

POSEIDON RESOURCES CORPORATION DESALINATION UPDATE

ISSUE 3 ♦ SPRING 2003

Desal Plant Now Operating in Carlsbad

Cabrillo Power and Poseidon Resources have installed and now are operating a Seawater desalination test facility at the Encina Power Station in Carlsbad. The test facility is producing nearly 40,000 gallons per day of extremely high quality water.

“This pilot facility has allowed us to demonstrate the viability of siting a 50 million gallon a day desalination facility in Carlsbad,” said Peter MacLaggan, vice president of Poseidon Resources. “The next step is to refine the process so to optimize the design based on the characteristics of the seawater at the site.”

Up and running since January, the test facility allows Poseidon to gather data during winter rains and routine lagoon dredging. These conditions are the most challenging for desalination because they increase silt in the water. In addition to helping the project team refine the technical processes associated with desalting seawater at this site, it will provide data required for the environmental review and regulatory permitting. ■



THE CARLSBAD DESALINATION PROJECT is a 50 million gallon per day seawater desalination facility that would provide a reliable new local source of high quality water that meets or exceeds all state and federal drinking water standards. A local company, Poseidon Resources Corporation, is working with the owner of the Encina Power Station, Cabrillo Power I LLC, the City of Carlsbad and the San Diego County Water Authority to advance the development of the Project. ***Seawater desalination is a new water source that provides the following important benefits:***

NEW DROUGHT-PROOF WATER SUPPLY: The Project would provide 56,000 acre-feet per year of new local water supply – enough water to meet the needs of nearly 300,000 people.

IMPROVED WATER QUALITY: The proven technology employed in the desalination facility would produce an extremely high quality drinking water supply. Reverse osmosis is a tested solution used around the world.

AVOIDED COST: The availability of this new supply could defer the expenditure of funds for facilities that would otherwise be required to expand the capacity of the local & regional water delivery systems.

ECONOMIC DEVELOPMENT: Implementation of the desalination project would result in increased region spending and employment of approximately \$170 million and creation of 2,100 jobs during construction, as well as \$37 million in expenditures and 400 permanent jobs each year once the Project becomes operational.

MWD SUPPORT: The Metropolitan Water District of Southern California has approved a program that would provide a \$250 per acre-foot rebate to offset the cost of the desalinated water supply.



