

남부지역의 태양열이용 열펌프식 온수난방시스템의 실증연구 분석

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Analysis of demonstration research on solar heat pump system for room and hot water heating in the southern part of South Korea

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우리나라 남부지방은 대체적으로 태양 일사량이 풍부하여 태양열 시스템의 설치조건으로는 가장 좋은 지역이다. 현재까지 국내에 보급된 태양열 시스템은 외기조건이 불량한 경우에는 비효율적이다. 최근 태양열 온수기는 전국적으로 매우 활발히 보급되고 있고 태양열 온수기에 대한 일반인들의 인식은 그 어느 때보다 높다고 할 수 있다. 태양열이용 열펌프시스템 기술은 소형 온수기에의 적용 뿐 아니라 건물의 난방기술에도 적용되고 있다. 본 연구에서는 태양열 집열기 직접 팽창식 열펌프시스템(이하 '태양열 시스템')의 열성능 효율 향상에 가장 많이 기여하는 팽창장치와 톨본드형 태양열집열기에 대하여 실험하였고 현장 적용가능성을 분석하였다. 또한 태양열 열펌프식 온수 및 난방시스템의 한국의 남부지방에서의 적용가능성은 지난 관련연구결과를 분석하여 비교하여 모색하였다. The goal of this study is to measure and compare the performance of solar heat pump for room and hot water heating. To accomplish the goal, solar heat pump with aluminum roll bond type evaporator and indoor heat exchanger(condenser) was built and fully instrumented with thermocouples and pressure transducers etc. The test results showed that the COP(coefficient of performance) of HFC-134a(CF₃CH₂F) were higher than those of CFC-12(CF₂Cl₂). One "stratospherically safe" new refrigerant is 1,1,1,2-tetrafluoroethane(HFC-134a), which is thermodynamically similar to CFC-12 and considered to be a potential direct replacement for CFC-12 in air-conditioning and refrigeration applications. The solar heat pump system for room heating was designed to show the best efficiency that the room temperature make 18~20°C and 23~25°C in the southern part of South Korea during November, December, and January.

Key words : Solar heat pump(태양열 열펌프), Solar Collector(태양열집열기), the southern part of South Korea(한국의 남부지방), Room and Hot water heating(온수 및 난방시스템)

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지열히트펌프의 작동시간 경과에 따른 COP 변화에 대한 연구

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Study on COP Variations with the duration of Ground Source Heat Pump Systems Operation

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In this study, the COP variation with the duration of Ground Source Heat Pump (GSHP) systems operation was analyzed by experiment. This experimental facility was installed in residential house as a back-up device of solar thermal heating system. The capacity of heat pump is 2.5 kW with a vertical bore hole of 150m depth. The COP of GSHP is varied, depending on the ground temperature which is used as a heat source. The ground heat source temperature influencing heating COP is the soil or rock temperature which adjoin with geo-source heat exchanger. This temperature is decreased rapidly according to the operation duration of heat pump. As a result, COP of GSHP is decreased to 3 in one hour of continuous operation time.

Key words : Ground Source Heat pump(지열히트펌프), GSHP, COP, Zero Energy Solar House(제로에너지 슬라하우스), ZeSH II, Renewable Energy Source(신재생에너지원), Geo Source Heat Pump

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