GREEN CHILLER ASSOCIATION

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Abstract

The Green Chiller Association for Sorption Cooling e.V., Berlin, Germany was formed in March 2009 as German Association to promote and develop the solar and thermal cooling markets. At present seven companies (AGO AG, EAW Energieanlagenbau Westenfeld GmbH, InvenSor GmbH, Pink GmbH, SolarNext AG, Sonnenklima GmbH, SorTech AG) and two research institutes (Fraunhofer ISE, ILK Dresden) are founding members of the association. The president of the association is Roland Weidner from EAW and the vice president is Dr. Uli Jakob (SolarNext).

1. Introduction

During the last few years especially in Europe various new sorption chillers with small-scale and medium-scale cooling capacity have been developed. Many of these absorption and adsorption chillers have now passed over from prototype stadium into small serial production, so that a rising amount of products is expected within the next few years. In general the market potential for solar cooling and thermal cooling is very large, but both markets are still under development. Until 2004, most of the solar cooling systems in Europe were realized in Germany (39.1%), Spain (27.5%) and Greece (8.7%) [1]. Due to the fact of the growing market and the lack of awareness of sorption cooling technologies in politics, industry, trade and public the Green Chiller Association was founded to form a powerful lobby association.

2. Market Developments

2.1. Conventional Air-Conditioning

Worldwide the energy consumption for cold and air-conditioning is rising rapidly. Usual electrically driven compressor chillers (split-units) have maximal energy consumptions in peak-load period during the summer. In the last few years even in Europe this regularly leads to overloaded electricity grids. The refrigerants that are currently used in the split-units do not have an ozone depletion potential (ODP) anymore, but they have a considerable global warming potential (GWP), because of leakages of the chiller in the area of 5 to 15% per year.

Particularly the sale figures of split-units with a cooling capacity range up to 5 kW are rising rapidly. In Europe the number of sold units has risen about 35% from 6.4 million in 2006 to predicted 8.6 million in 2008 [2]. The Japan Refrigeration and Air Conditioning Industry Association (JRAIA) has expected a worldwide sales of 82.3 million units in 2008 as shown in Figure 1.

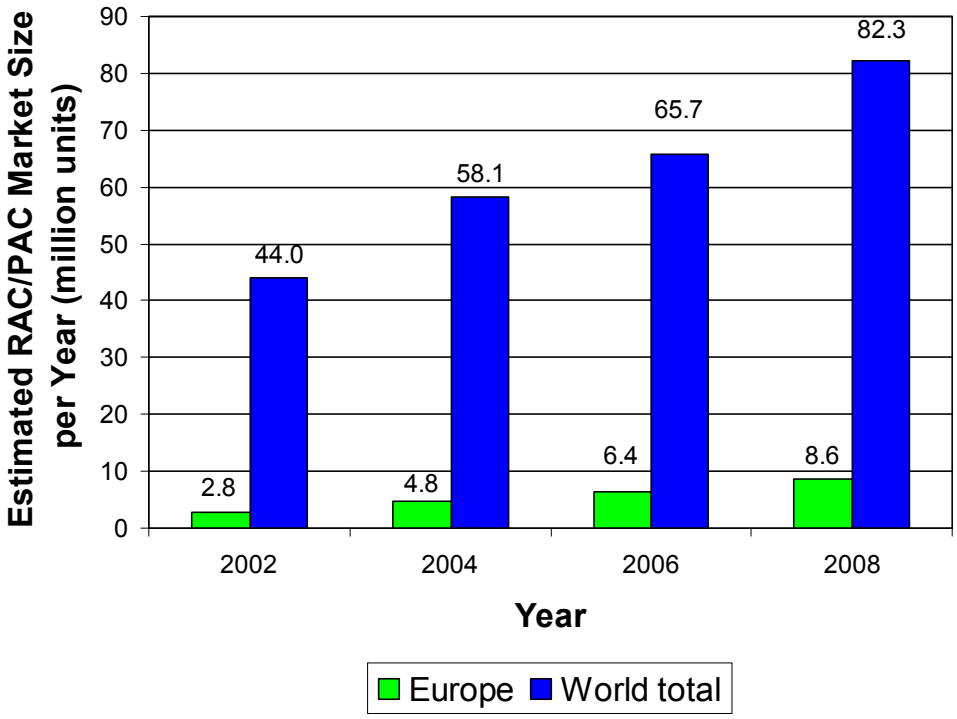

Figure 1: Market development of split-units up to 5 kW in Europe and worldwide (Source: JARN)

2.2 Solar Cooling

Thermal cooling by solar energy or district heating or waste heat from CHP units, biomass as well as processes could be lead to a considerable reduction of energy consumption. The sorption chillers use environmentally friendly refrigerants and have only very low electricity demand. Therefore the operating costs of these chillers are very low and the CO_2 balance compared to split-units is considerably better. The main advantage of solar air-conditioning is the coincidence of solar irradiation and cooling demand. In case active cooling being necessary, the long running times of the chillers are the key for economic efficiency of solar air-conditioning. For domestic buildings in the southern Mediterranean area approximately 800 to 1,000 full load cooling hours occur.

