INNOSTORAGE – USE OF INNOVATIVE THERMAL ENERGY STORAGE FOR MARKED ENERGY SAVINGS AND SIGNIFICANT LOWERING CO_2 EMISSIONS

Beneficiaries:

Partners:

D7.2 - Report on Staff Exchanges

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1 Objectives

The objective of this secondment is to investigate the use of phase change material (PCM) to reduce energy usage for space heating. This secondment builds on the previous work which we started during the previous secondment in 2016.

2 Introduction

Thermal storage is one of the promising technologies to reduce energy requirements for space heating and cooling. However, thermal storage systems are usually large and aesthetically unacceptable. Researchers have investigated the integration of PCM energy storage into the buildings components, such as façade and structure (de Gracia et al. 2013c; Navarro et al. 2015). This integration allows reducing the size of the required thermal storage as well as providing an aesthetically acceptable system. The experimental results demonstrate that this type of thermal energy storage systems can significantly reduce energy requirements (de Gracia et al. 2013b). To test this type of thermal energy storage under different conditions and configurations, a numerical model for cooling has been developed (de Gracia et al. 2013a). The work presented here complement the model for cooling by developing a numerical model for heating applications.

3 Description of work

The research work in this secondment consisted of optimising PCM temperature for maximising energy delivery during the winter season.

4 Methodology

The research work in this secondment consisted of improving the previously developed numerical model to allow its integration with the optimisation tool (GenOpt).

5 Results

Preliminary results show that the optimisation of PCM temperature is not trivial and depends on the optimisation objective. For instance, the required PCM temperature that maximises energy delivery is different from that that maximises energy delivery after sunset.

6 Outcomes or future work

A journal paper is being written that describes the numerical model and the results of PCM optimisation for multiple energy delivery objectives. A few ideas for future work have also been discussed which focused mainly on enhanced learning techniques and predictive control for managing energy storage.

7 References

de Gracia, A, Navarro, L, Castell, A & Cabeza, LF 2013a, 'Numerical study on the thermal performance of a ventilated facade with PCM', *Applied Thermal Engineering,* vol. 61, no. 2, 11/3/, pp. 372-380.

de Gracia, A, Navarro, L, Castell, A, Ruiz-Pardo, Á, Alvárez, S & Cabeza, LF 2013b, 'Experimental study of a ventilated facade with PCM during winter period', *Energy and Buildings,* vol. 58, 3//, pp. 324-332.

de Gracia, A, Navarro, L, Castell, A, Ruiz-Pardo, Á, Álvarez, S & Cabeza, LF 2013c, 'Thermal analysis of a ventilated facade with PCM for cooling applications', *Energy and Buildings,* vol. 65, 10//, pp. 508-515.

Navarro, L, de Gracia, A, Castell, A, Álvarez, S & Cabeza, LF 2015, 'PCM incorporation in a concrete core slab as a thermal storage and supply system: Proof of concept', *Energy and Buildings,* vol. 103, 9/15/, pp. 70-82.

8 Assessment

Although this secondment was relatively short, it provided a great opportunity to discuss research ideas and continue the previous work. If a new opportunity arises, I will not hesitate to visit the research group (GREA) again at the University of Lleida and continue the interesting research work together.