

environment

DRINKING WATER

Pilot Plant Desalinates Seawater with Less Energy 2/27/2006

By E. Michael Powers

Saltwater can be desalinated with about half the energy required by existing technologies, a research group claims. A 60,000-gallon-per-day pilot facility has demonstrated the energy reductions in two test runs and the group is forecasting similar results in a third test ending next month. A Florida desalination project now in construction could become the first commercial application of the technology.

The Affordable Desalination Collaboration, San Leandro, Calif., a 23-member group of private companies and government agencies, recently completed tests at the Navy's Seawater Desalination Test Facility, Port Hueneme, Calif.

During the first three-month phase of operation, the program produced results the group calls "unprecedented." The plant averaged 7.15 kWh per thousand gallons for the reverse-osmosis process, well below the typical industry benchmark of 10 to 15 kWh. RO typically accounts for 80% of a desalination plant's energy use. A second phase, concluded Feb. 3, improved that performance by 15%. It used lower-energy membranes, but water quality was lower. [▶ Click here to view diagram](#)

"I hope that engineers no longer use 10 to 14 kWh as a rule of thumb," says Tom Seacord, senior project manager in the Fountain Valley, Calif., office of Carollo Engineers. Carollo is an ADC member. "We have a project in Florida where we are planning on using this design concept," says Seacord. Carollo is building a 2-mgd plant in Naples, Fla., for the city's municipal water district. Construction will finish in late 2008, he says.

Seacord says the research is critical to the desalination industry. But the industry's own engineers constitute one of the most difficult challenges, he says. "The engineers tend to be very set in their ways. We want to open their eyes to the fact that these costs can be real using over-the-counter technologies," he says.

John MacHarg, ADC managing director and CEO, notes that new systems have cut energy consumption for desalination in half since 2000, but acceptance has come hard. ADC's goal is to overcome the knee-jerk reaction to desalination because of past cost issues.

ADC hopes to further tweak the system to squeeze additional improvements. The third phase of testing, which will conclude in March, is already showing numbers comparable to earlier results, says MacHarg. The test facility extrapolates best to the largest plants, he says, noting that 50-mgd plants will achieve the most comparable results due to efficiencies of the pumping mechanism.

Isobaric energy recovery is a key component of the pilot facility. The technology harnesses the leftover hydraulic energy of the RO process in an extraordinarily efficient manner, MacHarg says. Rather than run the water over a Pelton wheel to create mechanical energy that is converted to electric, then back to hydraulic, the high-salinity wastewater is fed back into the system to boost pressure without affecting feedwater salinity.

"We are looking at taking the facility to another site in Florida and performing a six-month demonstration project" under different conditions, says MacHarg. ADC also hopes to parlay its work in California into a hefty grant. "The California Resources Agency is offering \$25 million in grants for research and development construction

projects for desalination," he says.

Some greet the news with cautious optimism. "The numbers certainly look good. It's surprising they look as good as they do," says Tom Pankratz, Boise-based board member of the International Desalination Association and former vice president with CH2M Hill Cos.

Pankratz says ADC has taken a unique approach and demonstrated astounding numbers, but with limitations. "They don't factor in the numbers outside of the RO process," he says. The other potential shortcoming is the cost of using exclusively premium technologies, he says. "There are some plants still being built with the conventional Pelton wheel design because the long-run cost is not enough to offset the initial cost of isobaric energy recovery," he says.

Despite ADC's failure to account for variables such as having to pump seawater uphill, Pankratz is encouraged by the study. "The numbers are very positive for the entire industry," he says.

[Subscribe: Try 4 Issues of ENR for FREE!](#)

Copyright © 2006 The McGraw-Hill Companies - All Rights Reserved.