



Sorption Technologies

Adsorption Chillers in Process Cooling

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Sorpton Technologies GmbH – Locations in Europe

Sorpton Technologies GmbH founded in 2018 operates with daughter companies in Italy (R&D and sales) and Poland (production and sales) to produce, engineer and customize thermal chiller's solutions.

Main focus are thermal chillers, pre-heating & pre-cooling in industrial applications, process cooling industries and agriculture; small&medium trigeneration systems, desalination and innovative cooling solutions thanks to thermal and hybrid cooling combine with waste available heat sources.

Currently 12 employees



Sorpton Technologies GmbH Germany, Freiburg (a)

Sorpton Technologies Srl Italy, Rovereto (b)

Sorpton Technologies Sp. z o.o Poland, Żywiec (c)

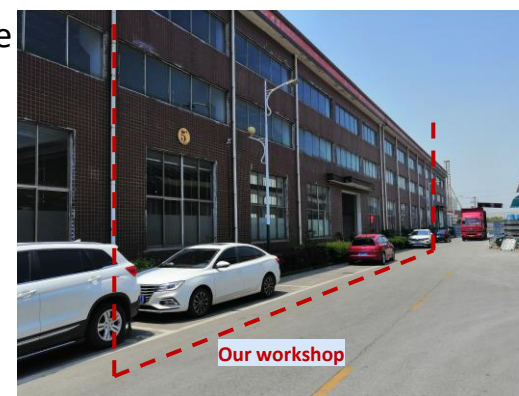
Suzhou Sorption Technology Co. Ltd. – Sister company in China

Location

- Suzhou Sorption Technology has been established in Taicang, Suzhou, Jiangsu in October 2020 and is located in the Taicang Port Development Zone, around 40 km from Shanghai and Suzhou.
- Our production facility comprises around 1,500 m² of which currently 2/3 is being used for production and office, the remaining area will be prepared for increasing of production capacity during 2022.

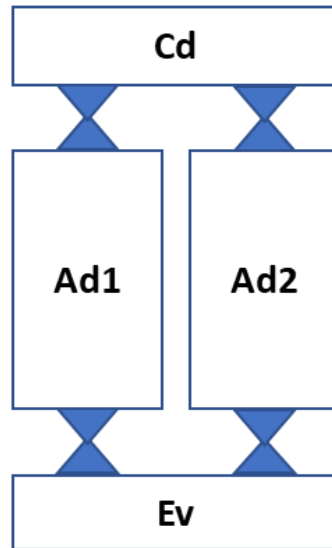
Adsorption chiller manufacturing

- Suzhou Sorption Technology has established a complete in-house manufacturing line of adsorption chillers, including final activation and quality control.
- Currently, the manufacturing process is mainly manual work, within the scope of business plan a step by step partial automatization of processes critical to product quality is planned.
- The company has 8 employees. In order to enhance flexibility for production we have a contract with local partners to increase the workforce by two to four welders on demand.



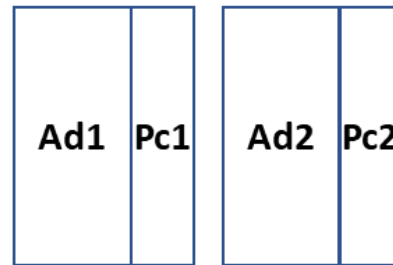
Sorption Technologies has invented a new (3rd) generation of adsorption chiller design

1st Generation



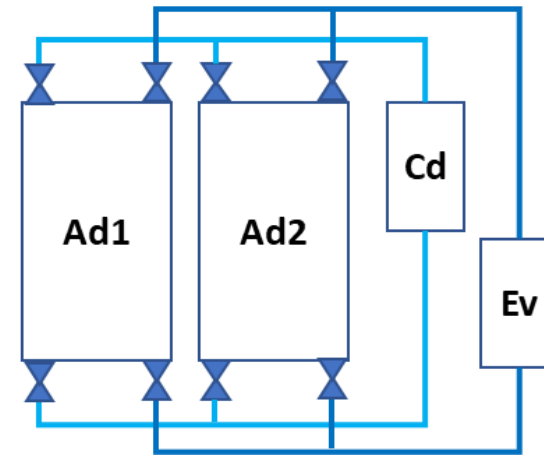
- Features:**
- Separate heat exchangers for evaporation / condensation
 - Distribution to adsorbers in the vapour phase
 - Large vacuum valves and complex vacuum system necessary

2nd Generation



- Features:**
- Separate heat exchangers for phase change (evaporation/condensation) in the adsorber
 - Advantages: Direct vapour transport without valves, simple vacuum system
 - Disadvantages: Thermal losses due to thermal cycling of phase changer, losses of temperature level because of system separation due to mixing of the loops.

