PREP

Promotion of Resource Efficiency Projects

PREP Topic: Solar Cooling – using the sun for climatisation

Background:

In recent years, the number of record-breaking hot summer days, especially in those regions with a usually moderate climate, has been increasing. This has led to a growing demand for climatisation in, for example, the workplace, and more and more office buildings are already being fitted with air-conditioning systems. In many countries air conditioning is, however, one of the highest energy consuming services in buildings.

Conventional cooling technologies are generally based on electrically driven refrigerating machines. These have several disadvantages: they lead to high levels of primary energy consumption, cause high and expensive electricity peak loads and usually employ refrigerants with negative environmental impacts. This is where solar cooling comes into play. The sun, while heating up buildings, also delivers the energy to cool them. The major attraction of this system is that the hottest days have the greatest need for cooling and, simultaneously, offer the maximum possible solar energy gain.

Solar cooling systems have the advantage of using harmless working fluids such as water or solutions of certain salts; they are environmentally safe. Additionally, they can lead to huge energy savings in primary energy of between 40% and 60% in chilled water systems. This, in turn, also reduces the pressure on electricity grids, which can sometimes reach their capacity limit on hot days.

In principle, two different alternative cooling technologies are available: closed cooling systems (absorption and adsorption) and open systems for dehumidification and/or cooling (desiccant cooling). In addition to using solar energy, both systems can also use waste heat from, for example, combined heat and power plants to power or regenerate the system. Closed cooling systems are based on the thermo-chemical process of sorption. A liquid or gaseous substance is either attached to a solid, porous material (adsorption) or is taken in by a liquid or solid material (absorption). Desiccant systems, on the other hand, reduce the humidity, which means that the air only seems to be cooler, yet comfort levels are significantly increased. Therefore, desiccant systems are often used in combination with evaporative cooling.

Although a large potential market for solar cooling exists, the current high investment costs present a significant barrier to broad implementation. Compared to conventional cooling systems, the upfront costs are around 2 to 2.5 times higher and, additionally, the overall annual costs of solar cooling systems are still between 1.2 and 1.5 times more than conventional systems. So far, larger cooling systems have been successfully put into operation; however, smaller systems for household use are still under development. Currently, there are about 120 of the larger installations in Europe.

However, despite the cost factors, it is accepted that there is great potential for solar cooling due to the basic benefits that it offers. Additionally, greater standardisation will, in time, result in cost reduction. In this context, WISIONS is looking for projects in which solar assisted cooling systems have already been implemented and invites the submission of examples of good practice.

Fields of interest include:

Implemented projects that use solar cooling systems applying

- adsorption, absorption or desiccant systems

in

- office buildings, public buildings, hotels, factories, hospitals etc.