

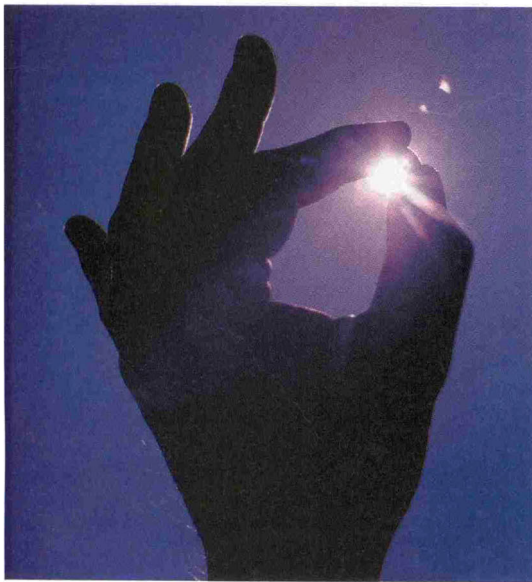
## || Air-conditioning

SOLAR ENERGY

# Chilling with the SUN

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In a perfect world, humans would live in harmony with their environment. They would thrive on its resources and learn to conserve them. But we don't live in a perfect world.



*I have no doubt that we will be successful in harnessing the sun's energy... If sunbeams were weapons of war, we would have solar energy centuries ago...*  
— Sir George Porter  
Nobel Winner in Chemistry (1967)

In a perfect world, there would be no greenhouse gas emissions and global warming, acid rain, melting icecaps, depleting hydrocarbon reserves and disappearing species of flora and fauna.

The UAE, which is working towards preserving its oil and gas, is taking a strong stance in promoting and employing new and renewable energy sources such as solar and wind power, as the demand for energy is close to exceeding supply.

In a bid to meet this demand, Shaikh Mohammad Bin Rashid Al Maktoum, Vice President and Prime Minister of the UAE and Ruler of Dubai, also announced that Dubai is



*Pacific Controls is a pioneer in the region and one of the first companies to go completely solar for cooling requirements*

looking at energy conservation and solar and wind schemes to help meet its electricity needs.

One of the areas that solar power could make an impact is the air conditioning sector. Air conditioning has been linked to high electricity consumption for years and the heavy penetration of air conditioners has perpetuated the situation.

Using solar thermal air conditioning could, therefore, be a step in the right direction, especially considering the UAE has an abundant supply of sunlight.

"There is in the region of 1,930 kilowatt hours per metre squared every year of solar radiation within the UAE, which signifies a good source of free energy virtually all year round. The cost of electricity will certainly increase over the years and clients will be looking to reduce their overheads. Solar air-conditioning systems will have to be part of the equation, especially if it becomes

mandatory that building's designs have to be energy efficient," says John Owen, representative for the Gulf region and North Africa, Sole SA. The Greece-based company designs, manufactures and supplies solar-powered heating and cooling systems.

### Green building

Owen says that solar air-conditioning systems have very few moving parts, and they can be cost effective in projects that are a long way from the electrical grid, with no need for large power cables or transformers to drive conventional electrical systems.

Pacific Controls, a leading automation company that markets IP enabled converged Building Integration solutions management systems (BMS) and machine-to-machine (M2M) solutions, is one of the pioneering companies in the region to adopt a solar thermal air conditioning system. Pacific Controls' headquarters, which is based in the Techno Park in Dubai, uses solar energy to meet its lighting and cooling needs. The building is also the Middle East's first USGBC Leed-certified Platinum rated 'green' building.

Dilip Rahulan, Chairman and CEO of Pacific Control Systems LLC, says that their solar thermal air conditioning plant is one of the largest in the region and world to be commercially implemented in a 'real' environment.

"The total cooling re-

quirement in this building is 400 tonnes, 100 tonnes (25 per cent) of which is provided by absorption chillers, that run on water heated by solar hot water panels," he says.

