

Know more about

Solar Water Heating System



EMSD



Information On Solar Water Heating System

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Energy from the Sun

The Sun is the world's largest energy resource, and solar energy is a form of renewable energy which is abundant in our environment. More importantly, the use of solar energy can reduce the use of fossil fuels as well as reducing harmful environmental emission resulting from the burning of fossil fuels. Hong Kong has significant solar energy resources. On average, the annual solar radiation is around $5,300\text{MJ/m}^2$.



Solar energy can be utilised in many ways. The most common method is to convert sunlight into heat energy to produce hot water. This technology has been in use for a long period of time and sufficient products are available commercially. This leaflet explains the concept of a solar thermal system for hot water production and provides an overview of the basic components, types of systems and installation issues.

Benefits of using Solar Water Heating System

Using solar water heating system will help to reduce harmful emission from fossil fuels. You can also enjoy free energy from the sun, which could save your energy cost in heating water.

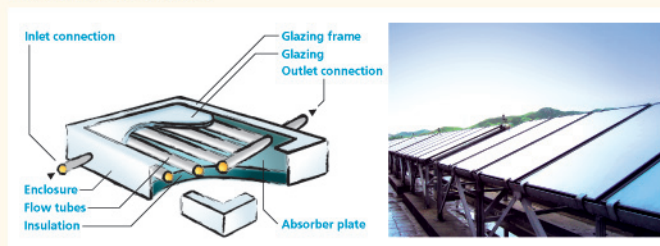


Basic Components

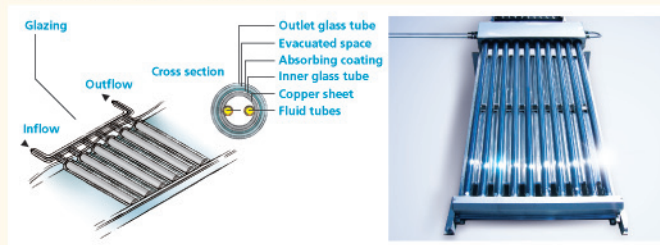
The basic form of a solar water heating system comprises solar collectors, a storage tank and interconnecting pipework. The solar collectors are usually mounted on roof of a building to capture solar radiation. Small tubes run through the solar collectors and carry fluid - either water or heat transfer liquid with low boiling point. The fluid absorbs heat from the solar collectors and transfers heat to incoming water.

Two types of solar collectors are commonly used in the solar thermal system:

Flat-plate collector



Evacuated Tube Collectors



Amongst these two types of solar collectors, the evacuated tube collector is generally more expensive due to a more complex manufacturing process. However, the evacuated tube collector is more effective per unit area than flat plate collector and requires a smaller installed area.



Flat-plate Collector

A flat-plate collector is a rectangular box with metal absorber plate inside the box. The box is painted in dark colour to maximise absorption of solar energy. The collector is glazed and insulated to limit the amount of heat escape from the box such that the fluid inside the collector can be maintained at warm temperature.

Evacuated Tube Collectors

Evacuated tubes collector is made up of parallel rows of transparent glass tubes, similar to fluorescent tubes. Each tube contains an inner glass tube and outer glass tube covered with special coating that absorbs solar energy well. As the tube is round in shape, the sun's ray are always striking the tubes surfaces at right angles (that is perpendicular to the tube surface in all directions), thus maximises the total amount of solar radiation absorbed during the day. In addition, the tube works in the same way as a vacuum flask with air is withdrawn from the space between the inner and outer tubes forming a vacuum, which can minimise heat loss from the collector and to reduce temperature drop of the heated water or heat transfer fluid inside the tube. The evacuated tubes employing heat transfer fluid inside the inner glass tube is known as the evacuated heat pipe collectors. Evacuated tube collectors can heat water to fairly high temperatures.

Storage Tank

A solar water heating system generally requires a well-insulated storage tank to hold the solar heated water. The storage tank may sometimes be housed with a backup electric or gas heater to boost the solar heated water to a desired temperature when the temperature of the solar heated water is lower than the desired temperature. This may happen when solar energy is not available, for example, at night or on a cloudy day.



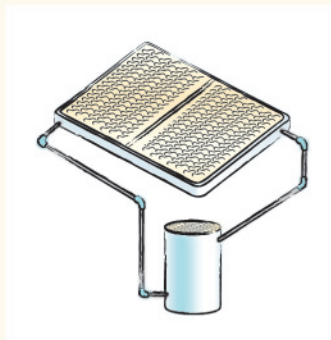
Common Types of Solar Water Heating System

Solar water heaters are characterized as either direct (also called “open loop”) or indirect (also called “closed loop”) depending on whether the incoming water is heated directly in the collectors or is indirectly heated via a heat exchanger.

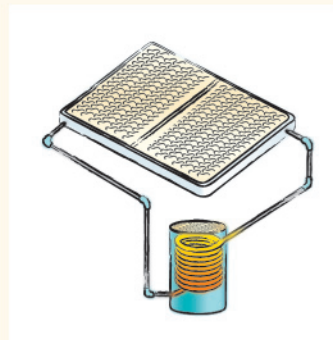
Both types of system can be either active or passive. An active system uses an electric pump to circulate water or a heat transfer fluid from storage tanks through the collectors. Whereas a passive system relies on gravity and the tendency for water to naturally circulate as it is heated, allowing water or heat-transfer fluid to move through the system without the use of a circulating pump.