The world first solar cooling system was running in Paris, France (Figure 2) during the world exhibition 1878 [3]. This system has consisted of an ammonia/water absorption chiller and a parabolic reflector to produce ice.

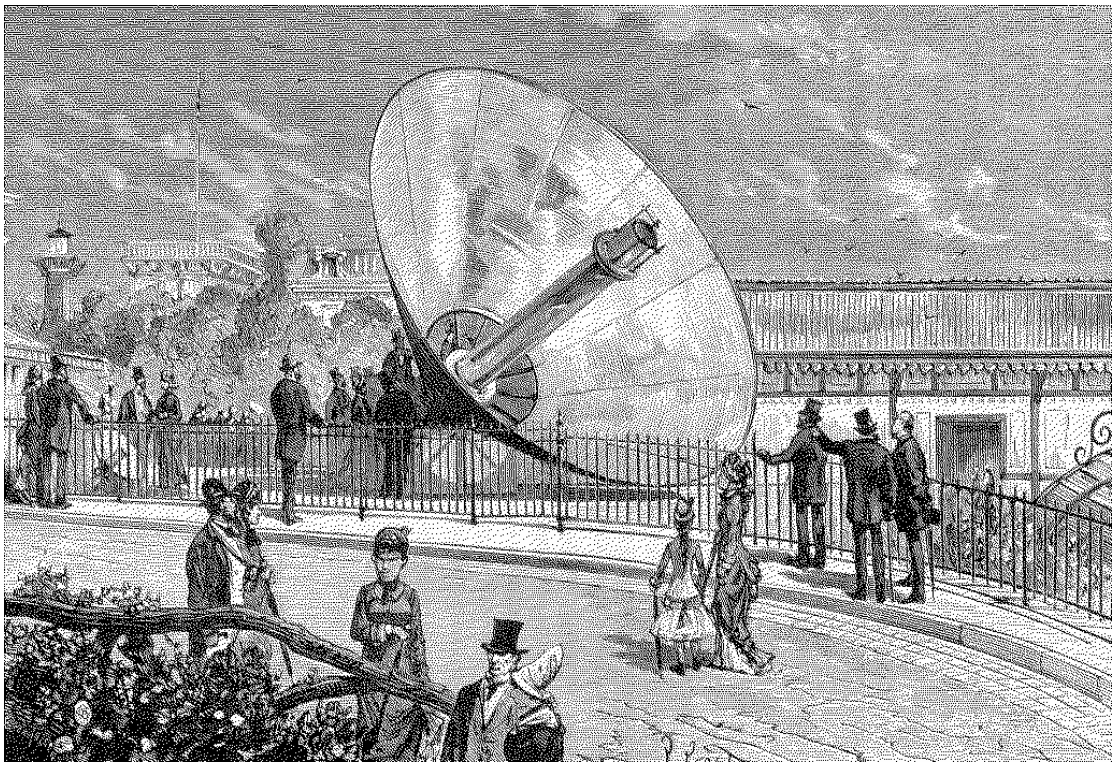

Figure 2: World exhibition 1878, Paris: Augustin Mouchot produced the first ice block through solar energy (Source: Olynthus Verlag)

The first commercial solar cooling systems for air-conditioning were developed in Europe and the USA one hundred years later, e.g. by the companies Dornier-Prinz Solartechnik, Germany [4, 5] and Arkla Industries, USA (today Robur, Italy) [6]. These systems have been realized in several demonstration projects. Due to the lack of demand on the market for solar cooling during this time, the production of these solar cooling systems was stopped.

At present 450 to 500 solar cooling systems are realized in total worldwide in 2008 [7]. Four hundred of these installations are in Europe. The market for solar cooling in Europe has increased in the last five years by 50 to 100% each year as shown in Figure 3. The total amount of installations shows that the solar cooling market is still a niche market, which is under development. Approximately 60% of these systems using absorption chillers, 11% adsorption chillers and 29% open systems (DEC and liquid sorption systems) [8].

