, with higher levels enhancing water vapor extraction. The country's annual relative humidity (RH) as of 2023 is 60% to 80%. A good sign is that Atmospheric Water Generators theoretically may run smoothly since one of the biggest factors for the machine to operate is the RH level. It offers an environmentally friendly solution independent of utilizing surface or groundwater supplies. However, due to the machine needing a powerful source of energy, its application during emergencies and arid places may be a challenge. In order to resolve this, solar energy is the most practical means of producing electricity in such areas. Several factors accentuate the need for long-term solutions, to avoid groundwater depletion and ecological harm. Taking into account the preceding, such a machine would be of great help in being a supplemental means of water when needed.

II. METHODOLOGY

First Phase

A hygrometer will be utilized to determine the DBT (Dry Bulb Temperature) and their corresponding relative humidity. These values are to be evaluated to observe whether the atmospheric conditions of the Philippines are applicable for an atmospheric water generator. These values were also used to calculate the dew point temperature in order to prove the relationship of moisture present in the air and the water being collected by the prototype. It will provide the study with a feasible value on how well the atmospheric water generator will function.

Second Phase

The next phase of the research involves developing the prototype itself. By adopting the concepts outlined in Tripathi et. al, the researchers aim to craft a design tailored to the specific environmental conditions of the country. Since the design of Tripathi et.al relies on large-capacity power cells, the study will focus on creating a Solar Atmospheric Water Generator (SAWG) powered by solar energy. Once the design is finalized, procurement of the necessary materials will begin, and the last is constructing the actual prototype. With the guidance of experts in the field, a testing phase will be conducted to ensure the prototype functions as intended, effectively converting vapor into usable water. It will also conduct a series of pilot tests to identify any areas requiring adjustments. If the prototype proves to be successful, the researchers will collect water samples to analyze their pH levels and assess the chosen water filtration system.

2.1 Calculations

Dew Point Temperature

Calculate the dew point temperature (which is the temperature where moisture vapor
begins to condense depending on the DBT (Dry Bulb Temperature) and relative humidity levels.

$$T_{dew} \approx T - \frac{100 - RH}{5}$$

Vapor Pressure

In a constant temperature, said vapor pressure allows the molecules to weaken thus, helping in the evaporation and condensation process in the atmosphere. $e = 611 \text{ x } e\text{^} \frac{(17.27 \, x \, Tdp)}{(237.3 + Tdp)}$

Absolute Humidity

This pertains to the amount of water vapor present in the air despite an increase or decrease in temperature. The data will be used to determine the percentage of water vapor that may be collected from the air.

$$\text{Absolute Humidity (grams/m}^3) = \frac{6.112 \times e\text{^}[(17.67 \times T)/(T+243.5)] \times rh \times 2.1674}{(273.15+T)}$$

Solar Energy Consumption

To calculate the power consumed by the prototype, which will be coming from solar panels, the total wattage of power consumption of the machine must be divided to the product of the battery capacity and the voltage of the solar panels.

$$\text{Solar Consumption} = \frac{\text{(Battery Cap. X Solar Cap)}}{\text{Prototype Power Consumption}}$$

Since the capacity of the battery to be used must only be utilized until its 50% so that the battery will be able to maintain its good condition.

2.2. System Design

An Atmospheric Water Generator is a machine that converts the air into water. The air will undergo a series of steps adopting the design of the atmospheric water generator from [1]. This system requires the machine to have parts like the evaporator, condenser, compressor, tanks, and filters. The following works as the following:

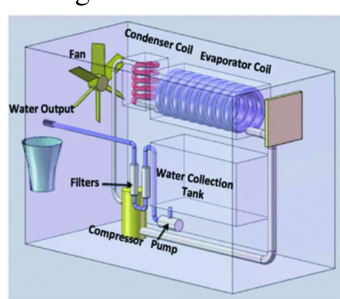

Figure 1. Tripathi's Atmospheric Water Generator Design

Air Filter

As air enters the machine, it first goes through an air filter to eliminate different pathogens and bacteria present in the atmosphere. As the world develops, different industries have greatly increased the pollution level around the globe.

