WP1.D4 / DESIGN AND INSTALLATION GUIDELINES FOR THE NEW SYSTEM GENERATION

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CONTENTS

SUMMARY

This document gives general recommendations on the design of small solar heating systems and informs about the installation guidelines prepared for the new system generation. Also it lists the events in which the knowledge derived from the evaluation of the new generation of solar thermal systems was disseminated to installers, manufacturers and the solar industry.

LIST OF EXISTING DESIGN AND INSTALLATION GUIDELINES

In addition to design and installation guidelines for new solar thermal system concepts existing guidelines were examined and listed. The result is a database with 78 entries, called “list of solar thermal engineering guidelines” (/Vog07/). Items listed include publications in various languages and some from non-European countries.

The database

- yields general information on the titles: E.g. the year of publication, the authors and the country of origin
- informs about the basic contents: E.g. it specifies whether there is information regarding system design, dimensioning, fundamentals or economics and whether it contains examples or summarizes experiences. Also it specifies whether the document focuses on small or large scale systems; solar domestic hot water systems or combisystems; collectors; stores; other components; materials or innovative system designs.
- tells about the target group (installers, planners, manufacturers or students)
- informs about the style of the publications listed
- specifies whether it is available free of charge or gives the approximate price and tells the interested reader from where it can be purchased or downloaded.

The database was set-up in a common and editable format in order to serve as a starting point for further work. Therefore, it is easy to improve, reduce or personalise the information. The file can be downloaded from the project website (/NEGST/).

DESIGN AND INSTALLATION GUIDELINES OF THE NEW GENERATION OF SYSTEMS

Recommendations for the design of small scale solar thermal energy systems

From the analysis of the new generation of solar thermal systems the following recommendations can be made for the design of small scale solar thermal heating systems.

Standardisation

Solar thermal heating systems should be designed for reasonable production numbers in order to achieve competitive costs. Concepts which comply with a large variety of requirements widen the range of application and give access to a larger market. (E.g.: a modular design which is optionally available with an optimised integrated auxiliary heater, but can alternatively be combined with an existing boiler; or: a concept which can often be used in conjunction with an existing water heater store, but which is also a competitive solar heating system in a new house). Flexibility due to modular design might help bridging the gap between the need for a high degree of prefabrication and the restrictions imposed by the large diversity required by the market.

Simplification and reduction

Systems should be designed for easy installation. This includes the technical integration in an existing heating system. It is expected that the size of the solar heating systems in one family houses increases (/Bok06/). Therefore the reduction of the amount of material used will have a crucial impact on both the cost and the amount of embodied energy used. Besides increasing efficiency, ways to reduce the amount of material used are: optimize the storage of solar heat by minimizing the storage of heat from the auxiliary heater; use lean concepts, e.g. non-pressurized tanks or recombine the functions of several components in one component.

Adaptation

Concepts used in one particular climate, country or market may be adapted and transferred to another market. Refer to the theoretical evaluation of the promising system concepts (/Vog06/) for examples of the type “adaptation” among the evaluated system concepts.

Reduced maintenance

Several concepts of the new generation of systems aim at reducing maintenance. Besides auto-diagnostics and a design with few, but reliable, components the focus lies on avoiding problems with glycol decomposition by using an appropriate system concept. Several of the systems, representing the new generation, follow this track. However, different approaches are possible. Regarding the evaluated systems, the approaches include the unique AquaSystem (/Abr06/); a drainback system with anti-freeze in the collector loop (/Wil06a/, /Wil06b/); a drainback system with a non-pressurized tank and a collector loop which uses water as the heat transfer fluid (/Rek06/). A good description of the drainback technology is given by Huib Visser and Markus Peter in /Wei03/.

Improved efficiency

Economic ways to increase the system efficiency are used in several of the new system concepts: the optimization of the storage management and an efficient utilization of the auxiliary heater. These concepts are the compact combisystem unit with gas auxiliary heater (REBUS-gas /Thü06/), the unit with pellets auxiliary heater (REBUS-pellet, /Lor06/) and the compact heating unit for solar domestic hot water (SDHW) preparation (auroCOMPACT, /Ima06/).

