

## Lentzakis (Hotel)



### Summary:

<b>Country</b>	GREECE	<b>Collector area</b>	Total: 600 m <sup>2</sup> , 448 m <sup>2</sup> for solar cooling
<b>Location</b>	CRETE RETHIMNO	<b>Collector type</b>	Flat plate solar collectors-selective surfaces
<b>Building</b>	HOTEL	<b>Cooling capacity</b>	105 kW
		<b>Heating capacity</b>	210 kW
<b>Technology</b>	ABSORPTION		

#### Main positive points :

Commercial Installation, 2<sup>nd</sup> hotel in the world using solar cooling.  
 Contribution to the environment.  
 Contribution to the company.  
 Contribution to the National energy balance sheet.

### Building description:

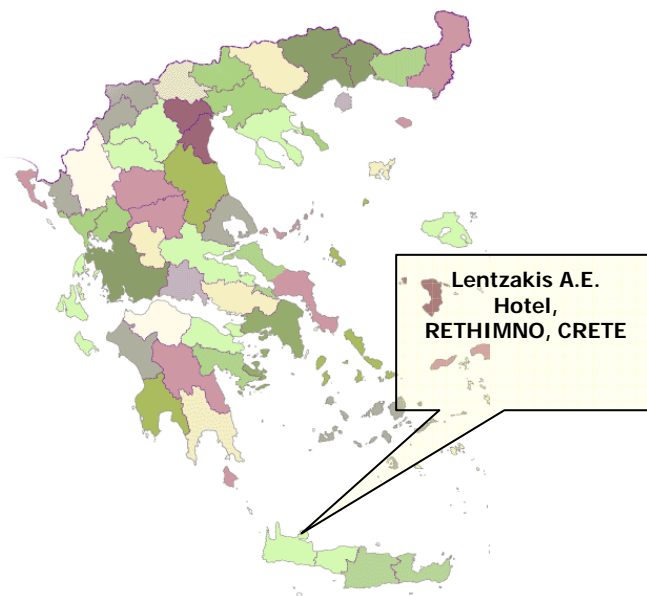
The "LENTZAKIS A.E." hotel is located in Rethimno Crete, in southern Greece. It caters mainly for tourism; with a bed capacity of 150 beds, and it has a 100% occupancy rate in the summer and a 45% occupancy rate in the winter.

This installation uses flat plate collectors (selective surfaces, 448 m<sup>2</sup>) for central air conditioning (cooling and heating) and also 152 m<sup>2</sup> polypropylene collectors provide hot water for the heating of the swimming pool.

The design, supply and installation of this system was done by SOLE S.A.

Total air conditioned area: 2.175 m<sup>2</sup>

Commencement of operation: 25/01/2002





**Picture 1 :** The solar collectors (448 m<sup>2</sup>) of “LENTZAKIS A.E.” hotel, located on the roof of the hotel.



**Picture 2:** View of the installed solar collects of “LENTZAKIS A.E.” hotel



**Picture 3:** Different view of the installation, “LENTZAKIS A.E.” hotel

## Cooling requirements:

Informations about: local climate, thermal loads....

Latitude: 35 21 N

Longitude: 24 31 E

Sunshine duration (h)	Average air temperature	Net Maximum Temperature	Net minimum Temperature	Relative humidity	Average cloudiness	rainfall	Wind direction
h	oC	oC	oC	%	8	mm	
110,8	12,9	24,9	0,8	69	5,6	153,5	S
132,2	13,1	25,4	2	67	5,3	88,9	N
157	14,4	28,5	3	65	4,6	69,7	N
218	17	33,2	5,4	64	5,8	38,1	N
309	20,7	37	9,6	64	2,7	8,7	N
335	24,9	37,5	13,6	61	1,6	5,3	N
373,1	26,8	41,4	15	60	0,9	0,1	N
350,2	26,9	39,3	16,4	61	1		N
263,7	24,3	38	13,6	64	2,4	19	N
166,1	20,9	35	8,8	67	4,1	104,9	N
165,8	17,9	30,5	6,9	68	4,3	49,7	N
112,9	14,9	28	2,4	67	5,3	104,5	S
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### ΠΙΝΑΚΑΣ 1: Cooling – heating and hot water needs.

