SOLAR UPDATE

NEWSLETTER OF THE INTERNATIONAL ENERGY AGENCY SOLAR HEATING AND COOLING PROGRAMME • NO. 38 JULY 2002

Proving the Potential of Solar Crop Drying

The combination of low temperature requirements, simple solar system design and good solar availability makes solar crop drying a logical alternative to the use of scarce fossil fuels and diminishing wood resources in many crop regions. The IEA SHC Programme is on the leading edge of developing this application through its Task 29 activities.

One of the most promising applications for active solar heating worldwide is the drying of agricultural products. In a 1999 study, jointly produced by Canada and the Netherlands, the potential amount of energy that could be displaced using solar in this market was estimated to be between 657 PJ and 1530 PJ annually.

If solar crop drying offers a sound alternative to other drying methods, why is it not more extensively used? The answer to this can be attributed to three key barriers:

- a lack of awareness,
- a lack of good technical information, and
- a lack of good local practical experience.

To tackle these barriers, the experts of SHC Task 29, *Solar Crop Drying*, are working with local companies to establish solar drying projects for a variety of crops. They also are providing technical and commercial information as well as compiling the experiences gained from the design, construction and operation of these full working demonstration systems.

The strongest market for solar drying is generally, but not always, crops that are mechanically dried at lower temperatures. Crops that are currently sun-dried are well suited to solar drying, but the financial resources to implement a solar drying system are often lacking.

The processes that are used to dry crops at temperatures greater than 50°C could benefit from solar drying as a supplemental system, but the drying process must be re-organized. Therefore, this Task is concentrating on displacing fuel-fired dryers for crops that are dried at temperatures less than 50°C. The identified potential for displacing conventional energy sources in this segment of the market is estimated to be between 216 PJ and 770 PJ, but the use of solar energy is largely undeveloped. Other than open air drying, wood and conventional fossil fuels are used most extensively. And, in many countries, more expensive diesel and propane fuels are replacing wood.

At this time, five SHC Task 29 projects have been completed in Zimbabwe, Panama and India. And, projects are under construction in China and are in the pipeline in Costa Rica, India and the United States.

Zimbabwe

In Zimbabwe, a Dutch team is working with the Tobacco Research Board of Zimbabwe to install two solar systems on drying barns at the Board's testing facility.

The first project is a thermo siphon air system using ground mounted air collectors and a rock storage bin. The collectors, designed by Zen Solar, use simple technology so that they can easily be manufactured locally. An objective of the Dutch project is to find a local partner to produce the panels and market the systems in Zimbabwe. The second project is a water-based system using market-ready hydronic solar panels and a heat exchanger.

Zimbabwe tobacco drying plant with ground mounted solar air collectors and raised solar water collectors.

In both cases, the solar system is used to preheat air going into the drying barns. Initial monitoring of the operation of these systems has been completed, and they are operating according to expectations. The monitoring also has identified opportunities to improve the design and construction of the drying barns, which should further increase the efficiency of the drying process.

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IN THIS ISSUE

Building Momentum For Solar Thermal Markets In Belgium

To increase the market share of solar energy technology in Belgium, commercial and non-profit market players are stepping forward. By combining government and industry initiatives, Belgium is entering into a new era of solar thermal energy.

Introduction

Market development of solar thermal applications in Belgium has not been able to keep up with the market evolution of other European Union member countries, and has remained at a marginal level. As a result, over the past years, commercial and non-profit market players have taken the initiative to organize themselves into several federations to support the development of the solar energy market in Belgium.

For example, these organizations have recently been able to put the issue of solar market development on the political agenda, which has given it substantial attention from public authorities over the past three years. This raised awareness of solar has led to several market development programs that are described below.

- APERe (Association for the promotion of renewable energies) was created in 1991 as a non- profit organization by some ten associations and research centers mainly active in the Walloon Region.
- ODE Vlaanderen (Organization Sustainable Energy Flanders) was established in 1996 by 22 founding members as an independent and permanent regional network in the Flemish Region.
- BELSOLAR (Belgian solar industry association), which represents two solar industry associations that merged earlier this year, BELSIA – a group of suppliers of solar equipment and Solar.be – a group of collector manufacturers.

