

# PROJECT PROFILE SERIES #27

## COMBINED CYCLE POWER PLANT IN SOUTHERN INDIA USES MEMBRANE DESALINATION FOR BOILER FEED

### The Facility

PPN, a 330 MW combined cycle power plant developed by PPN Power Generating Company, is located in Pillaiperumalnallur about 320 kilometers south of Chennai, India. It is one of the largest IPP power plants developed by an international consortium in India under a 30 year PPA with the state electricity board.

The plant consists of a single dual fuel power block and uses membrane based Seawater Desalination system for the make-up water requirements. The desalination system gets the water from the Bay of Bengal and has a total installed capacity of 2.3 MGD. The site is approximately 2.5 kilometers from the sea front. Naphtha, the primary fuel for the plant, is supplied by ocean going ships through a single point mooring system.

### The System

Since the feed water has high ingress of suspended solids, BOD and Oil & Grease due to the fuel delivery system, the pretreatment system consists of solids contact clarifier followed by two stage filtration. The pretreatment system also has a sludge handling system to dewater the sludge before disposal. The desalination system receives chlorinated seawater. 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.



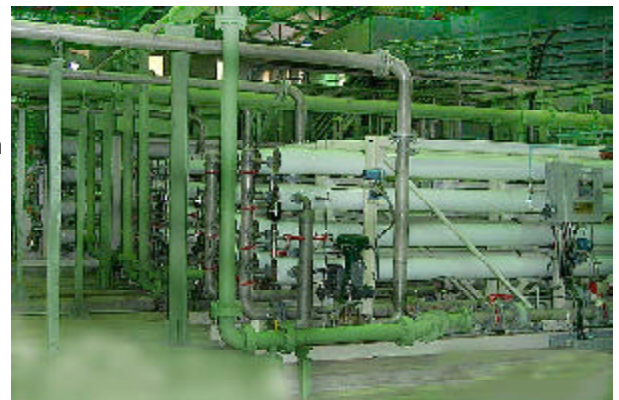
The filtered water is then processed through seawater reverse osmosis units operating in 4 x 33% configura-

tion. 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 37,900 ppm and the seawater reverse osmosis unit is designed to produce permeate having less than 200 ppm TDS at 42% 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 consists of 4 x 33% reverse osmosis trains operating at 90% 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% mixed bed polishers. The Mixed Bed polishers produce demineralized quality water with less than 0.4 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	MB 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	495	1.8	0.0	
Magnesium, ppm	1123	4.7	0.1	
Sodium, ppm	10220	95.0	2.2	0.01
Potassium, ppm	485	6.7	0.2	
Ammonium, ppm	0.4	0.0	0.0	
Bicarbonate, ppm	143	1.9	0.1	
Chloride, ppm	18259	160.1	3.7	
Sulfate, ppm	3072	11.3	0.1	
Nitrate, ppm	5.4	0.3	0.0	
Fluoride, ppm	0.6	0.0	0.0	
Silica, ppm	4.0	0.1	0.0	0.02
Barium, ppm	0.1	0.0	0.0	
Strontium, ppm	5.0			
Conductivity, mS/cm		» 560	» 20	< 0.4

## Process Flow Diagram

