

PRODES

Promotion of Renewable Energy for Water production through Desalination

## Solar Thermal Desalination



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Part of the presentation is prepared with the contribution of PRODES partners

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## Promising Technologies Combinations

RES	MSF	MED	VC	RO	ED
WEC			✓	✓	
PV				✓	✓
Solar Thermal collectors	✓	✓			
Geothermal	✓	✓			

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## RES Desalination installations

Technology	Percentage
PV-RO	32%
Other	18%
Wind RO	19%
Solar MED	13%
Wind MVC	5%
Solar MSF	6%
PV-ED	6%
Hybrid	4%

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## Solar Thermal Distillation Applications

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**Solar MED Plant (1)**  
 Capacity: 80 m<sup>3</sup>/d  
 Feed water: seawater  
 Performance ratio\*: 12  
 Number of Effects: 18  
 Collectors area: 1862 m<sup>2</sup>  
 Number of collectors: 1064  
 Seawater Temperature: 34°C  
 Heating Water Temperature: 99°C

Umm Al Nar, Abu Dhabi, UAE (1984)

Source: CRES, 1998

\*PR = mass of distillate produced/mass of steam

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**Solar MED Plant (2)**  
 Capacity: 3m<sup>3</sup>/hr (72 m<sup>3</sup>/d)  
 Feed water: seawater  
 Performance Ratio: 10.5-11  
 Number of Effects: 14, in vertical arrangement  
 Solar Collector Field: 500 m<sup>2</sup> CPC (Conc. Parabolic Collectors)  
 Number of collectors: 252  
 Water inlet temperature: ~70°C  
 Unit Water Cost: 2.5-3 €/m<sup>3</sup>  
 Spec. electricity consumption of 3.3 up to 5 kWh/m<sup>3</sup>  
 Spec. thermal energy consumption: 57.5-70 kWh<sub>th</sub>/m<sup>3</sup>

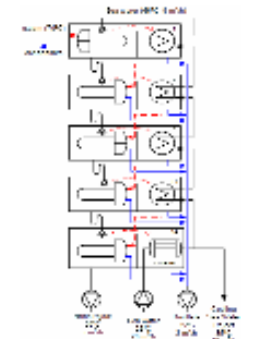
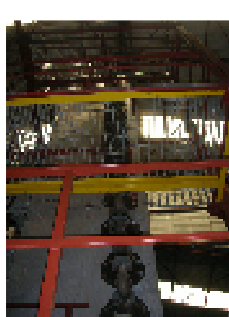
Almeria, Spain (1993)  
 CIEMAT, Spain



Source: CIEMAT

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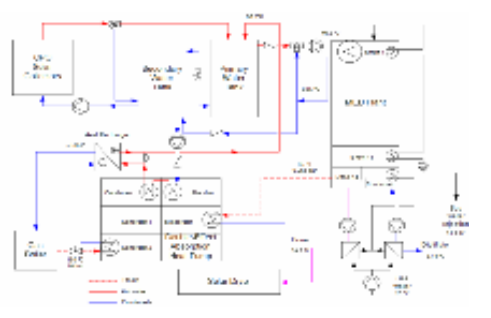
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**System Configuration**



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**CPC Collectors**  
4 rows of 63 collectors



**12 m<sup>3</sup> Thermal storage tanks**







**MED plant**






**Absorption heat pump**







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Location	Desalination unit	Solar collector	Year of installation
Hozag Tunisia	0.1-0.35 m <sup>3</sup> /h distillation	-	1980
La Paz, Mexico	10 m <sup>3</sup> /day MSF	352 m <sup>2</sup> FPC+PTC	1980
Lampedusa island, Italy	7.2 m <sup>3</sup> /day MSF	408 m <sup>2</sup> low concentration solar collectors	1983
Salat, Kuwait	10 m <sup>3</sup> /d MSF	220 m <sup>2</sup> line concentrating collectors	1984
Takami island, Japan	16 m <sup>3</sup> /d MED	FPC	-
Abu Dhabi, UAE	80-120 m <sup>3</sup> /d MED	ETC	1984
Almeria, Spain	72 m <sup>3</sup> /d MED	PCP	1993
Almeria, Spain	24 m <sup>3</sup> /d MED	Parabolic concentrating	1988/1990
Almeria, Spain, AQUASOL project	30-40 t/day	6 m <sup>2</sup> vacuum-tube solar collectors	1998
Al Azhar, PSA	0.2 m <sup>3</sup> /day MSF	FPC+PVs	1998/2000
Pozo Izquierdo, Gran Canaria, Spain SODESA Project	0.6 m <sup>3</sup> /day	50m <sup>2</sup> solar collectors+PVs	2000
Oman	1m <sup>3</sup> /day MED	5.34 m <sup>2</sup> VTC	2002



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**The Solar collector area, Pafos, Cyprus**



**The MED seawater desalination plant, Pafos, Cyprus**



