



First commercial solar driven air-conditioning system in South Africa

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... was just a question of time



It is an interesting paradox of South Africa's sunny climate that the very source of heat, which necessitates cooling in buildings, can in turn be utilized to cool these very same buildings. An exciting showcase project to prove the efficacy, efficiency and economic viability of commercial solar driven air-conditioning system has been implemented in Pretoria. The system has been installed, commissioned and is currently fully operational and data is being collected and monitored for later analysis. Utilizing absorption chiller technology, the project aims to define a new method of cooling buildings in Southern Africa.

Voltas Technologies is the South African importer and distributor of the absorption water chillers produced by the Japanese multinational, Yazaki, an undisputed world leader in the absorption industry. The Johannesburg-based company specializes in solar technology products and solutions and offers a large range of quality renewable energy products through its comprehensive Southern Africa dealer and installer network. In terms of its expertise, knowledge base and world-class product range the company is ideally positioned to offer optimal and cost-effective solar and green building technology solutions to the local market.



Solar thermal energy has perhaps the greatest potential of all solutions to transform global energy issues, as it is a highly efficient renewable energy source for heating and cooling. During 2008, according to the European Solar Thermal Industry Federation (ESTIF), despite the economic downturn, solar thermal heating and cooling solutions gained significant market share in an increasing number of countries around the world.

The industry is forecast to grow rapidly in the coming years as policymakers push renewable energies up the agenda and developers realize that initial costs will be offset by significant savings in the medium to long-term. In South Africa, developers are finding that electricity permissions and allowances are becoming more difficult to obtain and many are exploring solar and eco-friendly technology options as a solution to this problem. To further develop the quest for sustainability, the Green Building Council of South Africa has developed its own Green Star rating based on the Australian model which augers well for alternative energy solutions in South Africa.

Cristian F Cernat, CEO Voltas Technologies, is a mechanical engineer with 20 years experience in heating, ventilation and air conditioning design, installation and system integration. In 2008, he concluded a distribution agreement between the Yazaki Corporation in Japan and Voltas Technologies (Pty) Ltd. His choice of Yazaki was based on their outstanding international reputation for efficient high quality absorption chiller products, their advanced technology and research and their ISO 9001 and ISO 14001 certification.

Finally, technology utilizing free solar energy to power air conditioning systems was available in South Africa but Cernat was faced with several challenges which included the structural limitations of existing buildings and the need to prove that absorption chiller technology was ideal in the South African context.

"Today, almost 150 years from its inception (Carre 1858), absorption cooling technology has reached an acceptable level of process stability and therefore the use of it is highly recommended," says Cernat. "New innovative absorption chillers are now available. The newly developed chillers are suitable for use with low (less than 90oC) hot water temperatures. This characteristic makes them a very interesting application for systems based on wasted/recovered heat or solar heating systems. In South Africa, few absorption systems have been implemented and as far as we know, none has been solar power driven."

"It was clear that the only way forward would be a showcase installation which could prove to the market that absorption technology is a reliable, efficient and cost effective solution for the South African air conditioning market."

After months of negotiations with different entities trying to find a host for the showcase plant, Cernat approached a long-time client, Netcare Hospitals Pty Ltd. "Thanks to the commitment of Peter Schilder, Group Technical Manager and Eddie Herrmann, Regional Technical Manager, Netcare Hospitals agreed to provide Voltas Technologies with sufficient roof space and the opportunity to install and operate the system in parallel with the existing air conditioning plant at Moot Hospital, one of their facilities in Pretoria," explains Cernat.

"In order to demonstrate the economics and the operating characteristics of absorption cooling systems in South African conditions, Voltas Technologies, in partnership with several reputable solar installers, installed the solar chiller plant. The plant, known as the 'First Solar Thermal Driven Chilled Water System' (STDCHW) is a first in Southern Africa. The STDCHW is a showcase project, with a 35 kW cooling capacity, based on the Yazaki WFC 10 chiller and a number of solar collectors for a heat source on the roof of the Netcare facility.

The installation will produce chilled water, the cooling agent utilized in the building's air conditioning system, by deploying a thermally driven absorption cycle based chiller unit in lieu of an electrically driven compression chiller. Thus, solar thermal energy can be used to efficiently cool in the summer, and heat domestic hot water and buildings in the winter."

The aim of the two-phase project is (a) to prove the technology to the local market; (b) to establish the relationship between the kW cooling and the area of the solar collector field required in South

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African conditions to power the chiller; and (c) to optimise the heat storage solution in order to ensure a consistent and constant hot water temperature supply to the chiller.

Cernat says that the installation will be completed in two different phases: Phase One - the installation of an absorption based system, 35 kW nominal cooling capacity complete with a dual storage system and full monitoring and a web accessible bms system, and Phase Two - the upgrading of the system to 200 kW nominal cooling capacity. Phase One is now complete, the system is up and running and online. Once conclusive data is collected and the heat source/cooling ratio is confirmed, the project will move forward to Phase Two.

"Our project tasks include the calculation and validation of the relation between the cooling capacity of the chiller and the solar absorption area when evacuated tube collectors, 'U-tube' and 'heat-pipe' types are used; the calculation and validation of the minimum thermal storage required in order to ensure a 12 hour operation of the system; and the measurement and verification, both in-house and by a third party, of the electrical energy saving associated with this type of air conditioning system. A feasibility study of the implementation proven 'life' will be carried out by using the acquired data."

"The project will enable Voltas Technologies to establish a real baseline for consumption so that eventual savings can be presented in perspective," concludes Cernat. "The project's results will be available shortly and the absorption technology will be proven as the optimal air conditioning solution for South African conditions."

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