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Solar Energy -based Wind -sucking Wind Drought in the Dew Point Temperature

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Abstract

The foundation of water resources as the development of human beings is gradually becoming scarce. At present, the increasingly severe freshwater lack of freshwater in the world not only seriously restricts the development of society and the economy, but also puts forward unprecedented challenges to the survival of human beings. Water resources exist on the earth in three forms: solid, liquid, and gas, which are widely used in the liquid freshwater resources. The freshwater content on the earth only accounts for 2.53%of the total global water volume, of which 68.7%belong to the solid glacier and are distributed in high mountains and polar regions that are difficult to use. With the deterioration of the environment, these freshwater resources are becoming more and more scarce, especially in drought and islands, as shown in Figure 1. my country's per capita freshwater resources are small, less than one -third of the world's per capita level, and freshwater resources are also very uneven in time and space. The overall situation is rich in water resources in the southeast, and the lack of water resources in the northwest. In particular, freshwater resources in high mountains, Gobi, desert and other places are more scarce. Although the remote islands and reefs in Xisha and Nansha in my country are rich in sea water resources, they basically do not have freshwater resources. They usually use mainland shipping to ensure water on the island. And this method is very easy to be disturbed by severe climate and military struggle such as typhoons. It should be considered to develop a water supply technology that can guarantee locally. In fact, the atmosphere is rich in freshwater and is not restricted by geographical restrictions. It is estimated that the atmosphere contains about 14,000^{km}3 water vapor. The total amount of fresh water on the surface is only 1200^{km}3. The rate is almost zero. The arid areas are dehydrated due to the excessive groundwater on the surface and shallow layers, while the islands and coastal areas are due to excessive surrounding seawater, and the surrounding waters are large in salt, resulting in insufficient freshwater resources. The traditional method of solving the problem of freshwater supply in the above areas includes two ways: transportation freshwater and seawater desalination. The transportation cost is high, the speed is slow, the seawater desalination technology, the requirements of the equipment are high, and the cost is large. It is not applicable to most poverty -stricken areas. The above two methods are not suitable for widespread use. In order to solve the problems of expensive traffic costs, slow speeds, and high loss, the system introduces solar power supply modules under the premise of ensuring low cost and good results, and creatively use the temperature difference generated by the day and night alternation to take the air to draw water.

Keywords

Solar Energy; Day and Night Temperature Difference; Air Take Water; Dew Point Temperature.

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1. Introduction

This system combines the two natural energy sources of solar energy and day and night, and achieves air condensation into water throughout the weather. During the day, the system uses solar power generation boards to power the micro -suction fan. At night, the temperature difference generated by the natural day and night is used to condense water and stored it in the water depositor. When the air is inhaled by the micro -suction fan into the system device, the large gray particles that are mixed in the device are intercepted at the top of the device and cannot enter the inside of the water cup. The temperature difference will quickly reduce the air temperature of entering the cup to the dew point temperature. In the state of unchanged air pressure, the water vapor becomes a dewdrop and attached to the cup wall. With the continuous inhalation and excretion of air, water molecules gather more and more, and eventually converge at the bottom of the water cup to form the source of water.Before the system work, the device must be considered to determine the horizontal diameter of the well, and a 1.5m deep well can be excavated on the surface. In fact, according to the literature survey and experiments, it is found that about 1.8m is the most suitable. At this time, the well is not too deep, but also conducive to users to excavate, and also ensures the basic temperature difference between water condensation in the air. By constructed the condensation structure of the "air-formation", and keep the upper and lower shafts uniform, and closely integrate contact with the system device to ensure the best water extraction effect.

2. System Principle

This system combines the two natural energy sources of solar energy and day and night, and achieves air condensation into water throughout the weather. During the day, the system uses solar power generation boards to power the micro -suction fan. At night, the temperature difference generated by natural day and night is used to condense water and stored in the water depositor. When the air is inhaled by the micro -suction fan into the system device, the large gray particles that are mixed in the device are intercepted at the top of the device and cannot enter the inside of the water cup. The temperature difference will quickly reduce the air temperature of entering the cup to the dew point temperature. In the state of unchanged air pressure, the water vapor becomes a dewdrop and attached to the cup wall. With the continuous inhalation and excretion of air, water molecules gather more and more, and eventually converge at the bottom of the water cup to form the source of water.

