SOLAR HEATING & COOLING PROGRAMME
INTERNATIONAL ENERGY AGENCY

Task 48

2015 HIGHLIGHTS

SHC Task 48
Quality Assurance and Support Measures for Solar Cooling

THE ISSUE

The demand for air-conditioning is rapidly increasing, especially in developing countries. And the potential for solar cooling to meet this demand is immense. The results of past IEA SHC work in this field (most recently, *SHC Task 38: Solar Air-Conditioning and Refrigeration*) have demonstrated the technology's potential for building air-conditioning, particularly in sunny regions, and identified work needed to achieve economically competitive systems that provide solid long-term energy performance and reliability.

OUR WORK

Finding solutions to make solar thermally driven heating and cooling systems at the same time efficient, reliable and cost competitive is the goal of this Task. These three major targets should be reached thanks to four levels of activities:

1. Development of tools and procedures to characterize the main components of solar air-conditioning systems.
2. Creation of a practical and unified procedure, adapted to specific best technical configurations.
3. Development of three quality requirement targets — prescriptive and performance based.
4. Production of tools to promote solar thermally driven cooling and heating systems.

Participating Countries

Australia
Austria
Canada
China
France
Germany
Italy
United States

The scope of the work covers technologies for the production of cold water or conditioned air by means of solar heat, that is, starting with the solar radiation reaching the collector and ending with the chilled water and/or conditioned air transferred to the application. Although the distribution system, the building, and the interaction of both with the technical equipment are not the main topic of the Task this interaction will be considered where necessary.

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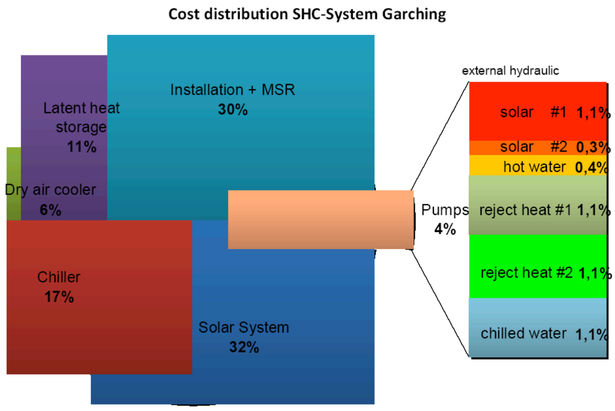
KEY RESULTS OF 2015

Pumps Efficiency and Adaptability

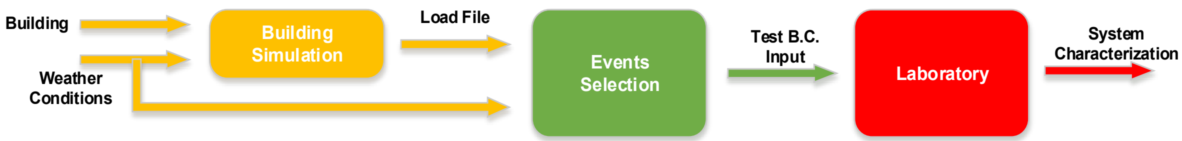
The final report on pumps efficiency and adaptability addresses the following key pumping aspects: design criteria, electricity consumption, theory of rotodynamic pumps, standards, pump control and design guidelines.



10 kW absorption cooling system with dry heat rejection: Investment and performances.

Since 2010 pump efficiency has greatly improved due to legislative restrictions: 50-80% efficiency depending on the size. Nevertheless, good design is crucial to properly size the pump and benefit from its good nominal efficiency. Chilled and cooling water loops consume the most energy: the use of variable speed pumps in these loops can improve EER (Energy Efficiency Ratio) dramatically, with low investment cost increase. Intelligent high-efficiency pumps featured with internal flow, pressure, temperature and power meters can lead to high energy savings, but for complexity reasons implementation will be reserved for manufacturers of prefabricated systems. At the current stage overall SEER of 20 seems to be feasible for solar cooling.

Report on System Characterization in the Laboratory



Example of test procedure for solar cooling system characterization (EURAC).

The performance of a heating and cooling system is strongly affected by the way the single components are integrated together and by the boundary conditions that the system is subject to. This is mostly true for systems driven by a number of different energy sources and setup with a complex control strategy. In these cases, the dynamics of the system have to be taken into account in order to perform a reliable system characterization. The implementation of a dynamic laboratory test procedure allows the evaluation of the performance considering those aspects. The aim of a dynamic test procedure is to assess the system performance when operating under acutal boundary conditions.

In this report, different dynamic test approaches are reviewed versus standardized stationary test methods. In addition, a test procedure newly developed at EURAC is presented and compared to the other. The latter results are reported with respect to a solar assisted heat pump system, while to-date the test has not been proved on a solar cooling system. Nonetheless, the degree of complication of the heating and cooling system presented here is comparable with a solar cooling one. The test procedure was also assessed on a single adsorption chiller operating in a real solar cooling plant, showing positive results system. This suggests that the procedure could be extended to solar heating and cooling systems.

To read these reports visit http://task48.iea-shc.org/publications.