

Brackish Water Boosts Barbados Supplies

A joint venture between GE's Water & Process Technologies and Barbados-based Williams Industries has built the largest brackish water RO desalination facility in the Caribbean providing fresh, potable water to one-fifth of the island's 264,000 population.

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Reverse osmosis technology at the Spring Garden plant.

Despite its lush vegetation, the Caribbean island of Barbados has been identified as one of the most water-scarce nations in the world, according to a recent United Nation's assessment. In fact, during 1994 and 1995 a "One in One Hundred and Fifty Year" draught caused over three thousand households to regularly be without water for significant periods. On 31 July 1995, virtually the whole of the capital Bridgetown, including the Queen Elizabeth Hospital, was without water for a prolonged period. Rainfall on Barbados, although enough to maintain the island's greenery, was not sufficient to replenish the main water supply.

Tourist Industry Hit

The drought also posed a threat to the island's economy, which is heavily dependent upon tourism. Plans to develop tourist attractions, such as golf courses, (which require a reliable water supply), were put on hold. David Millington, chairman of the Barbados Water Authority, said, "The Barbados Government was determined that economic development would not be held back by the lack of available water."

Results from an extensive technical and geological study suggested an adequate and reliable source of brackish water was available from the sub-surface aquifer, and that it could be desalted at a lower overall cost than seawater desalination.

"Eight contractors and joint ventures were pre-qualified to bid on the project and five bids were tendered," said Millington. "A team of directors and senior technical managers from the Barbados Water Authority visited four different plants overseas. The GE plant was regarded as the best designed and maintained, as well as the best performing of all the plants."

The Barbados Water Authority selected GE to help eliminate all present and future problems caused by drought. GE is a worldwide provider of water and wastewater solutions including membrane-based water desalination. The Barbados Water Authority entered into a water supply agreement with Ionics Freshwater Ltd., a joint venture between GE and its local partner, Williams Industries. The water supply agreement covered design, engineering, manufacturing, installation, start-up, commissioning and operating the water desalination plant in Spring Garden, St. Michael.



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On March 15 1999, construction of the plant began and by February 2000, the plant began producing fresh drinking water.

Stream separation

At the heart of the plant is GE's desalination system that employs reverse osmosis (RO) technology. RO is a widely accepted membrane-based technology that separates the brackish feedwater into two separate streams - a desalted stream for public consumption and a concentrated stream which is returned to the sea via deep well injection. The plant uses a combination of low-pressure brackish water elements and a single stage array to reduce overall energy requirements and to provide high quality drinking water. During the pretreatment stage, suspended solids and particulates, which might otherwise foul the RO membranes, are removed from the incoming brackish water. Antiscalant is included to prevent mineral scale build up, allowing the desalination plant to run at higher water recoveries.

Up to 75% of the pressurized feed-water is recovered as fresh water, whereas the remaining portion of the high-pressure feedwater concentrate passes through an energy-recovery turbine to minimize energy costs.

Secure potable water

GE's desalination plant is now a secure source of potable water for the island, and is strategically positioned to supply water to a large section of the population through a series of lift stations and intermediate reservoirs.

The plant at Spring Garden, St. Michael is the largest brackish water desalination facility in the Caribbean with a capacity of 30,000m³/day. It distributes drinking water to up to 20% of the island's 264,000 people.

During the tender evaluation period, the Authority had elected to increase the original stated capacity from 20,000m³/day to allow for follow-on negotiations concerning large volume supplies for the island's tourism-related industries.

Enhanced water quality

Not only is Barbados protected in the event of another drought, but the plant has also enhanced water quality by producing "soft water." In the past, "hard water" was the only potable water available to the island's residents.

The Spring Garden plant is distinct from similar water treatment plants in that it features virtually noiseless production - an important feature given its urban location - and low cost operation. Most significantly, water availability will never be a limiting factor in Barbados' day-to-day function or economic development. The successful award to GE was based on the initial capacity stated in the tender, and was for a water price of \$1.52/1000 gallons (\$0.40/m³).

The Barbados Water Authority's agreement with GE includes operation and maintenance of the plant for a 15-year period. Operating since February, Spring Garden had its official opening on Jun 10, the Rt. Honorable Rommel Marshall, Minister of Public Works and Transport, providing the feature address.

According to Spring Garden's general manager, Ron Beaudoin, "Our water has met all quality expectations and we are happy to be able to provide customers with high quality drinking water that ensures that hardships due to periods of low rainfall are non-existent."