

# WATER DESALINATION REPORT

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## California

### ON THE VERGE OF A PERMIT

Late last week, the Coastal Commission received what may be the last submittal it requires before issuing a long-awaited Coastal Development Permit for the 50 MGD (189,250 m<sup>3</sup>/d) Carlsbad desal plant. Commission attorneys are reviewing the submittal to see if it satisfies all 'prior to issuance' and 'prior to construction' stipulations attached to the conditional permit issued to Poseidon in November 2007.

Tom Luster, the Commission's desal staff specialist, told *WDR* that the permit could be issued by the middle of this week, paving the way for construction to start by the 15 November deadline.

However, what the Coastal Commission giveth, the Coastal Commission can taketh away. Although Carlsbad's Coastal Development permit looks imminent, three local environmental groups continue to fight the project. Surfriider Foundation, San Diego Coastkeeper and the Coastal Environmental Rights Foundation have filed a joint request for revocation of Poseidon's permit application.

According to the environmental groups, Poseidon submitted erroneous and incomplete impingement data, which denied them the opportunity to "fully participate in the proceedings" and should be the basis for revoking the permit. Poseidon said it considers the revocation request "a frivolous and completely meritless attempt to delay" its project.

The request will be the subject of a 5 November meeting between the Commissioners and staff to consider the matter, but no action is likely to be taken before a December board meeting. Poseidon's Scott Maloni confirmed to *WDR* that during his company's meetings with Commission staff, there seemed to be no impediments that would lead to the staff recommending that the permit be revoked.

Also last week, the Metropolitan Water District's (MWD) Desalination and Recycling Committee met to prepare for the 10 November Water Planning Committee meeting. The Committee reviewed and took into consideration the language of a proposed memorandum of understanding (MOU) that addresses the \$250/AF (\$0.20/m<sup>3</sup>) funding incentive that MWD will provide to the member water agencies that will purchase water from the Poseidon plant.

Jack Foley, the MWD desal committee chairman, told *WDR* that the MOU has been drafted and that language concerning the stewardship rate – a \$25/AF (\$0.02/m<sup>3</sup>) surcharge on all

MWD rates used to fund incentives for all alternative water supply projects – is undergoing a final edit. The MOU will go before the MWD board for approval on 10 November.

Meanwhile, Poseidon is set to go before the California Debt Limit Allocation Committee (CDLAC) on 18 November seeking a \$530 million tax-exempt, private activity bond (PAB) allocation. The amount is understood to include \$370 million for the plant and distribution piping, \$100 million for bond insurance and capitalized interest and \$60 million for development costs and reserve contingencies.

## Technology

### SHOW US THE NUMBERS: PART 2

*Global Water Intelligence's* (GWI) October issue includes a story entitled "Aggressive Capex Model Seals PEI Victory at Mactaa" that covers Hyflux's award of an energy recovery device (ERD) contract to Pump Engineering, Inc (PEI). Under the contract, PEI will supply 25 TurboChargers for the 500,000 m<sup>3</sup>/d (131 MGD) Mactaa SWRO plant in Algeria. The award is a watershed event for PEI and is the company's first win of a large-scale project.

*GWI's* concluding paragraph noted "Industry sources estimate that the efficiency losses of 15–20 percent associated with using turbochargers rather than isobaric devices will lead to \$80-90 million of additional expenditure on energy by Hyflux over the 25-year term of the Mactaa BOOT contract. As such, a retrofit several years down the line could look increasingly attractive."

### IDA World Congress Update

With the IDA World Congress in Dubai now less than one week away, IDA president Lisa Henthorne reminds *WDR* readers that it is not too late to make plans to attend. Dubai is a travel-friendly destination to which many visitors – including those holding passports from Australia, the EU and the US – do not require an advance visa.

Direct flights are available from most large international airports, including those in Australia and the US, and Dubai has many comfortable and affordable hotel rooms.

Over 1,200 delegates have pre-registered, 241 papers have been accepted for presentation and exhibit space has been sold out for almost two years. Don't be left out!

