WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

To Carry Out Sea Water Desalination by Solar Radiation

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A B S T R A C T

Nowadays there is great issue of drinking water and international companies are implementing number of charges to the customer for pure water. Till there is lack of necessary minerals in the drinking water and this kind of drinking water is not capable to provide all minerals and required vitamins to the body. Therefore developer has to think about out such a kind of water treatment plant that cannot reduce the required minerals and vitamins from the water and still it can verify the water as per the requirement

Water still one type of technology that can convert sea water into drinking water. Two convert sea water into proper drinking water radiation is necessary and heat treatment to the water must be in proper way then and then salt and other impurities may be laid down to the bottom and pure drinking water can be attributed by the proper evaporation of the water.

Number of countries is developing Solar still to get best drinking water in their country because number of countries do not have river bank and they don't have sufficient quantity of best drinking water below their land. But this type of countries have large costal area and they are trying to convert this seawater into drinking water.

Keywords: Solar still, boiling temperature, Evaporation temperature, Steam condensation, super heating, Water treatment, solar radiation,

1. Introduction.

High quality fuel is required for better generation of electricity and also this power plant has to provide continuous and emergency power supply to the required place. In metro city and industrial area whenever power requirement is at the topmost condition at that time peak load must be satisfied otherwise production of the plant may be stopped and it will effect on the economical condition of the plant in overall area of the manufacturing unit.

In solar still number of natural parameters affect the efficiency of unit. Solar radiation is the main parameter that affect on efficiency of solar still. Solar radiations are not continuous and not perpendicular to the glass of unit thorough the day. In winter and monsoon solar radiations are diffused and they are not giving proper heat to the water so developer has to give auxiliary heating system to the solar still. Also there should be a provision to restrict the outside wind because wind carries out external heat from the body and release this heat into the atmosphere and it will take down the temperature of the system below boiling point of water.

As boiling temperature of water is 100^0C Celsius but due to convection heat transfer by the wind because when wind will transfer heat from the system to the surrounding and it will take down the overall temperature down below the 100^0C Celsius therefore electric heating system is also required to take up the temperature up to 100^0C Celsius.

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Nomenclature

ST	Solar sill
St tem	Steam Temperature
AC	Alternative current (%)
H-Water	Water heated
Con.	Condensation of water
Eff Sol.	Solar still effiency
Rad. Cont	Concentration of radiation
Diff -S	Diffused radiation .
Cool-R =	Steam cooling rate

2. Solar still working

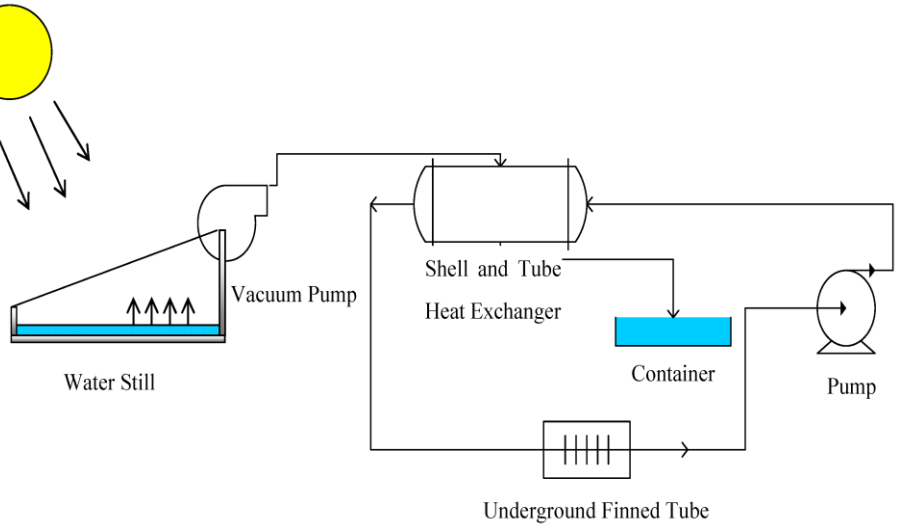

Figure 1 Solar still operation and tie up with geothermal plant.

