The Integral “SUN2000” modular collector has been developed by SK Solar energiesystem. One particular feature of the collector consists in the fact that it can be mounted without the use of tools. This solid aluminum collector can be connected to the adjacent module without soldering or the use of screws. The connecting element also provides for airtightness and workmanship.

The special frame design facilitates an absolutely tight integration of the collector into the roof. A great metal wedging system is available as an optional accessory. Low iron prismatic solar glass and a vacuum coated absorber are further features of this collector system.

The first test facade will be mounted on different wall constructions (reinforced and lightweight) in order to analyze the potentially different behavior of these two “wall-collector” systems. The second test facade for an office building at St. Veit is currently being developed by GREENoneTec. This project will use a collector mounted on a massive wall (25 cm wall system using highly porous bricks). The planned gross area will be 25 m². The collector will use selective surface coating.
The back was measured for wall systems with and without collectors. From these data the temperature gain as compared to the system wall – collector. For the summer period, heat transmission (W/m²K) for the condition of the wall to the space at the position of the building. The following projects have been selected.

The term facade-integrated solar collector refers to the collector that is directly mounted on the facade with thermal insulation on the back serving as insulation for the facade. There is no thermal separation between the facade and the structural elements of the building as ventilation on the back of the collectors is not possible. These elements are thus in a continuous thermal link. The facade-integrated wall, used as a structural component in the art of the building and in view of the economic efficiency as the collector fulfills various functions in a given building complex.

FACADE INTEGRATION OF THERMAL SOLAR COLLECTORS

The facade-integrated concept serves not only as collector, it also serves as thermal insulation and as a formal element of the facade. This multi-purpose use of building components may result in a constructive, hydraulic, and esthetically appealing solutions. The goal consists in developing constructive, hydraulic, and esthetically appealing solutions for the above mentioned items and to provide manufacturers, planners, and architects with the basic data for the implementation of facade-integrated solar collectors. The simulations also showed that the facade-integrated collector had a positive influence on heat loss (transmission in winter) by reducing the U-value. The simulative scenarios showed a reduction of U-value of walls as well as compared to a wall construction without collectors. On a winter and with an intense irradiation effective U-values were reduced by 22%, according to the static U-value, despite on wall construction. On days with low irradiation, the collector acts as “passive solar element” on account of its direct integration into the facade. The facade-integrated concept was tested in real installations with the required collector area to yield the same solar fraction as installations with higher than the solar fraction of the installation.

The simulations showed that for the Freeze días in an innerartmental family with medium high heat demand the area of a facade-integrated collector must be increased by a factor of 1.5 as compared to a 45° tilted collector. In order to achieve a 40% solar fraction, if the solar fraction to be increased further, the area of vertical collectors has to be increased by 50%. The results presented in this paper are a multi-family dwellings yielded similar results. The simulations including space heating showed quite different results. The larger the collector area (thus, the saved cover ratio), the smaller the difference in required collector area for 90° and 45° tilted surfaces, respectively, for the same given solar fraction. In other words, the percentage of additional collector area needed in the facade decreases. The reason for this lies in the fact that the solar fraction for space heating decreases with increasing collector area and doubles at 45° as compared with the cover ratio in the case of hot water preparation only. The following projects have been selected.

The term facade-integrated solar collector includes not only the collector, but also the thermal insulation for walls with and without collectors from a room in winter, the facade-integrated collectors benefit from increased insulation through radiation from snow which has largely negated until recently.

In order to be able to evaluate the dynamic behavior of the system “wall-collector”, the heat flow has been calculated for a selected wall construction. The simulations also showed that for the Freeze días in an innerartmental family with medium high heat demand the area of a facade-integrated collector must be increased by a factor of 1.5 as compared to a 45° tilted collector. In order to achieve a 40% solar fraction, if the solar fraction to be increased further, the area of vertical collectors has to be increased by 50%.

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The back was measured for wall systems with and without collector. From these data the temperature gain as compared to the space at 20 °C serves not only as collector, it also serves as radiant surface. The purpose of these calculations was to identify problems of overheating in the case of high irradiation and to develop an insulation requirement to avoid overheating. In addition, the test series examined the influence of the three-dimensional design of the facade on the heat loss of the wall construction through transmission in winter. For the summer period, heat transmission (W/m²) of the building envelope was reduced by a factor of 2 for facade-integrated collector systems. These results are compared with a room wall constructed without collector. One of the criteria to define minimum insulation requirements for walls with a facade collector was that the temperature increase in comparison to a non-collector wall must not exceed 1.0 K. This prerequisite resulted in the following insulation thicknesses:

5 – 8 cm collector insulation

The companies AEE INTEC, GREENenergy ONE, and SIKO Energie have developed a modular collector “SUN 2000”, which can be installed without tools.

The term facade-integrated solar collector refers to collector elements which are directly mounted on the facade with thermal insulation serving as insulation for the collector. There is no thermal separation between the structural elements as a ventilation on the back of the facade elements. These facade elements with a threedimensional design constitute an essential improvement, especially in comparison to conventional ventilation.

PRELIMINARY RESULTS

The term facade-integrated solar collector hence has advantages when used in large structures such as buildings and halls for trade and industry as well as for new construction as well as for the renovation of existing building stock. The aim consists in the development of a facade collector element with a U-value of < 0.20 (W/m²K) for the system wall – collector.

The project temperature and humidity were measured in all layers of the wall structure. The measurement programs were to be completed in the facade as well as a control system with an adapted storage management for facade-integrated collector installations.

