The ideal ETFE fenestration: The influence of material properties on thermal performance

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Abstract

The obvious benefits of ETFE – constructions opposed to glas, regarding weight, and flexibility, have generally to be traded in by inferior properties and options regarding thermal behavior. In this paper we present a general overview on the current development and recent activities at HFT Stuttgart in the context of ETFE cushion research. The main emphasis is placed on the numerical simulation of the heat transfer and energy consumption of buildings with various ETFE roof, façade or fenestration constructions.

Starting from theoretical considerations on the thermal behavior of ETFE cushions, we embark on the quest to explore the most suitable methods for modelling of said thermal behavior of ETFE cushion constructions.

We compare various methods of modelling and evaluate the calculations with regard to the reproduction of experimental data. We will elaborate on the influence of various methods for altering the thermal and visual properties of the material, like surface treatment, electrochromic or physical shading mechanisms and sheet configuration, on the energy consumption of hypothetical buildings in terms of heating and cooling loads.

Numerical simulations will be shown, in order to shed some light on the expectable energetic efficiency of said measures, which are investigated within the course of several research projects at HFT Stuttgart (Follow-e, Flex-G, FMESG). The outcomes of these research activities will ideally put ETFE cushions further on par with commercially available glas fenestration systems in terms of thermal efficiency.

References

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