Development and implementation of a water-flow glazing model in TRNSYS

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ABSTRACT

Legal regulations state that from 2020 on all new buildings, in Europe must fulfil Nearly-zero building requirements established in EPBD. Moreover, beyond 2020 EU aims to achieve low and zero-emission building stock by 2050. On this context, active facades acting as Building-Integrated Solar Thermal (BIST) collectors are called to perform a key role in new buildings, since they allow to adapt the envelope of the building dynamically to the ambient changing conditions.

Among active glazings, Water-Flow Glazings (WFGs) can dynamically change their U-value, and solar heat gain coefficient SHGC (g-value). These properties may give rise to save energy in buildings under specific conditions. Before their construction, energy consumption prediction of buildings is achieved by Building energy modelling (BEM) software. This software is usually designed to use windows as passive elements where thermal characteristics as U-value and SHGC (g-value) remain constant along with the simulations. When a heat balance of a common window is performed, the energy gained as incident solar radiation is mainly reflected or transmitted to the internal ambient of the building (since after some time the system achieves equilibrium state where the energy absorbed and the energy emitted by the glasses is the same). Unlike common glazings, in WFG a part of the incident radiation is not rejected either transmitted, but it is absorbed by the flowing water across the chamber. This makes that commercially available BEM software is not able to properly simulate WFGs. An adaptation of the existing model of WFG is presented and a solving method is implemented as a Type of TRNSYS to calculate WFG working variables.

References

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