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RESEARCH ARTICLE

SOLAR RADIATION MEASURMENTS, ANGLE OF INCLINATION, SOLAR IRRADIANCE FOR SOLAR WATER PURIFICATION SYSTEM

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ABSTRACT

The angle of inclination and solar irradiance are very exclusive parameter for the water purification system. The angle of sunlight projection and inclination are the two parameters for water purification system and the thickness of the glass, black paint, and volume of the still are taken more important part in the solar water purification system. Here pointed out that the solar radiation measuring devices such as Pyrheliometer, Pyranometers are discussed.

INTRODUCTION

Except from drinking purpose, the pure water is necessary to meet the requirements of medical and industrial applications. Solar energy exists all over the world, but not every place will be suitable for solar still, solar thermal collectors or other means of converting sunlight into useful energy. It is observed that the solar radiation intensity is gradually increased and reaches maximum during 12pm to 1pm and then decreased gradually. Heat energy transformation plays a vital role for conversion, Radiation and evaporation of heat energy from water to glass cover. Since the thermal capacity is high, more time has been taken for evaporation, convection and radiation. The solar still can be used as a water purifier for domestic purposes by using solar energy in winter and summer seasons. The performance of the still varies place to place and everyday due to the changes in solar power.

As the water evaporates, water vapor rises, and condensed on the glass surface for collection. This process removes impurities such as salts and heavy metals as well as eliminates microbiological organisms. The end result is the water cleaner than the purest rain water.

Glass cover

A glass cover is not exceeding than 5 to 7cm from the water level it will allow the solar still to work with efficiency. As glass-to-water distance increases, heat losses due to convection becomes greater, makes the still's efficiency to drop.

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Pyrheliometers

A pyrheliometer is used to measure direct solar radiation from the sun . The receiving surface must be arranged to be normal to the solar direction to measure direct solar radiation. A temperature difference is produced between the two sensor strips because one absorbs solar radiation and the other will not absorb, and thermo electromotive force is proportional to this difference induces current flow through the galvanometer. A current is allowed to the cooler sensor strip galvanometer pointer indicates zero, If S is the intensity of direct solar irradiance and i is the current, then

$$S = Ki^2,$$

where K is a constant intrinsic to the instrument and is determined from the size and electric resistance of the sensor strips and the absorption coefficient of their surfaces.

Irradiance

Solar radiation is partly absorbed, scattered and reflected by molecules, water vapor and clouds when it passes through the atmosphere. The direct solar beam reaching directly to the earth's surface is called direct solar radiation.

Solar irradiance: 1 kW/m^2 = 1.433 cal/cm2/min

Total amount of solar radiation: 1 MJ/m^2 = 23.89 cal/cm2

The value of direct solar irradiance is about 125 W/m^2 at around sunrise and sunset, and about 850 W/m2 at around noon on a clear day in summer.

Irradiance is a measurement of solar power and is explained as the rate at which solar energy falls onto a surface. Solar irradiance we measure the power per unit area, so irradiance is typically quoted as W/m² - that is Watts per square meter. The irradiance falling on a surface can and does vary from moment to moment.

The primary instruments are used to measure solar irradiance is the Pyranometer, which measures the sun's energy coming from all directions. The calculation is sum of the direct and the diffuse solar irradiance and is called the solar irradiance. A Pyranometer is used to measure solar irradiance. Sunlight has the advantage of zero fuel cost but it requires more space for its collection.

The ideal angle will be different in summer and winter. To capture the maximum amount of solar radiation over the year, a solar still should be tilted at an angle approximately equal to a site's latitude, and facing 15 degrees of south. To compare the energy output we should need to know the site's latitude, and actual tilt angle. If your solar still tilt is within 15% of the latitude angle, we can expect a reduction of 5% or less in our system's annual energy production. If solar still tilt is greater than 15 degrees off the latitude angle, the reduction in our system's annual energy production may fall by as much as 15% from its peak available value. During the winter months at higher latitude, the reduction will be greater.

Angle of inclination

The glass allows solar radiation to pass into the still. The upper black colour of the still absorbed part of solar radiation. The remaining amount of the radiation falling on the glass mirrors and then reflected on the bottom black colour.

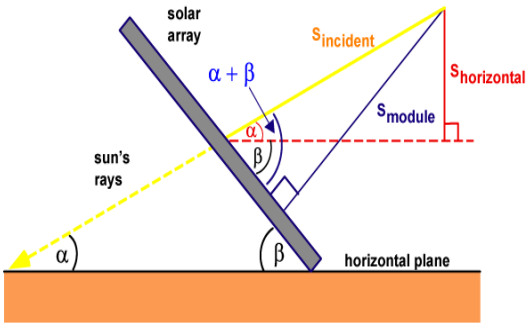

Figure 1 Tilting the module to the incoming light reduces the module output

The amount of solar radiation incident on a tilted surface of the solar radiation which is perpendicular to the surface. The following how to calculate the radiation incident on a tilted surface given either the solar radiation measured on horizontal surface or the solar radiation measured perpendicular to the sun. The inclination angle of glass will affect the dynamics of condensation and movement of the water along the inner surface of the glass.

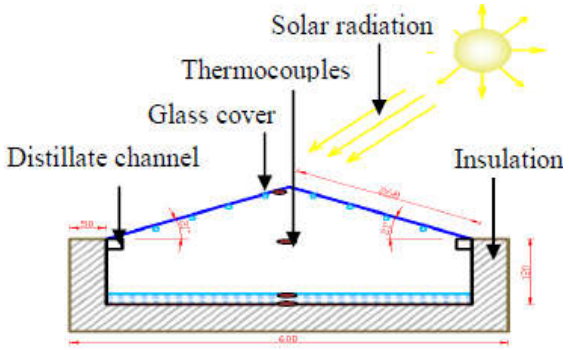

Figure 2 Schematic diagram of the double slope solar still

This system able to investigate the effect of the angle of inclination of the glass on the still's yield. It shows to study how the angle affects the driving force of a still performance and ultimately identify a suitable cover angle of inclination. The heated water vapor evaporates from the solar still and condenses on the inside of the glass cover. In this system, the salts and microbes that were in the original water are left behind. It shows that the solar still productivity is proportional to the solar intensity, which depends on climate conditions of the place where it get installed.

CONCLUSION

Even we have more measuring instruments to measure the solar irradiation, we need accurate measuring device. Then, the changes in climate also affect the solar still output. Because of recent changes in different climatic factors, there must be changes in the best angle of tilt recommended for gaining the best solar radiation. So, there is a need for further and continuous work in this area in order to obtain more accurate angles for optimum yield. Both Inclination Angle and solar irradiance are found to be significant factors.

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