

# Key Players...

## Solar Cooling: In the sun & chilling out

Worldwide energy consumption for cooling and air-conditioning is rising rapidly and the market potential for solar thermal cooling is certainly very large indeed. However, the market is still very much a work in progress – with only around 500 solar cooling systems installed globally – and has been largely dominated by Europe so far. **David Appleyard** takes a look at some of the key players in this emerging renewable energy sector.

During the last few years, especially in Europe, various new sorption chillers with small- and medium-scale cooling capacity have been developed. Many of these absorption and adsorption chillers have now passed from prototype and pre-commercial installations into small serial production and consequently a rising number of products are expected to enter the market in the coming years. Despite a growing interest, the market has nonetheless been slow to develop with accepted figures pointing to German leadership of the European market with close

to 40% up until 2004, followed by Spain with more than 27% of the European market. Indeed, by 2008, a total of only 450 to 500 solar cooling systems had been realized worldwide, the vast majority of which are in Europe, where the market has increased in the last five years by 50%–100% annually. Approximately 80% of these systems using absorption chillers, 11% adsorption chillers and 29% open systems (DEC and liquid sorption systems). Even so, the total volume of installations reveals that the solar cooling sector is still a niche market and effectively under starters orders.

### SORTECH AG

SorTech AG develops, manufactures and distributes adsorption chillers for cooling and air-conditioning applications in the small and medium scale performance range up to 75 kW cooling capacity. Using heat as the primary energy source for cold production, including solar or waste heat, the company's adsorption chillers – available with a nominal cooling capacity of 8 kW (ACS 08) and 15 kW (ACS 15) – are suitable for air-conditioning and cooling of one- or multi-family houses as well as smaller commercial and office buildings. The machines use water as refrigerant, and the company claims innovative coatings, compact design, and an optimized subsystem

including the re-cooler as key advantages.

The company was founded in April 2002 out of Fraunhofer-Institute for Solar Energy Systems (ISE) and the UFE Solar GmbH in Freiburg (Breisgau). During the summer of 2007 a prototype ACS 05, with a nominal cooling capacity of 5.5 kW was tested, cooling the Fraunhofer ISE cafeteria, for example, by means of 20m<sup>2</sup> flat solar collector field situated on the roof of the Institute. In early 2008 the testing phase was followed with the market launch of the ACS 08.

In 2009 an improved version of the adsorption chiller range, ACS, was launched and in March 2010, the company joined



the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) in promoting a widespread test for solar air-conditioning systems in the practice. Partners include – Solvis GmbH & Co. KG, SorTech AG, the Fraunhofer Institute for Solar Energy Systems ISE

and the University of Applied Sciences Offenburg.

Walter Mittelbach is the managing director and founding partner of the company. 'Due to the lower driving temperature from 60°C, the system is very compatible with solar cooling and district heating', explains Mittelbach.

## AGO AG ENERGIE + ANLAGEN

An absorption chiller manufacturer headquartered in Kulmbach, Germany, AGO AG was founded in 1960 as a specialist in the area of energy supply and facilities and focuses on the three business segments: project development and implementation, operation of facilities as well as service & consulting. For Solar Process Heat AGO provides systems based on Mirroxx Fresnel

collectors, suitable within the range of 100 to 200°C and designed for temperatures up to 400°C for cooling power generation and many other applications in combination with absorption chillers for air conditioning and process cooling.

AGO offers absorption chillers in a range of 50–500 kW cooling capacity and also markets the ammonia/water absorption chiller developed

by the Dresden Institut für Luft und Kältetechnik (Institute for Air and Refrigeration Engineering).

For 2009 AGO AG reported a turnover of about €50 million, some 36% up on the previous year.

Hans Ulrich Gruber, CEO of AGO AG Energie + Anlagen commented: 'The fact of us repeatedly having incoming orders on a record high on the one hand attributes to

our consequently pursued strategy to expand our operative business activities in Germany and to intensify our expansion on an international basis. On the other hand, it is the result of our concentration on the core competences of AGO AG. Those are for instance the design and construction of highly efficient energy centers for energy suppliers, [and] public utility companies.'

