GE
Water & Process Technologies

Case Study

Drought-proofing City Water Supplies

Challenge

During the late 1980's - early 1990's, residents of the City of Santa Barbara, California faced severe droughts and limitations on water consumption. The Cachuma Reservoir, which supplies more than one half of the City's water supply, was projected to be dry within a two year time frame. Santa Barbara water users had reduced their consumption by 47% and were facing a potential 80% shortage by the spring of 1992. The City needed significant rainfall or a new water supply that was not rainfall dependent.

Solution

The Santa Barbara City Council decided to build a seawater desalination facility next to the El Estero Wastewater Treatment plant.

Figure 1: Seawater desalination facility, Santa Barbara

The City's decision was based on two primary needs. The first was for a highly reliable, innovative technology not dependent on rainfall or having complicated water rights issues. The second factor was minimizing risk in delays or failure in execution.

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The seawater desalination plant took advantage of a virtually limitless natural resource—the ocean. The City's Long Term Water Supply Analysis found that seawater reverse osmosis (SWRO), used in conjunction with surface and groundwater supplies, would give Santa Barbara permanent water security and eliminate the concerns of a drought.

The desalination plant has successfully provided the City of Santa Barbara with a reliable source of water and the City has been contracted to provide Goleta and Montecito with potable water. (See Figure 1.) To meet future water needs, the site was designed to be expandable by adding filters and desalination units.

End-user:	City of Santa Barbara
Location:	Santa Barbara
Commissioned:	March 1992
Application:	Potable water production
Feedwater source:	Open seawater intake
Feedwater quality:	34,450 mg/l TDS
Product quality:	399 mg/l TDS
Capacity:	7.15 MGD (27,000 m^3/day) (7,500 acre-feet/year)
Technology:	Seawater reverse osmosis (SWRO)

System Description

Seawater is collected half a mile offshore and pumped to the desalination plant. There the water is filtered through two stages of round horizontal media filters. The water is chlorinated prior to the filters to kill any bacteria or virus existing in the water. The water is then dechlorinated prior to Seawater Reverse Osmosis (SWRO) to protect the SWRO membranes from chlorine attack.

The filtered water then goes through banks of cartridge filters to protect the SWRO membranes. After cartridge filtration, the treated water goes to the heart of the treatment facility, which are the Seawater Reverse Osmosis (SWRO) trailers. Due to the

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CS1066EN Mar-08

high feed salt concentrations, the seawater is pumped at high pressure (800 psi - 1000 psi). There are twelve (12) SWRO trailers.

Each SWRO trailer consists of a two stage 24 x 16 array for a total of 40 pressure vessels. Each pressure vessel contains seven (7) 8" x 40" seawater membrane elements.

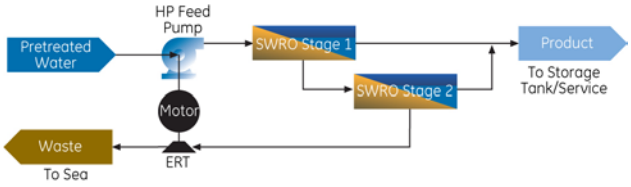

Figure 2: Seawater Reverse Osmosis

The RO feed pump is equipped with energy saving devices such as the Pelton Wheel Energy Recovery Turbine (ERT) and variable frequency drives (VFD).

The SWRO converts 45% of the seawater as freshwater. The remaining 55% of the high pressure reject passes through the Pelton Wheel to assist with the SWRO feed pump energy and then the reject proceeds to the City's wastewater outfall.