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Research and Analysis of Combined Operational Mode of Solar Energy Hot Water Heating System and Sewage Source Heat Pump Units

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Abstract

Based on the test studies of solar hot water system and water source heat pump units combined heating system and its theory analyses, we discussed the IPLV and electricity consumption of each major equipment in the system under different combined operation mode and control strategies, then it is concluded the best system equipment selection, best joint operation mode, the operation of the best control strategy theory of a complete set of suitable for solar energy and water source heat pump in the joint use, that eventually concluded that it is suitable for cold region of composite energy heating system optimum heating mode.

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1. Introduction

Energy and the energy consumption has become a widespread concern with the social development, the use of renewable energy is becoming more and more be taken seriously^[1]. In our country, Building energy conservation first carried out in cold region, during the period of "11th five-year plan" has been solved some key technology and key products of construction renewable energy which is advantageous to long-term development to use energy^[2].

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But its lack of fit between individual technology, the application of technology products are scattered, single standard specification, the lack of a complete set of technical system and standard system of research. Such as: single use solar hot water heating system for heating need to design the solar collector with larger area of the initial investment due to its heat load is bigger, And due to the instability of solar irradiation quantity, in order to ensure all-weather normal heating system, often need the investment of large heat storage equipment, and in order to ensure the hot water circulation system at night or when the outdoor temperature extreme low freezing does not occur, also need to set up in the pipeline and tank electric tracing band and temperature sensor, etc. therefore, all of the heat load undertaken by using Separately solar hot water heating system will result in a larger system equipment initial investment and the system reliability is poorer; The initial investment and running cost of heat pump units will increase, If separate using sewage-source heat pump for building heating, and IPLV of heat pump units can also change with the sewage water temperature and thermal building load change at any time , so it will virtually increase the power consumption of heat pump units.

So the joint efficient use of renewable energy technology and techniques of use the renewable energy and conventional energy complementary badly needed which to play the largest energy saving potential of t renewable energy application in the field of building^[3]. So this article is for composite system of the sewage-source heat pump and solar hot water heating technology research and optimization, and integrated with phase change heat storage technology.

2. METHODS

2.1. System equipment

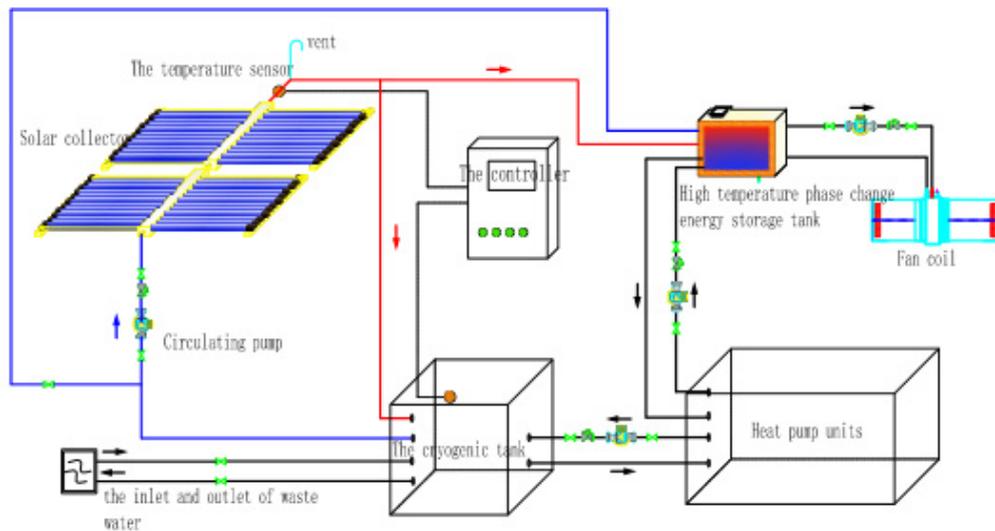


Fig. 1. Structure principle diagram of Joint operation heating system.

Joint operation heating system Consists of Solar collectors, heat circulation pump, cryogenic tank, heat pump units, the user circulating pump, electric auxiliary heater, high temperature phase change energy storage tank, fan coil, controller, etc.

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