

Solar absorption cooling in Spain: Perspectives and outcomes from the simulation of recent installations

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Abstract-

In spite of the fact that Spain is one of the EU countries with the highest solar resource on annual basis, the huge seasonal variation in solar radiation availability and the relatively short period with heating demand, make it difficult to reach significant contributions of solar energy to the buildings heating energy demand. This compromises the economic viability of big solar collector areas per capita, and introduces technical difficulties for the dissipation of the excess solar energy available in the summer months. On the other hand, in a large part of the Spanish territory, in order to reach adequate comfort conditions in our buildings, the energy demand for cooling is more important or of the same order than the heating demand. Cooling energy demand is now experiencing a fast growing rate as this comfort requirement becomes internalized. Domestic air conditioning equipments based on vapour compression cycles are being used to reach comfort conditions in some of the rooms of buildings that were designed without taking into account cooling requirements. In spite of their so far small contribution to the total building sector energy demand, these equipments are already imposing important constraints on the environment and the electricity distribution system. Solar absorption cooling arises as an interesting alternative, which at the same time allows reaching a higher solar contribution to the heating demand. However, solar cooling installations present several peculiarities with respect to the more known DHW or even heating installations, which require to incorporate a more detailed approach and additional considerations in the design and performance evaluation processes. Besides, some limitations still persist in solar absorption systems, which could make them lose their market potential for the benefit of other solar cooling options. In this paper, we present some conclusions arising from the experience gained in detailed TRNSYS dynamical simulation of some of the first commercial solar heating and cooling installations recently implemented in Spain, and analyse their perspectives in comparison with other solar cooling options.

Index Terms- Solar cooling; Solar energy; Absorption; Dynamic simulations; TRNSYS

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