Air Conditioning
for Commercial and Industrial Applications

Masdar · Abu Dhabi · United Arab Emirates · 60 MicroCSP Collectors · 50 Ton Air Conditioning · 6,120 Square Feet

ADVANTAGES OF MICROCSP TECHNOLOGY FOR SOLAR COOLING

The integrated solar collection system demonstrates a renewable energy technology that will assist customers to meet their energy goals, provide energy security and reduce greenhouse gas emissions over conventional technologies.

Additional advantages of the MicroCSP air conditioning system include:

- Integrated system design with the same solar array as either power generation or process heat to drive at least two processes - exceptionally appealing to those with more than one on-site power need.
- Continued production and storage of chilled water for cooling once the sun goes down or during inclement weather.
- Automated controls system seamlessly provides solar cooling into the building's operations with built-in diagnostic functions, simple panel operator interface, and data acquisition and logging capabilities.

Overview

Micro-scaled Concentrated Solar Power (MicroCSP) is a member of the Concentrating Solar Power (CSP) technology family that has been redesigned for installation in smaller, modular projects. By reducing the traditional CSP trough to one-third of its size, MicroCSP technology can be cost-effectively deployed to on-site markets for distributed power generation or industrial and commercial applications such as air conditioning and process heating.

Using Heat from the Sun to Cool

Annual average energy consumed by HVAC (Heating, Ventilating, and Air Conditioning) systems contribute to approximately 40%-60% of the total energy use in industrial and commercial establishments. As peak cooling demand runs almost in parallel with peak solar radiation, solar air conditioning has emerged as an ideal renewable energy solution.

MicroCSP technology is an innovative, cost competitive and sustainable solution for solar driven air conditioning – a key technology to offset the effects of fluctuating energy costs while mitigating environmental impacts. Solar air conditioning also enables major energy savings for large commercial and industrial users, especially for tiered rate structures used by the utilities during peak summer months – offering further cost savings to customers.

Absorption Chilling

The MicroCSP solar air conditioning system uses Sopogy's proprietary parabolic trough to provide solar thermal heat by concentrating the sun's energy on a receiver tube and heating the recirculated heat transfer fluid within the system. The generated heat is then used to drive the absorption chiller to provide a renewable source of industrial cooling.

Unlike photovoltaic cooling in which PV panels generate solar electricity to power an electrical cooling device, the dual-effect absorption chiller - a refrigeration system that uses a heated thermal fluid to drive a thermo-chemical process - uses water as a refrigerant and lithium bromide (LiBr) as the absorber. Typically, the heated thermal liquid is generated by using a natural gas or a waste heat and fed into the absorption chiller to produce chilled water.

Air Conditioning » Specifications

APPLICATION EFFICIENCY

SOPOGY » AIR CONDITIONING	Single Effect	Double Effect
Direct Solar Radiation on a Clear Day*	850 W/m²	
	269 Btuh/ft²	
Hot Water Driven Absorption Chiller Temperature Range:	185°F - 195.1°F	284°F - 320°F
	85°C - 90.6°C	140°C - 160°C
Solar to Thermal Efficiency, Collector Only*	62.2%	59.8%
Available Thermal Energy for Process after Losses	529 W/m²	508.3 W/m²
Average Output per Panel*	2.75 kW	2.65 kW
	9,392 Btuh	9,029 Btuh

DIMENSIONS/PANEL CAPACITY

SOPONOVA		
Length	3.66 m	11.99 ft
Width	1.65 m	5.42 ft
Center to Center Spacing	2.59 m	8.5 ft
Actual Area	6.04 m²	64.94 ft²
Reflector Aperture Area	5.21 m²	56.04 ft²

