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Solar water heating systems applied in high-rise residential buildings in China

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Abstract

This paper introduces the Beijing Meilifang Project and the Tianjin Dingxiuxinyuan Project which apply solar water heating systems with centralized collection & decentralized supply, including their basic composition, operation principle, structure characteristics and operation performance, so as to provide a practicable solution for solar water heating systems installed in high-rise residential buildings. These Projects show that this type of solar water heating system possesses some outstanding features: Economic use and operation, convenient management, balanced benefits, safety and reliability, as well as building integration.

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1. Introduction

According to the mode of solar heat collection & hot water supply, the solar water heating system applied in residential buildings could be classified into following three categories: centralized collection & centralized supply, centralized collection & decentralized supply, decentralized collection & decentralized supply [1].

So called ‘solar water heating system with centralized collection & decentralized supply’ is a system which adopts centralized solar collectors and decentralized storage tanks for each family in the building.

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There are lots of high-rise residential buildings in large/medium-sized cities in China. For this feature, centralized collection & decentralized supply system is one of the most suitable systems for solar water heating.

This paper introduces both the Beijing Meilifang Project and the Tianjin Dingxiuxinyuan Project which apply the solar water heating system with centralized collection & decentralized supply, so as to provide a practicable solution for solar water heating systems installed in high-rise residential buildings.

2. The Beijing Meilifang Project

2.1. Project overview

The Meilifang Community is located in Beiyuan Road at Chaoyang District in Beijing, China. There are five residential buildings with a total construction area $160,000 \text{ m}^2$ in the Community; the lowest building has 13 floors and the highest building has 20 floors with all the flat roofs. There are totally 2,112 families living in these buildings, respectively with two rooms or three rooms for each family.

The Project applies the solar water heating system with centralized collection & decentralized supply, which has been put into use since June 2011, as shown in Fig. 1. The solar system adopts heat-pipe evacuated tube collectors with a total aperture area $2,320 \text{ m}^2$. Each family is distributed with average 1.10 m^2 of the collector area.



Fig. 1. Overall view of the Beijing Meilifang Project

2.2. System composition

The whole solar water heating system in the Beijing Meilifang Community includes five independent subsystems, and each subsystem applies the solar water heating system with centralized collection & decentralized supply, as shown in Fig. 2.

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