



Cold from Heat with Adsorption Chillers

Solar cooling • Trigenation

District cooling • Cooling with process or waste heat



SorTech AG – Specialist for Compact Adsorption Chillers

As first company worldwide SorTech AG has brought compact adsorption chillers to the market.

SorTech AG develops, manufactures and distributes adsorption chillers in the small scale performance range based on innovative coating technologies. Our technology uses heat instead of electricity as primary energy for cold production. Due to the resulting primary energy savings and the natural materials used, our technology is a clean alternative to conventional chillers.

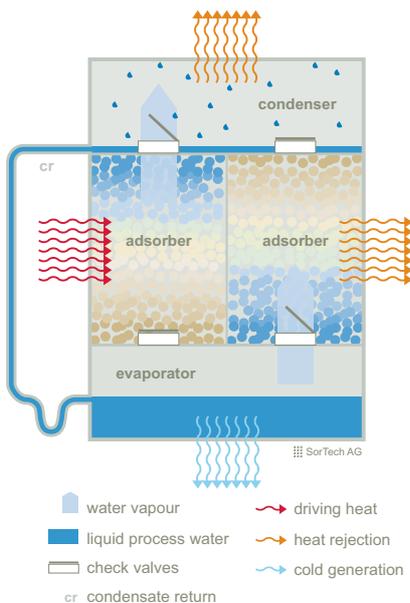
SorTech AG has been founded in 2002 by Walter Mittelbach and has won several innovation prizes. In 2008, after several years of intensive development and field tests, a first generation of adsorption chillers based on the working pair silica gel/water (product series ACS) has been introduced to the market. Since the beginning of 2009 an optimized version of the product series is available.



Adsorption – One of the Oldest Principles of Cold Production

Adsorption technology uses the "suction" effect of highly porous solid sorption materials (silica gel or zeolite) to produce cold from heat – without any compressors or pumps.

Like in conventional air conditioning systems, cold is generated through evaporation of a refrigerant - in our case pure water. However, our machine consumes heat instead of electricity for driving the process.



• Adsorption generates cold

The dry sorption material covering the central heat exchanger (the so-called adsorber) adsorbs water vapour through the open lower check valve. In the evaporator, water evaporates and generates cold.

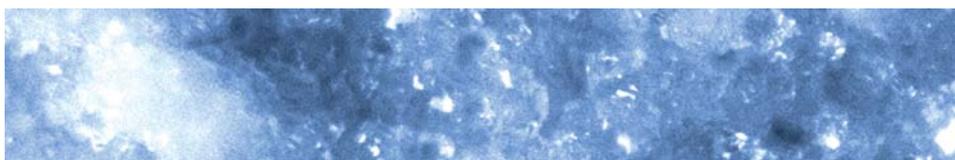
• Desorption through heat

The sorption material is dried by heat input. Water vapour is set free, flows into the condenser and is liquefied. The condensate returns to the evaporator, thus closing the circuit.

• Two adsorbers continuously generate cold

In order to achieve a continuous cold production two adsorbers work in combination, i.e. one adsorber desorbs while the other adsorber generates cold by adsorbing in the meantime.

The process cycle is taking place within a hermetically sealed vacuum chamber.



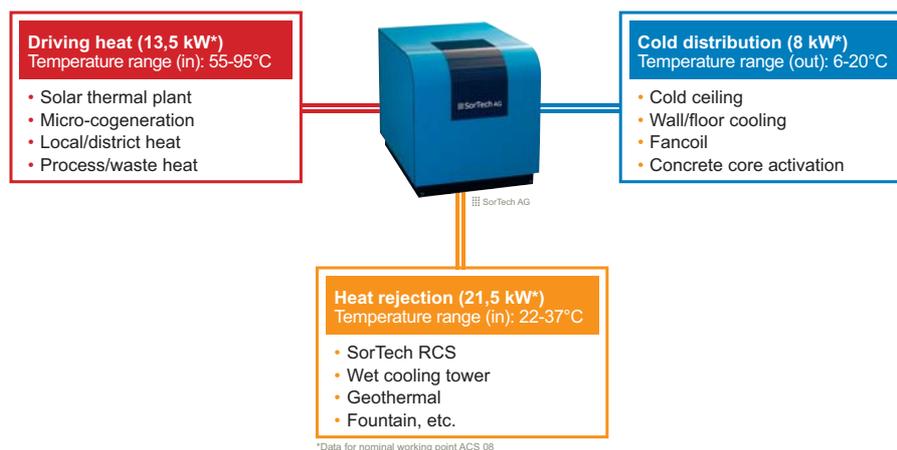
Thermal Cooling – Broad Range of Applications

SorTech adsorption chillers can be used for a broad range of air-conditioning and cooling applications in small and medium-sized buildings and systems:

- Solar cooling
- Trigeneration
- District cooling
- Cooling with process or waste heat

System Integration – Multiple Combinations Possible

In addition to the internal, closed process circuit a thermal cooling system based on adsorption technology consists of three external hydraulic circuits: driving heat, cold distribution and heat rejection.



• Driving heat

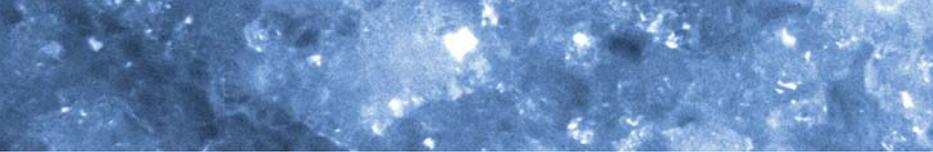
The SorTech Adsorption Chiller S product series (ACS) can use hot water between 55°C and 95°C. The nominal cooling capacity is already achieved at 72°C driving heat.

