House Onderstepoort now houses record-breaking solar water heating system

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The aim of the upgrading project at Onderstepoort was to make the new facilities as energy-efficient as possible.

House Onderstepoort, the student residence on the University's Veterinary Science campus, will now save almost 700 000 litres of water and produce 450 less tons of carbon dioxide per year. This is after the University acquired a world-class solar water heating system for the residence complex during a recent upgrading project.

The upgrading formed part of a R90 m project, which commenced in May 2010. The University's Faculty of Veterinary Science is the only one of its kind in South Africa. With the new facilities and accommodation that were added adjacent to the existing residence, it can now accommodate 604 students.

As part of the upgrading project the University aimed to make the new facilities as energy-efficient as possible. One of the measures taken to achieve this goal was the installation of a solar water heating system on the new carport. With a total collector surface of 672 m^2, it is the biggest glazed installation in southern Africa. The system, installed by Holms and Friends (formerly Omnibus Engineering), avoids the production of 450 tons CO_2 and will save 600 980 litres of water each year.

"The savings are remarkable, the system is fully functional and it is a pleasure to watch in action," said Alec Blackhall, Manager: Residence Affairs and Accommodation at the University.

Pretoria North, where Onderstepoort is situated, falls within the Northern Middleveld climatic region, which is characterised by its distinct rainy and dry seasons. Temperatures show a large daily variation and strong solar radiation is prevalent. This led to the decision to install SUNDA PG2.0-F/G flat plate collectors instead of the costlier, but more efficient, vacuum-tube collectors.

Some 336 two-metre^2 collectors were installed on top of the carport and rooftops. Three collectors were connected in parallel, and two parallel 'strings' were then connected in series to get a total thermal length of 12 metres. The total capacity of the installation, 430 kWh, could produce 404 700 kWh of electricity a year.

One central feeder tube transports the warm water to a building

constructed next to the carport to house the heart of the system: two giant 20 000-litre water storage tanks, an expansion tank, membrane expansion vessels (totalling 5 400 litres) and seven external heat exchangers, among others.

The water heated by the solar panels is stored in the buffer tanks. Through external heat exchangers (that is, exchangers not housed in the tanks themselves), a different continuous freshwater supply is warmed and distributed to the individual residences. This results in an indirect loop system, which automatically complies with health standards without having to manage a major maintenance programme, since it will never be used for human consumption. It is, simply, the 'working fluid' of the system.

The water is distributed through pump-circulation, via 40 mm diameter heavily insulated pipes. These are mounted on steel frame structures to reach each residence building. A safety measure has been put in place for those periods when the system is not in use; for instance, over the December holidays. During that time, the system could get extremely hot and the water can expand, sometimes even reaching a gaseous state.

Merely using open expansion vessels would result in having to continually top up the working fluid, which could lead to corrosion and contamination of the system. Therefore membrane expansion vessels were used for the project. These, and all other components for the system, are 'Made in Germany' quality and are directly imported or locally produced. Normal grid-connected electric heating serves as a back-up for the system.

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The residence facility at Onderstepoort will save almost 700 000 litres of water and produce 450 less tons of carbon dioxide a year.

While the full consequences of climate change are unknown, what is certain is that neither the planet nor humanity will be able to adapt in time, unless the process can be halted by developing new technologies to generate alternative and renewable sources of energy.