3rd Generation



Ad1,2 Adsorber 1,2
Ev Evaporator
Cd Condenser
Pc1,2 Phase Changer 1,2

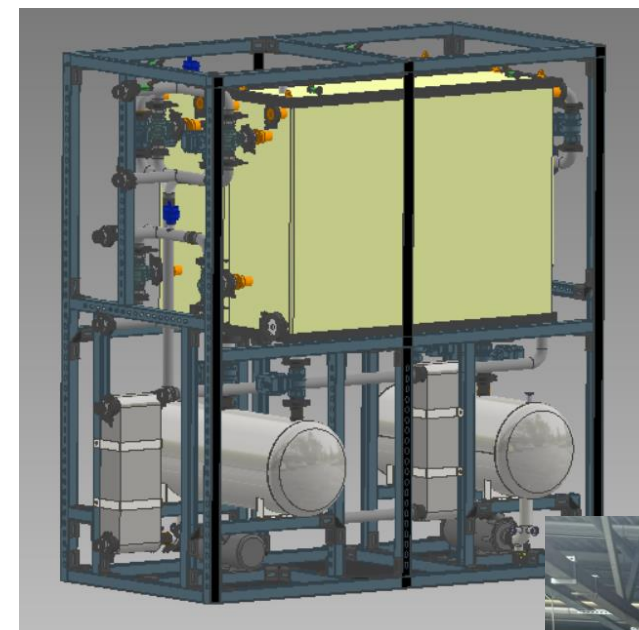
- Features:**
- Refrigerant distribution in the liquid phase
 - Direct evaporation/condensation of the liquid refrigerant within the adsorption module
 - Combines the advantages of 2nd generation without the disadvantages
 - Technical task of a magnetic drive low-pressure refrigerant pump solved for larger units and now being transferred to small systems.

Products: ACL-20 and ACL-30

Two sizes of basic modules will be available, larger capacities will be achieved by packaging of the adsorption modules

Preliminary specifications:

	ACL-20	ACL-30	
High Temperature Loop (HT)	33.3	50.0	kW
Inlet Temperature	85	85	°C
Outlet Temperature	75	75	°C
Flow	2.9	4.4	m ³ /h
Pipe dimension	DN 32	DN 40	
Medium Temperature Loop (MT)	53.3	80.0	kW
Inlet Temperature	30	30	°C
Outlet Temperature	35	35	°C
Flow	9.2	13.9	m ³ /h
MT_Ad	5.8	8.7	
MT_Cd	3.5	5.2	
Pipe dimension	DN 40	DN 50	
Low temperature Loop (LT)	20.0	30.0	kW
Inlet Temperature	19	19	°C
Outlet Temperature	14	14	°C
Flow	3.4	5.2	m ³ /h
Pipe dimension	DN 32	DN 40	
COP	0.6	0.6	



Internal design of the new adsorption chiller



Field test of new adsorption chiller prototype (average capacity of 20 kW) at a plant for rubber products for automotive industry (Hutchinson, Zywiec)

