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## PC A/C

### On the Trail of a Solar-Powered Chill

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**You want cool rooms, even on a hot summer's day? Electricity-guzzling air conditioner units have long been the only option. But change is afoot: A Hamburg firm is transforming sunshine into affordably cool air.**

Who hasn't wished for a nice, soothing air-conditioner on a hot summer's day in the office? Unfortunately, though, traditional air coolers have a nasty side-effect -- they use so much energy that they perpetuate, in their own, not-insignificant way, global warming.



AFP

Conventional solar panels are everywhere. But can they create cool air?

But what if one could harness the sun's rays to cool a home or office without gobbling up huge quantities of energy -- and without releasing too much CO2 in the process?

The revolutionary technology, though still in its infancy, already exists. But it remains prohibitively expensive. A Hamburg-based company, Thermodyna, has set out to solve the problem. It wants to build a household unit that can produce power, heat and cold air whenever the consumer needs it. A classic energy guzzling air-conditioning system, would no longer be required.

The core of the system is the so-called Schukey motor which transforms the sun's rays into cool air for comfortable buildings. It produces one kilowatt hour of coolness for five cents. By way of contrast, conventional air conditioners burn through 12 to 14 cents per kilowatt hour.

"There are no electronics and hardly any components," says Thermodyna boss Volker Bergholter, describing the machine's "sensational simplicity." It just requires two motors to produce the cool air.

The booster converts steam, which is produced by a solar panel, into mechanical energy. This then powers the actual cooling machine, which sucks up the damp warm air in a room, compresses it, then expands it and cools it to 20 degrees Celsius (68 degrees Fahrenheit).

Thermodyna plans to sell the first of these machines as early as 2010. Its biggest advantage is that cooling is required exactly when the sun is shining the most -- meaning the solar cooling machine can better match consumers' requirements.

For years, researchers and engineers have been striving to develop machines that can use the sun's heat to bring down room temperature. But they were never able to compete with classic, plug-in air-conditioning units. Solid, a solar power information service based in the city of Fürth, estimates that each year, air-conditioning units with a combined output of 250,000 megawatts are installed. Only a tiny percentage of those units, however, are environmentally friendly. "The technology has not been economically viable until now," says Oskar Wolf, an expert on solar cooling at Solid. Regenerative cooling systems have tended to cost between 24 and 30 cent per kilowatt hour -- double the cost of conventional systems.

### **Sky-High Costs**

These exorbitant costs have largely been due to the extraordinarily complex technology such green cooling systems have used until now. The current method involves using solar energy to heat a mixture of water and coolants in a so-called absorption cooling machine. The coolant evaporates, is condensed and sprayed into a heat exchanger, where it is evaporated again. The heat used to evaporate then extracts the water from the air, which then flows into the heat exchanger. It is cooled here and can then be used to cool the room.

The problem, says Wolf, is that even small machines with an output of just 15 kilowatts require a huge amount of electricity and temperatures of up to 100 degrees Celsius. It is also difficult to calibrate solar and cooling systems to each other. "It took a long time to get a grip on the technology," Wolf says.

The market for clean air-conditioning, by contrast, is enormous. The International Energy Agency (IEA) expects the demand for air-conditioning units in Europe to grow by more than 10 percent by 2020 as a result of climate change. Solar-powered units could cover the need without increasing CO<sub>2</sub> emissions and could help to reduce the effect on the climate. At the same time it could reduce the midday spikes in electricity use and stabilize the grid.

Germany provides healthy subsidies to those who install environmentally-friendly air-conditioning units. Once collector surfaces exceed 40 square meters (430 square feet), the state development bank KfW kicks in up to 30 percent of investment costs.

The newly-created Association for Sorption Cooling -- "sorption cooling" being the technical name of the new technology -- wants the state to go even further. It is pushing for special grants specifically for absorption and adsorption cooling machines. "We are looking for talks with the Environment Ministry," says Bernd Hebenstreit, sales manager with EAW, a solar panel manufacturer based in Westenfeld in eastern Germany. There is also movement at a European level. The EU directive on renewable energy, which came into force on May 1, looks to promote the technology. The member states are supposed to adopt regulations for the solar heating and cooling of buildings.

## Big Players

Official promotion of the chillers would make the technology attractive to large heating technology firms like Vaillant or Viessmann. "Should this come about, companies would be sure to engage more intensively with solar cooling," says Andreas Lücke, chief executive of BDH, an industry association. Up to now the technology has been neglected because it has not been cost effective. Instead the industry has concentrated on other climate technologies such as electric air-conditioning or reverse-cycle heat pumps.

If the big players were to take a greater interest in pursuing solar-powered units, then it would promote the commercialization of the chillers. These companies have the financial means for rapid innovation, big factories and marketing campaigns. They don't have to actually invent the cooling machines themselves. They could cooperate with the innovative smaller companies, which have been developing the technology in recent years. Companies like EAW, SK Sonnenklima or Sortech have either already produced small numbers of cooling machines or else are on the brink of beginning production.

EAW, for example, makes absorption coolers which put out between 15 to 200 kilowatts. Its cooperation with the Bielefeld-based, window and solar technology company Schüco could provide a role model for the rest of the industry. EAW builds the chillers and Schüco combines them with its solar panels and then sells the two as a combined system.

Hebenstreit, the sales manager with EAW, says that demand is modest at the moment due to the high manufacturing costs which make the units expensive. The basic unit costs €1,500 per kilowatt. That is three times as much as the units offered by other producers. However, the company hopes to reduce the cost to €500 per kilowatt within 10 years, something that can be achieved by increasing and optimizing production. "By then we will be able to compete with the traditional producers of cooling systems," says Hebenstreit.

Thermodyna is even further ahead. The company thinks it is already in a position to conquer the market with its Schukey motor. "In the short term we could bring about a revolution," company CEO Bergholter says.

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