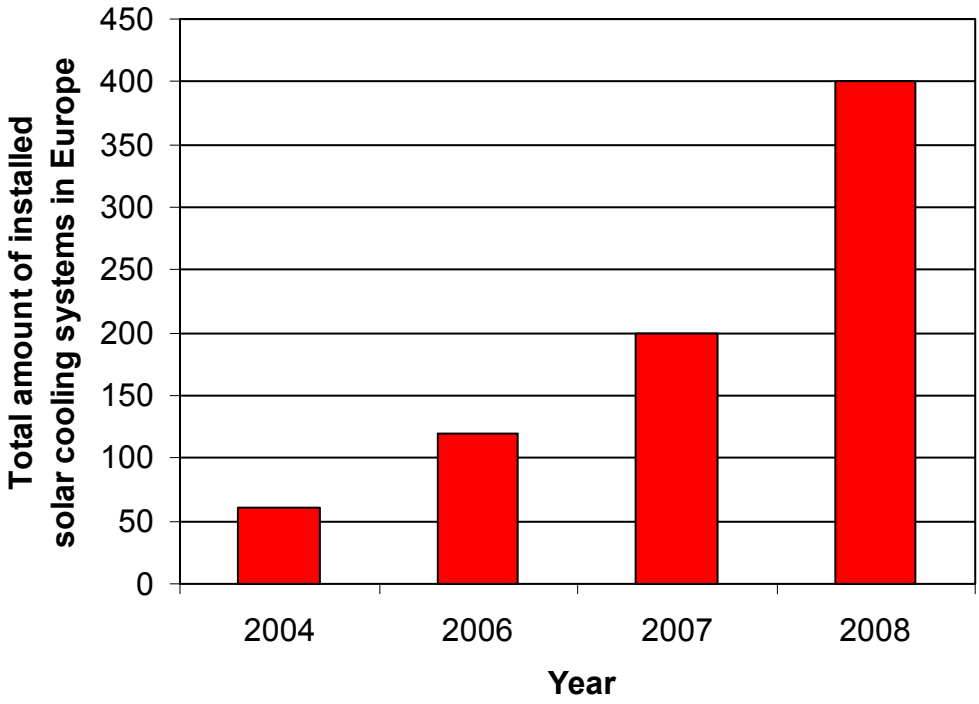

Figure 3: Market development of small to large-scale solar cooling systems in Europe (Sources: Climasol, Fraunhofer ISE, Rococo, Tecsol)

3. Members

The new association represents around 60% of all European manufacturers of sorption chillers in the small and medium-scale cooling capacity range. Most of them are based in Germany. All closed sorption technologies like absorption cooling (working pair's water/lithium bromide and ammonia/water) and adsorption cooling (water/silica gel and water/zeolith) are offered by the members (Table 1).

Figure 4: Members of the Green Chiller Association (Source: Green Chiller)

Table 1: Profiles of the current members of the Green Chiller Association

Company	Location	Profile
ago energie + anlagen	Kulmbach (Germany)	Manufacturer of Ammonia/Water Absorption Chillers (30 – 500 kW)
EAW	Westenfeld (Germany)	Manufacturer of Water/Lithium Bromide Absorption Chillers (15 – 200 kW)
Fraunhofer ISE Institut Solare Energiesysteme	Freiburg (Germany)	Research Institute for Solar Energy Systems, Cooperation with SorTech
ILK Dresden	Dresden (Germany)	Institut für Luft- und Kältetechnik Dresden, Developments in Cooperation with EAW and AGO
invensor	Berlin (Germany)	Manufacturer of Water/Zeolith Adsorption Chillers (7 – 10 kW)
PINK	Langenwang (Austria)	Manufacturer of a Ammonia/Water Absorption Chiller for SolarNext (12 kW)
SOLARNEXT	Rimsting (Germany)	System Supplier of thermally driven Absorption/ Adsorption Chillers and Cooling Kits (7 – 50 kW)
SONNENKLIMA suninverse	Berlin (Germany)	Manufacturer of a Water/Lithium Bromide Absorption Chiller (10 kW)
SorTech AG	Halle (Germany)	Manufacturer of Water/Silica Gel (and Water/Zeolith) Adsorption Chillers (8 – 15 kW)

4. Objectives

In general, the Green Chiller association would like to force a strong lobby work to increase the awareness for these innovative sorption cooling technologies in politics, industry, trade and the public. Therefore, a website (www.greenchiller.de) is set up to present and offer related information on the association and the technologies. Moreover, the members have identified the following main objectives of the association:

- Promoting and developing of the solar and thermal cooling markets in Germany and Europe
- Demonstration of different applications
- Development of design tools
- Standardisation of chillers and solar cooling / thermal cooling systems

One important target for developing the solar cooling market is to create the basis for funding of solar cooling systems. Therefore, a standardization of the solar cooling systems is necessary as well as the availability of design tools for planners and architects.

5. Conclusion

In March 2009 the Green Chiller Association for Sorption Cooling was formed in Berlin, Germany to develop and promote the solar cooling and thermal cooling markets in Germany and Europe. Seven Companies (sorption chiller manufactures and one system supplier) and two research institutes from Germany and Austria have brought together their expertise to get solar cooling out of its niche existence. These companies are representing all closed sorption technologies from small-scale and medium-scale water/lithium bromide and ammonia/water absorption chillers to water/silica gel and water/zeolith adsorption chillers. Today 450 to 500 solar cooling systems are realized in total worldwide in 2008, four hundred of these installations are in Europe. The target of the Green Chiller Association is to increase the awareness for these innovative technologies and with that to raise considerably the amount of solar cooling installations in the next few years.

References:

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