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ROBUST

WP 1.7: Innovative Cladding Systems

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8 Seiten einschließlich Deckblatt

Content

1 Integration of photovoltaics (PV)

The integration of solar cells into the building envelope allows the generation of electricity by solar irradiation. Flexible thinfilm solar cells can be laminated on a coated steel sheet, e.g. Thyssen Solartec (Fig. 1).

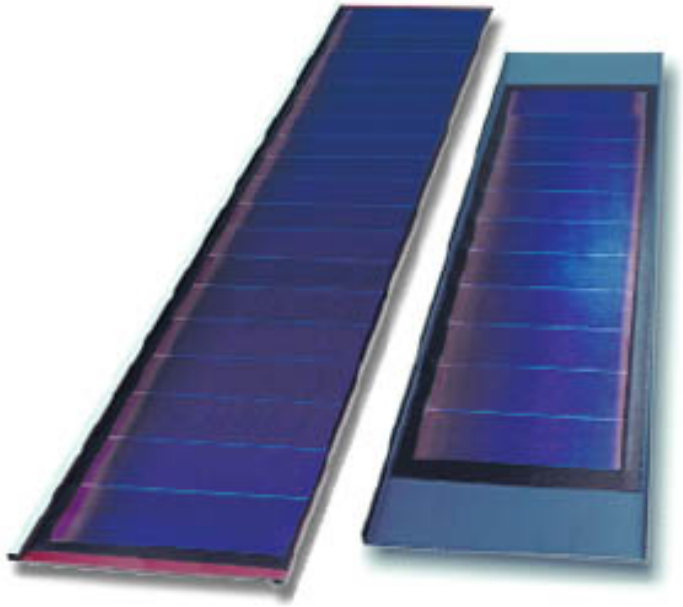

Fig. 1: Thyssen „Solartec“

A similar solution using an aluminium cladding is Aluplus Solar (Fig. 2), which applies flexible solar cells as a „solar film“ directly on the metal sheet.

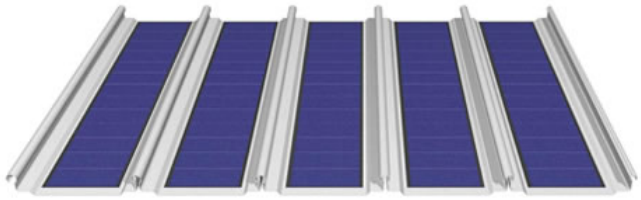

Fig. 2: Corus Kalzip „Aluplus Solar“

The Thyssen solartec mono element combines thinfilm PV-modules with a steel-sandwich panel (Fig. 3), that means thermal insulation and renewable energy is combined in one product.

Fig. 3: Thyssen solartec mono

The solutions shown above require a new cladding of the building (roof or facade). Further solution exist to add PV-elements on existing metal claddings (Fig. 4, Fig. 5).

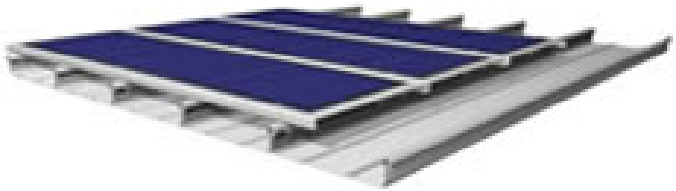

Fig. 4: Corus Kalzip „Solar Clad“

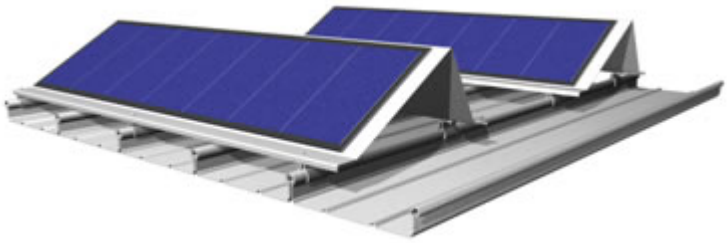

Fig. 5: Corus Kalzip „Solar Clad angled“

2 Integration of solar-air-collectors

A very cost efficient solution to integrate a renewable energy system is the unglazed transpired air collector (UTC) like the Solarwall system. A perforated external cladding is heated up solar irradiation, external air is aspired through this perforated sheet and pre-heated on its way through the cavity (Fig. 6). In consequence, this system can only be used if a mechanical ventilation system is foreseen.