The Carlsbad Seawater Desalination Plant

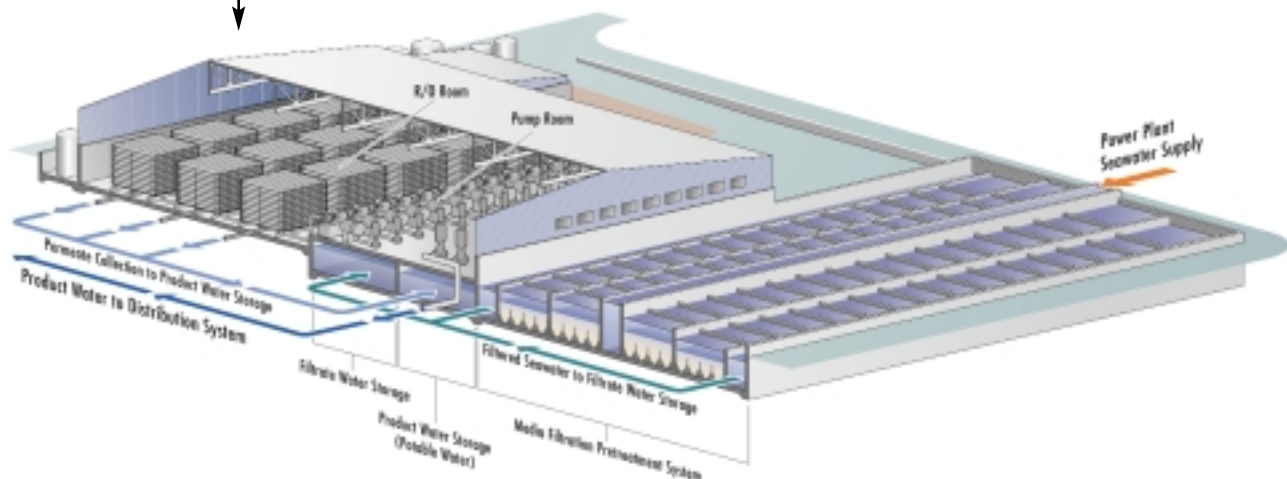
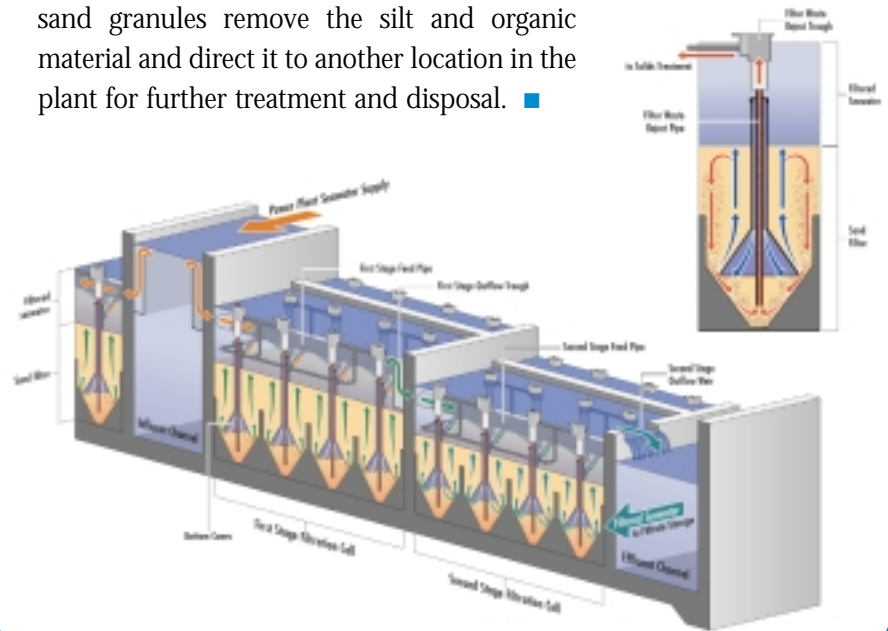
How The Treatment Process Works

The desalination process proposed for the Carlsbad project, and also used by the pilot facility, starts with seawater water used for cooling at the Encina Power Station. The seawater is piped through a series of filters that remove impurities so small they can't even be seen by the naked eye. Chemicals are added to the water to further purify it before it is sent through the reverse osmosis (RO) system that remove the salt and other impurities remaining in filtered seawater. One out of every two gallons of seawater processed by the RO system becomes ultra-high-quality fresh water. The other gallon of water is used to carry the salts removed by the RO process to the seawater coming from the power plant as it is returned to the ocean. ■