ΜΗΝΑΣ	COOLING	HEATING	HOT WATER	TOTAL
Ιανουάριος	-	27.900	5.510	33.410
Φεβρουάριος	-	33.600	6.630	40.230
Μάρτιος	-	41.850	9.180	51.030
Απρίλιος	-	40.500	13.330	53.830
Μάιος	48.127	-	16.520	64.647
Ιούνιος	82.800	-	17.770	100.570
Ιούλιος	106.950	-	18.360	125.310
Αύγουστος	106.950	-	18.360	125.310
Σεπτέμβριος	82.800	-	17.770	100.570
Οκτώβριος	51.336	-	14.690	66.026
Νοέμβριος	-	27.000	8.880	35.880
Δεκέμβριος	-	25.110	5.510	30.620
<b>TOTAL (KWh)</b>	<b>478.963</b>	<b>195.960</b>	<b>152.510</b>	<b>827.433</b>

The swimming pool needs between March and October are 173.611 KWh according to the chart below; they are equal to the total collectors output since there is no back up system available.

### ΠΙΝΑΚΑΣ 2: Collector output equal to the total swimming pool load.

Μήνας	Φορτίο (KWh)
3	13.777
4	18.639
5	25.083
6	27.139
7	28.694
8	26.417
9	20.305
10	13.528
<b>ΣΥΝΟΛΟ (KWh)</b>	<b>173.611</b>

## ***Air conditioning system description:***

The solar collectors supply an absorption chiller with hot water of temperature 70-75 °C which operates with a coefficient performance of 60%.

The absorption chiller, uses the hot water as source of energy and produces cool water of temperature 8-10 °C. The cooling medium is also water (instead of Freon or Ammonia).

This is achieved within the condensation and evaporation of the coolant (water) in vacuum. The adsorption chiller doesn't consist of movable parts and use minimum electric energy for the operation of the vacuum pump (0.5 kW).

The useful power is 105 kW. For the coverage of the peak load 1 conventional electric chillers of 80 kW has been installed. Also a boiler of 600 kW substitutes the collectors field when there is cloudiness or whenever there is need for air-conditioning during the night.

During the winter period the solar collectors produce hot water of 55 °C, which is circulated directly to the fan coil units in the building. The same boiler replace the collector field in case of overcast. The cold water (during the summer period) and the hot water (during the winter period) is directed to the local air-conditioning units where they cool or heat respectively the ambient air within physical procedures.

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**Figure 1:** General diagram of the system



**Picture 4 :** Absorption chiller



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**Picture 5:** Plant room “LENTZAKIS A.E.” hotel



**Picture 6:** Solar polypropylene collectors for swimming pool heating

## **Technical results:**

Annual results

Solar Energy output: 576.049 kWh

Total Energy load: 958.238 KWh

Solar coverage: 60%

## **Financial aspects:**

Investments costs, subsidies, financing method, operation costs, financial savings

Total cost of investment: 264.000 €

The project was subsidized up to 50 % by National Operational Programme for Energy (of the Greek Ministry of Development)

## **Environment:**

Environmental savings, primary energy savings...

Primary Energy Savings: 576.049 kWh/year

Environmental Savings: Emissions Reduction

<b>CO<sub>2</sub></b>	<b>1.070.361 kg/year</b>
<b>SO<sub>2</sub></b>	<b>17.872 kg/year</b>
<b>CO<sub>2</sub></b>	<b>183 kg/year</b>
<b>NO<sub>x</sub></b>	<b>1.444 kg/year</b>
<b>HC</b>	<b>52 kg/year</b>
<b>Particulars</b>	<b>920 kg/year</b>

## **Opinions:**

The owners of the building are really very satisfied by all aspects of their investment, i.e. financial, environmental, etc., they also believe that the whole project contributes to the ecological image of their company to their clients, employees, the government and the public. The project has been awarded by CRES in Greece (Center of renewable energy sources) as the best investment in Greece for the year 2000.

## **Contact:**

Address, e-mail or web-site for more information

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## **Conclusion:**

Summary of the major positive points of this installation (to give convincing arguments to go for solar air conditioning)