Present Market Situation

The current solar market volume is estimated to be about 3,000-4,000 m^2 of collector surface per year for all of Belgium, with an average annual growth between 30-50% over the past three years. Although no detailed statistics are available, it is estimated that the total installed collector surface by the end of 2001 was approximately 20,000-26,000 m^2, corresponding to around 2 m^2 per 1,000 inhabitants.

Investment Subsidy Versus Market Development Action Plan

Investment subsidies for solar thermal installations have existed on different levels since the second half of the 1990s. A subsidy given by gas and electricity utilities exists at the national level and separate public programs exist for small and larger systems at regional and provincial government levels. In addition, about 100 municipal governments also provide financial support.

Depending on the location of the solar thermal installation, total investment subsidies for a residential solar installation can amount to 2,750 Euros, with the mean value around 1,500 Euros. At present, this represents about 40-50% of the total installation cost.

For medium size and larger installations a total subsidy amount of 30% (and up to 40% in the Walloon Region) of the installation cost can be obtained. Unfortunately, none of these subsidy systems have been able to create considerable market growth or initiate the development of a viable industrial sector.

To address this, active market development programs were initiated for the first time in 2000 and are becoming increasingly important. Within these programs or initiatives different aspects of the solar market development are emphasized. An overview of the present initiatives is presented in the table below. This table also indicates how these initiatives compare to two closely related European Union (EU) projects.

Figure 1 indicates which program activities pertain to solar thermal (ST) or to photovoltaic (PV) solar energy applications. It also shows three different aspects that may be addressed: quality, market development and training of professionals (installers and/or architects).

In the following paragraphs the main initiatives in Belgium are presented.

Government Initiatives

SOLTHERM Wallonia: Investing in a Healthy Solar Future

In 2000, the Walloon regional government initiated the SOLTHERM action program. It has a horizon up to the year 2010 and the aim of developing the solar industry into a commercially viable sector. Among others, this means boosting the present annual installed collector surface in Belgium of around 1,000 m^2/year to approximately 30,000 m^2/year in 2010.

To meet these objectives an integrated approach is being taken consisting of 1) promotion and information activities for the public, 2) quality initiatives in

Figure 1. Overview of market development initiatives.

	ST	PV	Quality	Market development	Training
SOLTHERM Wallonia	●		●	●	●
VLAZON	●	●	●	●	●
SWH Promotion Campaign Brussels	●			●	
Quality System BELSOLAR	●	●	●		●
SOLTHERM EUROPE INITIATIVE	●		●	●	●
SOLAR KEYMARK (ALTENER)	●		●		

continued on page 3

collaboration with suppliers and installers, 3) specific actions for larger systems, mainly support services for energy managers to help them in the decision and implementation process, and 4) a comprehensive training program for installers, architects and energy managers in non-commercial organizations. In addition, an intensified commercial promotion campaign for potential buyers and information for the public is being conducted using printed material and an Internet site, www.soltherm.be.

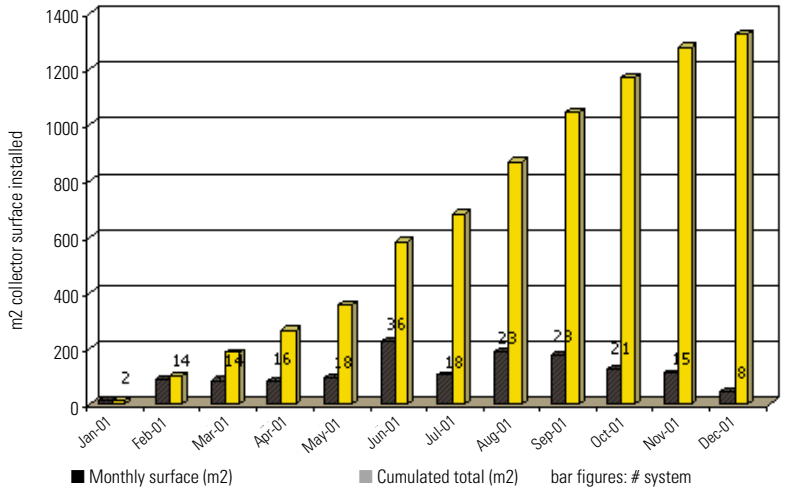
The promotion and information initiatives have had a multiplying effect. For example, a working group of "Active Municipalities" is supporting the organization of local promotion activities, financial incentives, etc. At this time, some 30 municipalities are participating in this initiative.

