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Yantong Li, Gongsheng huang, Huijun Wu, Tao Xu

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Feasibility study of a PCM storage tank integrated heating system for outdoor swimming pools during the winter season

Yantong LI^a, Gongsheng HUANG^{a*}, Huijun WU^b, Tao XU^b

^aDepartment of Architecture and Civil Engineering, City University of Hong Kong
Tat Chee Avenue, Kowloon, Hong Kong

^bSchool of Civil Engineering, Guangzhou University, Guangzhou 510006, China

*The corresponding author; Tele 852-34422408; Fax 852-34420427; Email: gongsheng.huang@cityu.edu.hk

ABSTRACT

This feasibility study explores a heating system for outdoor swimming pools with applications for winter in subtropical weather conditions. The proposed heating system integrates air-source heat pumps, a PCM storage tank, and a thermal insulation cover; the novelty is that the storage tank is used to completely shift electrical demand from on-peak to off-peak periods, making outdoor swimming pools economically viable during the winter season. The configuration, operation, and control of the heating system are illustrated in detail. Its technical and economic feasibility is analyzed from the aspects of control performance, energy performance, thermal comfort, and economic performance by comparing it with a traditional heating system that uses electrical boilers for its heat supply. Case studies show that the proposed heating system can reduce operating costs significantly, suggesting its potential for application to outdoor swimming pools in subtropical climates during the winter.

Keywords: PCM storage tank; Air-source heat pump; Feasibility study; Swimming pool; Heating

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