There are a total of 189 air pollutants that could affect the health of humans who consume them [8]. It is important to eliminate pollutants present in the air to make sure that they won't be incorporated into the product that the generator would produce.

Compressor

It is an essential part responsible for increasing the pressure inside the machine. Through this, it could guarantee that the vapor collected is enough for the machine to work. Once pressure and air are enough, the compressor automatically stops and then works again when it is still in need of air and pressure. Until the air is in need, it will stay first in a storage tank before continuing to the next part where it would travel.

Condenser

After being pressurized, the air will now go through a condenser. In this stage, air, which is in gaseous form, will be converted into water since the air temperature in this part will be lowered. As the condenser lowers the air temperature, fans are utilized to remove high-temperature air inside the machine to ensure that the condensation process can take place.

Evaporation Coil

When condensed air finishes its condensation process, the evaporation coil will continue the work of the condenser. Since both parts work hand in hand, they slightly have similarities since they both lower the temperature. In addition, the evaporation coil helps collect heat, which this part removes from the system so vapor can reach its dew point. This part is usually made out of copper and/or aluminum since these materials are good conductors of heat.

Tanks

Aside from the tank in the compressor, which stores the air, it is required to have a storage tank for the generated water. Since an atmospheric water generator continuously works, it has to have a tank to store water produced in a period of time before it undergoes water filtration.

Water Filters

According to Shafeian et. al, atmospheric water generator does not guarantee that the water that it could produce is safe for consumption even if air filters are included. The researchers provided safe drinking water by adding water filters to the system. This is essential to ensure that the water is free from different contaminants that could bring health complications to people.

2.3. Modified System Design

Condensation Mechanism

This part will be the heart of the prototype. In order to produce water from the air, a good conductor of temperature is needed to decrease the temperature and gain moisture. When a material reaches a certain temperature then cools down, water droplets will form around it, thus creating water.

Compressor

One of the most essential parts of the designed machine is the compressor. It serves as a helping hand to other parts which are responsible for increasing the pressure of the air that enters the machine. This enables the machine to gather sufficient air so that it may produce water more efficiently.

Insulation

During the condensation process of the machine, the temperature of water vapor decreases. To keep the right temperature during this level, an insulating material is needed for such. Researchers have utilized a polystyrene which have a good insulating property needed for the process.

Pump

After being condensed, the water vapor is then pushed for it to flow using a pump. This pump will help the process a lot since it acts as a driving force so the vapor will continue to go to the coils which will keep the temperature and moisture of the said vapor.

Water Filter

Due to different pollutants present in the air, such water produced is not guaranteed to be free from different contaminants that could harm people that will use the water from an Atmospheric Water Generator as an alternative source of water. This filter will be responsible to remove said contaminants that have stayed after the steps it underwent.

Storage Tank

Like the adopted design, the researcher's modified design also has such a storage tank which serves as a location of the water collected from the atmosphere. Since the machine continuously does it work overtime, the processed water goes into this part of the machine.

Solar Energy

To be able for the prototype to be considered self-sustaining, solar panels will be its main source of energy. This will make the machine work no matter what the circumstance is. Even if electrical complications occur the prototype will be designed to function despite of it.

2.4. Data Analysis

The purpose of this section is to elaborate the analytical processes to be applied in the study. Various treatments will be used to analyze the data correctly.

2.4.1. Experimental Data Analysis

Thermostat Setting

The main principle that the prototype revolves around is the principle of refrigeration. This pertains to the cooling of a certain object to create moisture. A thermostat was applied to regulate the temperature of the coils. Actual tests were conducted to see at what temperature the coils decrease in temperature to the point that it cools the circulating water down but not low enough that it solidifies.

Water Stability Test

The conducted pilot testing will determine if the machine that will be tested for five days consecutively will be able to produce a consistent amount of water. During this testing period, it will be evaluated whether the production of water correlates with the current RH level.

The machine will also be tested within 24 hours to see the full capacity of the prototype. This will determine any suggested improvements that may potentially be applied so that the machine can be more efficient to possibly be used by a larger scale of consumers.