Geothermal energy is a natural source of energy reservoir. In geothermal energy continuously heated water or steam is available if we are capable to recover the heat from that geothermal source then we can get highest speed in the purification of water. There is possibility to get heat from the Sun as well as from the geothermal source. Developer has to arrange shell and tube type heat exchanger to transfer heat from geothermal energy source to the solar still unit. There should be also provision of pump to increase the pressure and also so provision of completely transparent glass for better performance. Because the solar radiations are not continuous throughout the day there may be possibility of a less radiation in the early morning and at sunset. Throughout the whole night unit can use its own heat that it has absorbed during the day.

Number of glasses is used to recover heat from the Sun generally 2mm or 3mm thickness glasses are referred to capture heat from the Sun. If glasses are thin then rays can enter easily into the system but there is possibility of overheat due to its thin layer and glass may be break over a period of time. At other side if manufacturer is making thick class then there may be troubleshooting for entering of solar irradiation inside the system. After all there will be less heat transfer from the solar radiation to the solar still water and efficiency of the whole unit will be decreased. So glass should be design in such a way that it should not be so thin or it should not be so thick but it should be in a size that it can withstand the higher temperature and also it can resist impact load due to wind or any other natural causes.

2.1 Working parts of the Unit

1 Absorber plate

Absorber plate is commonly made from thin sheet with thickness of 0.2 to 0.7 mm white tubes which are made of metal in diameter of 1.5 CM. They are welded and pressure bonded to the bottom of the absorber plate. Absorber plate material should have high thermal conductivity and adequate tensile and also compressive strength. Copper is generally preferred due to high thermal conductivity and good resistance to the corrosion. The absorber plate also made from aluminium, iron, steel, brass, tin, zinc etc. Aluminium and steel require a corrosion inhibitor. Aluminium cannot be used with water because water contain chloride and heavy metal this would cause pitting of tube or channel.

2. Insulation material

Desired characteristics of an insulating material are low thermal conductivity and stability at high temperature. The insulating material are provided in the bottom and along with the side walls usually at 8 cm thick layer of glass wool to prevent heat loss from the rear surface and sides of the collector.

3. Glass material

The functions of cover plates are to permit the entry of solar radiation of short wavelength to minimise upward heat loss from absorb plate to the environment and to provide protection against environment. So cover plate must be transparent to permit entry of short wavelength and solar radiation and opaque to the longer infrared radiation reflected from the absorber. As a result the heat remains trapped in the Air space between the absorber plate and glass cover in a manner similar to a greenhouse . The most critical factors for the cover plate materials are strength, durability and transfer ability of solar radiation.

Toughened glass with 5 mm thickness is most favoured material for cover plate. The common practice is to have one or two covers with spacing of 3 cm . Transparent plastics may also be used in place of glass but they often offer inferior performance as compared to glass. The glass cover reflects some of incoming solar radiation which can be reduced by applying anti-reflective coating on the outer surface of the glass.

4 Advantages of system

This system can use direct and diffuse radiation and also reflected radiation from the atmosphere. It can be fixed in tilt and orientation and hence there is no need of tracking system. It is simpler than the concentrating reflectors absorbing surface and orientation devices of concentrating collector. It requires less maintenance and easy to make. It has low cost compared to the other systems so in the developing countries this kind of systems may be used to absorb the solar radiation and purification of water can be done at low cost with this kind of solar radiation absorber system.