The results of these promotional efforts are presented in more detail in Figure 2. In the first year of the campaign, a total of 1,323 m^2 of collector area (i.e., 213 residential systems) were installed. This corresponds to approximately 0.4 m^2 per 1,000 inhabitants or 1 m^2 for every 1,000 housing units. Monthly volumes vary from 15 m^2 to 225 m^2, and only a minor seasonal fluctuation exists – just over 50% of the systems are installed during the five summer months (June-October). In the first year, the sales volume surpassed the goals set for the program (150 systems), but it is expected that a sustained or even an increased effort will be required to reach the 2002 goal of 850 residential systems.

The light bars in Figure 2 represent the total cumulated collector area (m^2); the dark bars represent the monthly collector area installed (m^2). The figures near the bars indicate the number of systems installed per month.

Although the market development campaign focuses primarily on the residential sector, some actions are being taken in other sectors. One example is the standardized pre-feasibility analysis service being implemented and financed by the Walloon regional government for 20 demonstration projects (sports centers, hospitals, social housing projects, etc). To date, about 8 projects have been analyzed and the first project, a public swimming pool with a 250 m^2 collector area has entered the final design phase.

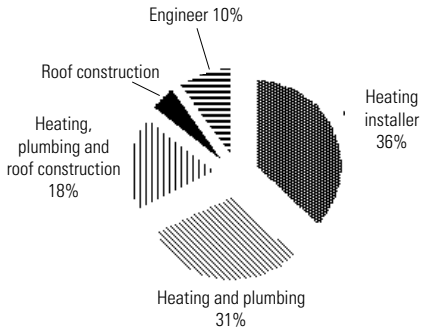
Figure 2. The installed solar collector area in 2001, the first year of the campaign.



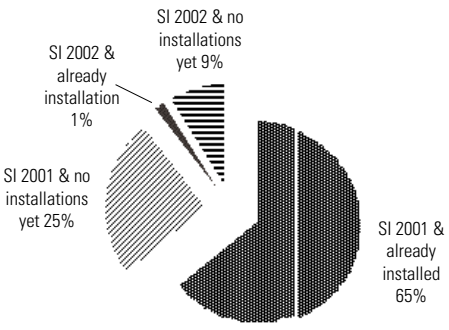
On the technical level, different initiatives are being implemented within the program including a training program for installers and architects, and a quality system program for suppliers and installers. The quality system program consists of a set of criteria for products (systems) and installation (guarantee, training, etc.) that are checked on at different intervals. The system operates on a voluntary basis with the suppliers and installers signing a voluntary agreement to participate and meet the criteria. In return, they are referenced as "SOLTHERM installers" and "SOLTHERM suppliers" and are promoted through the campaign marketing actions and tools. In 2002, a more intensive collaboration between this government program and industry was established by creating a joint single quality system and an agreement to develop joint preparatory actions for 2003.

Of the 35 (local and international) solar water heater brands represented in the Walloon market, about 10 suppliers are participating in the SOLTHERM quality system. And, of the approximate 5,000 system installers in Wallonia, 70 are participating in the program. Figure 3 shows the professional training of the participants, if they participated in 2001-2002 (thus trained by their supplier), and if any installations were sold. Of all the installers participating in 2001, 5% of them were responsible for over 50% of the market.

