

NAME:

Tampa Bay Seawater Desalination Plant

LOCATION:

Clearwater, Fla.

PLANT SIZE:

25-mgd capacity

INFRASTRUCTURE:

Now in full operation, North America's largest seawater desalination plant utilizes pretreatment, RO and post-treatment processes before pumping water 14.5 miles underground to a regional blending facility.



The plant will produce 25 million gal per day, or roughly 10% of the Tampa Bay regional water demand.

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PLANTPROFILE

By Neda Simeonova

Long Time Coming

The nation's first large-scale seawater desalination plant begins operations, eases Tampa Bay, Fla., region's drought worries

It took a long time for Florida's Tampa Bay Seawater Desalination Plant to get here, but after passing a rigorous acceptance test marking the end of facility remediation, as of Jan. 25, 2008, the plant is in full operation. The plant, which is the largest seawater desalination plant in North America, will produce 25 million gal per day (mgd), or roughly 10% of the Tampa Bay regional water demand.

The total capital cost of the project reached \$158 million, which includes the plant's remediation cost. The total water cost including capital debt service and O&M is currently \$3.38 per 1,000 gal, which is competitive with other plants around the world of similar size. With the Southwest Florida Water Management District cofunding contributions of \$85 million in installments over the next 18 months, the net cost will be reduced to \$3.04 per 1,000 gal.

Overcoming Hurdles

Tampa Bay Water Director of Operations and Facilities Ken R. Herd, who also served as a project director for the desalination plant, said that the project encountered multiple challenges. These included overcoming three bankruptcies by creating flexible contract documents that allowed for midstream changes of partners and ownership transfer capability. According to Herd, the original Design Build Own Operate Transfer contract in 1999 was with Poseidon Resources and Stone and Webster. Following Stone and Webster's bankruptcy, Ogden (now Covanta Energy) took over in 2000 and built the original facility.

Following Covanta's bankruptcy, Tampa Bay Water elected to exercise the transfer option and purchase ownership of the facility in 2002; however, the original facility failed an acceptance test in May 2003. As a result, the remediation contractor American Water Pridesa, a joint venture subsidiary of American Water and Acciona Agua of Spain, was hired in November 2004 to fix the plant.

In addition to the bankruptcies, the project had to overcome "a challenging source water quality [shallow Tampa Bay] by hiring an experienced desalination contractor who implemented a robust pretreatment process," Herd said. "The Tampa Bay Water board of directors deserves a lot of credit for allowing the additional time necessary for the remediation contractor to fix the plant in the face of public skepticism."

Modifications to the plant included repairing the pretreatment process to correct inadequate screening and filtration deficiencies in the reverse osmosis (RO) and post-treatment processes.

Plant Design

The 25-mgd facility is composed of three major treatment processes: a pretreatment process to remove suspended particles from the water, an RO desalination process (60% recovery) to remove dissolved minerals from the water and a post-treatment process to stabilize the water prior to pumping it through a 14.5-mile underground pipeline to a regional blending facility. The plant is co-located with a power plant owned and operated by Tampa Electric Co. that uses 1.4 billion gal per day (bgd) of bay water to cool its boilers, Herd explained. The plant takes 44 mgd of the warmer water and converts it into 25 mgd of drinking water, leaving

19 mgd of concentrated seawater (roughly twice as salty as the water in the bay). The 19 mgd of concentrate is then blended back with the 1.4 bgd of power plant cooling water, enabling a 70:1 dilution ratio prior to the water being returned to Tampa Bay.

A big concern for Tampa Bay Water and its project partners, American Water and Acciona Agua of Spain, was protecting the environment and meeting stringent environmental regulations. Results show that the salinity in the bay varies from 16 to 32 parts per thousand (ppt) compared with ocean or gulf water, which is in the 34 to 35 ppt range.

"Our environmental monitoring is showing that this method of concentrate management is working very well and has not resulted in any adverse environmental impact," Herd said.

The pretreatment process includes 1/16-in. traveling screens, chemical mixing, coagulation, flocculation, upflow sand filters and diatomaceous earth filters.

The RO system includes seven parallel first-pass trains, each capable of producing 4.2 mgd of drinking water. A second-pass RO train is included that can treat approximately 10% of first-pass permeate during the higher source water salinity periods. This is required to achieve a product water quality contractual requirement of 100 mg/L of chloride concentration, according to Herd.

"In total there are 10,032 8-in.-diameter RO elements in the plant, or approximately 85 acres of desalting membrane surface area," Herd said. "Pelton wheel energy recovery turbines are used to recover energy in concentrate prior to returning water to Tampa Bay."

The post-treatment process includes lime and carbon dioxide treatment capability to adjust product water alkalinity and pH for corrosion protection purposes.

Outcome

With drought conditions that are only expected to get worse across the U.S., the Tampa Bay desalination project is expected to ease water shortage issues in the Tampa Bay region. The now-operational plant will provide water to the public utility systems of Hillsborough, Pasco and Pinellas counties, as well as the cities of New Port Richey, St. Petersburg and Tampa, or approximately 2.5 million people.

"This project will have a very positive effect on the Tampa Bay community as it provides a drought-proof source of supply, enabling a reduction in groundwater pumping," Herd said. "This reduction in groundwater pumping has a net positive environmental benefit in allowing for increased fresh water levels in the Floridan aquifer and adjacent wetland systems as well as reduced salt water intrusion in the aquifer."

The Tampa Bay Desalination Plant is expected to serve as a model to other coastal communities in the U.S. that are in search of a sustainable water solution. www.wwdmag.com

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