In the testing installations used in the framework of the project temperature and humidity were measured in all layers of the wall structure. The measurement programs were to be completed in the facade as well as a control system with an adapted storage management for facade-integrated collector installations.

Simulations have shown that for the facade-integrated solar collector the disadvantage of a reduced global annual irradiation on the facade increases with growing inclination angles of the solar fraction of the installation.

The term facade-integrated solar collector has a positive influence on heat loss (energy reduction) in winter (by reducing the U-value). The test series showed a reduction of up to 45% compared to a wall construction without collector. On cold winter days with intense irradiation effective U-values were reduced by up to 40%, in comparison to the static value, due to the heat loss of the facade. On days with low irradiation, the collector acts as “passive solar element” on account of direct integration into the facade. On days with low irradiation the reduction of the U-value still reached as much as 45%.

Solar Coop, which is a joint venture of the companies AEE INTEC, Erneuerbare Energie, Institut für Nachhaltige Technologien (Erneuerbare Energie, Institut für Nachhaltige Technologien) is studying the systemic, building physical and solar technical fundamentals for the construction of facade-integrated solar collector installations.

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The back was measured for wall systems with and without collector. From these data the temperature gain as compared to a room without collector must not exceed 1 K. This prerequisite resulted in the following insulation thicknesses:

- System wall – collector.
- For the summer period, heat transmission through the facade caused only minimum additional costs or even reduces overall costs. In the testing installations used in the project temperature and humidity were measured in all layers of the wall structure. The measurement programs were to identify problems of overheating in the case of high irradiation and to define minimum insulation requirements to avoid overheating of the absorber (also in the inactivated state) on the heat loss of the wall construction through transmission in winter.

The facade-integrated solar collector refers to collector elements directly mounted on the facade with thermal insulation of the building also serving as insulation for the facade. There is no thermal separation between the building envelope and the structural elements of the facade as a ventilation on the back of the collector is not possible. These elements are 40 mm thick, 60 mm thick or 80 mm thick. The facade-integrated solar collector is an innovative concept that allows for the integration of solar thermal collectors into the facade of a building and thus, the integration of collectors in the facade causes only minimum additional costs or even reduces overall costs. With a view to a broader market introduction it is therefore necessary to develop sophisticated solutions for the integration of collectors in the envelope.

In order to be able to evaluate the dynamic behavior of the system “wall-collector”, the heat flow has been calculated for two selected wall constructions. Other typical wall constructions have also been considered in this paper in the specific investigation program. One of the criteria to define minimum insulation requirements for walls with a collector is that the temperature increase in comparison to a non-collector wall must not exceed 1 K. This prerequisite resulted in the following insulation thicknesses:

- Isolation wall – collector.
- Insulation profile in flat collectors: For the isolations of the required collector area to yield the same solar fraction as installations with 45° tilted collectors.

The simulations also showed that the facade-integrated collector had a positive influence on heat transfer in winter by reducing the U-value. The winter scenario showed a reduction of U-values of all cases accompanied to a wall construction without collectors. On cold winter days with an external temperature of -10 °C the inside temperature of the wall construction with an internal temperature of 20 °C is approximately 10 °C higher.

The facade-integrated collector serves not only as an element, it also serves as thermal insulation and as a formal element of the facade. This multi-use property of facade-integrated collector systems results in a reduction of costs. In addition, facade-integrated collector systems consist of a reduction in daylight. The facade-integrated collector consists in a reduction of costs. In addition, facade-integrated collector systems consist of a reduction in daylight. The facade-integrated collector consists in a reduction of costs. In addition, facade-integrated collector systems consist of a reduction in daylight. The facade-integrated collector consists in a reduction of costs. In addition, facade-integrated collector systems consist of a reduction in daylight.
INTEGRAL “SUN 2000” MODULAR COLLECTOR

The Integral “SUN2000” modular collector has been developed by SKO Energiesysteme. One particular feature of the collector consists in the fact that it can be mounted without the use of tools. This solid aluminium collector can be connected to the adjacent module without soldering or use of screws. The connecting element also provides for frame-free operation of the absorber in any temperature range as the thermal expansion is compensated in the connecting element itself. Flow and return piping, too, can be snapped on without the use of tools.

The special frame design facilitates an absolutely tight integration of the collector into the roof. A smooth metal wiggling system is available as optional accessory. Low iron prismatic solar glass and a vacuum coated absorber are further features of this collector system.

Technical data

- Dimensions: W/L/H: 1070 / 2070 / 130 mm
- Weight: 50 kg / collector

Applications

- Roof integration
- Rointop mounting
- Detached installation

The integral “SUN2000” modular collector has been developed by SKO Energiesysteme. One particular feature of the collector consists in the fact that it can be mounted without the use of tools. This solid aluminium collector can be connected to the adjacent module without soldering or use of screws. The connecting element also provides for frame-free operation of the absorber in any temperature range as the thermal expansion is compensated in the connecting element itself. Flow and return piping, too, can be snapped on without the use of tools.

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The special frame design facilitates an absolutely tight integration of the collector into the roof. A smooth metal wiggling system is available as optional accessory. Low iron prismatic solar glass and a vacuum coated absorber are further features of this collector system.
The test facades will be mounted on different wall constructions (reinforced and lightweight in order to analyze the potentially different behavior of these two "wall-collector" systems.

The second test facade for an office building will be currently developed by GREENoneTEC. This facade will use a collector mounted on a man-made system (30 m² wall system with highly porous bricks). The planned gross area will be 25 m², the collector will use effective surface coating.

The projects will be active until the end of 2003. The results of the measuring programs are to serve as a database for sizing and planning the implementation and broad marketing of this innovative technology.