VACUUM TUBE VS FLAT PANEL

Are solar tube collectors more efficient than flat plate collectors?

When comparing peak efficiency levels it may seem that there is little difference between flat plate and evacuated tubes, in fact flat plate may actually be higher, but this is during minimal heat loss conditions. when averaged over a year evacuated tube collector have a clear advantage. The key points as follows,

1. Due to the cylindrical shape of the evacuated tube, the solar tubes are able to passively track the sun throughout the day. Flat plate collector only provide peak energy output at midday when the sun is perpendicular to the collector's surface.

2. Air is evacuated from the solar tube to form a vacuum. This greatly reduces conductive and convective heat loss from the interior of the tube. As a result wind and cold temperatures have less effect on the efficiency of the evacuated tube collector.

3. riwatt solar collectors can often be used in subzero temperatures without the system sustaining damage. Flat plate systems often require expensive and complicated "antifreeze" systems to be installed.
4. Evacuated tubes are strong, long lasting, and should one be broken, inexpensive and easy to replace. If a flat plate collector panel is damaged the whole panel must be replaced.

5. Due to the high efficiency absorption of solar radiation even during overcast conditions, combined with excellent insulate properties of the solar tube, solar tube collectors can heat water all year round (backup from gas and electricity is still required).

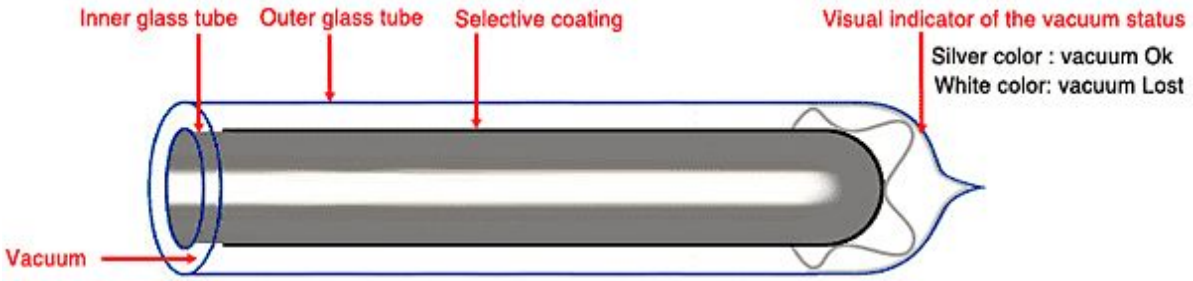
6. Due to the various advantages of evacuated tube collector over flat plate collectors, a smaller collector can be used to provide the same heating performance. For example, a standard household of 4-5 people would usually require a 250-300L water storage tank. Depending on your location, only 30 evacuated tubes would be required to provide all summer hot water needs and a large percentage in other seasons.

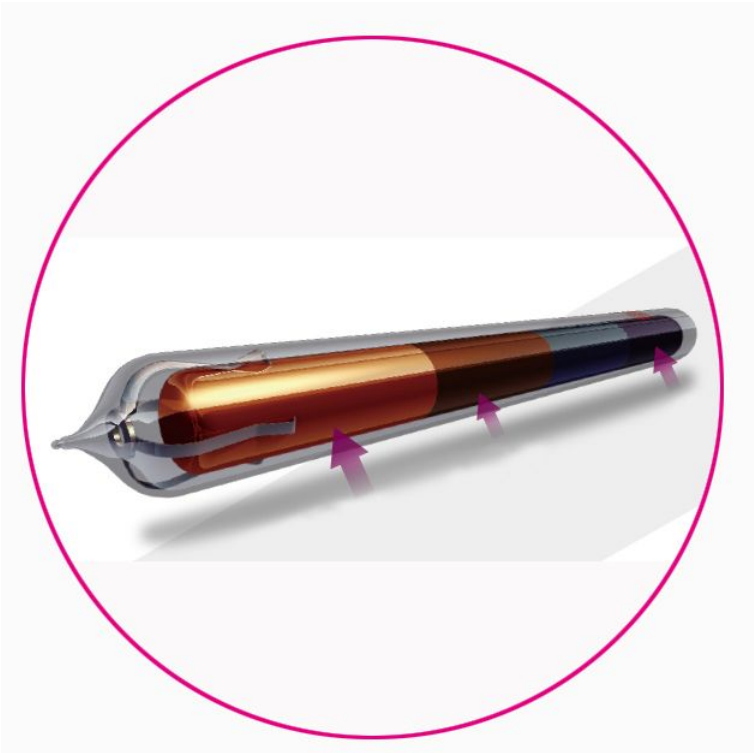
7.Flat plate solar collectors can produce similar heat output to evacuated tube collectors, but generally only during hot, sunny conditions. When averaged over an entire year, evacuated tube collector heat output per net m2 of absorb er area, is

between 25% to 40% greater that a flat plate collector.

The evacuated (vacuum) tube:

Each riwatt evacuated tube is composed of two concentric glass tubes ; the inner one is coated with highly selective layer and it converts solar radiation into thermal energy, as for the outer one, it is a cover to keep the vacuum . Both tubes are fused together and the gap between them is evacuated to achieve excellent thermal vacuum insulation .

