Adiabatic Gascooler

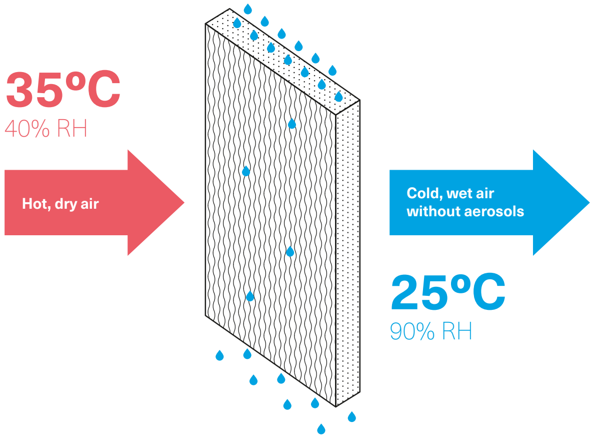
LEVANTE

New range of gas coolers with adiabatic support Levante

The new range of gas coolers LEVANTE is specially designed for the "Retail" sector. With it, by implementing adiabatic panels, the aim is to solve the problems caused by current gas coolers for condensing CO_2 in transcritical phase, which are causing serious operational issues at high temperatures.

What is an adiabatic panel

A heat exchange unit through water evaporation, or adiabatic panel, consists of a stream of water flowing over a panel that allows air to pass through it, causing the thin film of water to evaporate, saturating the air with moisture and thus reducing the temperature of this air stream.

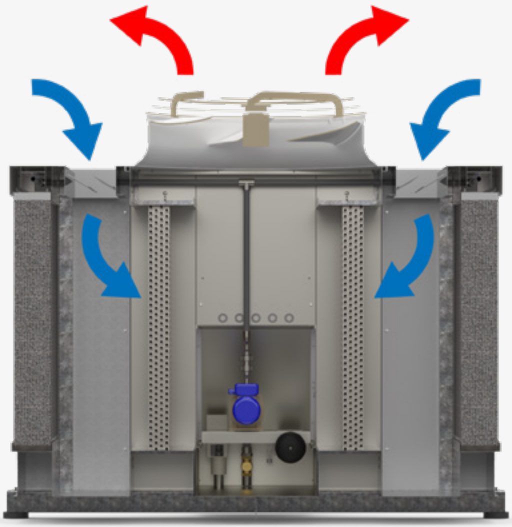


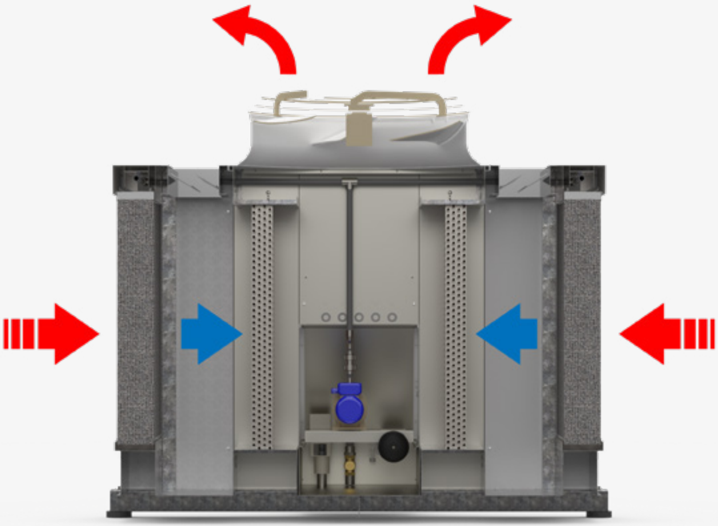
What it consists of

The adiabatic gas cooler consists of two vertically arranged coil banks in parallel with an upper horizontal ventilation train, two units of heat exchange through water evaporation, arranged in parallel to the condensation coil banks, and two air passage gates between them.

How it works

When temperatures are suitable, the Adiabatic Gas Cooler operates like a conventional heat exchanger. The PLC (Programmable Logic Controller) managing it keeps the gates between the adiabatic panels and the gas cooler coils open, allowing the airflow to pass through these gates to the condensation coils. This prevents excessive pressure drop and consequently unnecessary energy consumption. Electronically controlled fans, commanded by a pressure sensor, maintain airflow regulation based on the heat exchanger's need or demand.





When the outside temperature rises, the PLC activates the adiabatic mode. This involves a water tank that fills to an appropriate level, the water pump starts in a closed circuit and feeds the adiabatic panels, the gates that previously allowed bypass passage close, and the fan speeds are reduced to the appropriate level to allow maximum exchange efficiency.