It wasn't long before *GWI's* editor began receiving emails that begged to differ with that analysis. As a *GWI* sister company, *WDR* also received enquiries asking for an explanation. *WDR* will attempt not to fall (or be sucked) into the same trap, but will try to add some context to the discussion.

In the RO industry, the math surrounding ERD energy efficiency has always been notoriously difficult to follow. It's not that the math being presented is 'wrong', it's just that the person presenting it often has as a vested interest in presenting the calculations that show a device in the best possible light.

However, an ERD evaluation is not a straightforward comparison; the low-pressure terminal points as well as the entire high-pressure circuit must be considered, not just ERD itself. When a turbocharger is used, the efficiency of the high-pressure pump and both the turbine and pump side of the turbocharger must be included in the specific energy consumption (SEC) calculation. Whereas, in an isobaric calculation, the ERD efficiency is only part of the SEC equation, and the efficiency of the high-pressure and recirculation pumps, and the effect of brine leakage/mixing on the system's osmotic pressure, must be included.

This complexity has led to some interesting confrontations, including a very public debate that occurred at the 2005 IDA Congress in Singapore. After seeing an advance copy of Irving Moch's paper in support of turbine-based ERDs, ERI president GG Pique offered a \$10,000 reward to anyone who could verify Dr Moch's numbers. No one took home the \$10,000, but it sure increased attendance at the session in which the paper was presented.

When evaluating a project's specific energy consumption, it is also essential to consider the conditions used in the evaluation. Does the selected evaluation point – i.e. the feed pressure based on salinity, temperature, membrane age and fouling – represent the most common operating conditions? If not, it actually may be a one-off value representing design conditions, rather than the conditions at which the system is most likely and most frequently to be operating.

Some ERDs are more efficient at the primary design point, while others have better average performance over a wide range of operating conditions. One should consider how many hours per year a system will operate under specific conditions. For example, a system may operate for 1,000 hr/yr at 80 percent production while running on the coldest seawater and 500 hr/yr at 100 percent production during the summer when seawater is warmest. The final decision on which ERD is best suited for an application should also (obviously) consider local energy costs and the capital cost of the device itself and to some extent how readily the ERD accommodates varied operating conditions.

Although the energy consumption between SWROs equipped with different ERDs may vary, it is unlikely that the difference between an isobaric and turbo-type ERD under the same conditions could ever approach 20 percent; a more reasonable range with the existing technologies would be 5 to 10 percent.

At least nine presentations at next week's IDA Congress will address ERD technology, providing more fuel for the debate. In addition to papers by most ERD suppliers, Fichtner's Heinz Ludwig will present "Energy Consumption of SWRO—Expectations and Reality for State-of-the-Art Technology," and Pratt & Whitney Rocketdyne's Paul Horn will present "Physics-Based System Models Applied to SWRO Plant Design and Operation."

## Technology

### LARGE-DIAMETER MEMBRANE GETS MAKEOVER

Koch Membrane System (KMS) will unveil its newly re-engineered large-diameter seawater membrane at next week's IDA Congress in Dubai. The large-diameter MegaMagnum element has been fitted with a redesigned anti-telescoping device (ATD), and its active membrane area has been increased by 12 percent to 3,500 ft<sup>2</sup> (325.2 m<sup>2</sup>).

But the MegaMagnum's most significant improvement is the pressure vessel that will house the new 18-inch diameter, 60-inch long elements. Peter Waldron, KMS's RO/NF business manager told *WDR* that the housing is made of a glass-reinforced epoxy (GRE) that is both lighter and stronger than the former fiberglass-reinforced plastic (FRP) vessels.

"We developed the new housing in partnership with a composite vessel manufacturer and it is ASME Code 10 rated for 1200 psi [83 bar] operation. The new element, new vessel and our new, patented head assembly will weigh 30 percent less than the previous MegaMagnum," said Waldron.

Even though large-diameter seawater membranes offer some important advantages, its use has been held back because of cost and delivery schedules. "With this new arrangement, we have addressed both issues. Not only will the new system cost about one-third of the previous seawater MegaMagnum, our new, dedicated manufacturing facility will allow us to deliver the units with the same lead time as our 8-inch membranes," Waldron said.

