

# WATER DESALINATION REPORT

The international weekly for desalination and advanced water treatment since 1965

Volume 46, Number 23

21 June 2010

## California

### SO CLOSE, YET SO FAR AWAY...

When the Metropolitan Water District (MWD) issued its November 2001 invitation for cost-effective seawater desalination proposals, it said successful projects would receive a financial incentive of up to \$250/AF (\$0.20/m<sup>3</sup>). The Carlsbad Desalination Project also qualifies for a less publicized Local Water Supply Development Program incentive from the San Diego County Water Authority (SDCWA) of up to \$200/AF (\$0.16/m<sup>3</sup>).

For the 50 MGD (189,250 m<sup>3</sup>/d) SWRO project to be viable, Poseidon will require the combined \$450/AF in incentives for six to ten years to meet debt service coverage and equity investor returns. However, the MWD incentive is now in jeopardy since SDCWA filed a lawsuit last week that challenges the MWD rate structure.

If it is withdrawn, one possible solution is for SDCWA to backstop the MWD incentive at a cost of up to \$25.2 million per year, something that seems unlikely since the guarantee would be disproportionately borne by non-Desal Partner agencies. The CWA would need to participate in the project through a public-private partnership or a direct relationship with Poseidon, including future acquisition of real property interests and other assets.

The City of Oceanside was one of the nine public agencies with a Water Purchase Agreement (WPA) to purchase desalinated water from the plant. In a letter to City Council late last week, City Manager Peter Weiss said:

“In discussions with the CWA [County Water Authority], it is apparent the Poseidon project is not going to work as originally structured. CWA has indicated that they would be willing to negotiate with Poseidon to take over the project if the Desal Partners agreed. If CWA were to pursue negotiations and be successful, it would require all Desal Partners to cancel their existing WPAs.

At this time it appears that the only option for the region to receive 56,000 acre-feet [189,250 m<sup>3</sup>/d] of desalinated water is to have CWA take over the project and make the water available to all agencies within its system.”

The issue will be further discussed during the City's Wednesday council meeting, and taken up during SDCWA's board meeting on Thursday.

A lot of politics will happen this week.

## Caribbean

### WHAT A DIFFERENCE AN ELECTION MAKES

In April 2008, Trinidad and Tobago's newly appointed Public Utilities Minister told Parliament that it would take \$1.58 billion and five years to end the country's water woes. Minister Abdul-Hamid eloquently made a case for building five new desalination plants with a combined production capacity of 90 MIGD (108 MGD) and expanding the existing Desalcott Plant in Point Lisas from 25 MIGD (30 MGD) to 40 MIGD (48 MGD).

The plan also included provisions for a water reuse project at Beetham to provide high-quality effluent for industrial use, and the construction of two new dams and a new national water transmission and distribution system. He said that the projects would ensure that no Trinidadian would have water less than three days per week, and at least 60 percent of the households would be provided water on a 24 hours per day, seven days a week basis.

A tender was soon launched and AECOM was selected as implementation manager to move the program forward. The tentative plans were ambitious and called for a schedule in which much of the desal capacity would be built on a BOOT basis and commissioned by the third quarter of 2011.

Although things did not move as fast as predicted – after all, this *is* the Caribbean – prequalified BOOT developers received invitations in March to bid for a 20 MIGD (24 MGD) La Brea SWRO project at Point Fortin in Trinidad and a 5 MIGD (6 MGD) Cove SWRO project in Tobago.

Then...a new government was elected in the general election two weeks ago.

The Public Utilities Minister has been replaced and the boards of all state-run companies – including Water and Sewerage Authority (WASA) – have resigned. New boards should be in place by mid-July, and the desal tenders, which were due later this month, have been indefinitely postponed.

Not only will all new projects require a reassessment in light of the new government's plans, all contracts that have been signed in the past two months must be reviewed. Presumably, this includes WASA's award of the 4.6 MIGD (5.5 MGD) fast-track emergency desalinated seawater supply contract to Seven Seas Water.