Rahulan says that absorption chillers that run on hot water have been used for a long time. In the past, ammonia was used in a medium. However, new technology has seen new environment-friendly alternatives to ammonia. A pump helps the absorption chiller pump water through the system and a vacuum pump to control the vacuum within the chamber.

### Requirements

"We also rely on a diesel-run calorifier as a back-up measure to meet temperature requirements on cloudy days and nights. The calorifier kicks off only when the solar panels don't receive adequate sunlight to provide the required hot water. However, we have been getting temperatures between 85 to 95 degree Celsius from our solar panels, which is quite an accomplishment," says Rahulan.

According to Rahulan, the ability to adopt solar panels and organise and arrange them in a functional way to allow the circulation of large volumes of water was a design challenge.

Pacific Controls also relies on high-efficient screw chillers that provide the 300-tonne cooling requirement. The absorption chillers that are part of the solar air-conditioning sys-

tem provide the rest. "We are planning to bring the contribution of the solar thermal air-conditioning system to 50 per cent in the near future."

The success of this project and the application of solar air conditioning has also encouraged the company to offer the concept as part of a turnkey solution, among its other products, to customers across the region and internationally. "We feel that the successful operation of our solar thermal project can be an ideal showcase for other companies who wish to incorporate it," says Rahulan.

The trend towards sustainability is also likely to help make this concept more widely accepted. Coupled with environmental awareness, this factor has also created an interest in such concepts. Rahulan says that along with initiatives launched by the government, private companies should also take on some responsibility in assisting the drive towards such green initiatives, especially as part of their corporate social responsibility.

Solar air-conditioning systems are only limited by their collector field area and can be used virtually anywhere, if the space is available.

"A collector is primarily a rectangular aluminum box, within this box are copper pipes that run parallel to each other, attached to these pipes are thin copper plates. When the collector is exposed to the sun the plates heat up, transferring

the heat to the copper pipes, water passes through these pipes," says Owen. He adds that, in 1999, Sole S.A designed, manufactured and installed the largest solar air-conditioning system in the world using flat plate collectors. To do this, Sole designed a low energy absorption chiller, which would operate with temperatures as low as 45°C. The system produces 700Kw cooling capacity and has a collector field area of 2,900m<sup>2</sup>.

### Limitation

A standard collector is 2.7 m<sup>2</sup>. Depending on the energy required the collectors are joined together to make up a large collector field, which can produce a vast amount of hot water. An efficient system is designed so the collector field will produce enough energy (Heat) from the sun to run the absorption chiller without having to use any additional fuels, says Owen.

Shadow effects have to be considered when choosing a location to install the collector field, which means that if a collector is placed within a shadow (Probably from a nearby building), the collectors do not produce maximum energy. A car parked in direct sunlight during the summer becomes extremely hot, so if the car is parked in the shade there is little heat. Therefore, it is important to consider this when installing a collector field.

Another limitation is the cost. Owen says that solar thermal air conditioned

systems are more expensive than conventional systems. "This makes it a hard selling point within the region, but when one considers the potential savings against the cost of running conventional electric systems, they become cost effective to the end user. At today's cost of electricity the additional capital cost for the solar system has an investment return between 10 and 12 percent," he says.

Although this technology is not new in Europe, it is recent to the UAE and with any new technology; it is difficult to convince clients to install such systems in the initial stages.

### Regulations

For commercial applications, going solar is a long term commitment considering its higher payback period on the investment. Unless some forms of incentives, subsidies or mandatory regulations are provided or made by the government, implementation of solar projects is negligible.

For instance, the successful implementation of solar parks in Germany, commercial and residential usage of solar energy in USA, latest government incentives in Spain and Italy are all examples of their governments' involvement to support commercialisation of solar energy," says Prabish Thomas, Managing Director for Middle East, Africa & Asia Pacific for Geosolar.

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