2.5. Ethical Consideration

Environmental Impact

The researchers should consider an eco-friendly design. Utilizing solar panels is a smart move; this will help mitigate carbon emissions that contribute to today's biggest problem, which is climate change. The effects of climate change are very evident nowadays. According to a study on heat activity, the Philippines is experiencing an extreme heat condition with a temperature of 42°C as of April 2, 2024. So, considering an environment-friendly design of an atmospheric water generator is essential to avoid contributing to this societal problem.

III. RESULT AND DISCUSSION

The results and discussion state the following data that was gathered into an organized and elaborate manner thus interpreting the results in line with the objectives of the research. This chapter contains the computations, test results and final outputs through the use of visual presentations.

3.1 Data Analysis and Findings

The following data was analyzed to indicate whether the atmospheric conditions in Mexico, Pampanga is able to accommodate the prototype. Formulas, previously stated, were used to solve the values stated in the preceding tables and were observed to know certain aspects in the atmosphere that may have an effect on the efficiency and overall performance of the SAWG prototype.

3.1.1 Atmospheric Condition

The information presented addresses atmospheric conditions collected through hygrometer readings such as temperature, humidity, vapor pressure, and the presence of water in the air. Several parameters were determined using these data. The significantly elevated dry bulb temperature suggests warm weather, which could result in higher water evaporation into the surrounding atmosphere. The comparatively high relative humidity indicates a substantial quantity of moisture in the air. The dew point temperature, or the temperature at which air gets saturated with water vapor, is lower than the dry bulb temperature but still exceptionally high, which also suggests a substantial amount of moisture in the air. These factors lead to the high vapor pressure and specific humidity levels reported. Furthermore, an atmospheric pressure measurement provides information on the general atmospheric conditions, which, along with temperature and humidity, determine weather patterns and cases in the area.

Day	Temperature (AM)	Relative humidity (AM)	Dew Point Temperature
1	29.3 °C	87.6 %	26. 82°C
2	28.1 °C	87.4 %	25.58°C
3	32.3 °C	72.7 %	26.84°C
4	29.8 °C	77.2 %	25.24°C
5	30.5 °C	62.2 %	22.94°C

Table 1: Hygrometer Readings in Morning

1. 1 Morning Dew Point Temperature Formula:

$$Tdew = T - \frac{100-RH}{5}$$

$Tdew = 29.3 - \frac{100-87.6}{5}$

Tdew = 26. 82°C

$Tdew = 28.1 - \frac{100-87.4}{5}$

Tdew = 25.58°C

$Tdew = 32.3 - \frac{100-72.7}{5}$

Tdew = 26.84°C

$Tdew = 29.8 - \frac{100-77.2}{5}$

Day	Temperature (PM)	Relative humidity (PM)	Dew Point Temperature
1	30.5 °	76.3 %	25.76° C
2	27.2 °	77.2 %	22.64°C
3	29.9 °	68.1 %	23.52°C
4	30.6 °	63.3 %	23.26 °C
5	31.6 °	55.5 %	22.7 °C

Table 2: Hygrometer Readings in Afternoon

1. 2 Afternoon Dew Point Temperature

Formula:

$$Tdew = T - \frac{100-RH}{5}$$

$$Tdew = 30.5 - \frac{100-76.3}{5}$$

Tdew = 25.76°C

$$Tdew = 27.2 - \frac{100-77.2}{5}$$

Tdew = 22.64°C

$$Tdew = 29.9 - \frac{100-68.1}{5}$$

Tdew = 23.52°C

$$Tdew = 30.6 - \frac{100-63.3}{5}$$

Tdew = 23.26 °C

$$Tdew = 31.6 - \frac{100-55.5}{5}$$

Tdew = 22.7 °C

Table 1 and 2 as a whole shows that there is a clear correlation between the temperature of the atmosphere and the relative humidity. Relative humidity and dew point temperature are connected, though. A high dew point temperature is correlated with a high relative humidity. The third day with a temperature of 29.3°C had the greatest RH level and dew point temperature of all the data, as seen in the above table.

In terms of the prototype's functioning probability, this kind of atmospheric situation just indicates that there is a very good chance that an atmospheric water generator will operate effectively in the Philippines. As stated by Pokorny et al. Even though it was 39°C outside, the atmospheric water generator functioned well. This is why more advancements in the design of a solar atmospheric water generator might potentially supply additional water to several social units.