The company offers its new, large-diameter SWRO technology in pre-engineered, package plant systems, as well as vessel control blocks (VCB) for larger, field-erected systems. VCB modules contain up to 12 pressure vessels, each fitted with five elements, assembled in pre-piped racks.

The new MegaMagnums will be available in the first quarter of 2010.

## Florida

### LAND VERSUS VESSEL-BASED PRICING

In the 28 September *WDR* (Volume 44 Issue 35), the preliminary cost estimates for the proposed 50 to 80 MGD Coquina Coast project were reported. The estimates were developed as part of a study led by Malcolm Pirnie that compared various land-based and vessel-based SWRO system alternatives. The total water costs of the land-based systems ranged from \$5.22–\$6.08/kgal (\$1.38–\$1.61/m<sup>3</sup>), while the cost for a vessel-based system were \$9.03–\$9.14/kgal (\$2.39–\$2.41/m<sup>3</sup>).

Several readers noted that the costs were higher than those recently reported for other projects around the world, and asked *WDR* for an explanation.

Actually, a review of all of the options that were evaluated indicates that the water cost could be much higher depending on which of 133 plant configurations were selected; the evaluation was based on nine intake and six concentrate discharge options, and three pretreatment configurations.

According to Malcolm Pirnie's Chris Hill, the intake and outfall costs figured significantly in the costs. Because of the area's shallow water, the estimates for offshore intake and outfall options were based on extending the intake three miles from shore. Intake capital cost for the 50 MGD plant ranged from \$23 to \$498 million, while the concentrate discharge options ranged from \$44 to \$243 million.

The shallow water also worked to the disadvantage of vessel-based options. Hill told *WDR*, "Based on local bathymetry and what we know about the ships, it is necessary to be at least three miles off the coast to get to a depth of 40 feet, and it may be as many as five miles to reach a depth of 60 feet."

Two of three vessel-based desal providers furnished estimated pricing, but Water Standards' Nick Dyer said that it did not appear that this application was well-suited for a vessel alternative and his company did not offer cost data. "We are working on some projects in the Eastern Mediterranean and off the northern Chilean coasts that are much better suited for vessels. Not only are we competitive with land-based systems, we can be up and delivering water in less than 12 months, offering flexible contract terms and using an environmentally sound approach," he said.

## Technology

### COMPACT, SOLAR-POWERED RO

A Swiss-based HVAC and metal fabrication company has increased its product line to include small, solar-powered membrane water systems. Trunz Water Systems recently exhibited one of its solar-powered RO systems at Jeddah's Saudi Water & Power Forum.

Trunz's UF systems are based on GE Water's Homespring technology and the company also offers brackish and seawater RO systems. Pretreatment systems for the RO units consist of automatically backwashable 100, 25 and 5 micron cartridge filters arranged in series. Spectra Watermaker's Pearson Pump – a combination reciprocating pump and energy recovery device – minimizes energy consumption.

The solar power centers for the water systems include photovoltaic modules, inverter, charge controller, gel batteries and an optional solar tracking system. For 24 hour per day operation, the company can provide an optional wind turbine.



The €40,000 (\$60,000) RO system pictured above was installed at Alice Springs, Australia and operated on groundwater with a 15,000 mg/L TDS. It produced 5,000 L/d (1,320 GPD) of drinking water at a cost of approximately €3.00/m<sup>3</sup> (\$4.44/m<sup>3</sup>; \$16.81/kgal), based on a 5-year amortization.

Marketing director Andrea Trunz told *WDR* that the company has installed units in 30 countries and although most units are UF or BWRO systems, they have operated a seawater RO system, with a 20 percent recovery, at a Dubai harbor.

## New Product

### NEW, NON-METALLIC PIPE COUPLING

Although some desalters got an early look at Piedmont Pacific's new non-metallic pipe coupling at last week's Southeast Desalting Association's (SEDA) conference in Miami, the company will formally introduce the product next week in Dubai. Piedmont boss Jim Medanich told *WDR* that the new coupling is the first to be expressly designed for the low-pressure water market.

The couplings are made from Noryl, a well known engineered plastic that is UV-resistant and does not absorb water. “It looks and works just like a metallic coupling, but is lighter and less expensive than galvanized steel. We designed it for MF, UF, NF and brackish RO applications,” said Medanich.