When temperatures drop below the critical point, the system self-regulates and returns to classic operation. This means the pump stops recirculating water through the adiabatic panels, the water tank empties, and the bypass gates open, allowing the fans to operate at the speed required by the exchanger once again.

This entire process is automatic, controlled by a PLC that manages it based on the input parameters.

Constructive features

- **Coil:** Constructed with staggered copper tubing of high-strength K65 to withstand pressures of 130 bars. Aluminum fins with turbulators to enhance performance. Protected with vinyl treatment to guard against potential corrosion from moisture caused by the adiabatic panels.
- **Body:** Manufactured with high-strength galvanized steel sheeting, painted in white with oven-polymerized epoxy-polyester, stainless steel screws.
- **Fans:** EC electronic fans, external rotor, three-phase 400/480V-50Hz. Equipped with Class F thermal protector, wired to an IP54 terminal box.
- **Electrical panel:** Integrated management of full operation, possibility of connection for remote management, control, and monitoring.
- For complete installation and operation, only electrical and water connections are required.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Energy Efficiency

In the following table, we observe how, depending on the ambient temperature and relative humidity, the air passing through the adiabatic panels manages to reduce the temperature of the outgoing air, significantly increasing the thermal differential ΔT, resulting in energy savings for the compressor unit.

Dry Bulb Temperature (ambient) [°C]	24						26					
Relative Humidity [%]	15	30	45	60	75	90	15	30	45	60	75	90
Wet Bulb Temperature [°C]	10.9	13.7	16.3	18.6	20.8	22.8	12.1	15.1	17.9	20.3	22.6	24.7
ΔT	**12.3**	**9.7**	**7.2**	**5.1**	**3**	**1.1**	**13.1**	**10.2**	**7.6**	**5.4**	**3.2**	**1.2**
Outlet Temperature of the Adiabatic Panel [°C]	**11.7**	**14.3**	**16.8**	**18.9**	**21**	**22.9**	**12.9**	**15.8**	**18.4**	**20.6**	**22.8**	**24.8**
Reduction in Compressor Energy Consumption	**-34%**	**-29%**	**-20%**	**-13%**	**-6%**	**-3%**	**-45%**	**-38%**	**-33%**	**-24%**	**-21%**	**-1%**

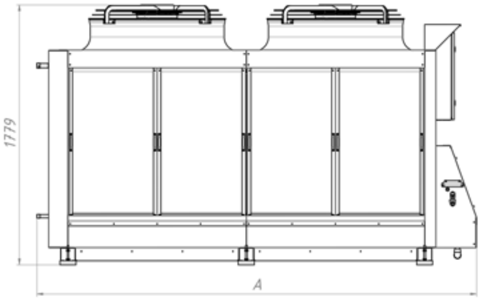
Dry Bulb Temperature (ambient) [°C]	34						36					
Relative Humidity [%]	15	30	45	60	75	90	15	30	45	60	75	90
Wet Bulb Temperature [°C]	16.9	20.8	24.3	27.3	30	32.5	18	22.2	25.9	29.1	31.9	34.4
ΔT	**16.1**	**12.4**	**9.1**	**6.3**	**3.8**	**1.4**	**16.9**	**13**	**9.5**	**6.5**	**3.9**	**1.5**
Outlet Temperature of the Adiabatic Panel [°C]	**17.9**	**21.6**	**24.9**	**27.7**	**30.2**	**32.6**	**19.1**	**23**	**26.5**	**29.5**	**32.1**	**34.5**
Reduction in Compressor Energy Consumption	**-50%**	**-43%**	**-26%**	**-22%**	**-15%**	**-4%**	**-52%**	**-46%**	**-30%**	**-22%**	**-14%**	**-4%**

Dry Bulb Temperature (ambient) [°C]	28						30						32					
Relative Humidity [%]	15	30	45	60	75	90	15	30	45	60	75	90	15	30	45	60	75	90
Wet Bulb Temperature [°C]	13.3	16.6	19.5	21.1	24.5	26.6	14.5	18	21.1	23.8	26.3	28.6	15.7	19.4	22.7	25.6	28.2	30.5
ΔT	**13.8**	**10.7**	**8**	**6.5**	**3.3**	**1.3**	**14.6**	**11.3**	**8.4**	**5.8**	**3.5**	**1.3**	**15.3**	**11.8**	**8.7**	**6**	**3.6**	**1.4**
Outlet Temperature of the Adiabatic Panel [°C]	**14.2**	**17.3**	**20**	**21.5**	**24.7**	**26.7**	**15.4**	**18.7**	**21.6**	**24.2**	**26.5**	**28.7**	**16.7**	**20.2**	**23.3**	**26**	**28.4**	**30.6**
Reduction in Compressor Energy Consumption	**-45%**	**-38%**	**-30%**	**-27%**	**-6%**	**-3%**	**-47%**	**-38%**	**-33%**	**-29%**	**-10%**	**-4%**	**-48%**	**-41%**	**-36%**	**-19%**	**-15%**	**-4%**