Table 3. SOLTHERM installers participating in the quality system



Main professional background of the 70 SOLTHERM installers



Current results of SOLTHERM installers participating since 2001 and 2002 (SI= SOLTHERM installer)

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Belgium *from page 3*

VLAZON, the Flemish Solar Energy Program

Due to the presence of a research laboratory and active small and medium sized enterprises (SMEs), the Flemish regional government has focused on photovoltaic systems. However, a new program on strategic solar market development is being developed. The overall goal of this new program is to create a stable environment for the industry and the market to develop. Specific activities include developing strategic R&D activities and creating quality guidelines for products, services and training of professionals.

Solar Water Heater Promotion Campaign in the Brussels Capital Region

A 2001-2002 promotional campaign setup by the Brussels regional government under the auspices of the Brussels Institute for Environmental Management and Department of Energy, has numerous projects underway in the center of Brussels:

- Five demonstration houses with residential solar water heating system,
- Two demonstration renovation projects of 100 m^2 each of collective systems for apartment buildings, and
- A retrofit of social housing blocks with 3 collective systems for 100 housing units.

The campaign also has produced a series of professional tools designed to encourage the use of solar applications:

- Tender documents for small and large solar water heating systems made available to engineering offices and architects.
- Simple design guidelines for building designers.
- Address lists of solar suppliers and installers active in the Brussels region.
- Standard document to be used by the installer to submit an offer to the end customer (with predetermined grid of technical and financial aspects for the installer to specify)

Industry Initiative

BELSOLAR

A well-structured supply chain is considered to be essential to meet the needs of a growing solar market, and therefore a national solar industry association, Belsolar, has been established. As the 'spokesperson' for the solar industry, Belsolar is:

- Lobbying for a stable and certain investment subsidy scheme for solar thermal systems.
- Implementation of a Belsolar quality system.
- Increasing partnerships with authorities in order to jointly develop market development strategies that best suit the Belgian market.

The Belsolar values the link between sustainable market development and quality of products/services supplied in a market. To support this goal, Belsolar is working closely with the Walloon regional government, which has its own quality system program, to develop a national quality system program for residential solar water heaters. This new program is integrating the recent European standards, but has a wider scope that includes:

- Criteria for the collaboration between suppliers and their official installers (agreements on quality of training and installation work).
- Technical criteria, based on the EN-standards, for solar systems marketed in Belgium. These integrate aspects regarding performance on component and system level as well as durability and documentation.
- A set of minimum BELSOLAR guarantees conditions towards the end customer.
- A code of conduct with respect to commercial communication and information.

Integration with European Initiatives

To ensure the integration of the Belgian initiatives into European developments, Belgium is participating in the SOLTHERM Europe Initiative (www.soltherm.org) and in IEA SHC Task 24, *Solar Procurement* (www.ieatask24.org). The Walloon SOLTHERM and Belsolar quality systems also have integrated European standards and been used to prepare the Belgian market players to participate in Solar Keymark (www.solarkeymark.org) a European quality certification program for solar water heater equipment, which is financed by the EC under the Altener program.

Conclusion

The solar thermal market in Belgium is at the beginning of a new era. Since 2000, several regional government initiatives and action programs have been initiated with the SOLTHERM program of the Walloon regional government being the most extensive. In addition, the integrated approach of market and quality development is achieving its first successes. And, the solar industry has willingly taken on the responsibility of restructuring and implementing a quality system for suppliers and installers.

The market is small, approximately 4,000 m^2 in 2001, but on schedule with its growth objectives and a mean annual growth of 30-50% over the past few years. This growth rate is expected to be maintained in the near future.✷

This article was contributed by L. De Gheselle, B. Huberlant, and R. De Coninck of 3E - Engineering a sustainable energy future at the request of the Belgian Executive Committee member, André de Herde.

Solar Crop Drying *from page 1*

Panama

Two projects have been installed at a coffee drying facility near Sona, Panama at the recently established Panama Coffee Trading and Export Company. Over the past three years, approximately 1,200 hectares of Robusta coffee plants have been planted and the first major harvest is expected to start in 2003.

