

Alternative Energy

Edited by

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Chapter 33

A solar assisted heat pump system for desalination

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Abstract

This paper includes the performance of a solar assisted heat pump desalination system. Renewable, solar and ambient, energy and waste heat from air conditioning system are used for the production of fresh water. The experiment was conducted under meteorological conditions of Singapore (1°21'N; 103°55'E). The coefficient of performance (COP) for the heat pump was around 5.5 for the compressor running at 30 Hz, where the performance ratio (PR) was 1.2. For the pre-heating of feed water to the evaporation chamber, a single glazed collector of 2.0 m² was used. An unglazed solar evaporator-collector was used to collect solar and ambient energy in the heat pump cycle. The efficiency of the evaporator collector was much higher than the conventional solar collector. The system has an average water production rate of 10 kg/hr.

Keywords: Solar energy, heat pump, desalination.

INTRODUCTION

Many industrial processes require thermal energy input. A conventional energy resource, which mainly comes from oil, is exhaustible and causes environmental problems. In the recent decades, there has been a rise in the search of a new source of energy, one that is renewable and non-pollutant. In providing such energy, especially in thermal processes, solar energy has been identified as one available option. Many attempts have been made to obtain fresh water from sea or saline water. These attempts resulted in desalination plants operating as Multi-Stage Flash (MSF), Multi-effect Distillation (MED), or Reverse Osmosis (RO). Such plants, MED and MSF, require considerable amount of thermal energy input. Use of conventional energy resources, such as, oil will definitely have adverse effect on the environment. As mentioned previously, it will be beneficial if solar energy could be applied in desalination processes.

A combination of solar energy and heat pump can improve the quality of the energy available and shows potential for different applications [1- 2]. The evaporator-collector used in such system can absorb both