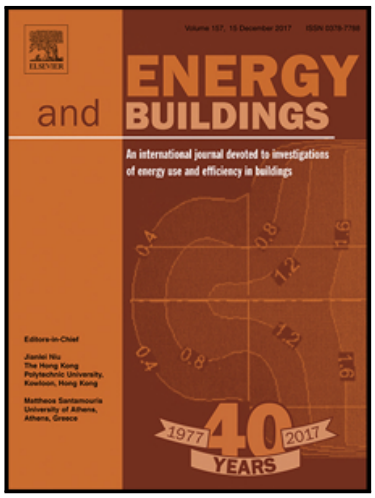

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ABSTRACT

To achieve energy efficient Heating, Ventilation and Air Conditioning (HVAC) systems in buildings it is essential to enhance the designs of their various integrated mechanical and electrical components and to control and operate plant optimally. More efficient HVAC systems lead to a significant reduction in power consumption in buildings, which is significant bearing in mind that buildings consume over 40% of the total power consumption in many developed countries.

This Special Issue on energy efficient HVAC systems was open to all contributors in the field of heating, ventilation and air conditioning systems in buildings. The invitation was for novel and original papers which extend and advance our scientific and technical understanding of efficient energy HVAC systems including Heat Pumps, water heating and cooling systems in buildings, efficient air conditioning systems, efficient component designs, energy storage (heating and cooling) and regenerative processes. In the event, all these topics were covered in the very wide-ranging submissions accepted but interesting papers on other aspects of HVAC systems and operation were also received.

RESEARCH TOPICS INVESTIGATED

Use of heat pumps

Many of the papers covering space heating or water heating in buildings reported investigations on systems which rely wholly or in part on renewable energy sources, in particular, using heat pumps. Hu et al. [1] examined control strategies for ground source heat pumps for both heating and cooling seasons. With the best case operating scenario there were significant increases in exergy efficiency and coefficient of performance and substantial decreases in exergy loss and energy consumption. Li et al. [2] considered three different operation strategies for a combined solar thermal and ground source heat pump for heating buildings. Predictions for a ground source heat pump system of a much larger scale, in this case for an entire hospital building with 10 heat pumps employed, were made by Park et al. [3] Their predictive tool used multiple linear regression and an artificial neural network. Experimental data collected over a nine-year period by Bryś et al. [4] demonstrated the potential of the subsurface shallow depth soil layer as a heat source for ground source heat pumps in Poland. The effectiveness of ground source heat pumps in combination with cooling towers was studied by Gong et al. [5]and the optimal operating conditions identified.

In contrast, Shen et al [6]developed a model for an air source integrated heat pump, which provides space conditioning and a water heating function. The authors demonstrated that annual energy savings of 50% could be achieved compared with a baseline heat pump and electrical water heating. Dong et al [7]also investigated an air source heat pump, this time