

## 압축기 용량 및 유량변화에 따른 물대물 열펌프 유닛의 충전량 변화에 따른 성능 특성

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### Influence of Refrigerant Charge Amount on the Performance of a Water-to-Water Heat Pump with a Variation of Compressor Speed and Water Flow Rate

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The objective of this study is to investigate the effects of the refrigerant charge amount on the performance of a water-to-water ground source heat pump with a variation of compressor speed and the secondary fluid flow rate. The water-to-water ground source heat pump was tested by varying refrigerant charge amount from -40% to 20% of full charge. Compressor speed was changed from 30 Hz to 75 Hz, and the secondary fluid flow rate was adjusted from 6 LPM to 14 LPM. For all test conditions, EWT of an indoor heat exchanger and an outdoor heat exchanger were maintained at standard conditions of ISO 13256-2. The slope of the COP with the variation of charge amount is much steeper at undercharged conditions than that at overcharged conditions. For all compressor speed, the variation of the system performance according to charge amounts showed the similar trends. However, the optimum charge amount of the system increased a little with an increment of compressor speed. When the secondary fluid flow rate decreased, the system optimized at higher refrigerant charge amount conditions.

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**Key words** : Heat pump (열펌프), Charge(충전량), Capacity(용량), Water flow rate(유량)

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## 빌딩 구조체 활용 지열원 열펌프 시스템의 냉난방성능 특성

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### Heating and Cooling Performance Characteristics of Ground Source Heat Pump System Utilizing Building Structures as Heat Source and Sink

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Energy foundations and other thermo-active ground structure, energy wells, energy slab, and pavement heating and cooling represent an innovative technology that contributes to environmental protection and provides substantial long-term cost savings and minimized maintenance. This paper focuses on earth-contact concrete elements that are already required for structural reasons, but which simultaneously work as heat exchangers. Pipes, energy slabs, filled with a heat carrier fluid are installed under conventional structural elements, forming the primary circuit of a geothermal energy system. The natural ground temperature is used as a heat source in winter and heat sink in summer season. The system represented very high heating and cooling performance due to the stability of EWT from energy slab. Maximum heat pump unit COP and system COP were 4.9 and 4.3.

후 기 : 본 연구는 지식경제부의 재원으로 한국에너지 기술평가원(KETEP)의 지원을 받아 수행한 연구과제입니다. (No. 2009T100101148)

**Key words** : Ground source heat pump(지열원 열펌프), COP(성적계수), Cooling mode(냉방모드), Heating mode(난방모드), Energy-Slab(에너지 슬래브)

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