3.2. Absolute Humidity

The absolute humidity will indicate the amount of water that can possibly be collected through the present water vapor in the air. The formula for vapor pressure was utilized to be able to manually solve for the absolute humidity.

3.2.1. Vapor Pressure

3.2.2. Absolute Humidity

$$e = 611 \text{ x } e\text{^} \frac{(17.27 \, x \, Tdp)}{(237.3+Tdp)}$$

$$e = 611 \text{ x } e\text{^} \frac{(17.27 \, x \, 22.07)}{(237.3+22.07)}$$

e = 2656.102 Pa

$$\text{Absolute Humidity (grams/m}^3) = \frac{6.112 \times e\text{^}[(17.67 \times T)/(T+243.5)] \times rh \times 2.1674}{(273.15+T)}$$

$$\text{AbsoluteHumidity} = \frac{6.112x2656.102\text{^}[(17.67x29.3)/(29.3+243.5)]x0.876x2.1674}{(273.15+29.3)}$$

Absolute Humidity = 44.074 g/m^3

The calculated vapor pressure is 2656.102 pascal. This proves that the vapor pressure is high which may result in a high absolute humidity.

Furthermore, this observation is evaluated to be true because the results of the absolute humidity, 44.074 grams per cubic meter is above average, 30 grams per cubic meter only. As a conclusion the atmospheric conditions have a high potential percentage for an atmospheric water generator to function efficiently.

3.3. Final Design

Figure 2: Front Design of SAWG

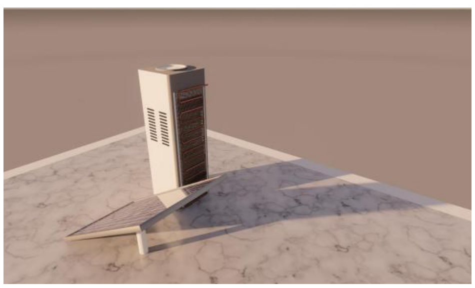

Figure 3: Back Design of SAWG

The design of the atmospheric water generator was adopted through the research from Tripathi et. al in order to convert the air from the atmosphere to water. The researchers opted to develop the prototype due to different factors that affect the production of water as stated in the introduction. The process starts as the air enters a compressor, which is the most essential part of the machine. It is considered important since as the air gets in this part, it results in a higher pressure. When this process is done, the pressurized air is pumped into copper wires. This part is responsible for cooling and condensing the air. This process could be compared with the condenser and evaporator coils from the adopted design since the copper wires serve as a part where high temperature air evaporates and condenses into moisture. Another pump is needed after to draw the generated water out from the machine to its storage tank and stays before being tested and used. In addition to the main parts there is also a thermostat which is essential to regulate the temperature of the moisture keeping it away from reaching its freezing point. Another minor part of the prototype is an insulator. This part is to keep the low temperature during the condensation process from heat that could pass through the machine. Lastly, the design is a photovoltaic water generator which means that the electricity that powers the machine comes from the sun using solar panels. The voltage and the longevity of making the machine work will cause a lot of electricity. Designing the machine as a solar powered machine, will ensure that even having electricity shortage, the machine will continue to generate water.

Figure 4: Isometric View of SAWG

Figure 5: Interior Design of SAWG

Compressor

The compressor is responsible for the lowering of temperature in the atmospheric water generator.

It helps to maintain a consistent and normal water temperature by actively cooling the water, ensuring that it is cold after being discharged. The use of a compressor system makes it easier to decrease the temperature, as opposed to passive cold methods such as ice or thermoelectric. It is capable of maintaining the required temperature, without needing to be refilled or maintained at regular intervals.

Thermostat

In order to maintain the desired water temperature, a thermostat is an essential component of any cooling system. Based on a comparison between the water's current temperature and the set-point temperature, the thermostat will either activate or deactivate the compressed and cooled system of the Atmospheric Water Generator. The thermostat instructs the compressor to begin chilling the water if the temperature of the water increases over this point. On the other hand, the thermostat alerts the compressor to cease cooling if the temperature drops below the set-point.