Someone familiar with the project told *WDR* that because of the urgent need for fresh water, it is likely that the project

will move forward. However, it is less certain whether the government agencies responsible for permitting the project will be responsive to the project's current schedule to be online by the end of August.

Desalcott, which owns and operates the 30 MIGD (36 MGD) Point Lisas SWRO plant, is currently working on a fast-track project to increase its production capacity to 40 MIGD (48 MGD). Because the contract was signed in January, it should be unaffected by any board changes, even though it has not yet reached financial closure.

The status of a second Point Lisas expansion, which would increase its capacity to 60 MIGD (72 MGD), is less certain.

Meanwhile, Petrotrin's long-delayed, ever-evolving desal project is another story. *WDR* has learned that Petrotrin's board will undergo a complete restructuring, and the SWRO project planned to provide boiler feed and process water for the refinery's expansions may ultimately be cancelled. Instead, the refinery may employ an existing, but uninstalled BWRO system purchased from Aquatech several years ago to desalinate water imported from dams in the south.

## Florida

### RE-BID SHORTLIST ANNOUNCED

The City of Clearwater, Florida has shortlisted the consultants that it will interview next Monday, 28 June, to provide engineering services to design and permit two new BWRO facilities. The selection comes after the project was re-bid following the protest of one bidder that was not shortlisted when the project was originally bid in February.

The specification language was apparently changed slightly to require bidders to more clearly state whether they were bidding for plant #1 or #2. The protesting bidder was not shortlisted after the second bid.

Tetra Tech and CDM will be interviewed for the 1 MGD (3,785 m<sup>3</sup>/d) expansion of RO plant #1, while Reiss Environmental and Tetra Tech will be interviewed for the new, 6.5 MGD (24,602 m<sup>3</sup>/d) RO plant #2. The projects are scheduled for commissioning in December 2012 and December 2015, respectively.

## Company News

### UF COMPANY GETS NEW BOSS

Group Degrémont's Aquasource subsidiary has named Eric Dehouck as its new chief operating officer.

This news would normally be included in *WDR*'s "People" section. However, one detail that accompanied the announcement caught your correspondent's attention. The statement noted that this UF membrane pioneer has more than 260 membrane installations in over 25 countries.

Because most of these installations are located in Europe and Asia, readers in North America and the Middle East who are unfamiliar with the company may be interested in an update.

Although Dehouck was in primary school when Aquasource was founded in 1984, he has spent eight years within the Degrémont group, including assignments with Infilco Degrémont (US) and Anderson Water (Canada). He understands the company culture well and, for someone who didn't have a strong membrane background, is surprisingly knowledgeable of the company's history and technologies.

Aquasource's membrane portfolio has evolved from its original cellulose acetate UF product to include a hydrophilic polysulfone UF product. All of its membranes filter from inside/out, and most can be used in either a dead-end or cross flow configuration. In addition to membrane modules, the company has developed standard module racks and UF packaged plants for its OEM partners and autonomous, skid-mounted systems with production capacities from 10 to 50,000 m<sup>3</sup>/d (13.2 MGD), concentrating its sales efforts in Europe and Asia.

Dehouck, who is based in Toulouse, France, sees a segmentation in the market, noting that outside/in PVDF membranes may be better suited for wastewater filtration applications, but believes that inside/out polysulfone and cellulose acetate membrane products will perform better in clean water applications and those equipped with effective pretreatment systems.

"Because of the inside/out flow, we are able to get a more efficient backwash and, therefore, better permeability recovery while operating with fewer chemicals. For this reason, we will continue to focus on municipal drinking water, industrial process water and seawater pretreatment markets. We now have a portfolio of UF systems that have been operating reliably for more than ten years and our strength stems from the fact that we are focused on ultrafiltration as our core activity with complete control of the value chain from manufacture of the hollow fibers through to commissioning," he told *WDR*.

## 1990-1999

### A UF DRINKING WATER MARKET RETROSPECTIVE

A 1993 *Cryptosporidium* outbreak in Milwaukee, Wisconsin, helped change the way potable water is treated around the world. Over a two-week period – until Milwaukee's Howard Avenue Water Treatment Plant was shut down – more than 400,000 people were sickened by the largest waterborne disease outbreak in US history.

