GE Power & Water
Water & Process Technologies

Case Study

Africa's Largest Seawater Desalination Plant Eases Water Scarcity for City of Algiers, Algeria

Challenge

Over the past decade Algeria has experienced a dramatic demographic shift as large numbers of rural dwellers have moved to cities. Urban residents now account for about 60 percent of the nation's population, placing a major strain on infrastructure and water supplies. In Algiers, the nation's capital, water scarcity caused by demand, drought, and an aging, leaky distribution system left residents and businesses facing frequent water rationing, often receiving water for only one of every three days.

With very few surface water sources to rely on, the Algerian government has invested heavily in new dams to improve its rain catchment capabilities, but drought conditions have persisted for many years and the dams have not produced a significant increase in the nation's water reserves. The City of Algiers has also embarked on an extensive rehabilitation of the water distribution system, which has cut water losses from 40 percent to less than 25 percent. Despite the improvements, Algiers still suffered from a dire water shortage.

Solution

To alleviate the water shortage, Algiers needed to find a sustainable, long-term water supply that could meet the expanding urban water demand. With limited surface and groundwater sources available, the Mediterranean Sea offered the only abundant new source of water.

Desalination technology would enable Algiers to use the sea as a virtually unlimited source of raw water that can be reliably and cost-effectively converted to fresh potable water.

In an international tendering process involving leading global desalination companies Hamma Water Desalination SpA, a special project company, lead by GE Water & Process Technologies, was selected to design, build, own and operate the 200,000m^3/day (53 MGD) Hamma Seawater Desalination Plant (SWDP), a reverse osmosis seawater desalination facility that would significantly alleviate water scarcity in Algiers.

Completed on time and on budget in 24 months the Hamma SWDP uses GE's advanced ecomagination-certified reverse osmosis membranes to providing as many as two million residents of Algiers with a reliable and drought-proof supply of fresh water.

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Results

The Hamma Water Desalination (HWD) plant is also Africa's first reverse osmosis (RO) desalination plant to be funded by public and private investment. The special project company, Hamma Water Desalination, SpA, combines 70 percent funding from GE with 30 percent from the stateowned Algerian Energy Company. The Overseas Private Investment Company, which helps US businesses invest in new and emerging overseas markets, financed $200 million towards the project.

Private or public/private structured financing arrangements are increasingly replacing, traditional government-only funded large-scale water projects. This new approach is opening up new opportunities for constructing and operating much needed water projects. In the case of the Hamma Seawater Desalination Plant, GE provides unique project delivery and financing capabilities and a turnkey water treatment solution that includes best-in-class technologies, operation, maintenance and financing.

The plant was constructed on a brown-field site just east of the Port of Algiers. Although, the water quality in this part of the bay can be affected by ship traffic and port activities, the site is ideal for its proximity to the city's water distribution network, power grid, and transportation routes.

GE is responsible for the ongoing operations and maintenance of the plant. The facility will draw seawater through two 550-meter direct intake pipes to a pre-treatment system, where it will enter a lamella clarifier and have coagulants added to help remove suspended solids and reduce biological challenges of the raw water.

Seawater is affected by seasonal dynamics, biological blooms and turbidity affects from a working port. Following flocculation and settling, the water will pass through a dual media filter and enter a clearwell. Water from the clearwell will be pumped through five-micron cartridge filters before being distributed among nine trains of single-pass RO membranes. Remineralization and disinfection will be the final steps in the process before the water can enter the city's distribution system.

The robust process is designed to handle the potential variability in raw water quality. Moreover, the advanced membrane process offers operational and economic advantages over alternatives like thermal desalination processes, including reduced energy consumption and lower chemical requirements. The finished water is guaranteed to meet the following parameters: Total Dissolved Solids of less than 500 mg/L, Alkalinity of up to 65 ppm, Total Hardness of between 50 – 65 ppm, and a pH of 8 – 8.5.

Reverse osmosis technology, once used only for relatively small, specialized pure water applications, is gaining wider acceptance as a mainstream water treatment solution in large-scale plants of unprecedented size. The cost of producing water with RO membranes has fallen by more than 80% in the last 20 years, making seawater desalination an increasingly affordable option for nations such as Algeria who have to cope with increasing water stresses caused by growing populations, expanding economies and climate change.