Pump

The water generator system shall use a pump to circulate the air. The airflow is essential for the water production process, because it brings moisture into the air.

Pump 1: Is for the cycle of cold water in copper coils and then moist will start to flow.

Pump 2: The second pump is responsible for releasing the air output into the water.

Copper Coil

Copper coils are often part of the refrigeration system. It is wrapped around a water reservoir or placed directly in contact with the cold water. Refrigerant fluid flows through the coil, absorbing cold water and transferring it to the compressor, where it is then dissipated outside the unit and the moisture starts to flow in copper coils. As a substitute for Peltier chips, copper coils were utilized because of their ability to conduct temperature very well. It lowers in temperature then immediately increases once the timer goes off thus creating moisture, resulting in water.

Styrofoam

Since the main principle of the prototype relies on the lowering of temperature, a means of insulation is needed. The prototype functions through the use of energy, and energy produces heat. Moreover, heat puts the machine at a disadvantage, that is why it must be regulated properly. Styrofoam used as panels will serve as a barrier within the machine so that the copper coils could reach its optimum temperature easily.

Filter

A filter's primary function is to remove various impurities, such as sediment, chlorine, bacteria, viruses, heavy metals and other undesirable substances from water. This process is relevant because there are several substances present in the air due to pollution and may cause severe bodily harm. That is why a filtration system was applied to be able to remove such impurities.

Storage Tank

The storage tank's main purpose is to hold the water that the water generator produces. This ensures that, if the generator does not produce water at all, there is always a steady supply of water available for consumption. The amount of water that can be stored depends on the size of your storage tank.

During the construction of the prototype, different changes were made with the parts to extend the machine's full potential. The adopted design includes an evaporator coil and condenser which were changed into Peltier chips to speed up the evaporation and condensation of the air into a liquid form. Seeing the amount of water generated from it after 3 hours of letting it work, only a cap of bottle amount of water will not be enough to prove the machine’s ability. With this, having copper coils has greatly increased the amount of water that the machine could produce. Another change is installing two pumps which help the process faster during the flow to the copper coils and drawing the water out from the machine. In addition to these changes, the moisture produced turns into ice since it freezes which is why a thermostat is included to avoid having a lower than the suggested temperature for the condensation process.

3.4. Pilot Testing

After the construction of the prototype was finished, a trial run was conducted. The trial run lasted for 5 days and each day, the prototype ran for 5 hours. These are the results that were gathered during the period of the trial run:

DAY	RELATIVE HUMIDITY	WATER COLLECTED (ML)	TEMPERATURE (10AM)	TEMPERATURE (3PM)
1	87.6; 76.3	85	29.3°C	30.5°C
2	87.4; 77.2	89	28.1°C	27.2°C
3	72.7; 68.1	80	32.3°C	29.9°C
4	77.2; 63.3	85	29.8°C	30.6°C
5	62.2; 55.5	70	30.5°C	31.6°C

Table 3: Pilot Test Results

Day 1

The data from 10:00 am to 03:00 pm shows a change in temperature from 29.3°C to 30.5°C and also a decrease in relative humidity from 87.6% to 76.3%. In addition, these data resulted in the production of 85mL of water.

Day 2

The data from 10:00 am to 03:00 pm shows a decrease in temperature from 28.1°C to 27.2°C and an increase in relative humidity from 77.2% to 87.4%. And it produced 89mL of water.

Day 3

The data from 10:00 am to 03:00 pm of the 3rd day of testing appeared to have a decrease in temperature from 32.3°C to 29.9°C and in relative humidity from 72.7% to 68.1%. With this temperature and relative humidity, the SAWG is able to produce 80mL of water.

Day 4

The reading evidently shows an increase in temperature from 29.8°C in 10:00 am to 30.6°C in 03:00 pm of the same day. It also appears that there is a decrease in relative humidity level from 77.2% down to 63.3%, but the machine has still produced 85mL of water.

Day 5

There is a decrease in temperature from 30.5°C in 10:00 am to 31.6°C in 03:00 pm. It also shows a difference of 5.7% in relative humidity level. This data resulted in the production of 70mL of water.

