Solar Heat for Industrial Processes
IEA SHC – Task 33 IEA SolarPACES – Task IV
INTERNATIONAL ENERGY AGENCY
Solar Heating & Cooling Programme
www.iea-shc.org
SolarPACES
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Solar Heat for Industrial Processes – Task 33/IV

Around 100 million square meters of solar thermal collectors with a capacity of 70 GW_{th} had been installed up to the year 2001 worldwide. The use of solar energy in commercial and industrial applications is currently insignificant compared to the use in swimming pools and the household sector. On the other hand, the industrial sector in the OECD countries has the highest energy consumption, at approximately 30%, followed closely by the transportation and household sectors.

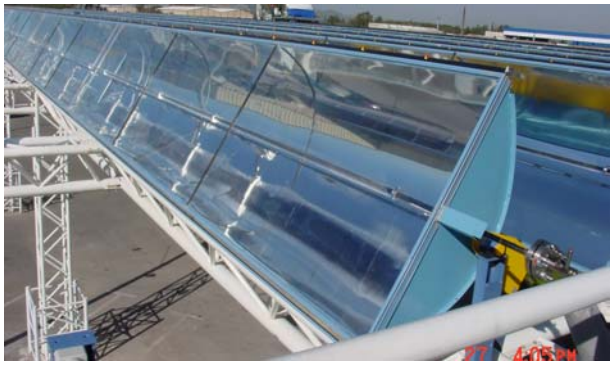
Task 33/IV – A collaborative research project

Task 33/IV – a collaborative research project of the IEA Solar Heating and Cooling Programme and the IEA Solar PACES Programme – will study the potential of and investigate the most promising applications and industrial sectors for solar heat. Task 33/IV was launched on 1 November 2003 and will be completed on 31 October 2007. It involves 27 experts from Australia, Austria, the Czech Republic, Germany, Italy, Mexico, Portugal and Spain and 11 participants from the solar industry.

Cooperation with Industry

The Task is designed to attract as many engineering companies, solar manufacturers and system vendors as possible. The solar industries of all participating countries are invited to participate in the work of Task 33/IV as well as to cooperate in the design and the erection of pilot plants.

If you are interested in a cooperation, please contact either the Operating Agent of the Task (e-mail: w.weiss@aee.at) or one of the Task participants in your country.



Further information: www.iea-ship.org/

How to integrate solar heat into industrial processes

The integration of solar heat into industrial production processes is a challenge to both the process engineer and the solar expert. In applying solar heat, attention must be paid to the temperature levels used in the heat supply system. Another challenge is the time-dependency of the solar energy supply and the heat demand of the processes.

Favourable conditions for solar thermal energy mean temperatures which are as low as possible, processes that need a constant amount of energy during sunlight hours and high energy prices in the existing system. There are suitable processes in many sectors of industry (see table, right). Payback times of less than 10 years are possible even at present energy and equipment prices. There are also promising considerations offering solar-contracting solutions to industry. In these models, the solar energy supplier carries the investment costs of the solar equipment and the customer pays for the energy delivered.

Operations and processes in some important industrial sectors

(● : important, X: very important)

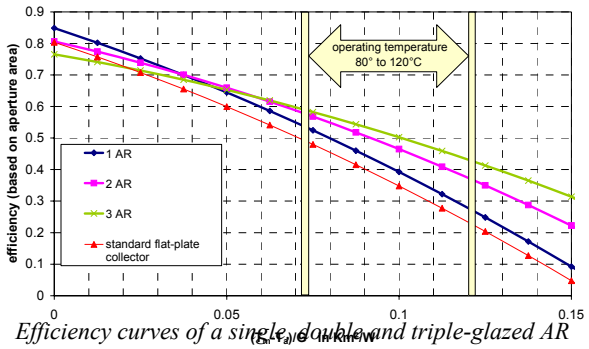
process	food	textile	building material	galvanizing, electroplating	fine chemicals	pharmaceutical and biochemical	service industry	paper industry	automobile supply	tanning	painting	wood and wood products
cleaning	X	X	●	X	●	X	X		●	●	X	
drying	X	X	●		●	X	X	●	●	X	X	X
evaporation and distillation	X				●	X						
pasteurisation	X					X						
sterilization	X					X						
cooking	X											
general process heating	●	●	●	X	●	●	X		●			●
boiler feed water preheating	X	X	●		●	●		●		●		
heating of production halls	X	X		●	●	●	●		X	X	X	X
solar absorption cooling	X			●		X	X					

Further information:
www.ieaship.org/documents/papersofnewsletterNo1.pdf

New developments of 'medium temperature' collectors for 80° to 250°C

The new term 'medium temperature collectors' is used to denote collectors with operating temperatures between 80°C and 250°C. The aim is to develop collectors that are suitable for applications in this temperature range within which there has been very limited experience to date. In order to give a short overview, three categories may be introduced:

- improved flat-plate collectors: double-glazed flat-plate collectors with anti-reflection glazing and hermetically sealed collectors with inert gas fillings, or a combination of both.
- stationary low-concentration collectors: stationary CPC type collectors and MaReCos (maximum reflector collectors)
- small parabolic trough collectors

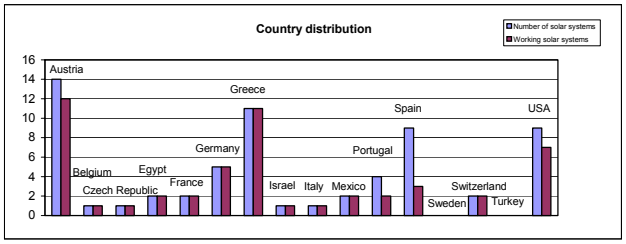


Efficiency curves of a single, double and triple-glazed AR collector in comparison with a standard flat-plate collector with normal solar glass.

