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Abstract

The purpose of this study is to develop the heating water system using flat-plate solar collectors commercially used for years. Normally this system is capable of working particularly on day-time while there is sunlight. To exploit the same device, an additional equipment for cooling water is designed and installed. This newly developed device fixed to the flat-plate solar collector is used to cool off flat-plate surfaces in the night by way of self-radiation called "Sky radiation cooling system". The highlight of this newly-developed device is that it can work without using any other source of energy. Our testing equipment consists of two sets of flat-plates whitened and blackened with the mixture of TiO_2. Each has its own surface area of 1.67 m^2

The experiment tests were made in the winter season at King Mongkut's Institute of Technology North Bangkok (from-14th November, 1990 to 10th January, 1991). Our experiment has been done by adjusting of the plates to some selected elevated angles, viz, 5 degrees, 15 degrees and 30 degrees. The proper angle for the efficient work simultaneously showed that during the period of radiation of the sun falling on the earth surface was found to be 12-24 MJ/m^2 day, a volume of 70 litres of heating water per day can reach an average temperature of 75.9°C. The temperature obtained at night of the cooling system using both sets of device was found to be

alone related between 11.2°-11.3°C, which was 2-6°C lower than that of the surroundings in cooling a volume of 50 litres of water per day.

The efficiency of heating water system with the blackened plate undergoing no heat loss was found to be 77 % up to 81 %, while that of the cooling system was found to be 42 % up to 58 %. The average energy total heat from both systems reached the highest value while the adjustment of the angles of elevation of the flat-plate solar collectors was found to be in the range between 5 degrees and 15 degrees.