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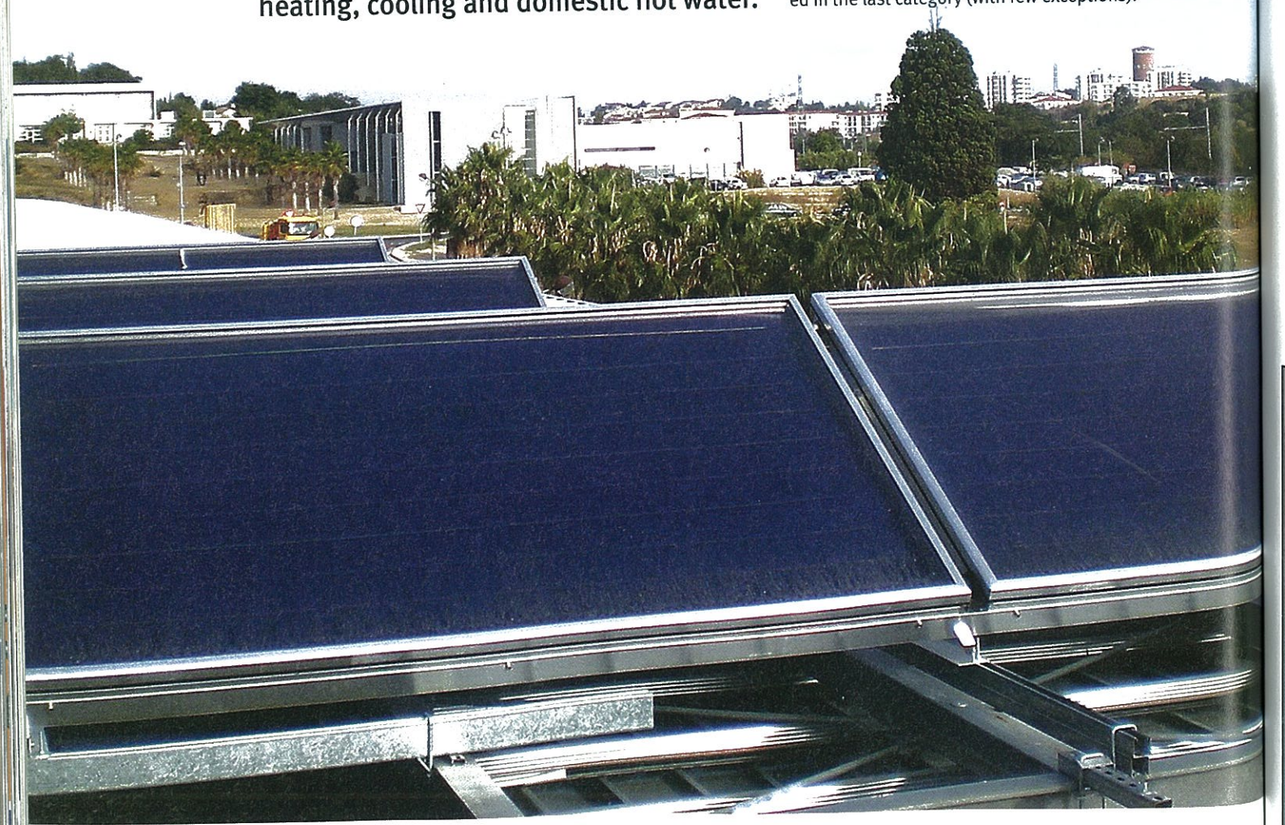
Online tool for solar cooling

In the framework of the EU-financed project SolarCombi+ researchers have developed a free of charge online tool, which gives installers the possibility of quickly and easily pre-sizing installations used for heating, cooling and domestic hot water.

SolarCombi+ online offers the possibility to any user or installer to evaluate the operation of a combined solar installation for domestic hot water, heating, and cooling in only one programme. This online tool is very easy to use. At the start-up, the user has to choose between three popular climate zones which are available in the programme. These climate zones are related to distinct European areas, which are shown on the map. The user will have to choose which climate is closest to the one of his location.

The next step is to choose the building typology from three available typologies. Two of them are residential buildings, the third is an office building. For the residential buildings, the user has to choose between a residential high-efficiency building with low energy consumption thanks to a good thermal insulation, and a relatively high energy consumption residential building (standard residential building). Most of the residential buildings older than five years would be included in the last category (with few exceptions).



For "SolarCombi+" applications, a collector size of 4 to 5 m² per kW cooling capacity is energetically optimal. The online tool suggests reasonable system configurations. Photo: Tecsol

SolarCombi+

The European project "SolarCombi+" aims at promoting standards for solar combined systems for heating, cooling and domestic hot water (systems named SolarCombi+) for small size applications. The combined use of solar energy for heating and cooling can give even more value to solar thermal energy, because due to a SolarCombi+ system, solar energy can become the number one thermal energy source in the targeted building. The project is financed by the IEE programme.

European solar cooling market

The project identifies and promotes small absorption/adsorption chillers up to a cooling capacity of 20 kW. The systems have to be standardized for basic configurations to strongly reduce the design effort for individual applications. The project partners have established "kit" solutions. The project included a market study, due to which the most promising markets were identified. Then the technology was promoted in those markets to enhance the profitability of these systems as soon as the chillers are produced on a large scale.