Before the system work, the device must be considered to determine the horizontal diameter of the well, and a 1.5m deep well can be excavated on the surface. In fact, according to the literature survey and experiments, it is found that about 1.8m is the most suitable. At this time, the well is not too deep, but also conducive to users to excavate, and also ensures the basic temperature difference between water condensation in the air. By constructed the condensation structure of the "air-formation", and keep the vertical well uniform up and down, and closely integrate contact with the system device, it can ensure the best water extraction effect.

3. Experimental device

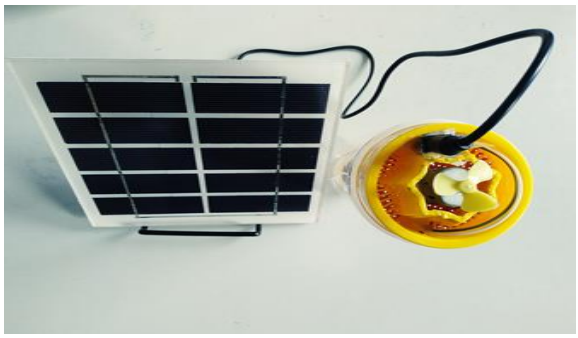

Figure 1. Device physical diagram

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The system contains three parts: air introduction, cold formation water and water source storage. The air introduction part includes solar panels, power transmission cables, micrograv ations, and anti -particle filters. The body is tight contact layer structure, and the water source storage depends on the design of the design of the design. The specific physical diagram is shown in Figure 1, and the schematic diagram is shown in Figure 2.

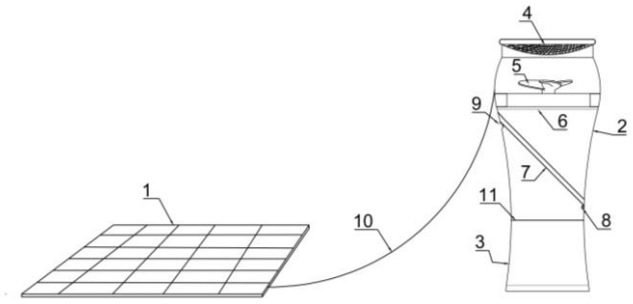


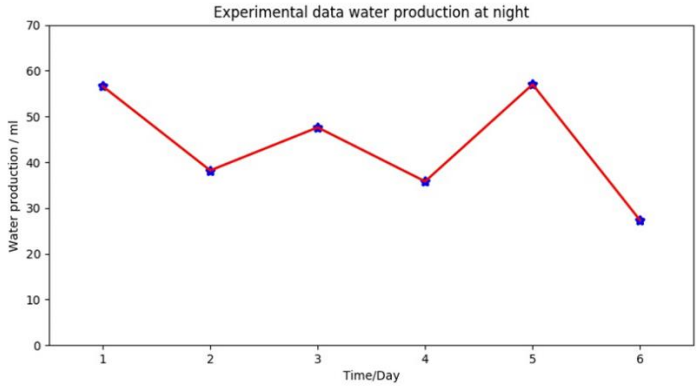
Figure 2. Device model schematic diagram

1 -solar panel; 2,3 — cup body structure; 4 -anti -particle filter; 5 -micro -suction fan; 6 -bottom of the fan;7 — anti -light board; 8, 9 — both sides of the reflective board; 10 -power transmission line; 11 — storage cap

4. Experimental Testing and Analysis

4.1 Day and Night Maternal Water Test

The water production test will be performed within two time periods from January 15, 2021 to January 20, 2021 from the two time periods from 14:00 to 17:00 and 20:00 to 20: 00 to 8:00 the next day. For a week of water production experiments, quantitative analysis within the space and space range, the water drawing experiment data is shown in Figure 3 and Figure 4.



time/day	Water production/ml
1.15	21.6
1.16	33.2
1.17	13.6
1.18	34.8
1.19	23.0
1.20	15.3

Figure 3. Data data table of water drawing at day

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time/day	Water production/ml
1.16	56.6
1.17	38.2
1.18	47.6
1.19	35.8
1.20	57.0
1.21	27.3