To dry the coffee beans, a solar system is being used that incorporates the Solarwall®, an air heating collector, supplied by Conserval Engineering of Canada. The Solarwall panel is profiled metal siding that is perforated with a pattern of small closely spaced slots. Air, at the rate of about 15,000 liters/second is heated as it is drawn over the surface of the panels, through the slots and behind the panels before it is ducted to the furnace. The larger system on the Sona installation uses 574 square meters of roof-mounted solar panels that preheats the furnace supply air. The furnace, which is wood fired, feeds large vertical dryers that reduce the moisture content of the coffee beans from 52% to 11%. Once this process is complete, the beans are stored in a series of silos. The second solar system is then used to further reduce the moisture content of the beans or maintain a constant moisture level, depending on what is required. This system, which uses 278 square meters of roof-mounted Solarwall panels, preheats air going to the silos at a rate of 7,500 liters/second. The solar components and control system have been installed and commissioned and the system will be first employed in the process of the 2002 crop.

Coffee drying plant in Panama.

Task participants examining the solar collector.

India

The Indian project to dry coir pith at a new plant built by Kaveri Argi-Care is located in Arskiere, Karnataka, (near Bangalore). Coir pith is a fine granulate that is found on coconut shells. The plant washes out the sodium that is concentrated in the coir pith, and then the material is pressed and dried. The finished product is marketed as Core Peat or Green Soils for use as a potting soil substitute as it absorbs about 12 times its weight in water and will hold moisture 8 times longer than standard soils. The product also floats and so is used as an oil absorbent as well. For this project, 438 square meters of Solarwall, installed by Conserval's Indian affiliate, Kotak Urja, was retrofitted to an existing facility. This system heats ambient air and then sends it directly into the furnace. This process reduces the moisture content of the core pith by approximately 70%. The economics of this project are particularly attractive since coir pith drying is a year-round operation.

A second project is also expected to proceed at a cardamom drying facility near New Hope in the Nilgri Highlands of India. The solar system will be installed to supplement the heat for one of the drying chambers in an existing building. The project is also expected to include a pulse jet dryer designed by Kotak Urja.

China

Two projects in China are currently under construction. One is for the drying of jujubes. Jujubes are similar to dates or figs with a slightly harder skin. The Xinzheng Fengli Food Company is constructing a new building near Mengzhuang, Henan, (central China to dry jujubes and other products, such as garlic.

The other system will be installed in Lianghe, Yunnan (southern China) on a new building constructed by the China Fuels Company to produce biomass briquettes for charcoal burners. A 50:50 mixture of crushed coal and biomass such as sawdust is mixed in a slurry from which a rotating press produces the briquettes. The company needs to increase production and wants to use solar drying, since the product cannot be shipped when wet.

Costa Rica and the United States

Work also is underway to install a system at a coffee drying facility in Costa Rica and at three facilities in New York State to dry grain, chicken manure and wool.

Project Funding

The projects in Panama, India, China and Costa Rica are supported by the Government of Canada's Climate Change Action Fund. The Zimbabwe project is supported by SENTER International, Department of the Ministry of Economic Affairs of the Netherlands. The U.S. projects are supported by the New York State Energy Research and Development Authority.

Results

All of the projects in the Task are expected to be completed by the end of 2002. During 2003, monitoring will continue and the Task reports will be produced in 2004.✷

For more information contact Doug Lorriman, Task 29 Operating Agent, e-mail: dpl@aztec-net.com, fax: +1-905-873-2735 or visit the SHC website.

MarketPlace $$$$

The Solar Heating and Cooling (SHC) Programme is not only making strides in R&D, but also impacting the building sector. This section of the newsletter highlights solar technologies that have been developed or conceptualized in a SHC Task and are now being commercially manufactured, marketed or used.

Working to Expand the Sustainable Solar Housing Market

SHC Task 28, Sustainable Solar Housing, a joint activity with the IEA Energy Conservation in Building and Community Systems Programme, is investigating the effectiveness of various design solutions by monitoring built projects, computer analyzing key design variables, and assessing home buyer and owner reactions. The goal is affordable, ecological housing requiring very little purchased energy.