## INVENSOR GMBH

A developer and producer of adsorption heat pumps driven by waste energy or solar heating, currently InvenSor GmbH offers two types of chillers: LTC with 7 kW and HTC with 10 kW of cooling capacity respectively. Exact specifications depend on client systems and requirements.

InvenSor High Temperature Chillers (HTC)

are particularly adapted for solar cooling in a warm climate, operating at a typical ambient temperature of more than 30°C and driving temperatures of 65–95°C. In cooling mode the water chiller unit has outlet temperatures of 6–18°C depending on specification. The compressor of a conventional chiller is substituted by a thermally driven adsorption

reactor which is regenerated by solar energy. The evacuated reactor is operated without any active components like pumps or valves inside. Therefore maintenance is limited to the peripheral parts of the machine. The adsorption process operates using water instead of volatile or corrosive fluids that are typically used in many other chilling devices.

## GREEN CHILLER ASSOCIATION

In March 2009, with a growing market but an apparent lack of awareness of sorption cooling technologies in politics, industry, trade and the public, the Green Chiller Association for Sorption Cooling (Verband für Sorptionskälte e.V) was formed in Berlin, Germany, to develop and promote the solar cooling and thermal cooling markets in Europe and elsewhere.

Lead by its president, Roland Weidner from EAW, seven companies – AGO AG, Energieanlagenbau Westenfeld GmbH (EAW), InvenSor GmbH, Pink GmbH, SolarNext AG, Sonnenklima GmbH, and SorTech AG – and two research institutes – Fraunhofer ISE and ILK

Dresden – became founder members of the Association. Green Chiller aims to represent all technologies, though chiefly closed sorption systems from small-scale and medium-scale water/lithium bromide and ammonia/water absorption chillers to water/silica gel and water/zeolith adsorption chillers.

With the goal of increasing the awareness of these technologies and considerably increasing the number of solar cooling installations in the next few years, the association recently extended its membership to all technologies and to chiller manufacturers in other European countries.

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## MENERGA GMBH

Launched in 1980 by a small group of engineers with an idea to develop air-conditioning equipment for indoor swimming pools, today more than 650 people are employed at Menerga across three company locations in Mülheim an der Ruhr, as well as in a Europe-wide marketing and service operation.

Menerga uses liquid desiccant solar cooling technology with its sorption-supported cooling

system – which uses sorption to remove humidity from the outside air before cooling. The company's products can be operated using low regeneration temperatures of about 55–70°C making them suitable for use with solar thermal technology. Furthermore, the products don't require conventional refrigeration agents.

Its Sorpsolair products cool by indirect evaporative cooling and sorption-supported

air dehumidification, in which water is sprayed into the return/exhaust air of the plate heat exchanger. The resulting evaporation of water withdraws heat from the outside air and temperature reductions of more than 10°C are possible. Equipment providing additional dehumidification of outside air with a sorption system and nominal air output 2,500 m<sup>3</sup> / h – 15,000 m<sup>3</sup> / h is available from

the firm, which supplies products suitable for the air conditioning of low-energy buildings such as schools, office buildings, banks and other public spaces.

For example, since February 2009 the freight canteen of Munich Airport has been air-conditioned with a 70 kW sorption-supported Menerga Sorpsolair system for the client Flughafen München GmbH using 75 m<sup>2</sup> of solar collector.

## SOLAR NEXT AG

System supplier Solar Next is focused on the development and commercialisation of standardised solar thermal cooling kits, as well as comprehensive conceptual design, planning, lay-out and commissioning of solar thermal cooling kits for private, commercial, and industrial applications.

The firm offers its SolarNext chilli Technology and chilli System

Controller for the optimised heat management of modern heating systems as well as services such as the measuring and evaluation of ab- and adsorption chiller systems of up to 105 kW of cooling capacity.