Further information:
www.iea-ship.org/documents/papersofnewsletterNo1.pdf

Overview of existing solar process heat plants

Within Task 33/IV, information has been collected on industrial-process solar heat plants operating world wide. From the 49 plants that have been reported, the majority of the projects are in the food and beverage, textile, transport and chemistry sectors with a large majority in food processes. Indeed there are 12 plants in the food industry in fish, meat and olive processing. In the transport sector, most plants are washing installations; in the textile industry, at laundry companies.



Distribution of solar plants reported to Task 33/IV. Number of projects: (a) total and (b) plants still in operation.

Further information: www.iea-ship.org/documents/papersofnewsletterNo1.pdf

EL NASR, Pharmaceutical Chemicals (Egypt)

Application: Production of process steam for a pharmaceutical company

Location:	El Cairo, Egypt
Installed capacity:	1330 kW
Collector Area:	1900 m^2
Collector type:	parabolic trough collector
Heat transfer medium:	steam (8 bar)
Operating temperature:	173 ºC
Storage:	not specified
Year of operation start:	2004 (January)

Owner: NREA (New and Renewable Energy Authority, Cairo); financed by ADF (African Development Fund, Abidjan, Ivory Cost); Contractor: Lotus Solar Technologies (Cairo, Egypt); Engineering Consultant:Fichtner Solar GmbH (Stuttgart, Germany)

100 percent renewable energy for a production hall and office building

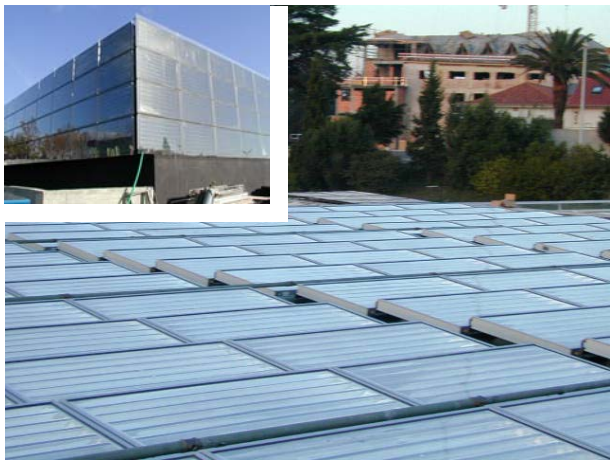
Application: Space Heating of a Production Hall

Location:	Bludesch, Austria
Installed capacity:	56 kW
Collector Area:	80 m²
Collector Type:	flat plate collector
Heat Transfer Medium:	water-glycol
Operating temperature:	20 – 80°C
Storage:	950 Litres
Year of operation start:	1994

Solar-powered air conditioning system for a road traffic control centre in Carcavelos, Portugal

Application: Space heating and cooling with a single effect Lithium-Bromide 79kW absorption cooling machine.

Location: Carcavelos (BRISA), Portugal
Installed capacity: 464 kW
Collector area: 663,3 m^2
Collector type: CPC solar collectors
Heat transfer medium: water glycol
Operating temperature: 80 - 90 ºC
Storage: 20 m^3
Year of operation start: 2004 (January)



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Short News

Environmentally friendly solar collectors

Solar thermal systems, using the sun as fuel, are undoubtedly environmentally friendly. But to what extent? How is it possible to evaluate the global environmental performance of solar devices (also considering the hidden impacts related to the production and disposal phases)? To what degree can the environmental benefits of solar technologies be increased? The University of Rome is carrying out a life cycle assessment of several solar collectors taking into account their environmental "cost" and comparing it with the benefits related to the traditional energy displaced by the systems themselves during their clean operation. This kind of result is today increasingly applicable for commercial purposes, (e.g. environmental product declaration systems, the German blue angel, etc.: www.blauerengel.de; www.environdec.com) , and its application to solar systems should be very interesting so long as solar costumers are highly aware of the importance of their environmental behaviour. [University of Rome, Italy: riccardo.battisti@uniroma1.it]

Sun and biomass: "Fossil free" process heat supply for agricultural factories

Is it possible to exploit solar energy twice? Yes, it is. Especially for agricultural factories which very often have a large amount of residual biomass available that could be used on-site to generate fossil-free process heat, together with solar thermal systems. Some case studies, currently under development in Italy, will focus on the combination of these two energy sources, in order to find the most viable technical solutions for their mutual integration. [University of Rome, Italy: riccardo.battisti@uniroma1.it]

"Fully sustainable" routes towards solar thermal applications

Clean energy is just one of the steps towards overall sustainability. Thanks to the participation of a social cooperative in Task 33/IV, the Italian group is developing fully sustainable solar thermal plants, working together with a design and installation team which includes 50% highly qualified people with disabilities. Solar thermal applications in bio-agricultural factories surrounding Rome are currently under development. [University of Rome, Italy: riccardo.battisti@uniroma1.it]