

## A New Perspective: The Use of Low-Cost Phase Change Material in Building Envelope System

**Authors :** Andrey A. Chernousov, Ben Y. B. Chan

**Abstract :** The use of the low-cost paraffinic phase change material can be rather effective in smart building envelopes in the South China region. Particular attention has to be paid to the PCM optimization as an exploitation conditions and the envelope insulation changes its thermal characteristics. The studied smart building envelope consists of a reinforced aluminum exterior, polymeric insulation foam, phase change material and reinforced interior gypsum board. A prototype sample was tested to validate the numerical scheme using EnergyPlus software. Three scenarios of insulation thermal resistance loss ( $\Delta R/R = 0\%$ ,  $25\%$ ,  $50\%$ ) were compared with the different PCM thicknesses ( $t_P=0, 1, 2.5, 5$  mm). The comparisons were carried out for a west facing enveloped office building (50 storey). PCM optimization was applied to find the maximum efficiency for the different  $\Delta R/R$  cases. It was found, during the optimization, that the PCM is an important smart component, lowering the peak energy demand up to 2.7 times. The results are not influenced by the insulation aging in terms of  $\Delta R/R$  during long-term exploitation. In hot and humid climates like Hong Kong, the insulation core of the smart systems is recommended to be laminated completely. This can be very helpful in achieving an acceptable payback period.

**Keywords :** smart building envelope, thermal performance, phase change material, energy efficiency, large-scale sandwich panel

**Conference Title :** ICSEST 2015 : International Conference on Sustainable Energy Sources and Technologies

**Conference Location :** Rome, Italy

**Conference Dates :** May 05-06, 2015