Water Desalination Report

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Company News

Ovivo to be taken private

SKion GMbH, a German investment company, and la Caisse, Canada's leading private equity investor, announced that they will partner to acquire Ovivo, a Canadian water and wastewater treatment system supplier, and take the company private in a deal valued at Can$185 ($141.6 million). Following the expected September closure, SKion will hold 70 percent of the company and la Caisse, a long-time investor, will raise its holding from its current 18.7 percent to 30 percent.

An investment company of German entrepreneur and anchor BMW shareholder Susanne Klatten, SKion's other water industry holdings include Eliquo Water Group (Germany), EnviroChemie (Germany), Evodos (Netherlands), Mattenplant (Singapore), Miranda (Turkey), Microvi (US) and Paques (Netherlands).

Ovivo CEO Marc Barbeau told *WDR* that he's very optimistic about the deal and believes it will prove to be a good cultural fit. "SKion understands the water industry and views it pragmatically. It's difficult to operate a relatively small public company on a global scale. The water treatment industry requires long-term investments in technologies and expertise in order to compete and grow, and by taking the company private, we will be able to focus on a longer horizon, and realize our full potential."

The company's water industry history dates back to the 19th century when Eimco was founded to serve the coal mining industry. Eimco and Dorr-Oliver were acquired by GLV in 2002 and rebranded as Ovivo in 2010. Its legacy brands include Brackett Green (intake screens), Caird & Rayner Clark (RO systems), Christ Water (ultrapure drinking water systems) and Enviroquip (MBR systems).

In another, lower key announcement, Barbeau said that the company has signed a licensing agreement with Cembrane A/S, a Danish supplier of flat sheet, silicon carbide (SiC) ceramic MF and UF membranes. Under the agreement, Ovivo will have exclusive rights to offer the membrane in systems within the semiconductor and related industries.

"We have one new project that will use the ceramic membrane and we are about to conduct a pilot study on another project," Barbeau told *WDR*.

Research

Project seeks to boost ED application

With €9.8 million ($10.8 million) of funding under the European Union's (EU) Framework Programme for Research and Innovation, Horizon 2020, a consortium of ten European partner organizations hopes to promote the use of electrodialysis (ED) in a broad range of applications.

Information disseminated by the European Desalination Society (EDS) said that the REvivED project was launched on 1 May 2016, with a kickoff meeting held in Brussels in early June. In a press release issued last week, the consortium offered an ambitious, and surprisingly bold statement, which said that the project will "contribute to addressing the world's drinking water challenge by establishing ED as the preferred process for desalination of seawater, in order to provide a source of safe, affordable and cost-competitive drinking water."

The press release then goes on to list the five applications on which it will focus: off-grid brackish ED desal in developing countries; ED-based tap water softening; industrial scale seawater ED desal; industrial scale seawater desal integrating ED with reverse electrodialysis (RED); and SWRO combined with ED/RED. It also says it will conduct pilot testing "in real environments to demonstrate achievements regarding energy consumption, water quality and cost/price, among others."

Consortium members include Abengoa, Aquatt, Deukum, EDS, Fujifilm, Phaesun, REDstack, Università of Degli Studi Di Palermo, Universiteit Gent and Westus. The project is due to run through April 2020.

Fujifilm's Dr Natalie Tiggelman is the project coordinator, and more information is available from the EDS at balabanmiriam@gmail.com.

Editor's comment: EU's funding of the REvivED project should be welcomed by the desal community. Research funding available for brackish water desal projects is usually far less than that available for seawater applications, and €9.8 million can go a long way. However, this newspaper respectfully suggests that the consortium carefully consider the projects that they undertake, and that they first review the work done by Ronan McGovern in John Lienhard's group at MIT. The work, which includes two journal papers and a

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doctoral thesis, carefully considers ED, RED and hybrid ED-RO in brackish and high salinity applications, and defines ED's energetic and economic sweet spots.

Reuse

Potable water IS potable water

Everyone understands what *drinking water* is and most people understand the difference between *potable* and *nonpotable water*. However, many people do not understand that water is presently used and reused, so their understanding of water reuse is imperfect. In fact, within the water industry itself there are many people that are unable to accurately describe the difference between *indirect potable reuse* (IPR) and *direct potable reuse (DPR)* and use definitions that are off-putting to lay audiences.

