

Setting	
Country	Thailand
Location	Bangkok
Project start date	September, 2008
Project end date	March, 2009
Technology keywords	Solar Energy (heat)
Host sector	Royal Orchid Sheraton Hotel

Technical summary of the project

Objective of the project	To save energy by reducing the use of fuel oil in boiler and use solar water heating system instead.
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Project description

Royal Orchid Sheraton hotel was opened for business about 25 years ago. It is located near by the Chaopraya river and has 740 rooms.

The hotel has 2 boilers (1 stand-by), 5 tons/hour each, to produce steam for laundry, kitchen and domestic hot water supply. Average fuel consumption (bunker oil A) of boiler was about 2,000 liter/day. There are 5 hot water generator using steam as heat source. Temperature of domestic hot water supply is about 55 °C. Average hot water consumption is about 95 m³/day at 70% occupancy.

When the price of fuel oil was increased to over 25 Baht/liter (about US\$ 0.7/liter) in 2008, the hotel decided to use solar water heating system to save energy cost. At the same time, there was an incentive from the Department of Alternative Energy Development and Efficiency (DEDE) which provided hotel with a subsidy of 4,500 Baht/m² of solar collector area.

The system includes 360 m² of flat plate solar collectors, hot water storage tanks (2 x 23,000 liter), circulation pumps, and control system. The system can produce about 24,000 liter/day at an average temperature of 55 °C. The system was installed on the concrete roof top. The system operates automatically using differential thermostat. When the temperature of solar collector is about 10 degree higher than water temperature in the storage tanks, the circulation pumps are turned on, and turned off when temperature different is about 5 degree. Hot water from the storage tanks gravity flows to the existing hot water generators and discharged to the existing hot water piping system. *Figure A* and *B* show schematic diagram of the system and photo of the installation, respectively.

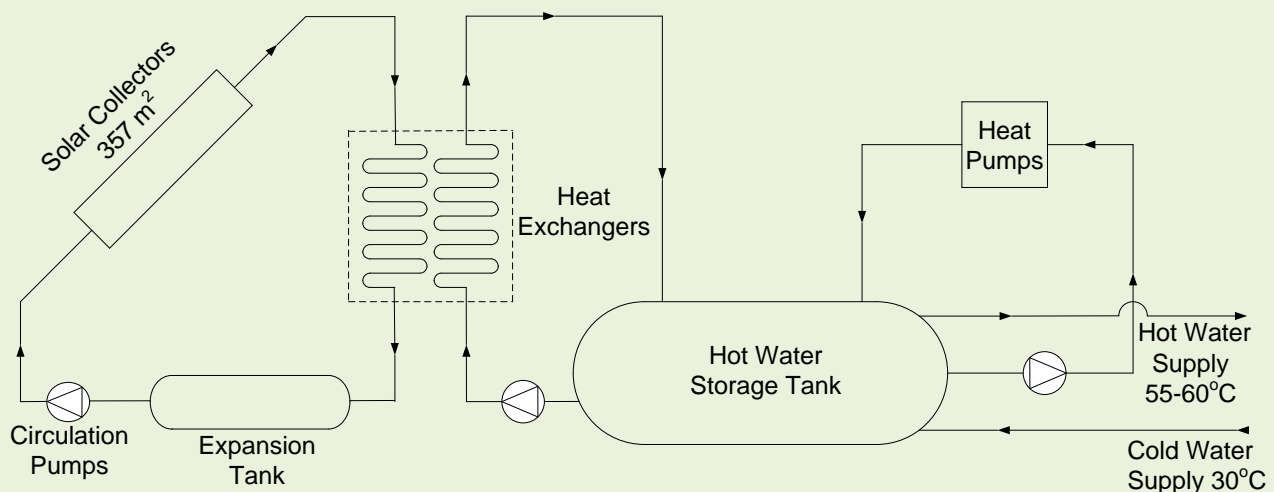


FIGURE A: SCHEMATIC DIAGRAM OF SOLAR WATER HEATING SYSTEM



FIGURE B: FLAT PLATE SOLAR COLLECTORS ON THE ROOF TOP OF ROYAL ORCHID SHERATON HOTEL

The hotel also installed 5 units of heat pump to produce additional hot water to meet the demand as shown in *Figure C*. Each unit has a capacity of 1,500-2,000L/hr. At 20-30°C/ Unit. The heat pump will operate only when temperature of solar heated water is below a set point, which is normally in the evening and night time. This is to ensure that there is always enough hot water supply in the storage tanks. Each heat pump can produce about 2,000 liter/hour at 50°C (at 30°C water inlet temperature). Each has a rated power consumption of 18.8 kW.

Total investment for both solar water heating system and heat pumps was about 16 million Baht. Energy saving was about 3.04 million Baht/year. Therefore, the payback period is about 5.3 years before subsidy and about 4.8 years after receiving the subsidy.



FIGURE C: HEAT PUMP ON THE ROOF TOP

Environmental and social benefits

(Estimate of) Greenhouse Gases abated (in metric tons of CO ₂ -equivalent)	Annual: 300 tCO ₂ /year (74,100 kg/TJ-source: 2006 IPCC Guides for National Greenhouse Gas Inventories), based on fuel oil saving of 148,516 l/year minus an increase of electricity consumption of 274 MWh/year for the heat pumps). Up to and including 2012: 1,200 tCO ₂ -equivalent Up to a period of 10 years: 3,000 tCO ₂ -equivalent Up to a period of 15 years: 4,500 tCO ₂ -equivalent
Number of reduction units (EAU, CER, ERU, AAU)	
Socio-economic aspects What social and economic effects can be attributed to the project and which would not have occurred in a comparable situation without that project?	The project makes use of renewable energy to produce hot water and reduce fuel oil consumption and CO ₂ emission.
Methodology used (if applicable: approved baseline methodology or study done - refer to this; and monitoring organisation)	

Economic data

Capital costs	Investment on solar water heating was about 6.03 million Baht (US\$ 172,230) and heat pump was about 10.09 million Baht (US\$ 288,290)
Financing scheme	By owner and some incentive from the Department of Alternative Energy Development and Efficiency (DEDE) which provided a subsidy of 4,500 Baht/m ² (US\$ 129/ m ²) of solar collector area or a total of 1,607,040 Baht (US\$ 45,915). (Exchange rate 35 Baht/US\$)
Financing organisation (if third party)	

Host organisation

Name of Host organisation	Royal Orchid Sheraton Hotel & Towers
E-mail and/or web address	songsit.boonyasatpan@sheraton.com
Contact person	Mr. Songsit Boonyasatpan

Technology provider

Name of Technology provider	Pranee Tech Ltd (Solarhart solar collector imported from Australia and Grundfos pump)
E-mail and/or web address	renergy@praneetech.com
Contact person	Ms. Issaree Rukgun