To design a house needing almost no purchased energy is theoretically easy – the building must be so well insulated that heat losses are offset by heat produced by the occupants, appliances and sunlight through windows. Since the building should not leak cold air to the inside nor heated air to the outside, it must be airtight and hence mechanical ventilation is needed. Europe, which is leading in this area, has over 500 such housing projects.

Responding to the Market

To sell such high performance houses, as with any houses, three factors are important:

- **Price:** The price must be within the limit of what a homebuyer can finance. Today, the price of some high performance projects is 10 % more than equivalent houses. One way to get the price down is to use more rational construction than that which is currently in local use.
- **Value:** The value of such homes are often stated in terms of superior comfort, such as no cold walls, no downdrafts by windows, distributed fresh air (even with closed windows) and less environmental impact.
- **Economy:** The economy can be very convincing for homebuyers because the remaining purchased heating energy is so minimal. One builder even offers his houses with 10 years of free heat.

The row houses in Nebikon, Switzerland

A Swiss Project

The first row house project in Switzerland built to the "Passivhaus-Standards" has been built and monitored in detail as part of an European project. These row houses deviate from the compact building design typical of such passive houses. The trade-off in this design was private terraces for slightly more heat-losing wall area. Each row house has a very large glass area to the south that provides passive solar gains, extremely good insulation (U=1.1 W/m^2K), and fresh ventilation air that is first tempered by an underground duct then heated by a heat exchanger. The house is constructed of prefabricated wooden panels. And, the stairs, kitchen, and bath spaces were delivered from the factory to the building site as a single finished module. Because the project is being completed in phases, alternatives to achieve the annual energy target of 15 kWh/m^2 of net floor area can be tested at less cost and feedback from sales staff can be taken into consideration.

In this Task, raw data from over 50 such housing projects have been collected and are being analyzed. Projects range from single-family detached houses to apartment buildings to whole housing estates. What is learned will be published in 2003 as a book of example projects.

Thanks To...

Lex Bosselaar who has stepped down as Chairman of the Executive Committee. Lex served as the Chairman since 1998. His dedicated leadership guided the Programme through the start of new Tasks, Programme workshops and its celebration of 25 years of R&D. The Executive Committee greatly appreciates his many valuable contributions.

Congratulations To...

Michael Rantil, the Swedish Executive Committee member, who is the newly elected Executive Committee Chairman.

Welcome To...

Henrik Sørensen, of Esbensen Consulting Engineers Ltd, who is leading the Working Group on PV-Thermal Solar Systems.

IN BRIEF

NEW REPORTS AVAILABLE ON THE WEB

Visit the Task pages on the SHC web site, www.iea-shc.org, to find downloadable copies of these reports.

Task 22: Building Energy Analysis Tools

Empirical Validation of EDF, ETNA & GENEC Test-Cell Models
Documents empirical validation testing for thermal models related to the architectural fabric of the buildings. In this study predictions from several building energy simulation programs were compared to measured results for three separate experiments.

Models for Building Indoor Climate and Energy Simulation
For readers with a basic knowledge of Neutral Model Format (NMF) and access to the NMF source code of the models. The report deals with detailed documentation and engineering justification on the individual models and provides an overview of the NMF library architecture.

Empirical Validation of the Iowa Energy Resource Station Building Energy Analysis Simulation Models
Documents empirical validation testing for models related to the thermal behavior of buildings and commercial HVAC equipment installed in typical commercial buildings. In this study, predications from several building energy simulation programs were compared to measured results for three separate experiments.

IEA Building Energy Simulation Test and Diagnostic Method for HVAC Equipment Models (HVAC BESTEST), Volume 1: Cases E100-E200
Part I is a user's manual on how to apply the HVAC BESTEST procedure. Part II describes development of the analytical solutions and final analytical solution results. Part III describes the development, field testing and production of simulation data for the test procedures. Part IV presents the analytical solution and simulation program results in tables and graphs.