At the time of the outbreak, virtually all municipal water treatment plants, including Howard Avenue, employed granular media filters. Backwashable, hollow fiber

ultrafiltration (UF) and microfiltration (MF) membrane products were still new to the market and just beginning to be commercialized.

The three leading MF/UF membrane suppliers for the municipal drinking water market in the early 1990s were Memtec (Australia), Koch Membrane Systems (US) and Aquasource (France). Pall, Norit and Zenon (now GE) did not have a strong presence in the drinking water market until the late 1990s.

Today, according to a recent survey of water consultants conducted by Herschell Environmental's Ron Maness, more than 75 percent of the drinking water plants under design will be membrane plants.

Of the three original suppliers, Memtec's MF/UF products are now part of Siemens' Memcor group and its activities have expanded to include MBR and tertiary filtration markets. Although Koch Membrane Systems remains fully engaged in the MF/UF membrane market, it focuses on industrial water and MBR applications, and is not currently active in the drinking water market.

Meanwhile, Aquasource remains a subsidiary of Degre-mont's Technologies Division, pursuing drinking water, industrial process water and SWRO pretreatment applications (see preceding story). It left the US market in the late 1990s to focus on a growing number of European opportunities closer to where its membranes and membrane modules were manufactured. Not only were the exchange rates and freight costs more favorable, its European organization was solely membrane oriented, and its membrane products did not face the internal competition of Infilco Degre-mont's own highly successful conventional filtration products.

Aquasource continues to support its US membrane installations and anticipates increasing its North American presence over the next few years.

## Technology

### FORWARD OSMOSIS RECLAIMS OILFIELD WASTE

Produced water characteristics and physical properties vary considerably depending on an oilfield's location, geological formation, age and the type of hydrocarbon being produced. Other than its oil and grease content, the constituent of produced water that usually draws the most attention is its salinity. Although some produced waters and drilling fluids can have a total dissolved solids (TDS) concentration of less than 1,000 mg/L, most are much higher, with some reaching 200,000 mg/L or more.

The management of these waste streams can be a significant problem in oil and gas production. In some recent, well-publicized cases, such as Texas' Barnett Shale and the

northeastern US' Marcellus Shale, the treatment and disposal of large volumes of high salinity waste streams are preventing the exploitation of significant energy reserves.

Deep well injection or other means of disposal may be cost prohibitive or environmentally impractical, while treatment of high salinity wastewaters with evaporative or RO membrane technology may not be possible due to the extremely high energy requirements and/or scaling tendencies of saturated waters.

Mark Lambert, director of corporate development for Arizona-based Hydration Technology Innovation (HTI), told *WDR* that these are exactly the type of applications for which his company's forward osmosis (FO) membrane process is best suited. In fact, the company has recently formed a joint venture with Louisiana-based Bear Creek Services to develop a fleet of trailer-mounted FO systems now in commercial operation in the Haynesville Shale gas play in Northern Louisiana and East Texas.

Like well operators around the world, those operating in the Haynesville Shale purchase a concentrated brine solution for use in well completion, workover and frac fluids. Before it can be used, however, it must first be diluted from a 26 to 28 percent salt concentration to 4 to 7 percent. Rather than using fresh water for dilution, HTI uses FO to reclaim drilling wastewater that would otherwise require disposal.



20 membrane elements are fit inside open ended PVC vessels which are mounted vertically in a common tank filled with drilling waste fluid.



Concentrated draw solution is introduced to the element on the opposite side of the FO membrane from the drilling waste. Water from the waste solution permeates the membrane to dilute the draw solution and the remaining wastewater is discharged back to the reserve pit.

HTI's Forward Osmosis "Green Machine"



“Even though the wastewater itself may have a fairly high TDS – as well as a high concentration of suspended solids – the osmotic gradient causes some water in the drilling waste to permeate through the membrane, diluting the brine. By applying our FO process, we are able to take advantage of the potential energy source in a product that the oilfield uses every day and that would otherwise be wasted,” Lambert said. “We are usually able to reclaim 80 to 85 percent of a typical 20,000 barrel drilling waste reserve pit.”

