

A Solar Collector with Oscillating Heat Pipe (OHP)

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Opinion

Nowadays, more paleontological fuels are now depleted as the use of energy such as oil, natural gas and coal is increasing. And tends to increase every year because of business growth and the use of equipment that requires energy from these fuels increases. All over the world are turning to renewable energy that is never out of this world. There are many types of renewable energy such as wind energy, hydro energy, solar energy and geothermal energy. In this opinion need focus on renewable energy from solar. Solar energy can be utilized as follows.

A. Power generation, it can generate electricity anywhere there is sunlight. Solar energy is developed to generate electricity with a device called solar cell can be divided into 3 systems:

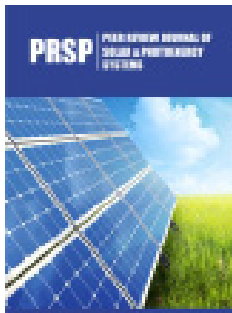
- i. Autonomous solar cells suitable for use in areas far away from prosperity no electric poles.
- ii. Integrated solar cells with distribution system used for generating electricity in the city area by converting direct current into AC power into the power transmission system.
- iii. Hybrid solar cells, the system will be designed to work with other types of energy such as wind power, hydro power, diesel engine, etc.

B. Heat generation, the production of hot water with solar energy can be divided into 3 types:

- i. Production of natural hot water circulation. The water tank is higher than the solar panel.
- ii. Hot water production using circulating water pumps. Suitable for hot water production in large quantities and want to use hot water continuously.
- iii. Combined hot water production it is the use of hot water produced from solar energy to be used with the residual heat from the cooling of the chiller. Air conditioners using a heat exchanger.

C. Solar drying, solar drying, there are currently 3 types:

- i. Passive drying is a drying system that relies on solar energy and the airflow blows like a natural dryer. By taking food or items that need to be dried outdoors. It relies on the heat from the sun and the wind to evaporate moisture away direct solar drying cabinet. The heat generated by the absorption of solar energy is directed to the incubator. And a mixed solar incubator it is to heat the contents of the incubator from direct sunlight and indirectly with solar panels.
- ii. Active drying is a drying system that allows air to circulate in the desired direction, such as a fan, when the external exhaust fan enters through the solar panel. The hot air flowing through the fan and drying chamber has a relative humidity lower than that of crops. Thus, bringing the moisture from the crops to the outside.
- iii. Hybrid drying is a drying that uses solar energy and other forms of energy during the absence of sunlight or irregular or want something that dries faster.



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In order to use the energy from the sun to power generate, heat generate and solar drying. There needs to be some method of harnessing the solar radiation. There are two main methods: Photovoltaic Cells (PV) and Solar Collectors (SC). The PV can be more useful as they directly transform solar radiation into power generate. The SC is a device that collects and/or concentrates solar radiation from the sun. These devices are primarily used for active solar heating and allow for the heating of water for personal use. These collectors are generally mounted on the roof and must be very sturdy as they are exposed to a variety of different weather conditions. The use of these SC provides an alternative for traditional domestic water heating using a water heater, potentially reducing energy costs over time. As well as in domestic settings, a large number of these collectors can be combined in an array and used to generate electricity in solar thermal power plants.

Problems and Solution

However, typically, conventional SC use water or wind pipes attached to the collecting plate where water or wind circulates either naturally or forcibly and transfers the heat it collects to a storage tank. Some of the short comings of this type solar collectors system include the extra expense of a pump and the power needed to operate it, the extra space required for any natural circulation system, the corrosion effect of water or wind, and the limited quantity of heat transferred by the fluid. Oscillating Heat Pipes (OHP) offer a promising solution to these problems.

The OHP is a very effective heat transfer device; its structure is simple and it has fast thermal response. It consists of a long capillary tube bent into many turns; the evaporator, adiabatic and condenser sections are located at these turns shown in Figure 1. However, there is no wick structure to return the condensate liquid from the condenser to the evaporator section. Heat is transported from the evaporator section to the condenser section by the pulsation of the working fluid moving in an axial direction in the tube. The OHP is established many type such as, Closed End Oscillating Heat Pipe (CEOHP), Closed Loop Oscillating Heat Pipe (CLOHP) and Closed Loop Oscillating Heat Pipe With Check Valve (CLOHP/CV) etc.

