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An Overview of 200kW Solar Power Plant Based on Organic Rankine Cycle

Jianyuan Zhang, Li Zhao*, Jue Wen, Shuai Deng

Key Laboratory of Efficient Utilization of Low and Medium Grade Energy (Tianjin University), Ministry of Education of China, Tianjin, 300350, China

Abstract

Solar-driven ORC-based distributed energy system (DES) is a potential integration energy solution for sustainable development of low carbon community. A 200kW ORC DES system was demonstrated in Tianjin for a combined supply of power, heating, cooling and fresh water from solar thermal energy source. This paper briefly introduced the information about the design and construction of this demonstration project. The main components in 200kW solar-driven multi-generation system are presented.

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Keywords: Organic Rankine cycle (ORC); solar energy; renewable energy; solar power; multi-generation

1. Introduction

* Corresponding author. Tel.: +86-022-2789-0051.
E-mail address: jons@tju.edu.cn.

Solar energy is one of the most promising energy sources since the characteristics of sustainability and cleanliness. Solar ORC uses organic fluids as working fluids and solar energy as heat source. Through general researches, it is regarded as an effective method to convert solar radiation to electricity [1-3]. Hung [4] has made the comparison among benzene, toluene, p-xylene, R113 and R123, and the results indicate that the irreversible loss is minimum using p-xylene with heat source of 300°C or so, but R123 and R113 are better with heat source of 200 °C.

The reviewed information has shown that the solar ORC system is a promising technology for distributed electricity supply in the future with cascade utilization of energy for heating and cooling. However there is few experimental work in literature about large-scale solar ORC systems.

This paper aims to present a work about a 200kW solar-driven ORC multi-generation system using parabolic trough collectors which is still in progress. The system is located in Binhai New District, Tianjin, China. Now most of the components of this plant have been installed. Due to page limitation, only core system on solar ORC is presented in this paper.

Nomenclature

ORC	Organic Rankine Cycle
DES	Distributed energy system
T	Temperature
P	Pressure
ρ	Density
h	Enthalpy
s	Entropy

2. Solar ORC power plant

2.1. Outline



Fig. 1. Full view of the solar power plant

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