

Desalination Destination

By Blanca Salgado & Joan Sanz

With the global population estimated to grow from 7 billion in 2011 to more than 9.5 billion by 2050, profound stress has been placed on the world's limited water supply, not only by its burgeoning population, but also by other factors, such as rapid urbanization, industrialization, pollution and climate change.¹ As water scarcity and "water stress" persist, the water treatment industry has been tasked with developing innovative solutions to produce clean, potable water.

Demand for Desalination

Bordered by seawater on all sides and experiencing low levels of annual rainfall and high temperatures, freshwater is a scarce resource in the Canary Islands, an archipelago of Spanish islands located off the northwest coast of Africa. This popular vacation destination hosts more than 12 million visitors per year, requiring local businesses to find long-term solutions to meet the growing demand for clean water.

In order to meet the needs of the local population, the historically dry island has established desalination plants to support the production of potable water. In 2003, Veolia Water Technologies Ibérica built the Canary Islands Seawater Reverse Osmosis Desalination Plant. The facility treats well seawater from the Atlantic Ocean to produce drinking water for the island through reverse osmosis (RO), a technology commonly applied to reduce salt and impurities from water streams. Veolia initially equipped the facility with Dow Filmtec SW30HR-380 RO elements to process and remove salt content from seawater.

Keeping Current

In order to reduce the cost of water production and maximize operational

efficiency, membrane manufacturers continue to innovate, reaching higher permeability thresholds, especially in seawater applications, where operating pressure and energy consumption are critical factors. After 11 years in operation, the desalination plant required a system upgrade. Veolia and Dow Water & Process Solutions evaluated alternatives for a new configuration, and performed design calculations using Reverse Osmosis System Analysis simulation software to ensure that the upgrades would comply with local water quality regulations, increase production capacity and maintain high-quality permeate, all while reducing energy consumption.

A hybrid system designed with Dow Filmtec SW30XHR-440i and Seamaxx RO elements was ultimately selected and integrated into the plant's pressure vessels. In addition, the plant's high-pressure pump system was replaced with next-generation technology, and a data logger was installed to register and store operational information for control and maintenance purposes.

System Savings

Operational for more than a year, the plant has delivered positive results. For example, water production capacity has increased by 40% and specific energy consumption has decreased by 57%. The replacement and upgrades also have:

- Increased production capacity from 400 to 550 cu meters of water per day;
- Decreased energy consumption from 4.9 to 2.1 kWh per cu meter;
- Decreased feed pressure from 61 to 50 bar;
- Maintained consistent water quality with total dissolved solids (TDS) levels of less than 400

ppm and boron levels of less than 1 ppm; and

- Required no performance of clean in place despite challenging conditions.

The RO elements provide a sustainable solution to produce clean water at low cost and reduce impact on the environment. With an optimized module design of 440 sq ft of active membrane surface and interlocking technology, these low-energy elements allow systems to operate at higher recovery levels, leading to capital cost savings, and comparable or lower feed pressures, leading to operational cost savings, when compared to conventional RO membranes.²

Demonstrating success in producing maintained salt rejection, up to 10% energy savings and less fouling at high operating flux, Filmtec Seamaxx RO technology is well suited for applications that treat medium to high TDS, brine or high-salinity brackish water, providing reliable water quality for single-pass, double-pass and inter-staged desalination systems. The market demands new options to improve the economics and sustainability of water treatment, and the industry will continue to innovate and deliver. *wqp*

References

1. United Nations. *World population projected to reach 9.6 billion by 2050. June 2013.* <http://www.un.org/en/development/desa/news/population/un-report-world-population-projected-to-reach-9-6-billion-by-2050.html>.
2. *Low-energy capability: 17,000 gal per day. Standard test seawater conditions: 32,000 mg/L, 25°C, 800 psi and 8% recovery.*

Blanca Salgado is technical service and development for Dow Water & Process Solutions. Salgado can be reached at bsalgado@dow.com or +33 672 36 59 99.

Joan Sanz is technical direction for Veolia Water Technologies Ibérica. Sanz can be reached at joan.sanz@veolia.com and +34 935 110 141.

For more information on this subject write in 1001 on this issue's reader service card.

Popular vacation spot uses RO desalination to produce drinking water

Figure 1. Comparison of the Canary Islands' Former & Current Treatment Systems