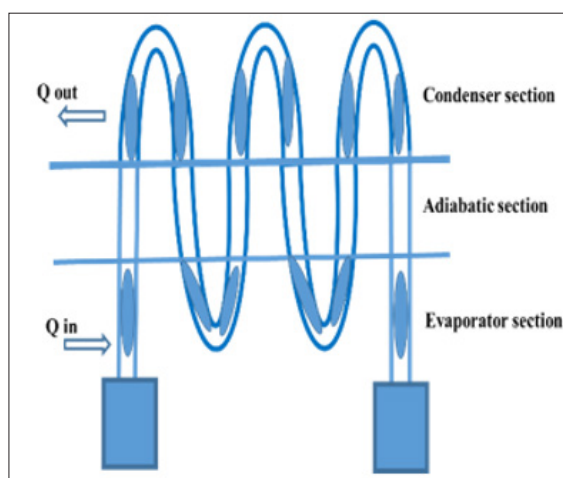


Figure 1: Oscillating heat pipe, CEOHP type.

A solar collector design concept to solve conventional SC problems. The design, it is divided into 3 parts as:

- The OHP, the OHP tube arrangement was aligned at an inclination angle about of 18 degrees from the horizontal plane. The condenser section was inserted in a water tank. The evaporator section occupied the collecting plate with an area. The size and position of the OHP system can be arranged to conform to the environment in which it will be located.
- The oscillating plate, the black zinc sheet was used to make a collecting plate with test area. When considering solar energy irradiation and the performance of, OHP, it was determined that OHP turns in the tubing of the OHP were sufficient for the area provided. The collecting plate was cut to size, holed and pressed to make room for the tubing which was soldered in place to the plate surface with an 18-degree angle of inclination. The plate was then painted black.
- The assembly, the wooden box made to house the plate had layer of insulation at the backside and a glass plate with air gap at the front side that was fitted and sealed with silicone glue. The concept design of solar collector with oscillating heat pipe shown in Figure 2.

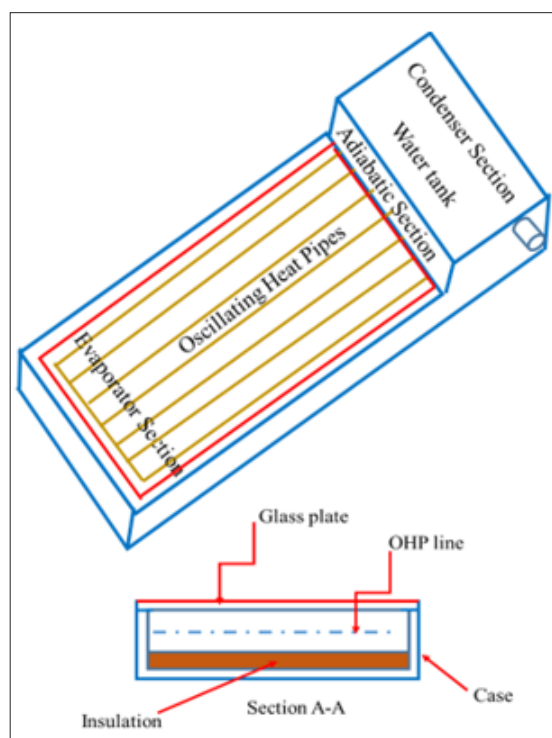


Figure 2: Concept design of a solar collector with oscillating heat pipe.

Nowadays many researchers are using this opinion to investigate the performance of solar collector with oscillating heat pipe. According to the research, it was found that solar collector with oscillating heat pipe performance was higher when compared with the conventional SC. Therefore, this opinion of a solar collector with oscillating heat pipe can be applied in practical.

Finally

In this opinion shown a solar collector with Oscillating Heat Pipe (OHP). It can actually solve the problem of conventional SC.

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