The Media Filtration Pretreatment System

Pretreatment System Overview

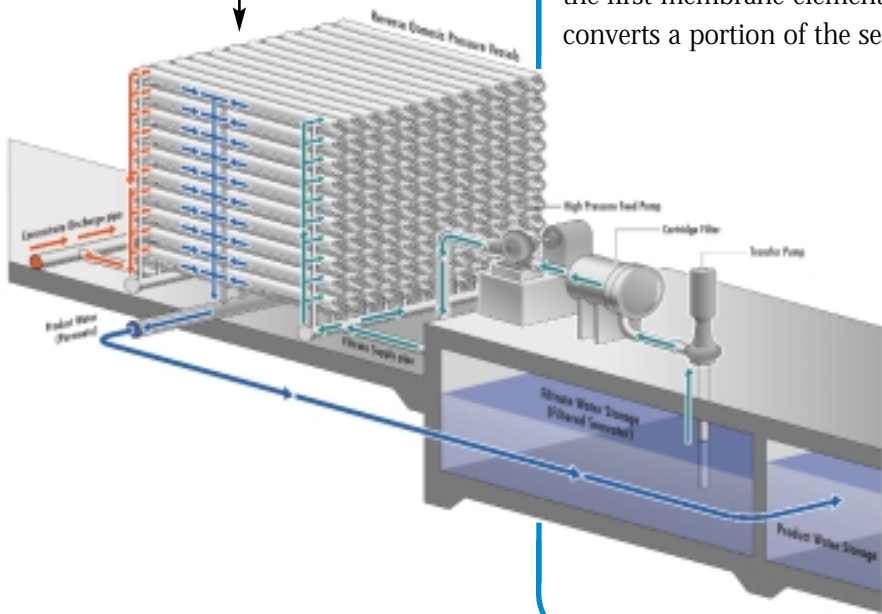
Seawater from the Power Plant cooling system (*orange arrows*) is pumped into the influent channel. From there it flows by gravity through a two stage sand filtration process specially designed to remove silt and organic material from the seawater that might otherwise plug the reverse osmosis membranes. The first stage filtered water (*green arrows*) flows into the second stage where the filtration process is repeated. Second stage filtered water (*turquoise arrows*) flows into the effluent channel and on to the filtrate storage tank. As seawater passes through the filter beds, the sand granules remove the silt and organic material and direct it to another location in the plant for further treatment and disposal. ■



The Reverse Osmosis System

Membrane Filtration System

The filtrate or filtered seawater (*turquoise arrows*) is pumped out of the filtrate storage tank and through the cartridge filter. The high pressure feed pump forces the filtered seawater into pressure vessels housing the reverse osmosis membrane elements. The reverse osmosis membrane elements convert the filtered seawater into two streams of roughly equal proportions: ultra-high-quality product water and concentrated seawater. The product water (*blue arrows*) flows to the product water storage tank and the concentrated seawater (*red arrows*) is returned to the ocean through the power plant outfall. ■