The coupling carries a 3X safety factor for use up to 200 psi [14 bar]. It is fitted with EPDM rubber gaskets and is furnished with type 316 stainless steel hardware for pipe sizes that range from ¾ to 8 inches.

## R&D

### PUBLIC REUSE AWARENESS TO BE STUDIED

Two requests for proposals (RFP) have been released as part of the WaterReuse Foundation’s solicited research program. The US Bureau of Reclamation is a funding partner on both projects.

The first project will investigate whether community knowledge and awareness of ‘unplanned’ indirect potable water reuse (IPR) through the discharge of treated wastewater into the raw water supply improves their acceptance of ‘planned’ IPR. It will determine if the quality and quantity of treated wastewater in the source water influences community acceptance of IPR, and will test for public recognition of the water cycle.

Up to \$150,000 of funding will be provided, and an 18-month time period has been allotted for the investigation.

A second project will investigate and develop an alternative approach for managing and monitoring microbial water quality of reclaimed water effluent through the Hazard Analysis and Critical Control Points (HACCP) process. In addition to documenting the applicability of HACCP for risk management, the study will also develop international collaborations in implementing an HACCP framework for reuse applications.

Up to \$200,000 of funding will be provided, and the project duration will be 24 months.

Proposals are due on 19 November and more information is available at [www.watereuse.org/foundation/research/rfps](http://www.watereuse.org/foundation/research/rfps).

## IN BRIEF

**Namibia’s** first large-scale seawater desalination plant was commissioned near Swakopmund last week. The N\$1 billion (\$129 million) SWRO plant will furnish 20 million m<sup>3</sup>/yr (14.5 MGD) of potable water to support the mining operations at Trekkopje, about 48km (30 mi) inland, and excess production may serve local communities.

Next Monday, the **IDA board** will select a new president to preside over the organization for the next two years. After formal nominations are made at the 2 November board meeting, the sitting directors will vote for president. Three directors have tentatively thrown their hats in the ring and indicated an interest in the position. The three are:

- *Abdulmajeed Ali Al-Awadhi*, the chief executive, Bahrain Electricity & Water Authority
- *Imad Makhzoumi*, COO, Future Pipe Industries
- *Fayyaz Muddassir Mubeen*, consultant to ACWA Power

Nominations for the fourth **Prince Sultan Bin Abdulaziz International Prize for Water** can be made online at [www.psipw.org](http://www.psipw.org) until 31 January 2010. An award will be given in the category of Alternative (non-traditional) water resources for topics related to innovative methods of water production from non-traditional resources.

## PEOPLE

Toray Industries has announced the appointment of **Jim Hotchkies** as vice president of marketing for its UF and MBR technologies in the Americas. He was formerly a senior vice president for Zenon Environmental and GE Water and will be dividing his time between Torays’s Poway, California and Basel, Switzerland, offices. He can be contacted at [hotchkies.james@toraywater.com](mailto:hotchkies.james@toraywater.com).

Pump Engineering, Inc (PEI) has announced the appointment of **Juan Reverter** as its sales representative in Spain. He is the commercial director for Alkary Getra, and was previously general manager of Toray-Ropur Spain and Hydranautics Spain. He is based in Barcelona and can be contacted at [jreverter@alkary.es](mailto:jreverter@alkary.es).

Doosan Hydro Technology has appointed **Peter Shen** as its business development manager of the Western US. He was formerly a senior project manager with California American Water where he also served as technical project manager for the Moss Landing Desalination Pilot Project. He is based in San Diego, California and can be contacted at [psen@doosanhydro.com](mailto:psen@doosanhydro.com).

## JOBS

The Global Water Sustainability Center (a joint venture between **ConocoPhillips** and **GE Water & Process Technologies**) in Doha, Qatar is seeking fresh and experienced Engineers & Technologists with Advanced Degrees in the areas of membranes, desalination and analytical chemistry. Ideal candidates will have a Doctorate degree with field/lab experience. Interested candidates please send your resumes to [Samer.Adham@conocophillips.com](mailto:Samer.Adham@conocophillips.com).