After five (5) days of testing, the results showed that temperature had a significant impact on water output. As a result, while relative humidity level greatly affects water production, temperature effectively determines the dew point of air. It is clear that when relative humidity level is higher, the possibility of SAWG to produce large amounts of water is also higher. On the other hand, the five days of testing also manifest an uneven outcome.

This is possible since it only depends on the readings that the hygrometer will give. The product of the machine on the second day was the highest, even though its RH level was lower compared with the first day. The collected water on the first day was 85mL while 89mL of water was produced on the second day. Their RH level does not have a huge significant difference; however, the machine having the capability to warm up on the first day caused more water to be produced on the preceding day.

In comparison to the experimental study of Tu and Wang, in which they have tested an atmospheric water generator exposed in a 90% and 70% humidity level, the SAWG proves to be more efficient. With the Rh levels of Mexico, Pampanga, the prototype was able to produce 0.088 liters of water while their experiment only produced 0.031 liters at their highest humidity level making the SAWG produce 96% more water compared to other commercially available atmospheric water generators.

3.5. pH Level Test

Figure 6: Litmus Paper Test

The litmus paper used consisted of 4 pads because it will be able to show more accurate results compared to plain litmus papers. It was also tested 3 times for more accuracy. The water that was gathered was found to have a pH level of 7, according to the test results.

With a pH level that consistently hovers around 7, the water harvested from the Solar Atmospheric Water Generator (SAWG) exhibits significant consistency. A pH level of 7 indicates that the water is neutral. Pure water has a pH of 7.0 which shows a high potential of its product to become potable when a more efficient filter is applied, due to the potable water pH level being 6.5-8.5. This dependability highlights how well the SAWG technology works, producing water that is accurately set. The neutral pH of the water collected shows that the system is effective at capturing atmospheric moisture and that it may provide water that is appropriate for a wide variety of uses. The consistent pH level of the SAWG output reduces the need for extra pH adjustment techniques, making it more practical and sustainable for use in industrial operations, drinking water, and agricultural irrigation.

IV. CONCLUSION

The researchers have succeeded in producing a solar-powered atmospheric water generator prototype. The utilization of solar panels is a wise choice since it gives the machine a convenience to use everywhere even in the places where electricity is rare. The creation of machine became possible through the determination of each researcher to seek for the following: (1) related studies that serve as a guide to the overall physical appearance and mechanical processes of the atmospheric water generator, (2) machine parts which help to materialize and execute the proposed model, and lastly (3) professionals (mechanical engineers) who supervised and guided the researchers in accomplishing the SAWG. In addition, the guidance of thesis adviser and coordinator and the collaborative knowledge of researchers contribute to materializing the proposed prototype.

Multiple tests are made on the SAWG model of the researchers, each of every test manifesting the successful design; the prototype can serve its designated purpose, which is to convert atmospheric air into water. However, since this is just a prototype, meaning it is just a smaller version of the original, it is expected that the machine can only produce a small amount of water. Despite these results, the machine is still open for possible improvements such as changing some parts, remodeling, and increasing its size just to increase water production. Overall, the machine is functional as it can produce water, each part is reasonable and serves their functions.

The five (5) days testing of the prototype revealed that RH Level is directly proportional to the production of water, since RH Level is depending on the water vapor in the air. In simple words, the higher the RH Level, the higher the amount of water that the SAWG can produce. This is an important assessment since not all the places have the same RH Level. So, only in the places with high RH Level can maximize the effectiveness of the prototype.

Through the usage of a universal litmus paper, the results have shown that the water being produced by the filtration system of the prototype is neutral with a pH level of 7.0. These results indicate that the filtration system may either be changed or unchanged because the water produced is safe for all water usage. The atmospheric vapor being converted is overall clean and does not require a more complex filtration system. However, it was observed that the copper coils and storage tank must be maintained at a clean condition to ensure such results.

The study is not limited in testing the effectiveness of the prototype but it also covers the test in pH level of the water. The product of the SAWG was tested in a laboratory and found out that the water was not potable but only suitable for domestic use. This result only shows that the machine is really up for improvements. This result may serve as a stepping stone for other future researchers and try to remodel the machine where it can produce a drinkable product. Overall, the product is helpful for the society and a great contribution in today's innovation and modernization.

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