Bear Creek Services president Nathan Hutchings, whose company operates the units, said five trailer-mounted “Green Machine” FO units are currently in operation. Systems run at low pressure, requiring only a 25 kW generator that uses less than 25 gallons (95 L) of diesel fuel per day. Each system is equipped with 240 spiral wound elements and can recycle 4 bbl/min (168 GPM; 10.6 L/s). The membranes are made of a cellulose blend, and like their RO counterparts, measure 8 inches in diameter and 40 inches in length.

HTI – founded in Oregon in 1986 and the only company to commercially manufacture forward osmosis membranes – also offers a line of forward osmosis filter packs for personal and military applications and is developing products for other municipal and industrial applications.

## Publishing

### ELSEVIER'S DESALINATION MAKES AN IMPACT

A journal's impact factor is the measure widely used to assess the relative importance of the journal within its field. It reflects the frequency with which a journal's average article has been cited in a particular year.

Thomson Reuters, publisher of the annual *Journal Citation Reports*, has released the details of its impact factor calculations for 2008 and 2009. It has assigned Elsevier's *Desalination* journal a 2008 impact factor of 1.155 based on 7,562 total cites. The 2009 impact factor has almost doubled to 2.034 based on 11,695 total cites.

*WDR* congratulates *Desalination* on the excellent results and recognizes the contributions of Miriam Balaban, its founding editor, and its current editorial triumvirate that includes Professors Nidal Hilal, Raphael Semiat and Eric Hoek.

## IN BRIEF

South Korea's **Woongjin Chemicals'** CSM membranes have been selected for a 131,000 m<sup>3</sup>/d (34.6 MGD) BWRO facility to be installed at the Fajr Petrochemical Plant in Bandar Imam Khomeini, Iran. The system will desalt river water with a TDS of 1,700 mg/L to produce 30 mg/L permeate for

potable, boiler feed and service water applications. Zolal Iran is the EPC contractor and the system, which will be commissioned in September 2011, is the second RO system at the plant to employ CSM membranes.

H2O Innovation's **Professional Water Technologies** (PWT) group announced the development of a new method of infusing its dendrimer antiscalant technology with sodium benzoate preservative. The company says that the process will allow them to significantly improve product shelf-life of its 11X concentrated antiscalants, while controlling biological growth in pretreatment tanks, associated equipment and the membranes.

The **National Centre for Excellence in Desalination** at Murdoch University in Western Australia has appointed Graeme Rowley as chairman. He was formerly an executive with Fortescue Metals and Rio Tinto.

A new book edited by Joseph Cotruvo entitled *Desalination Technology: Health and Environmental Impacts* will be published by **CRC Press** this Wednesday, 23 June. More information is available at: <http://www.crcpress.com/product/isbn/9781439828908>.

Final Reminder: The AWWA will accept abstracts for its **2011 Membrane Technology Conference** until 7 July. The conference will be held in Long Beach, California, on 28-31 March 2011. See abstract submittal details at <http://apps.awwa.org/EbusMain/Default.aspx?TabID=203>.

## JOBS

**Woongjin Chemical America** is seeking (1) Florida-based Sales Representative for the Southeast US to develop customer relationships, identify opportunities; (2) Southern California-based Technical Support Engineer to review project specifications, and write proposals, provide technical support and training. Applicants should be proficient with MS Office and membrane design simulation software. An engineering or science degree is preferred, and up to 50% travel is required. Email resume to [kenyoon@wjcsm.com](mailto:kenyoon@wjcsm.com).

**Oasys Water** seeks a Director of Process Applications. Responsible for pilot test program development, implementation and management of engineers and technicians. Tasks include designing and conducting test campaigns of customer waters with membrane and thermal treatment equipment, RO and UF systems; communicating results and improvements to the engineering and business teams; and contributing to the strategic development of our products and markets. Email resume to [HR@oasyswater.com](mailto:HR@oasyswater.com).