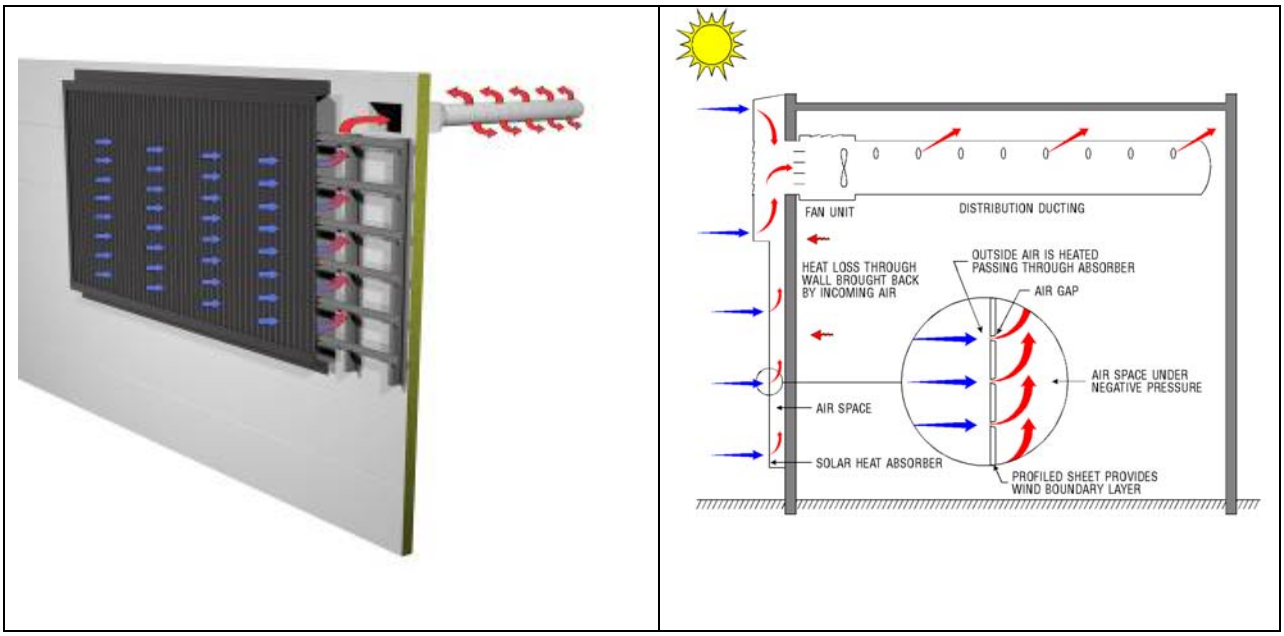

Fig. 6: Unglazed transpired air collector „Solar Wall“

3 Other techniques

3.1 Dynamic Insulation

Two principles of dynamic insulation are presented:

a) Insulation with an internal air flow

Fig. 7 shows an insulation element with integrated channels. The supply air for a mechanical ventilation system is aspired through these elements, in consequence the energy losses to the surrounding can be partly recovered by pre-heating the inlet air. The quantity of the airflow determines the amount of recovered energy.

Fig. 7: Dynamic insulation “Energyflo cell”

b) Vacuum insulation panel with switchable vacuum

Vacuum insulation panels show very high thermal performance with a reduced thickness. Normally the pressure in the vacuum panel is fix, any changes should be avoided.

On the other hand, if the pressure in the element can be controlled, switchable insulation properties can be obtained (Fig. 8).

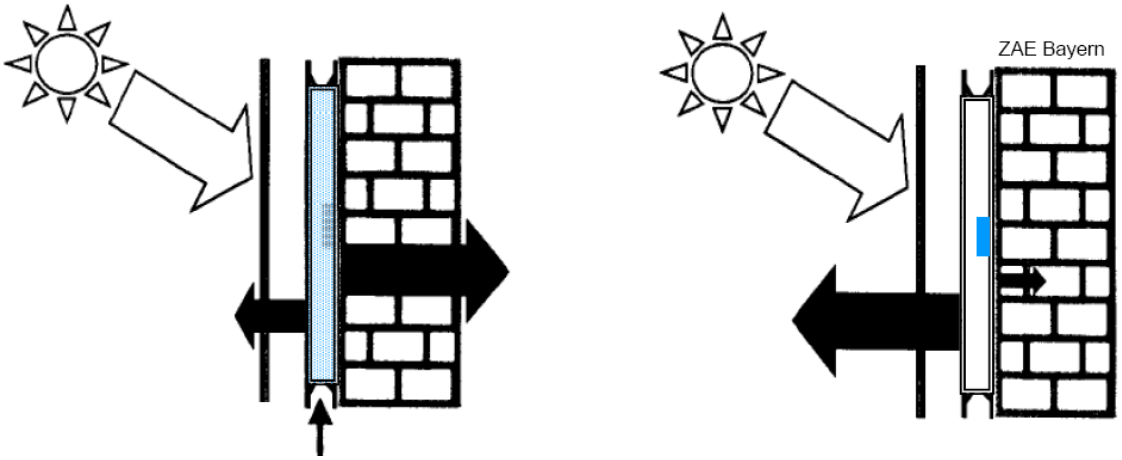

Fig. 8: Dynamic insulation by varying internal pressure of VIP

3.2 Thermal inertia

The use of thermal inertia is beneficial mainly for the summer case to reduce overheating and the demand for cooling energy (reference: EEBIS). Some options exist to improve the thermal inertia in renovation:

a) Remove claddings of internal decks (false ceilings) to expose the existing thermal mass. This option assumes, that the deck system has a noteworthy mass (equivalent 10 cm of con-

crete, e.g.) and that the functions of the false ceiling are not indispensable (aspects: acoustics, fire).

b) Integration of additional thermal inertia (PCM)
Phase Change Material (PCM) offers the possibility to implement relevant thermal inertia with very low additional weight. Process of melting absorbs a high amount of energy, therefore materials have to be used with a melting temperature of about 24 °C. Fig. 9 shows an example for the integration of PCM-filled bags in a suspended ceiling.

Fig. 9: Implementation of PCM in a suspended ceiling (Product: Dörken Delta Cool 24)

3.3 Solar shading

The improvement of solar shading is also a relevant aspect in renovation. If the thermal losses reduced by better insulation and less ventilation losses, the tendency to get unwanted high internal temperatures is increasing. Therefore sufficient solutions for solar shading are a must to reach sufficient indoor climate over the year. Solutions in steel, and in particular stain-less steel are on the market (Fig. 10).

Fig. 10: External solar shading in stainless steel (GKD, Düren)