• Cold distribution

Cold is made available in the form of cold water. Therefore all common water-based cold distribution systems can be used. SorTech ACS achieve their best efficiency at slightly elevated cold water temperatures (10-20°C optimal inlet temperature).

• Heat rejection

Both driving heat as well as the energy taken from the object to be cooled (= cold produced) have to be rejected to the environment at a temperature level of 22-37°C – the lower the re-cooling temperature, the better. SorTech offers a customized re-cooler series RCS which has been optimized for system efficiency.



Innovative Technologies – High Power Density and Electrical Efficiency

Fundamental technological innovations by SorTech AG are the base for chillers with high power density and highest electrical efficiency – the power consumption of the ACS 08 (only 7 W) is unmatched worldwide.



Adsorbent with silica gel coating; coating technology of the current, market-ready product series

1. Innovative coating technologies

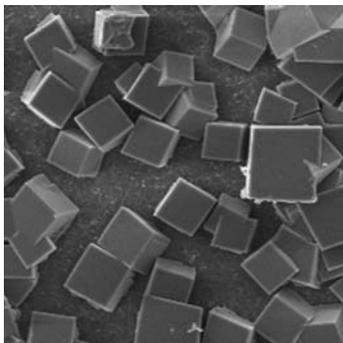
By means of two processes developed and filed for patent application by SorTech AG, our adsorbents are coated with silica gel or zeolite respectively. These coating techniques enable improved heat transfer and vapour flow and thus are essential for the performance of the machine.

2. Patented design

An innovative arrangement of the internal components of the chiller in a vacuum chamber allows a much more compact, lighter and less costly overall design of the machine than traditional solutions.

3. Subsystem chiller plus re-cooler

Like any other thermally-driven chiller, the ACS relies on an efficient and high-performing re-cooler. The performance of the SorTech RCS re-cooler has been tailored exactly to the requirements of the adsorption chiller. Due to an integrated controller high overall system performance (seasonal electrical efficiency ratios of 10 and beyond) as well as easy system integration can be achieved.



Zeolite coating; photo taken by electron microscope

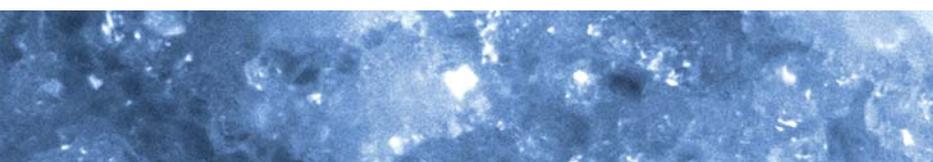
4. Heat pump mode as standard

SorTech adsorption chillers are equipped with control features for operating in heat pump mode. Thus, in connection with a low-temperature energy source such as geothermal energy, ambient air or a solar plant, the efficiency of traditional heating equipment can be increased by 30-50%. The driving energy for the heat pump mode is also hot water instead of electrical energy.

Clean Technology – Positive Impact on Environment and Climate

SorTech chillers save energy, avoid emissions of environmentally harmful refrigerants, and thus positively contribute to protecting our environment and climate.

The electricity savings of our technology directly translate into reduced CO₂ emissions. In addition, water as refrigerant avoids the global warming effect caused by leakages of conventional refrigerants with very high global warming potential (GWP). Using SorTech chillers thus can save substantial amounts of CO₂-equivalents – up to more than 2 tons per year just for one ACS 08.

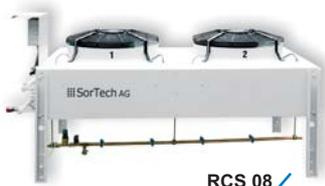




ACS 08



ACS 15



RCS 08

SorTech ACS/RCS – System Solutions for Thermal Cooling

Our chillers and energy optimized subsystems are available in two different cooling capacities. In a modular approach also larger projects can be realized.

Our chillers – optionally in combination with an optimized re-cooler – are available in two cooling capacities:

- **ACS 08/RCS 08** – 8 kW nominal cooling capacity with a thermal COP of 0.6; maximum cooling capacity of 11 kW
- **ACS 15/RCS 15** – 15 kW nominal cooling capacity with a thermal COP of 0.6; maximum cooling capacity of 23 kW

Our chillers can also be combined with other re-cooling solutions (wet cooling tower, geothermal/bore holes, fountain, etc.).

By interconnecting single ACS-modules larger cooling capacities can be realised.

Heat Pump Mode – Cooling and Heating

The ACS as thermally driven heat pump provides additional value.

Due to increased efficiency, costs for heating can be reduced during the heating period. Thus the amortisation period decreases when the ACS is used both for cooling and heating.



Main advantages and distinctive features at a glance

- Compact, high performing chiller
- Nominal cooling capacity already at 72°C, operation starting at 55°C driving heat
- Robust operations also with varying temperatures in all circuits
- High electrical efficiency of optimized subsystem (seasonal electrical efficiency ratios of 10 and beyond)
- Easy integration into overall system
- Up to 80% savings in primary energy and CO₂
- Completely clean technology - water as refrigerant
- Robust and proven technology
- Silent (ACS)
- Cooling and heating



Weinbergweg 23
06120 Halle (Saale)
Germany

Phone: +49 (0) 345 279809-0
Fax: +49 (0) 345 279809-98
E-Mail: office@sortech.de
Internet: www.sortech.de

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