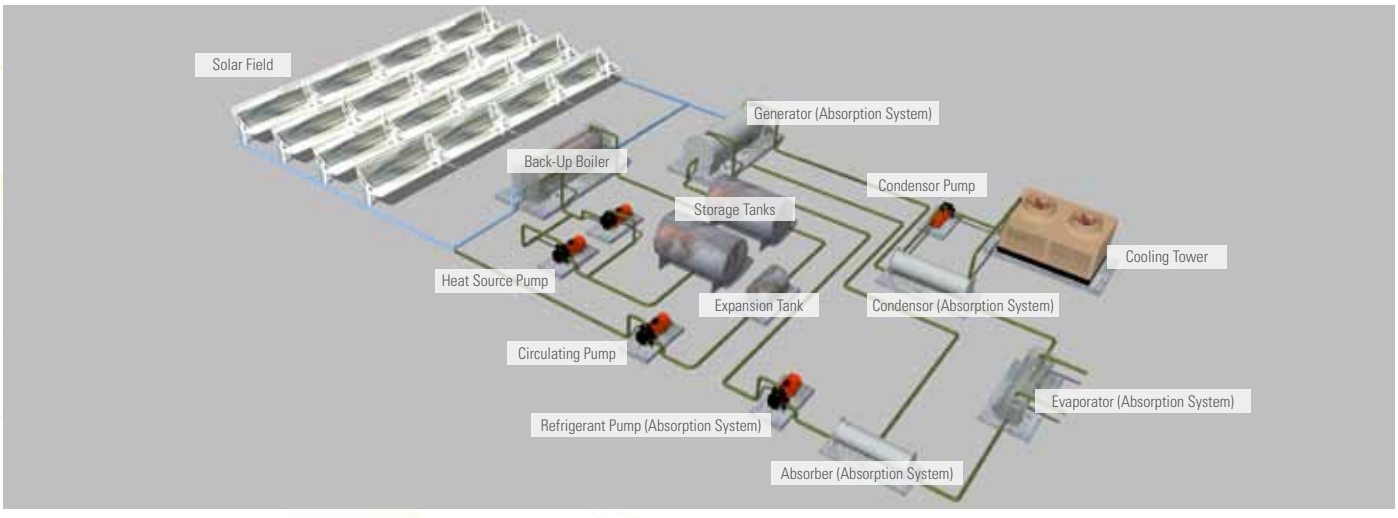
APPLICATION DATA

SINGLE EFFECT					
Nominal Cooling (Tons)	20	50	100	200	500
Nominal Cooling (kW)	70.34	175.84	351.69	703.37	1,758.43
COP	0.7	0.7	0.7	0.7	0.7
Thermal Energy from Solar (kW)	100.48	251.20	502.41	1,004.81	2,512.04
Number of Panels	42	108	210	420	1,050
SPACE REQUIREMENTS (ONLY SOLAR FIELD AREA)					
square feet	4,284	11,016	21,420	42,840	107,100
square meter	398	1,023	1,990	3,980	9,950
acre	0.10	0.25	0.49	0.98	2.46
hectare	0.04	0.10	0.20	0.40	0.99

DOUBLE EFFECT					
Nominal Cooling (Tons)	20	50	100	200	500
Nominal Cooling (kW)	70.34	175.84	351.69	703.37	1,758.43
COP	1.25	1.25	1.25	1.25	1.25
Thermal Energy from Solar (kW)	56.27	140.67	281.35	562.70	1,406.74
Number of Panels	24	60	120	240	600
SPACE REQUIREMENTS (ONLY SOLAR FIELD AREA)					
square feet	2,448	6,120	12,240	24,480	61,200
square meter	227	569	1,137	2,274	5,686
acre	0.06	0.14	0.28	0.56	1.40
hectare	0.02	0.06	0.11	0.23	0.57

* Design DNI - 850 W/m2
* Ambient Air (Tamb) - 26 °C
* Wind Speed - 3 m/s
* Collector Optical Efficiency - 67.3%
* Zero Incident Angle

AIR CONDITIONING SYSTEM LAYOUT



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