AventaSolar collector system

INFO Sheet B16

Description:	*Instead of replacing major components of conventional materials with polymeric components, the present concept modifies conventional solar heating system design for optimal use of polymeric materials*
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Introduction

The motivation for the development of the AventaSolar concept was to offer architecturally appealing and cost competitive solutions for solar thermal energy production to the end user.

AventaSolar collector

An innovative part of the AventaSolar collector is the absorber, consisting of extruded, polyphenylene sulfide (PPS) sheets (Figure 1). Aventa together with the raw material supplier and processing partners have been worldwide pioneers to demonstrate the extrusion of high temperature performance polymers to structured sheets (Köhl et al., 2012).

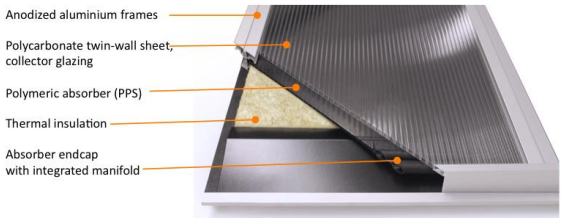

Figure 1: Components of the AventaSolar collector module

Main characteristics

Modular, adaptable, light-weight **–** The collector has a modular design with units of 60cm width and various collector lengths between 200cm to 500cm. Hence the collector's size is rather flexible and adaptable to almost any roof or facade shape. The weight of the collector per square meter is considerably lower (approximately 8kg/m^2) than conventional flat plate collectors of metals and glass. The low weight opens new ways for the design and easy handling of large modules (up to 5m length) reducing the amount of inter-connections.

Building modules **–** The availability of various module lengths together with the functional design of replacing conventional roof- or facade covers makes the AventaSolar collectors multi-functional modules, covering buildings' roofs or facades and producing thermal energy. The collector design is such that the thermal insulation of the building also acts as collector insulation where possible. Both aspects contribute to cost savings in terms of materials and installation. The intention with developing this design is to create architecturally appealing solutions, which inspire decision makers and planers to take solar thermal technology in use.

Simple system design **–** The present collector is part of drain-back system with non-pressurized solar heating loop, being open to atmospheric pressure, not having intermediate heat exchangers between the collector loop and the heat buffer store volume. The present solar heating concept has a simple system

design, avoiding various state of the art components included in conventional solar heating systems (Figure 2, right): Antifreeze liquid, expansion vessel, overpressure safety valve, heat exchangers between heat buffer store volume and solar/floor loop. All important components as shunts valves, solar pump, floor circulation pump and system controller are pre-installed at the front panel of the Aventa heat buffer store in the factory and are all – for easy logistic in the boiler room – placed on one side of the heat storage.

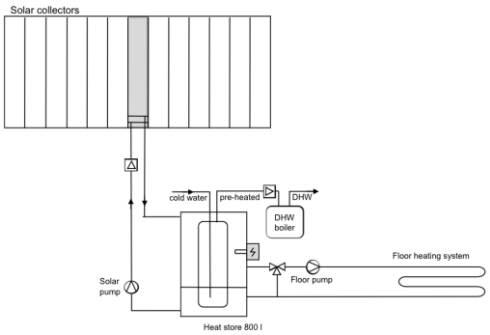

Figure 2: Façade integrated AventaSolar collectors (left) and hydraulic design (right).

Building integration, installation, cost savings **–** The above mentioned aspects make the AventaSolar collector suitable to be mounted by roof or facade installers during the building/retrofit process. The installation time of the collector is in the same order of magnitude as for conventional roof- or facade covers. For the collector installation, the weight of all parts is below the limit for being handled by one person. Due to the fact that the solar collector loop is not pressurized, the on-roof or on-facade installation does not require authorized HVAC installers, but can be carried out by skilled roof- or façade experts. In the collaboration with building industry, the involved actors in the distribution chain are reduced, logistics at the building site is improved and resulting in overall cost savings for the end customer. The production method of the absorber and the collector cover offer a large potential for cost reduction, especially when large production volumes can be obtained (extrusion and moulding).

Environmental friendly because of more favorable LCA figures compared to conventional collector systems (Carlsson et al., 2013; Task 39 Info Sheet A4), reduction of system components and using pure water instead of antifreeze liquid.

Favorable applications for the AventaSolar concept are systems for combined DHW preparation and space heating (solar combisystem) or solar DHW systems with large DHW consumption (hospitals, nursing homes, sport centers, hotels, etc.).

References, further reading

[1] Köhl et al., 2012. Polymeric Materials for Solar Thermal Applications, Weinheim: Wiley-VCH, 2012. ISBN: 978-3-527-33246-5.

[2] Carlsson B., Persson H., Meir M., Rekstad J.: A total cost perspective on use of polymeric materials in solar collectors - Importance of environmental performance on suitability, Applied Energy 125 (2014) 10–20.

[3 Carlsson, Bo, 2014. Task 39 Info Sheet A4: Total cost accounting approach; http://task39.iea-shc.org/publications.