

# Adsorption Refrigeration

# SIRAC CASE STUDY

## WHAT IS ADSORPTION REFRIGERATION?

### KEY FACTS

Adsorption is a heat driven cooling process. It uses an adsorption medium such as activated carbon together with a refrigerant to achieve a cooling effect.

It uses a chemical rather than a mechanical compressor and is driven by heat rather than mechanical work. The operation of adsorption heat pumps and refrigerators is based on the ability of porous solids (the adsorbent) to adsorb vapour (the adsorbate or refrigerant) when at low temperature and to desorb it when heated. Although the heating and cooling provided by a single generator is discontinuous, it can be made continuous by operating two or more generators out of phase.

### APPLICATIONS

Refrigeration, air conditioning and heat pumps eg:

- Solar or biomass powered refrigeration & air conditioning
- Vehicle (mobile) air conditioning from waste engine heat
- Domestic gas fired heat pumps

### BENEFITS

Has the potential to reduce the environmental impact of cooling:

- Heat powered cycles can make use of renewables or waste heat as well as conventional fuels to reduce CO<sub>2</sub> emissions
- Refrigerants used are natural working fluids with low GWP/ODP

## CHALLENGES

Research work is focused on improving performance in these two main areas:

- The basic adsorption cycle has low efficiency, however, recovery of heat between adsorbent beds can give good performance
- Low thermal conductivity of available adsorbent materials can lead to large sized equipment but innovative heat exchanger design can overcome the problem

## HOW FAR IS IT FROM THE MARKET?

Sorption Energy is a spin-out company intended to bring the latest machines to market. This is timely competition for the likes of Vaillant and Viessmann who plan to launch gas fired heat pumps in spring/summer 2010.

## WHO IS LEADING THIS RESEARCH IN THE UK?

University of Warwick, Sustainable Energy Engineering and Design research group led by Bob Critoph

<http://www2.warwick.ac.uk/fac/sci/eng/research/seed/>

