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INTEGRATED ENGINEERING SOLUTION

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Solar Photovoltaic / Thermal (PVT)

The potential in solar technology is high, however, it inherits flaws in the conversion efficiency of solar energy to electricity and high initial cost. During the process, minimal solar energy is converted into electricity, whilst majority being lost in the form of thermal energy. Another issue being, when the operating temperature of photovoltaics cells increases, the electricity conversion ratio subsequently decreases. To optimize the solar energy conversion, the thermal energy may be harnessed with a Solar Photovoltaic/ Thermal (PVT) collector, which is an hybrid equipment utilizing both the electrical and thermal energy.

PVT integrate a photovoltaics module, for conversion of solar energy into electrical energy, and a single thermal conversion module using fluid as the heat exchange medium. In other words, solar energy can be converted into both electric and thermal energy. Meanwhile, the thermal

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fluid can enhance the electricity conversion by cooling the operating temperature of the photovoltaics cell.

Advantages of Photovoltaic-thermal Solar Collector (PVT):

1. *Full spectrum of optimize of solar radiation*

Existence semiconductor can only convert 60% of the solar radiation into electrical energy, PVT can convert the remaining 40% to thermal energy, in turn utilization the solar energy.

2. *Improve the operation life of photovoltaic modules*

Operation temperature of the photovoltaic cell can now be controlled using the cooling medium fluid, this will reduce over heating of the photovoltaic cells as a result extending its operation life.

3. *Integrated architectural design*

PVT system integrate photovoltaics and photothermal system into one, providing heating and electric power. Consequently, saving materials, installation space/time and maintenance cost.

4. *Diversified energy supply*

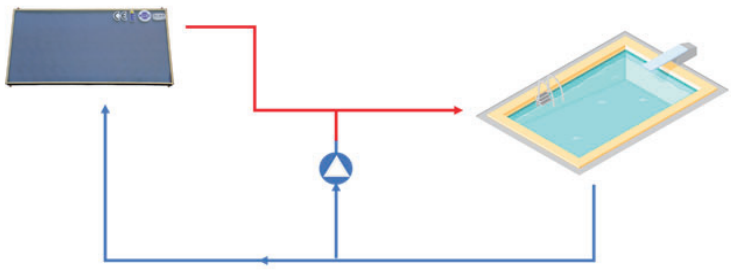
PVT system can provide both power and heat independently, or in conjunction. This enables design for different conditions to satisfy different needs.

PVT (Solar Photovoltaic/ Thermal) System

= Electricity + Hot water + Energy Storage + Heating

Electricity + Water Heating

PVT system can provide electricity and domestic hot water usage for hotel, hospital and school, etc.



For cold weather regions, PVT system can be applied to air-source heat pump heating providing electricity and thermal energy. In turn, improving the working efficiency of the heat pump.

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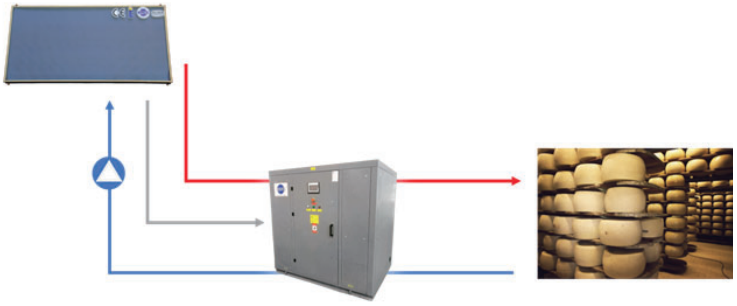
Electricity + Heating (Drying)

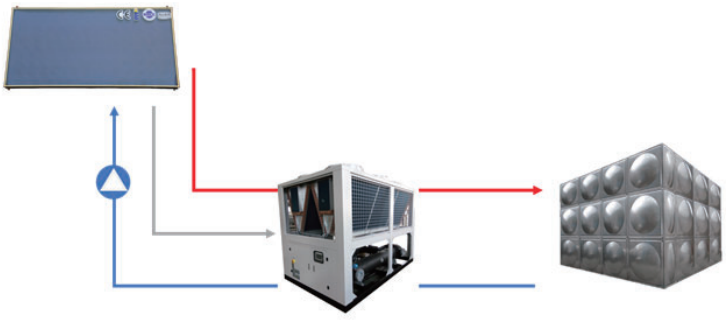
Traditional Tobacco, medicinal materials, food and agricultural drying processes uses coal burning or electric heating method for drying. PVT system can help reduce coal burning by convert solar energy into electric (for electric heating) and thermal energy (air heating) at the same time.



This is crucial in remote areas and areas with insufficient electricity. PVT system can be used to operate independently providing thermal energy resource for the drying process.

Electricity + Heat Pump

During winter season, when the heat pump system is in operation, one of the major problems is the performance of the system reduces due to frosting at the surface of the evaporator from evaporator. To overcome this issue PVT system can be used in conjunction to provide excess heat energy to heat pump system, increasing the temperature of evaporator thereby increasing the energy efficiency ratio of the heat pump system, and greatly improving the overall energy efficiency of the entire system.



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Electricity + Heating (Agricultural Use)

PVT systems can be integrated into agricultural greenhouse, it provides both electric power and thermal energy to meet the heating needs of agricultural greenhouses. Throughout the year it uses solar energy to generate electricity and adjust greenhouse temperature according to the production characteristics of different crops needs.