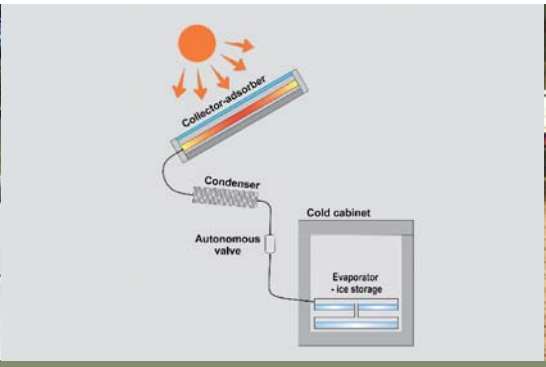
University of Applied, Sciences Western Switzerland (HES-SO/IGT)



ABSTRACT

The Thermal Engineering Institute (IGT) of the University of Applied Sciences of West-Switzerland (Switzerland) works in the domain of renewable energies since two decades. The solar adsorptive refrigeration development has been one of the main axes of applied research in the last years. Thermal solar refrigerators have been planned initially to meet cooling needs in non electrified areas of the Sahel countries where an important demand exists for the medecine refrigeration and for food conservation.

On the basis of papers published by different teams of researchers in the eighties, the IGT achieved in 1999 a first prototype.

Since then, different solutions have been developed and tested, with two main objectives:

1) achieving both reliability and simplicity of solar adsorptive refrigerators
2) making as easy as possible their manufacturing in developing countries.

Simultaneously, a technology transfer toward the Ecological Centre Albert Schweitzer in Burkina Faso (CEAS-BF) has been initiated. This collaboration allowed promoting an operational and independent workshop in Ouagadougou for assembly, maintenance and repair of solar refrigerators, which begun its activities in the second semester of 2005. The solar refrigerator has been awarded the Swiss solar price 2002.

WORKING

The IGT's solar refrigerator works with a thermal adsorption cycle of water with an adsorbat either in silicagel or in zeolite.

The basis of the adsorption cooling cycle is based on a 24 hour cycle during which the adsorbat pumps the vapour in and out like a thermally driven piston. The cooling process happens during the night where ice is produced in the evaporator.

The main components of the adsorptive cooling machine are:

- The collector-adsorber: contains the adsorbent which is heated by the solar radiation, induces desorption of the adsorbat.
- The condenser: condenses the steams of adsorbat during the desorption step.
- The cold cabinet: is composed of an isolated surrounding wall and the evaporator which contains the ice storage.
- The autonomous valve: This organ developed at the IGT is automatic and doesn't possess any electronic device (registered pattern).

The COP (ratio between cold production and solar irradiation) for this adsorptive cooling machine range between 0.10 and 0.18 depending on the climate. A classic refrigerator with a photovoltaic installation gives the same range value for the global COP. Our refrigerators are therefore quite competitive in terms of energetic performance, but as advantage they have no mechanical mobile part, which could break

TECHNOLOGY TRANSFER

Since the beginning of these developments, the IGT has been collaborating with the CEAS-BF to allow this NGO to assimilate the technical aspects of the solar adsorptive refrigeration in their workshop in Ouagadougou. Our aim was not to export finished refrigerators toward the Sahel countries, but instead to let local people acquire the knowledge to produce, set up and to make the system follow-up.

At the present time, the team of the CEAS-BF is constructing their first prototypes based on our last developments. They will be installed in rural hospitals and will be tested under real conditions.

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