

# Alternative Energy for Reliable RO



PHOTOS COURTESY OF TOM AND JULIE VANCE

RO desalination system provides reliable water supply for remote island

By Clark Beek

**T**iny Utrik Atoll is part of the Marshall Islands, a scattered group of atolls in the northwestern Pacific Ocean. On Utrik and neighboring islands, rain catchment traditionally supplied all of the drinking water, while well water was used for washing. Over the past decade, however, rainfall has become unreliable, and during the dry seasons Utrik islanders were forced to drink well water with unsafe salinity levels.

In 2010, they decided to do something about it. With the help of Tom Vance of Moana Marine LLC, they installed the region's first permanent reverse osmosis (RO) desalination plant powered by alternative energy.

### Fuel Cost-Conscious

A typical remote desalination plant would be powered by a diesel generator, but outer island fuel prices have averaged \$8 to \$10 per gallon, and the supply has become unreliable. Utrik, with a population of 485, is situated more than 300 miles from Majuro, the capital and commercial center of the Marshall Islands. Depending on the

season, those 300 miles can be plagued by rough weather and even hurricanes, delaying flights and shipping for weeks.

Outer island fuel prices are now soaring to \$15 per gallon, so the only way to ensure consistent, affordable water on this remote, drought-prone island was to power the RO desalination system with solar and wind energy.

### Affordable RO

The core of Utrik's system is two Spectra LB-1800 RO desalination systems, which draw seawater from a beach well to take advantage of natural prefiltration. Spectra's small desalination plants use proprietary energy recovery pumps, meaning they can produce a given quantity of water using less electricity. This allows for smaller wind turbines, solar arrays and battery banks, and less expense in shipping them to remote islands.

After additional prefiltration through polyester elements, the system converts seawater into 3,600 gal per day of clean, fresh U.S. Environmental Protection Agency (EPA)-approved drinking water, which is stored in

two large tanks. The water is sterilized with ultraviolet light as it leaves the tanks to guard against biological growth during storage.

To power the system, Vance installed two Bergey XL.1 wind turbines and an array of Sharp solar panels. A small outbuilding protects equipment and tools, and a short pipe run carries drinking water to the village school.

The same installation powered by a diesel generator would have resulted in \$30,000 to \$75,000 in annual fuel costs. With no fuel expenses, the Spectra installation has paid for itself in fuel savings alone.

Local technicians trained by Vance maintain the installation. "The Utrik technicians are doing a great job," Vance said. "They value the water treatment facility and are devoted to the operation and maintenance of the machines."

Ongoing maintenance is key: While upkeep is minimal—changing prefiltration, topping battery water, general cleaning and inspections—without maintenance, the systems could become unusable.

Scheduled maintenance and its associated costs must be rolled into the project at the outset, or systems could fall into neglect. This is not the case on Utrik, where Vance has trained and ingrained maintenance in the local technicians, and he returns every one to two years to check on the installation.

### A Permanent Solution

By 2013, drought conditions had become critical in the northern Marshall Islands. After 10 months with little to no rain, residents of neighboring islands were forced to drink well water reported by EPA to have salinity levels 15 times higher than



Utrik's new RO system treats 3,600 gal per day of seawater to EPA drinking water standards.

the acceptable range. As the drought dragged on, well water quality continued to deteriorate as the small islands' water tables drew in more seawater. Incidences of waterborne illnesses such as diarrhea and hepatitis increased, especially in children and the elderly. Local food staples such as bananas, coconuts, pandanus and breadfruit were dying off, leaving 6,400 lives in danger.

On May 8, 2013, conditions in the northern Marshall Islands were elevated from a State of Drought Emergency to a State of National Disaster. The U.S. Agency for International Development, the International Organization for Migration, and the Australian Agency for International Development routed 30 solar-powered Spectra Aquifer 360 water-making units to the northern

Marshall Islands. Packed in rolling totes for immediate air shipping, the portable desalination plants provided immediate relief, but still must be considered a temporary solution. The permanent installation on Utrik desalinates 10 times as much water as one of the portable units.

With more drought and water crises predicted for the area, Utrik remains a model for drought preparedness and safe, sustainable water production in the Pacific Island region. *wqp*

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