The main factors that will govern the choice for types of system to be installed include the climatic conditions, hot water demand, size of the system and space availability for placing extra components etc. For example, low maintenance passive direct system can be used in smaller facilities with low hot water demand whereas active indirect system is usually installed in larger facilities with higher hot water demand.

Direct Solar Water Heater

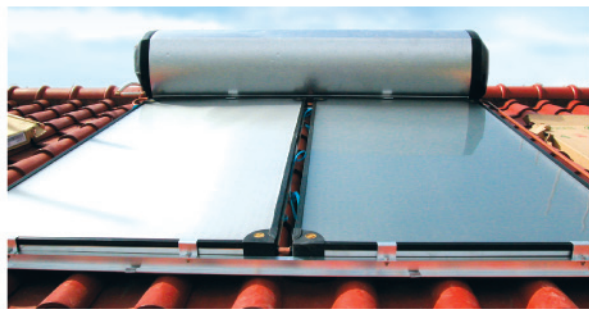


Indirect Solar Water Heater



Packaged Type Solar Water Heaters

Packaged type solar water heaters, with solar collectors and an insulated storage tank in one package, are also available in the market. Since the installation of this type of system is less complicated, it is suitable for smaller facilities and for household use. The packaged type solar water heaters are available at different sizes. Smaller one is sufficient for a family of two and a larger one can provide hot water for eight people. These types of systems are suitable for low density housing development such as villas, low rise houses and village houses etc as they tend to have more roof space for installation.



Issues to be considered when installing Solar Water Heating System

Solar Collectors Orientation

Solar collectors need to be located where plenty of sunshine strikes its surface. Solar collectors can be mounted from horizontal to an inclined angle. To maximize the amount of annual solar energy that solar collectors can receive, they should ideally be tilted at latitude angle of the location (around 22° in Hong Kong) on a south-facing roof. It is also necessary to avoid any obstructions such as buildings or trees etc. that could prevent solar collectors from getting adequate exposure to solar radiation.

Applications of solar water heating systems

Solar water heating system can be used for a wide range of applications. It may be suitable for establishments with regular hot water demand in daytime and year round hot water demand such as hotels, hostels, household and hospitals. It is also suitable for sport centres and holiday villages. It can also be used in the heated swimming pool for pre-heating of pool water. Low rise offices buildings with canteens and washrooms and or showers can also be considered for installation.

Retrofitting of solar water heating system

Retrofitting solar water heating system in premises which already employed centralised storage type water heating system are usually more straightforward as the existing plumbing pipe work and storage tank can be utilised.

It is advised that to employ experienced designer and installer to carry out system design and installation.



Market Availability

In terms of the technologies development, there are plenty of solar thermal technologies products available in the market. Solar thermal products sold in Hong Kong are either imported from overseas countries such as Australia, Israel, USA or from the Mainland. Since there are many products available in the local market, prices are becoming competitive in recent years.

Maintenance and Expected Life

The maintenance requirements for solar water heating system vary depending on the system configuration. In general, solar thermal collectors have no moving parts and the maintenance requirements are very low. A well-made, properly maintained system should last 15 to 20 years or more.

Lung Cheung Road E & M Workshop



Sheung Shui Slaughter House



Building Structure/Space Considerations

The building owner / occupant is advised to make reference to approved plans of the parent building and to consult building professionals to ensure that the existing building is structurally safe to support the additional system components, and that the prescribed windows as well as the means of escape including any roof designated as refuge floor thereof are not obstructed. Where alterations and additions works to the existing building structure are involved to support the additional system components, prior approval and consent from the Building Authority under the Buildings Ordinance and Lands Department are required. An Authorized Person (AP) (Architect, Engineer or Surveyor registered under the Buildings Ordinance) and the respective District Lands Offices should be consulted in case of doubt.

Buildings Department

12/F Pioneer Centre
750 Nathan Road, Kowloon
Tel: 1823
Email: enquiry@bd.gov.hk
Website: www.bd.gov.hk

Lands Department

20/F North Point Government Offices
333 Java Road, North Point, Hong Kong
Tel: 2231 3294
Email: landsd@landsd.gov.hk
Website: www.landsd.gov.hk

Plumbing /Drainage Considerations

Retrofitting a solar water heating system may sometimes involve alteration of the existing water supply system. Prior approval of any such alteration shall be sought from the Water Supplies Department.

Water Supplies Department

43/F Immigration Tower,
7 Gloucester Road,
Wan Chai, Hong Kong.
Tel: 2824 5000
Email: wsdinfo@wsd.gov.hk
Website: www.wsd.gov.hk



General Information on Renewable Energy

For further information about renewable energy, please contact:

Energy Efficiency Office
Electrical and Mechanical Services Department
3 Kai Shing Street, Kowloon, Hong Kong
Tel: 1823
Email: eepublic@emsd.gov.hk
Website: www.emsd.gov.hk