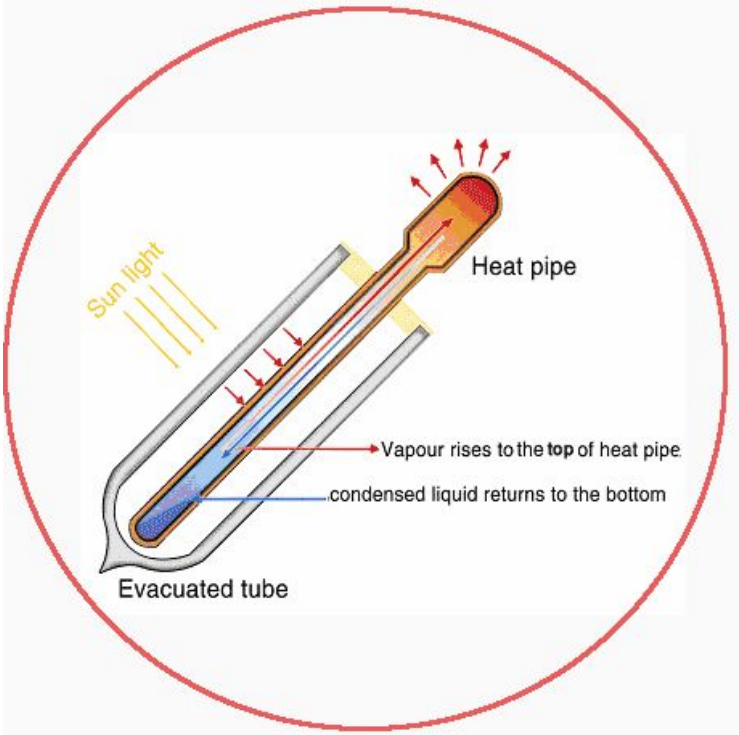


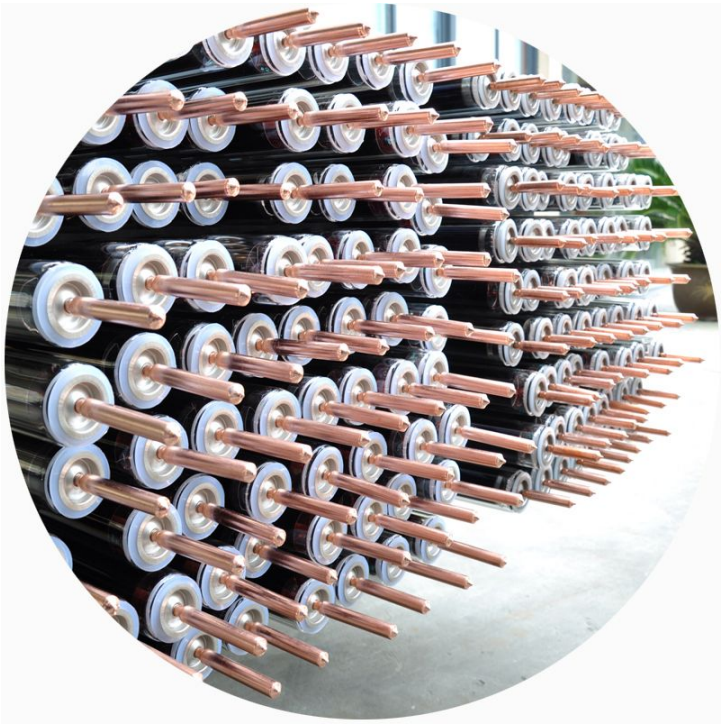


The Heat pipe - Evacuated tube:

rwiatt heat pipe works as a solar energy absorb er inside the evacuated tube and transfers the absorbed solar energy to a working vaporizable fluid. When the heat pipe reach 30ºC, the fluid will vaporize. This vapor rapidly rises to the top of the heat

pipe transferring heat to the condenser. As the heat is lost at the condenser, the vapor condenses to form a liquid and returns to the bottom of the heat pipe. Then the evaporating-condensing cycle process starts again.





Advantages of evacuate tubes

Why vacuum tubes?

Vacuum (evacuated) tube works like well-known, a thermos flask, which uses vacuum to provide thermal insulation; once the evacuated tube absorbs the radiation from the sun and converts it to heat; the vacuum helps keep the heat.
The vacuum insulation makes evacuated tube collector excel the traditional flat plate collector in performance.
What are the main advantages of evacuated tube over flat plates collectors?

1. Increased efficiency: Due to the tabular shape of the evacuated tubes, the sun is always perpendicular to the surface of the glass for most of the day. Flat plate reaches maximum efficiency only at noon time.

2. Minimal heat loss: Since air is evacuated from the glass tubes to form a vacuum, it reduces the heat loss from the tube. This means that wind and colder temperatures have less effect on the collectors efficiency.

3. Freeze protection: Evacuated tube collectors can be used in freezing conditions without the system being damaged. Flat plates require more sophisticated antifreeze systems which increases maintenance costs and lowers efficiency.