

PROJECT PROFILE SERIES #28

COST EFFECTIVE BOILER MAKEUP SYSTEM USING MEMBRANE DESALINATION FOR POWER PLANT IN DOMINICAN REPUBLIC

The Facility

Andres Power Plant, developed by Caribbean Thermal Electric LLC, is located in Boca Chica, near Santo Domingo, Dominican Republic. It is a 300 MW gas fired combined cycle power plant and is one of the largest IPP power plants in the Dominican Republic and will supply electricity to Corporacion Dominicana de Electricidad.

The plant consists of two power blocks, which share a common membrane based Seawater Desalination system for their make-up water requirements. The desalination system gets the water from the Caribbean Sea and has a total installed capacity of 1.6 MGD.

The System

The desalination system receives chlorinated seawater, however due to the variations in the free residual chlorine a hypochlorite feed system was provided as part of the water treatment package. Since feed from a deep-water source is relatively low in the suspended solids, BOD and Oil & Grease, the pretreatment system consists of two stage contact filtration with a flocculation tank upstream to ensure proper reaction time for the coagulant and polymer. Due to high flow rate the dual media filters are provided in horizontal configuration and consist of a primary & polishing filter battery of 3 x 50% units.

The filtered water is then processed through seawater reverse osmosis units operating in 3 x 50% configuration. The reverse osmosis booster pumps are provided with hydraulic turbo-charger units as a means of energy recovery to optimize the energy consumption. The raw seawater TDS is around 35,300 ppm and the seawater reverse osmosis unit is designed to produce permeate having less than 300 ppm TDS at 45% recovery. A part of the seawater

reverse osmosis permeate is used for potable use and the remainder is stored in a service water tank for further polishing.

The polishing system consist of 2 x 100% reverse osmosis trains operating at 85% recovery producing a permeate of less than 10 ppm TDS. The reject from the polishing reverse osmosis trains is recycled back to the upstream of seawater reverse osmosis cartridge filters to improve the overall recovery of the system. Permeate from these reverse osmosis trains is further polished using 2 x 100% Electrodeionization (EDI) units. The EDI produce demineralized quality water with less than 0.1 mS/cm conductivity and is stored in the demineralized water tank.



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Design Water Analysis

Parameters	Filter Outlet	SWRO Outlet	PRO Outlet	EDI Outlet
Turbidity, NTU	< 1	N/A	N/A	N/A
Color, PCU	< 10	N/A	N/A	N/A
SDI	£ 3	N/A	N/A	N/A
Calcium, ppm	431	4.0	0.0	
Magnesium, ppm	1330	23.8	0.4	
Sodium, ppm	10800	213.3	6.3	< 0.01
Potassium, ppm	390	6.8	0.3	
Ammonium, ppm	0.3	0.0	0.0	
Bicarbonate, ppm	118	1.6	0.1	
Chloride, ppm	19900	237.6	6.9	
Sulfate, ppm	2230	8.5	0.1	
Nitrate, ppm	0.2	0.0	0.0	
Fluoride, ppm	0.8	0.0	0.0	
Silica, ppm	20	0.5	0.0	< 0.01
Barium, ppm	0.1	0.0	0.0	
Conductivity, mS/cm	61,400	» 600	» 20	< 0.1

Process Flow Diagram

