Innovative Applications of Solar Trough Concentration for Quality Fresh Water Production and Waste Water Treatment by Solar Distillation

Reporting

Project Information

AQUA SOLIS
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Final Report Summary - AQUA SOLIS (Innovative Applications of Solar Trough Concentration for Quality Fresh Water Production and Waste Water Treatment by Solar Distillation)

The AQUASOLIS project was thought as a support action for of a larger project dedicated to the use of solar concentrating plants for the production of hot water and air conditioning for Southern Mediterranean countries. AQUASOLIS found that the technology used in these plants can be used to generate fresh water at no additional cost of equipment and at times in which there is an excess energy available that, otherwise, would be lost. The solution to the water problem, as well as that of power, lies in renewable energy. However, renewable sources remain costly and the combination of the existing desalination plants (usually large scale ones) with renewable plants (usually small scale) is problematic and economically inefficient.

The main objectives of the project were the following:
- Data on the climatology and the socio economical framework of the three Mediterranean partner countries identified as targets of the project: Morocco, Lebanon and Jordan.
- Review of the state of the art of water production processes.
- Examination and evaluation of the concept of water production by means of the solar cooling system consisting of a solar parabolic trough and a single effect lithium bromide-water chiller.
- Organisation of a conference for the diffusion of the results of this support action. The conference was held as a workshop within the 'Desalination and the Environment' Congress that took place in Halkidiki (Greece) at the end of April 2006.
- Other dissemination actions.

The production of the final feasibility study on the use of the solar cooling system used in the Sixth Framework Programme (FP6) REACT has started from the study of the state of the art. After this phase, two main decisions were taken about the work that should be actually performed in the project. The research team was concentrated on two different technologies for the production of water: extraction of air humidity from the atmosphere and desalination by humidification / dehumidification of air.

In order to properly simulate the proposed technologies, meteorological data were needed. Since the in
Desalination by humidification dehumidification of air coupled to solar concentrators can be applied when:
- seawater or brackish water is available. Suitable areas are remote areas on the seaside or inland where
brackish wells are available.
- solar concentrating HD can be performed using robust materials (such as plastics) and can be operated and maintained with a complexity that is equal or lower to the complexity in operating a solar cooling system.
- it presents a limited additional cost for the contextual installation with the solar cooling system, while providing very high yields in terms of specific production and energy compared to other thermal desalination processes.

Extraction of water from air can be applied when:
- it is a by-product of an existing solar cooling system;
- no sea water or underground water resource is present or exploitable.

Whereas so far the approach has been to minimise costs by increasing the size of desalination plants, the AQUASOLIS approach showed the possibility of small size plants usable for small communities where fresh water is a by-product of a multi-purpose approach. The AQUASOLIS approach located therefore a possibility for a further economic gain of cylindrical solar collectors that the REACT project had not - so far - considered. It is hoped that this first survey of the matter can be put to test in the future with real multi-generative plants.

Further work is needed for a better understanding of the economic and technical implications of fresh water production from solar concentrating plants. In particular, the safety of distilled water for human consumption should be carefully assessed. However, the diffusion of plants that can produce water as an additional economic output to heating and cooling for can be seen as a boost for renewable energy which will kick start the diffusion of solar energy in Mediterranean countries.

Related documents

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