



FP7-ENERGY-2013-1

Research and development of innovative solar thermal facades

FLUIDGLASS

Solar Thermal Glass Facades with Adjustable Transparency

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Intermediate LCA report

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Executive Summary

For the FLUIDGLASS-LCA a method is established, the system boundaries are defined, an inventory analysis for the so far known components are made and impact assessments are done.

Outcomes are:

- With the current design, no hazardous substances according to the LCA standards were identified. Any adverse effects of nanoparticles on the environment could not be investigated within this LCA study.
- The primary energy demand of the FLUIDGLASS façade within the production stage and the component replacement within the use stage over the whole life cycle of the building will be approximately up to 50% of the energy demand for cooling and heating within the use stage. The selection of the FLUIDGLASS components has a great influence on the overall balance of the FLUIDGLASS facade.
- A FLUIDGLASS façade requires a little bit less primary energy as the comparable reference scenario – sun protection glass façade, façade integrated solar thermal collectors and heating and cooling ceiling - if production, use and End of life stage are considered during the 50 years life-cycle.
- The thermal and visual comfort with a FLUIDGLASS façade is much better than with sun protection glazing.
- The simulation results of FLUIDGLASS compared to the reference scenario show the importance of an intelligent control strategy of the FLUIDGLASS. Without coloring, the energy demand for heating and cooling during the use stage of the FLUIDGLASS will be higher than the benchmark scenario with sun shading glasses (see also D4.1)
- The selection of the antifreeze fluid additives has a great influence on the LCA. Propylene glycol has a significant environmental impact, especially if it is replaced every 5 years. The amount of antifreeze should be properly selected for each site (climate conditions), the less the better. The time intervals for fluid replacement should be as long as possible.
- On district level for the use stage, one office building (5700 m² floor area) and up to nine residential buildings (25200 m² floor area) need less primary energy with a FLUIDGLASS energy network than with decentralized gas or oil boilers in Munich. The primary energy savings are approximately 90 MWh/a for FGS compared to gas and oil. The reduction of CO₂ equivalent is approximately 9 t/a compared to gas and approximately 95 t/a compared to oil.

The FLUIDGLASS LCA needs to be an accompanying process during further developments of the FLUIDGLASS.

The economical LCA has been conducted based on currently expected values for element cost and energy savings. The results show a significant savings potential during the operating phase, but also the need to reduce investment costs for the elements in order to allow a financially beneficial use of FG over its lifetime. Since this is essential as sales argument once a mass market penetration is attempted, the cost aspect of the design will have to be given high attention during the exploitation of the product.