For example the company's chilli Cooling Kit ISC7 includes a water/zeolith chiller with a nominal cooling capacity of 7 kW.

Solar Next says this system is suitable for cooling and air conditioning applications with a minimal cold water temperature of 8°C and at high ambient temperatures, for instance air conditioning of private households and offices.

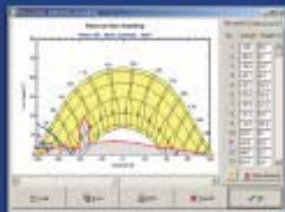
However, the company's absorption chiller chilli ACC50 system features an ammonia/

water chiller with a nominal cooling capacity of 50 kW producing temperatures down to -20°C thus making the machine optimally suitable for use in the industry and the food sector and also for hotels, the company says.

The parent company of SolarNext AG, Hightex, is an international company in the field of tensile fabric engineering.

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## MUNTERS

Sweden's Munters is a supplier of desiccant evaporative cooling systems (DEC). A listed company and a leading manufacturer of air treatment systems and restoration services based on humidity and climate control technologies. Customers are served in a wide range of segments, the most important being insurance, utilities, food, pharma and electronics. Manufacturing and sales are carried out in more than 30 countries and the group has more than 4000 employees and net sales of about SEK 6570 million (US\$876 million).

The company is organized in three global divisions, two product divisions; HumiCool and Dehumidification, and a service organization MCS (Moisture Control Services).

From its original focus on humidity control, Munters has gradually expanded its business concept to adjacent areas.

The company's HumiCool division was most severely affected by the business climate with the largest business area, AgHort, which sells climate systems to breeding houses and greenhouses, experiencing an unexpectedly sharp decline during the fourth quarter as a result of insufficient financing options among end-customers.

At the beginning of 2008, an efficiency improvement program designated MEP2 was launched, intended to increase the efficiency of production in manufacturing divisions.

The company acquired Toussaint Nyssen in Belgium during the fourth quarter of 2009. Now called Munters Belgium, it will be the base for manufacturing DesiCool products in Europe.

## YAZAKI CORPORATION

With over 30 years' experience in developing and manufacturing absorption chillers, Japan's Yazaki has amassed considerable experience in the development and mass production of absorption chillers, which it began in the 1970s.

Today, well over 100,000 of the company's units are in operation worldwide, with more than 2000 installations in the EU alone, making the company

the market leader in non-CFC based central air-conditioning solutions with a global cooling capacity installed exceeding 3500 MW.

The installations offer capacities from 17.5 kW to up to 700 kW for such diverse projects as offices, hotels, hospitals and industrial facilities and was one of the first designers and manufacturers of solar cooling for Solar House 1 in Japan in 1974.

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## AIL RESEARCH INC.

The primary mission of US-based company AIL Research, Inc. is to commercialize heat-driven liquid-desiccant air conditioners for their use in applications in, for example, domestic residences, schools, hotels, auditoriums, offices and other types of buildings.

AIL Research, Inc. was incorporated in 1990 as a research and development (R&D) laboratory focused on developing novel energy technologies and for the past 15 years the company has provided product-development and field-testing services to the gas and electric utility industry, manufacturers and the US Department of Energy.

The company claims its OA Series liquid-desiccant air conditioners will compete better than absorption chillers in most solar applications because they can easily and efficiently store 'cooling capacity' as concentrated

desiccant, allowing the solar cooling system to meet the large late afternoon and early evening cooling loads that occur on most buildings. They also require a smaller cooling tower, among other factors, AIL says.

AIL's solar specific SOA Series – the end product of a seven year, US\$5 million initiative funded by the Department of Energy's SBIR programme and the National Renewable Energy Laboratory – uses patented low-flow technology and, in addition, requires lower activation temperatures than absorption chillers or solid desiccant systems, the company says. Two models are now available, the OA3000 and the OA6000, following field operation in the summer of 2006. AIL Research says it will accept a limited number of orders for OA Series air conditioners designed for solar cooling.



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