Installation guidelines of the new generation of systems

This section informs about the various guidelines prepared for the installation of systems representing the new generation. There are important aspects and relevant details which are specific to each system concept. The transformation of the system concepts into products requires installation procedures which are more specifically related to the products than to the various concepts applied. The diversity of the systems and system concepts made it impossible to write installation guidelines which are generally applicable. Therefore, guidelines were formulated specifically and only for those systems concepts for which respective products had been developed to the state of market introduction. Being product related, some installation guidelines are not public ("restricted distribution"). The developing companies of the REBUS gas and REBUS pellets systems (MetroTherm AS and Solentek AB) are in the process of deciding upon a commercialisation plan. As yet no installation guidelines specific for these systems have been created and also no courses for installers have been made. (At the end of NEGST project in summer 2007 the REBUS systems are still in the process of testing. Results of field tests are available from NEGST /WP1.D5/.)
The experiences made with the design and the development of the new generation of solar thermal systems were transferred to a broad audience in special workshops. The important target groups (manufacturers and planners) were addressed. On the same occasions also the results of the field evaluation were presented. The companies which have successfully introduced their systems of the new generation into the market, organized training seminars for designated installers on a regular basis. (E.g. until November 2006 the company Paradigma – the manufacturer of the AquaSystem, which employs the system concept with water filled collector loop – has held more than 30 training courses for installers with in total approximately 300 attendees. Subsequent courses will take place with the further market penetration and the continued expansion of the sales area. Special topics of these training seminars are: special features of the system hydraulics and its integration into the existing heating system for different types of heating systems; considerations regarding the special controls and the instruction of the users.)
In the following, specific guidelines are listed.

Compact heating unit for solar domestic hot water preparation (auroCOMPACT)

Specification and installation manual of Vaillant auroCOMPACT: "Funktionsbeschrieb auroCOMPACT" (22 pages); "Installations- und Wartungsanleitung für den Fachhandwerker" (VSC S 196-C, 64 pages); "Planungsinformation Solar" (132 pages); Training: "Trainer-Leifaden auroCOMPACT und ecoCOMPACT" (82 pages, restricted distribution).

Solar system concept with water filled collector loop (AquaSystem)

Installation and operation manual of the AquaSystem: "Paradigma, PL-2007, Technische Unterlagen, AquaPaket CPC Star azz." (restricted distribution).

Drainback solar water heating system

Technical information and installation guidelines: "SECUSOL – Solarkomplettsystem: Technische Information / Montageanleitung" (20 pages with 27 figures, publicly available as pdf file on www.wagner-solar.com). Contents (selected topics): qualification of user; application; standards & guidelines; installation: preparation, mounting of the collector, installation of the heat store, connection of tap water line, installation of the solar circuit, implementation of the auxiliary heater, inserting the control device; implementation; tips for users: maintenance, failure detection.

Integrated Collector Storage (ICS)

"Installation Manual - Solior FL150 solar water heater", Solior B.V., Utrecht. Contents (selected topics): installation, maintenance, error search, windload, decommissioning.

DISSEMINATION OF GUIDELINES AND EVALUATION RESULTS

This section lists the workshops and congresses in which the experiences made in the course of the design and the evaluation of the new generation of solar thermal systems were presented and discussed.

Workshops, seminars, congresses:

- Workshop with the presentation of the compact heating unit (REBUS system)
  Date and Location: 14 November 2006, Technical University of Denmark, Lyngby
  Attendees: 75, mostly from Industry: planners, installers, manufacturers
  Special topics presented: Field test on the compact heating units (REBUS Gas, REBUS Pellets) lessons learnt, conclusions from measurements.
- Workshop with the presentation of the compact heating unit (REBUS System),
  28 November 2006, Citykonferens Center, Klostergatan 23, Örebro
  Attendees: 60, mostly from industry: planners, installers, manufacturers
  Special topics presented: Field test on the compact heating unit (REBUS Pellets and REBUS Gas) lessons learnt, conclusions from measurements.
- Presentation on the development and testing of the SOLIOR ICS solar water heater at the ESTEC 2007 conference and trade fair (/Sch07/)
- Workshop at the Intersolar trade fair, 21 June 2007: Presentation on WP1: the Next Generation of Systems: Freiburg, Germany, which included an overview and conclusions from all evaluated systems (presentation: /Vog07-2/) and a presentation of the compact heating unit with gas auxiliary (REBUS Gas) and its field evaluation (/Thü07-2/).

At the same events the results of the on-site evaluation of the new system generation were presented. Besides presentations and workshops, results were also disseminated by means of the NEGST project internet web site and the written documents listed in the section REFERENCES.

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/NEGST/ New generation of solar systems. Project description and public deliverables: http://www.swt-technologie.de/html/negst.html

Further information is available on project website:
http://www.swt-technologie.de/html/negst.html

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