First products will be available at the beginning of 2023

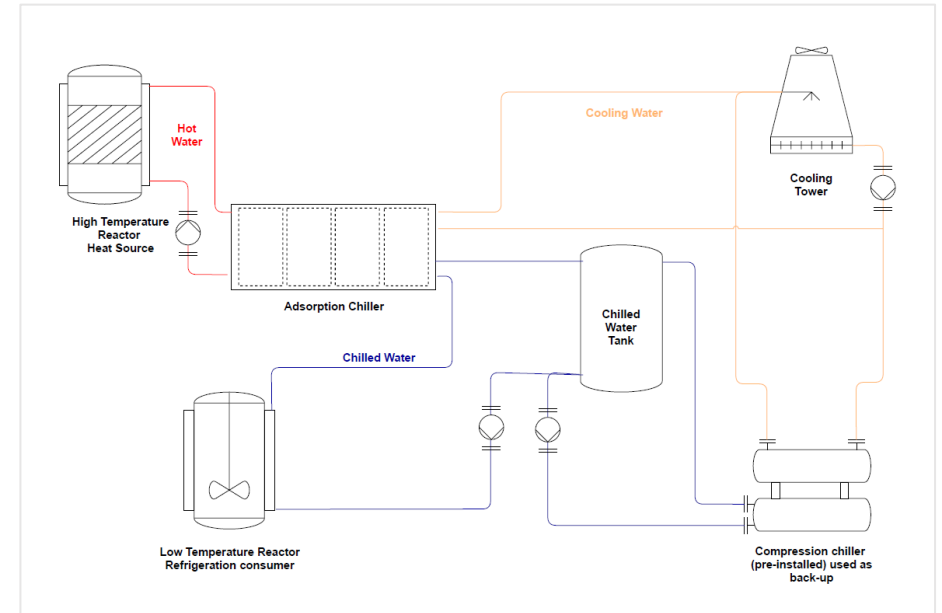
Example of applications: Application 1 Chemical Industry

Task: Electricity saving by heat recovery from chemical reaction

- **Heat source:** Reaction cooling water temperatures 65-95 °C (ideally 75-85 °C)
- **Cold consumer:** Water cooled reactor temperatures 7-20 °C (ideally 15-20 °C)

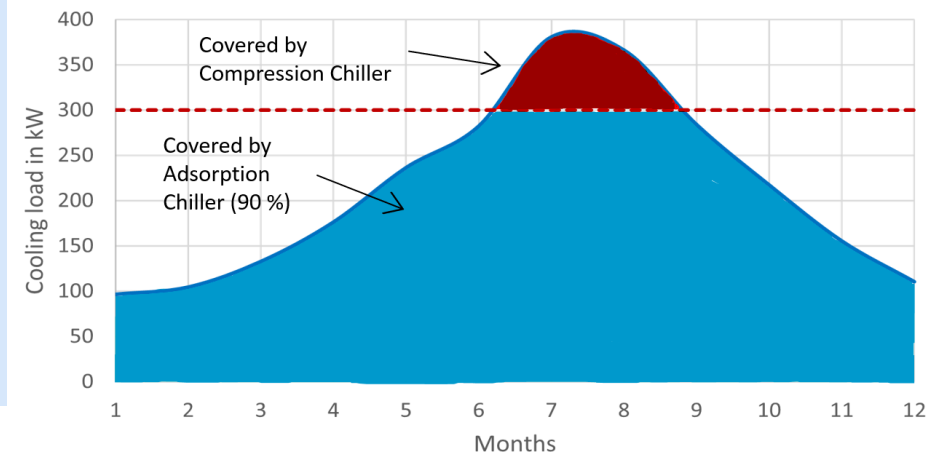
Example of an application in Nantong (Jiangsu province, China)

- **Cooling load:** Annual distribution (Shanghai climate conditions)
 Summer: Peak 381 kW, Winter: 100 kW, annual average 212 kW
 7,200 hours of operation / year = 1,526,516 kWh
- **Chilled water installation:**
 Adsorption Chiller Capacity: 300 kW covering 90% of annual load
 Compression Chiller (pre-installed): 400 kW covering 10% of annual load
- **Electricity savings: 541,331 kWh / year (82%)**



Existing Installation	Capacity	COP	Cooling Load	Electricity Demand	Cost Comparison China - Dubai:
Compressor	400 kWth	3.07	1,526,516	497,237 kWh	
Compressor pump	30 kWel			162,000 kWh	
Total			1,526,516	659,237 kWh	Annual savings: 422,238 ¥ - 205,706 AED
New system					
Adsorber	300 kWth	150	1,377,235	9,182 kWh	Total price: 1,050,000 ¥ - 540,000 AED
Internal pumps*	6 kWel			38,975 kWh	
Compressor	400 kWth	3.07	149,281	48,626 kWh	
Compressor pump	30 kWel			21,123 kWh	
Total			1,526,516	117,906 kWh	

Annual distribution of cooling load



- **Return on investment: China 2.5 years, Dubai 2.6 years**