The Reverse Osmosis Pressure Vessels

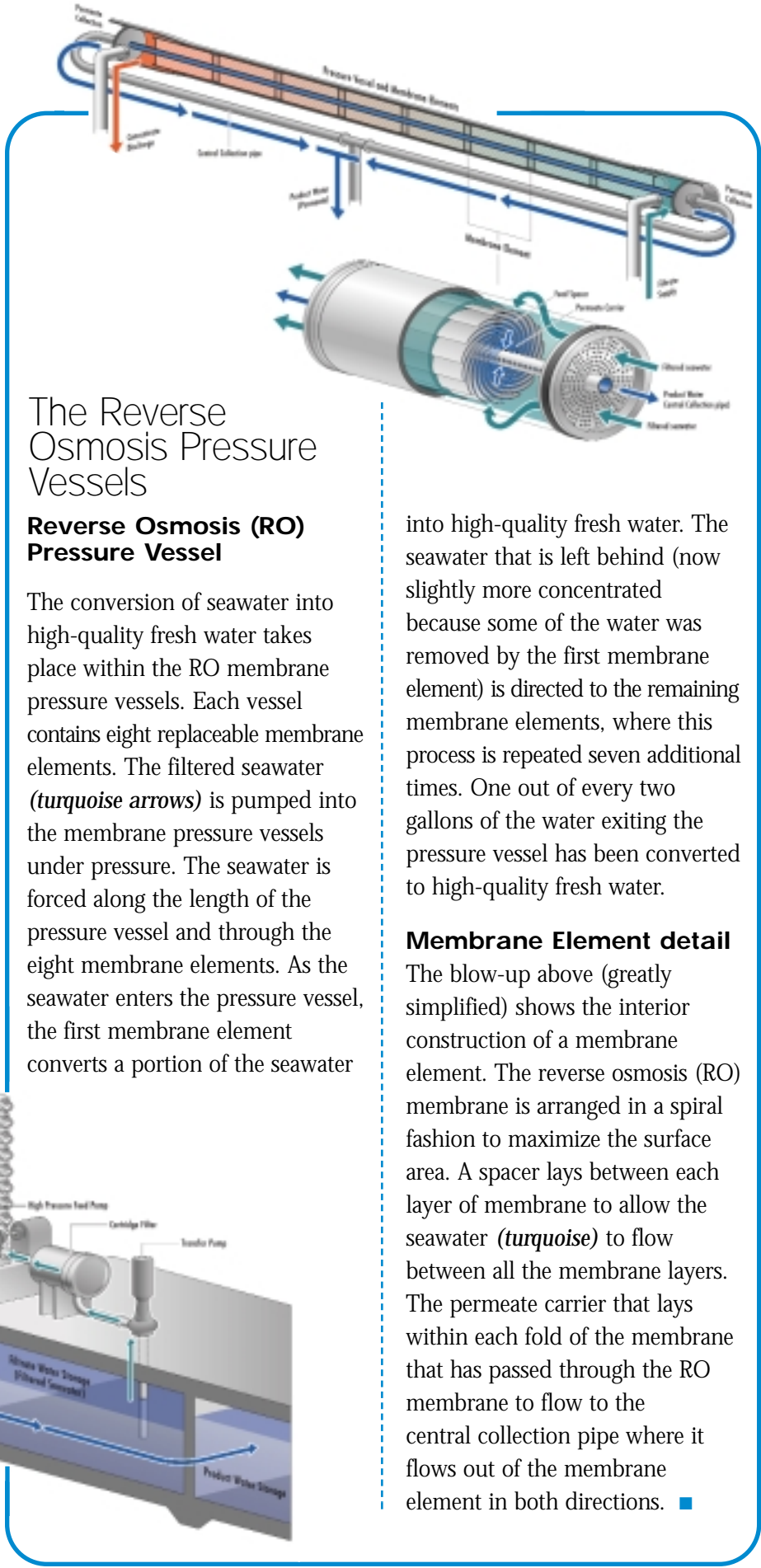
Reverse Osmosis (RO) Pressure Vessel

The conversion of seawater into high-quality fresh water takes place within the RO membrane pressure vessels. Each vessel contains eight replaceable membrane elements. The filtered seawater (*turquoise arrows*) is pumped into the membrane pressure vessels under pressure. The seawater is forced along the length of the pressure vessel and through the eight membrane elements. As the seawater enters the pressure vessel, the first membrane element converts a portion of the seawater

into high-quality fresh water. The seawater that is left behind (now slightly more concentrated because some of the water was removed by the first membrane element) is directed to the remaining membrane elements, where this process is repeated seven additional times. One out of every two gallons of the water exiting the pressure vessel has been converted to high-quality fresh water.

Membrane Element detail

The blow-up above (greatly simplified) shows the interior construction of a membrane element. The reverse osmosis (RO) membrane is arranged in a spiral fashion to maximize the surface area. A spacer lays between each layer of membrane to allow the seawater (*turquoise*) to flow between all the membrane layers. The permeate carrier that lays within each fold of the membrane that has passed through the RO membrane to flow to the central collection pipe where it flows out of the membrane element in both directions. ■





Huntington Beach Project in Final Stages of Environmental Review

Poseidon recently completed the public comment phase of the Draft Environmental Impact Report (DEIR) for the Huntington Beach Seawater Desalination Project. The DEIR analyzes the environmental impacts of the proposed project, which includes state-of-the-art reverse osmosis technology to meet California's stringent water quality requirements. This is one of several stages of regulatory and public

review the project will undergo before its scheduled completion in early 2006.

Similar to the Carlsbad Project, Poseidon's Huntington Beach Project would produce 50 million gallons per day of ultra high quality drinking water. The project would be co-located at the Huntington Beach Generating Station and would share the use of the Power Plant's existing ocean water intake and discharge

structures. The project would include a seven-mile pipeline to carry the water into the regional distribution system serving Orange County water agencies.

Poseidon expects to be before the Huntington Beach planning commission this spring for certification of the Environmental Impact Report (EIR), approval of the Conditional Use Permit and Local Coastal Development Permit for the Project. ■

Want More Information?

For more information about desalination, please call Poseidon Resources at **(619) 595-7802**.

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