Dry Bulb Temperature (ambient) [°C]	38						40					
Relative Humidity [%]	15	30	45	60	75	90	15	30	45	60	75	90
Wet Bulb Temperature [°C]	19.2	23.7	27.5	30.8	33.7	36.4	20.4	25.1	29.1	32.6	35.6	38.3
ΔT	**17.7**	**13.4**	**9.9**	**6.8**	**4**	**1.5**	**18.4**	**14**	**10.2**	**7**	**4.1**	**1.6**
Outlet Temperature of the Adiabatic Panel [°C]	**20.3**	**24.6**	**28.1**	**31.2**	**34**	**36.5**	**21.6**	**26**	**29.8**	**33**	**35.9**	**38.4**
Reduction in Compressor Energy Consumption	**-53%**	**-36%**	**-33%**	**-24%**	**-14%**	**-4%**	**-55%**	**-40%**	**-32%**	**-23%**	**-13%**	**-7%**

Model	Capacity (Standard Conditions*)		Water Evaporated Flow (l/h)	No. x Ø	Fan Arrangement	Electronic Fans (0 to 1,100 rpm) ErP2015				Area (m^2)	Volume (dm^3)	Weight (kg)	Length (mm)	COP/EER
	Capacity (kW)	CO_2 Flow (kg/h)				Air Flow (m^3/h)	kW	Amp.	Sound Level dB(A) (10m)					
LVE100B2E	96	1320	200	2 x 900		43,200	3.8	6	57	156.0	20.0	620	3,008	2.14
LVE150B2E	149	2040	200	2 x 900		43,200	3.8	6	57	234.0	28.0	720	3,008	2.10
LVE200B2E	204	2800	200	2 x 900		43,200	3.8	6	57	312.0	40.0	820	3,008	2.09
LVE240B3E	241	3300	300	3 x 900		64,800	5.7	9	58	351.0	45.0	1080	4,208	2.10
LVE300B3E	306	4200	300	3 x 900		64,800	5.7	9	58	468.0	60.0	1230	4,208	2.09
LVE370B4E	373	5100	500	5 x 900		108,000	9.5	15	61	585.0	70.0	1800	6,608	2.10
LVE400B4E	408	5600	400	4 x 900		86,400	7.6	12	60	624.0	80.0	1640	5,408	2.09
LVE4806BE	482	6600	600	6 x 900		129,600	11.4	18	62	702.0	90.0	2160	7,808	2.10
LVE510B5E	510	7000	500	5 x 900		108,000	9.5	15	61	780.0	100.0	2050	6,608	2.09
LVE6106BE	612	8400	600	6 x 900		129,600	11.4	18	62	936.0	120.0	2460	7,808	2.09

*
Ambient Temperature at 35°C (47% RH) → adjusted to 26°C
CO_2 Inlet Temperature at 115°C
CO_2 Inlet Pressure at 92 Bar
CO_2 Outlet Temperature at 37°C → adjusted to 28°C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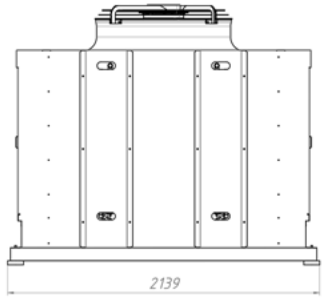
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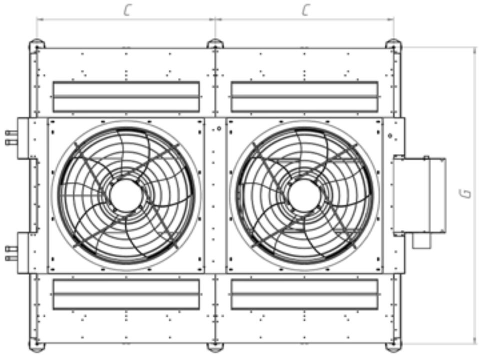
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GARCIA CAMARA

GARCIA CAMARA S.L.
Polígono Industrial de Marines, s/n
46163 Marines, Valencia (España)
Tel: 96 272 40 01 / Fax: 96 164 81 26
comercial@garciacamara.com
www.garciacamara.com

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