Remote project a proof of concept for eco-friendly desalination

March 24 2015, by Julia Stepowska

Tjuntjuntjara

In the past water desalination has been identified with industrial-scale, energy hungry plants but researchers working at a remote Indigenous community In Western Australia have proved portable, solar-powered desalination can provide cost-effective water security for a small community.

A team from UTS, Murdoch University and the Western Australia Department of Housing implemented a prototype solar-powered portable desalination plant in the community of Tjuntjuntjara, located 800km northeast of Kalgoorlie.

The project, funded by the National Centre of Excellence in Desalination (NCED), was aimed at developing an energy-efficient and chemical free pre-treatment process that would sustainably deliver water to the drought-prone area and growing community. The research team was pivotal in optimising the conditions for the desalination system and determining whether a system with low maintenance requirements would be feasible in such an isolated location.

Initial background data by NCED found that Tjuntjuntjara obtains its water supply from an area of internal drainage, known as a donga groundwater catchment, roughly four kilometres from the town. Stormwater flows into the donga and percolates down through the strata, forming a thin blackish lens of drinkable water, floating atop of hypersaline water.

The pilot plant site

"Their existing water source has a very, very high content of salt – roughly twice the levels of saline as seawater. We also found it to be contaminated with iron and nitrate, exceeding the recommended level for infants and pregnant women," said Gayathri Naidu, a UTS PhD student working on the project.

"The safe yield of the donga is thought to be about 23 kilolitres per day, but the lens shrinks during periods of drought. Who knows what the community would do then. Trucking in water is too difficult because Tjuntjuntjara is too remote. It would take at least three days to get there."

The prototype tapped the hypersaline water and treated it via a membrane distillation system. Modifying an existing MemSYS system,

the team were able to build a prototype to best meet the Tjuntjuntjara community's requirements to produce clean, drinkable water. The MemSYS system treats water with thermal energy, sourced from the solar panels, which was tested by Murdoch University. A simple filter is used to remove the iron.

"The memSYS membrane desalination technology proved to be a promising alternative technology for small-scale drinking water production. It is compact, produces less waste water and is easy to clean," said Professor Saravanamuth Vigneswaran, Director of the UTS School of Civil and Environmental Engineering and UTS supervisor for the project.

"We were able to optimise the conditions by identifying the best temperature for the system, how to wash it, what processes we needed to remove the iron, etc," said Naidu. "We also didn't want to use anything that required chemicals, because of the remoteness of the plant.

"In the end, we've got a desalination system that is technically robust, low-maintenance, economically competitive and eco-friendly for small-scale application."

Provided by University of Technology, Sydney