2.2 Improvement in the Solar still

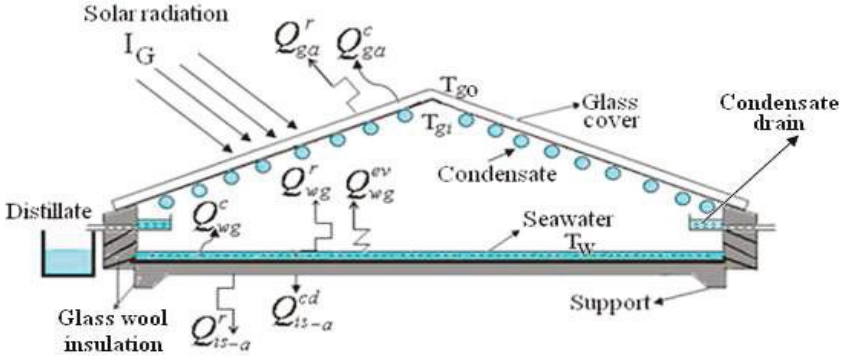

Figure 2 Factors affecting the still systems.

1. Selective surface

Absorber plate surface which exhibit the characteristics of a high value of absorptivity for incoming solar radiation and low value of emissivity for outgoing re radiation are called selective surfaces. Such surfaces are desirable because they maximize the net energy collection. It is an effective way to reduce thermal losses from the absorber plate of a solar heating panel. Some examples of selective surface layers are copper oxide nickel black and black Chrome.

2. Covers calculation

The main function of glass cover in collector is to transmit as much solar energy as possible to the absorber and to minimise heat loss from the absorber plate. With increase in the number of covers the value of radiation decrease and thus the flux absorbed by the absorber plate decreases. The value of heat loss from the absorber plate also decreases. Maximum efficiency is obtained with one or two covers.

3. Tilt of system

Systems is normally fixed in one position and do not track the sun. So the tilt angle at which it is fixed is very important. Optimum tilt depends on the nature of the application. The optimum tilt which will result in maximizing the annual isolation. For latitude up to 30^0small deviations of a degree or two degree from the optimum tilt will not cause much change in the relative isolation.

4. Spacing

The proper spacing is to be kept between absorber and plate and first cover or between two covers is important. Because heat loss varies with spacing. Spacing must be kept such that the values of the convective heat transfer coefficient is minimised for stop the variation of the heat transfer coefficient with spacing is verily continuously as per the direction of radiation. The collectors are designed to operate at different locations with wearing tilts and under varying service conditions and optimum value of spacing is difficult to specify.

5. Dust of the top of cover

When a collector is deployed in a practical system that gets accumulated over it reducing the transmitted flux through the cover. To stop this requires continuous cleaning of the cover which is not possible in a practical situation. Cleaning is generally done once in a few days. For this reason it is recommended that the incident flux be multiplied by a correction factor which accounts for the reduction in intensity because of the accumulation of the dust.

3. Conclusion

Solar still mainly works in the principle of radiation of heat transfer. Radiations throughout the day is not constant and it is continuously varying respect to time therefore heat transfer inside the system is also not constant . So some auxiliary heat transfer system must be available. Direct radiations must be absorbed inside the system and for that proper tilt of the system must be arranged in such a way that system can get maximum amount of radiation throughout the day. Optimization of the class cover must be done before installation of the system because extra thin or extra thick glass is not compactable for the better performance of the system

There is also one possibility to reduce the amount of system at the time of installation by proper insulation by choosing the proper material that is responsible for the reflections of the radiations and also proper base metal must be choose. If developer is focusing for the proper selection of the material than overall cost of the system can be reduced and this reduced cost will be more effective in the developing countries for the use of solar still for the purification of water at low cost. Most of the countries in the world have coastal area and they can use this systems by proper optimisation of each and every component and they can also reduce the auxiliary heat transfer unit consumption after getting the proper radiations from the Sun.

One can also do a modification in glass cover specially they are made from glass wool and they are also working to get the reflected radiations in the form of photons so they can transfer maximum amount of heat to the solar still water. If this is possible then operation of the solar still very fast and condensation of the vapour can also be done at high speed so maximum amount of pure water can be achieved at a frequent of time.

Acknowledgements

We are thankful to of Team members and staff of our Institute for helping us in this article. The team member of other team also helped us for the preparation of the paper and guided us about the same. There is also a great support from the various lab assistants from the Institute and other technical staff for this paper publication work.

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