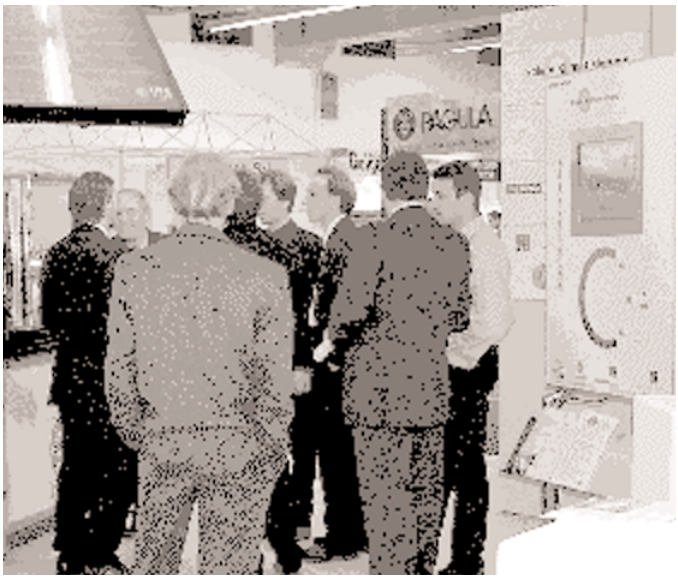
Task 25: Solar Assisted Air Conditioning

Survey of Solar Assisted Cooling
This is a database of finished and ongoing solar assisted cooling projects in 12 countries.

SOLAR ASSISTED AIR CONDITIONING DEMONSTRATED AT TRADE FAIR

A highlight of the SHC Task 25, *Solar Assisted Air Conditioning of Buildings*, presentation at the April 2002 AirCon Tec trade fair was the demonstration of an operating desiccant cooling model. This model not only produced cold air, but also had an interactive poster that allowed visitors to learn about the process by changing the operation conditions. This model was realized with the help of many companies and the German Environmental Foundation.

SHC Task 25 presentations at this major German trade fair for air conditioning and ventilation, which is connected with the Light & Building trade fair, were organized with the Fachinstitut Gebäude-Klima, a German association of air conditioning companies. Posters informed visitors about technology items and a slide show presented realized systems in the 11 countries participating in the SHC Task. In addition, a workshop was held that covered the whole range of topics – components, systems, design and market. The trade fair stand was a success – visited by interested experts from many countries. Visitors with a particular interest in this technology were from countries in Arabia and the near east. ✷



Solar desiccant cooling demonstration unit with interactive poster (right) – a center of attraction at the German AirConTec trade fair

IEA Solar Heating and Cooling Programme

The International Energy Agency was formed in 1974 within the framework of the Organization for Economic Cooperation and Development (OECD) to implement a program of international energy cooperation among its member countries, including collaborative research, development and demonstration projects in new energy technologies. The 21 members of the IEA Solar Heating and Cooling Agreement have initiated a total of 29 R&D projects (known as Tasks) to advance solar technologies for buildings. The overall program is managed by an Executive Committee while the individual Tasks are led by Operating Agents.

Current Tasks and Operating Agents

Task 22: Building Energy Analysis Tools
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SOLAR UPDATE

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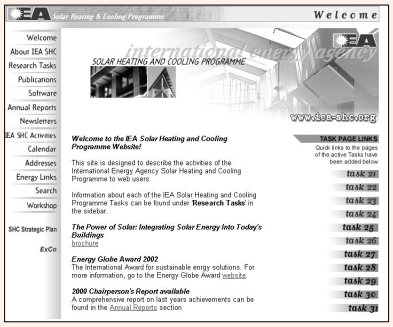

The SHC Website

Visit the SHC website next time you're on the Internet. You will find Programme information, details on Task activities, publications, names of Programme contacts, calendar of upcoming SHC meetings and workshops and other useful information.

http://www.iea-shc.org

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