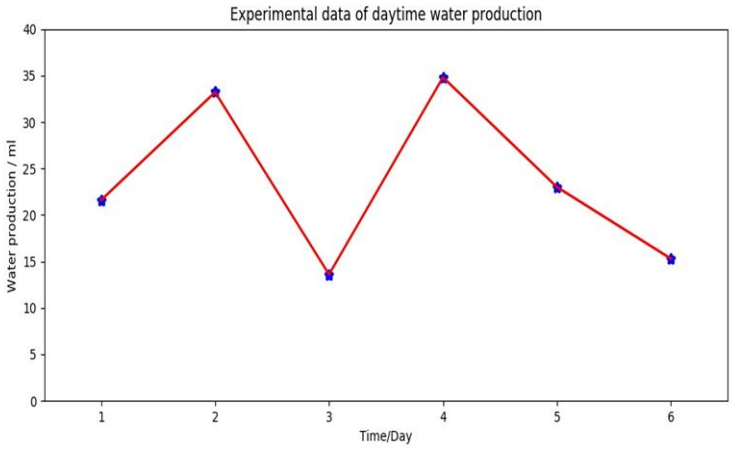

Figure 4. Data data table of water drawing at night

4.2 Danker Depth Test

Before assembling the complete system device, verify the principle, and build a device model. When you try to ensure that other conditions are the same, you can get different water drawings through different depth of the depth gradient test (1 hour). Figure 7 shown.

By analyzing the sample data, the relationship between water drawing and shaft can be obtained, as shown in Figure 8. The minimum secondary multiplication is used to fit the curve to optimize through the minimized square difference loss. The entire process is checked by an unconstrained optimizer. In the end, the better fitting effect is obtained. The loss error loss is 0.182550684346. The fitting curve is shown in Figure 5, and the equation expression is formula (1). Among them, Y represents water production, and the unit is ML; X represents the depth of the well, and the unit is M.

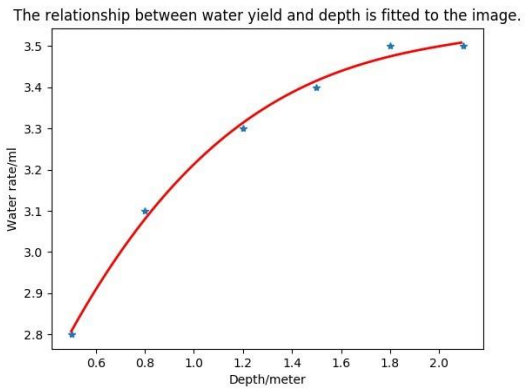

Figure 5. The relationship between the vertical well and the water production

$$Y = 0.2221 * X^3 - 1.476 * X^2 + 3.445 * X + 4.234 \quad (1)$$

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4.3 Social and Economic Analysis

It should be noted that the water drawing system is affected by related factors such as local weather, humidity, day and night temperature difference, and belongs to a typical multi -linear regression model, so the daily water production is different. After experimental verification, the larger the temperature difference between the day and night, the lower the degree of air pressure, and the high humidity of the system device.

From the perspective of social and economic perspective, this device can reduce economic losses and energy loss in the process of cross -waters' water regulation of water resources to solve the problem of water resources, including energy costs, time costs, and water supply costs of transportation. If the device is used as an example of the 1%population of Xinjiang a year, it can be calculated according to the average level of the survey result of one day and night (24 hours). This device can achieve 6716000L of water production. This device can be obtained on average to reduce drinking water expenditures by users by 15%. At the same time, this device has great benefits for the macroeconomic and ecological environment. After the promotion, conservative estimates can reduce the cost of the national environmental protection and the cost of the construction and implementation of high -psionic water adjustment projects.

At the same time, under the long -term shortcoming environment, the minimum drinking water drinking water daily is 300ml, and the 80ml can maintain life under extreme water shortage. It can be seen that the device also has greater use value for travelers.

5. Conclusion

The technology of air water extraction has provided a new solution for the area where freshwater deficiency. At present, the international air water removal technology has shown productization trends. The United States, Germany, Canada, Israel and other countries have developed The use of large -scale and large -capacity water removal equipment technology is currently developing rapidly, but it also shows the disadvantages of the system's clumsy, large volume, and inability to carry and promote difficulties. In recent years, my country's dry district accounts for about 30%of my country's land area. Its climate is characterized by small precipitation and large changes. Generally, the temperature is poor and the year is large. powerful. This system, with the needle for my country's arid and semi-arid areas, creatively combines the climatic characteristics of the daylight and large temperature difference between day and night, and the condensation structure of the "air-strata" is used to achieve sustainable air types. Take water. In addition, the system device is exquisite and small, with low production cost, strong assembly, and easy promotion and development.

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