Simulation

Some virtual cases were developed to identify the interesting areas for these achievements. The following reference buildings were used: an office building, a residential building with high energy consumption and a residential building with low energy consumption. Research was done for these three building types, which were set in the three representative locations Strasbourg, Toulouse and Naples.

Based on the market study, the most promising system configurations for typical installations were simulated and evaluated. One of the outcomes: the applications which obtain the best energy outcome are the ones with 4 to 5 m² of collector size per kW cooling capacity combined with 50 to 75 L/m² of storage volume. This is approximately 1 m² less of collector size than with applications which are only used for solar cooling and not for solar heating or domestic hot water. The cheapest system configurations reach a solar fraction of 80 % and primary energy saving of 60 %.

Dissemination

As part of the SolarCombi+ project, some complementary dissemination actions were and will be carried out. That includes training courses for solar thermal installers, presentations for professionals, information for the public in the most promising regions, but also advice for policy makers and promotion of pilot plant installations to public authorities. Installers, planners and architects were offered workshops in the framework of Solar Combi+ to disseminate the best possible and correct application of the technology.

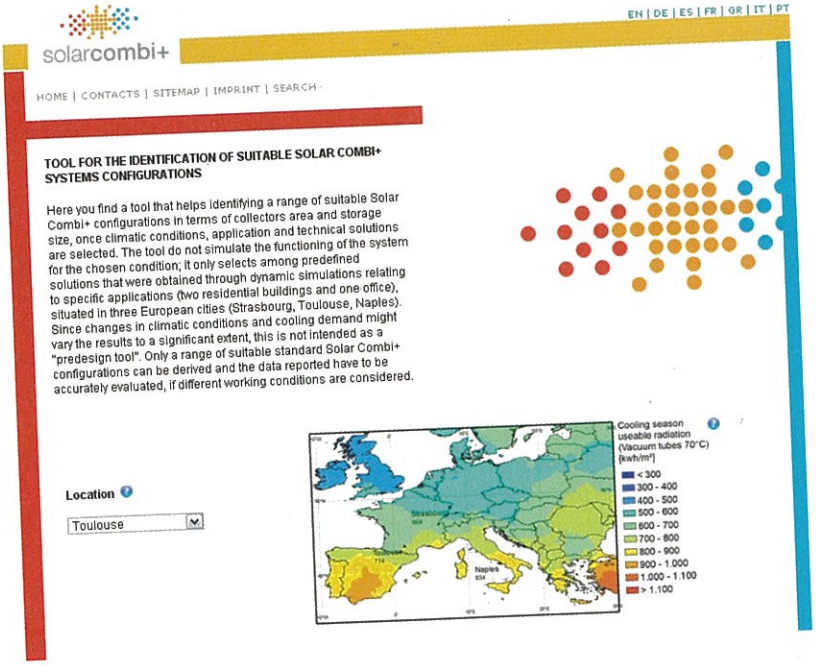
Objectives

The new standardized small scale solar cooling and heating kit will open the market for small applications, which constitutes the largest part of the heating demand, and a part of the cooling demand which is constantly increasing in Europe. The SolarCombi+ project will speed up and smooth the penetration of small scale SolarCombi+ systems in the market. As a consequence, the project will contribute to reaching the EU energy policy targets, for example the renewable energy ratio for the primary energy, or European energy supply security.

Target groups

The target groups for the project are: producers of small scale sorption chillers (absorption and adsorption), solar thermal enterprises, professional groups of traditional small scale solar thermal installers, policy makers, potential customers, architects and engineers.

Further information: *www.solarcombiplus.eu*



The input mask of the online tool: in a first step, the user must choose the location of the application. Screenshot: Tecsol

Following the typology, the user can choose the distribution technology implemented for heating and cooling. The distribution system can be fan coils or a radiant technology system (cooling ceiling). Usually, the cooling ceilings lead to the best performance. However, if it is an existing building, possibly a fan coil distribution system is already installed.

For the solar collectors, the user has to choose between flat plate collectors and evacuated tube collectors. The evacuated tube collectors are more efficient than the flat plate collectors, but they are also more expensive. As a consequence, a compromise has to be found to work out which technology is the most suitable for the user's needs.

Finally, the heat rejection technology must be selected. Three technologies are available. The first one is a wet cooling tower, the second one is a dry air cooler, and the last one is a dry cooler fitted with water sprays (hybrid cooler). If it is not essential, the cooling tower shouldn't be used, indeed it involves important annual maintenance costs, and moreover the use of this kind of device involves strong regulations to avoid the development of legionella.

To finish the calculation, the user only has to push a button, for the programme to provide results based on TRNSYS simulations for the different configurations with different sizes of solar collectors and tank storage. To respect the industrial partners' wishes, the results are presented anonymously regarding the type of chiller used. As a consequence, due to these results, the installer can design the system in a very efficient way. Besides, the user will be able to vary the different inlet parameters (collector type, heat rejection system, distribution system, etc.) and consider the energetic results supplied by the programme. Amongst the supplied results will be the used solar energy fraction, the primary energy savings, etc. Finally, based on these results, the installer will be able to evaluate in concrete terms the possibility to install or not to install a SolarCombi+ system for the building.

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SolarCombi+ online tool:
http://wis.eurac.edu/solarcombiplus/default.aspx