The meaning of a reuse term becomes more convoluted with the addition of each new adjective; so much so that technologists and water professionals actively engaged in reuse projects—and depending on the context in which they are speaking—are not consistent in their use of the words water reuse, recycled water, reclaimed water, centralized or decentralized nonpotable reuse, planned indirect potable reuse, unplanned indirect potable reuse, de facto potable reuse, re-purified water, advanced purified water, water augmentation, pipe-to-pipe potable reuse and direct blend potable reuse.

The inconsistencies of the reuse vocabulary affect a city engineer's ability to explain something to a city manager, city council members or the lay public, and it can hinder a company's ability to convey its strategy to its employees, customers and shareholders. It certainly confuses the community engagement programs that are typically used when a new project is considered.

A well-known scientist/consultant that specializes in potable reuse projects admitted that the inconsistent use of reuse terminology within his firm is a challenge that must be dealt with on a daily basis.

During the past few weeks, your correspondent has fielded numerous calls from people trying to understand how the current reuse market compares to the desalination market. While trying to answer those questions, it became obvious that many people are simultaneously using a very broad definition of *reuse* and the narrowest possible definition of *desalination*. They apparently assume that reuse water included everything from recycled gray water to purple pipe/nonpotable reuse to direct potable reuse, while desalination was limited to seawater desalination and did not even embrace brackish water desalination.

Reuse in Texas

The Trinity River in Texas is an example of an effluent-dominated surface water system where unacknowledged potable water reuse occurs. Wastewater treatment plants in Dallas/Fort Worth collectively discharge 500 MGD (1.9 million m^3/d) of effluent into the Trinity River, which account for almost its entire capacity under base flow conditions.

Little dilution of the effluent-dominated waters occurs as it travels south to Lake Livingston, one of Houston's main drinking water reservoirs.

During the estimated two-week travel time, many of the trace organic contaminants undergo transformation by microbial and photochemical processes. Additional contaminant attenuation and pathogen inactivation also may occur during the water's one-year residence in the reservoir, after which it undergoes conventional drinking water treatment.

On an annual basis, about half of the water flowing into Lake Livingston is derived from precipitation. Therefore, water entering the drinking water treatment plant consists of approximately 50 percent wastewater effluent, and after undergoing treatment, meets all EPA drinking water quality regulations, and has been your correspondent's primary drinking water source for over forty years.

Excerpted from *Water Reuse: Potential for Expanding the Nation's Water Supply Through Reuse of Municipal Wastewater*, National Academy of Sciences, 2012, available at http://tinyurl.com/j4ssm86.

The reuse lexicon is not limited to confusion created by variations of the word reuse itself. Depending on the technical expertise of the reader and the context in which it is used, confusion may be created by many related words. For example, water can contain *pollutants* without being *polluted*; an *environmental barrier* can be a good thing that prevents pollution at polluting concentrations, or it might imply that the barrier somehow treats the water when the actual water being discharged is far purer than the water in the 'environmental barrier'. The levels of treatment being discharged into a barrier may be very different.

When discussing reuse issues with technologists, it's usually best to take a more granular approach in defining terms. It's also best to limit reuse water's classification as either potable or nonpotable with the public, while remembering Dr Louis van Vuuren's sage advice: "Water should be judged by its quality, not its history." The public wants to know that the water they drink is safe. This is true whether their water plant intake is below another community's wastewater discharge point (which is business as usual in most of the world), or if their community's water intake is below their own utility's discharge.

In *WDR's* opinion, the only way the reuse market will overtake the brackish and seawater desalination markets is if *reuse* is used in its most broad definition.

It should also be kept in mind that potable reuse projects and desalination projects use the same technology. Are the definitions we are using advancing understanding with the public or even within the water industry? As George Tchobanoglous has said, "If it is drinking water, it is drinking water."

Isn't it time to step back and look at the issue in context of the urban water cycle of use and reuse?

California

WWTP to get RO/IX boiler feed system

As planes depart LAX over the Pacific Ocean, the last view of Los Angeles that passengers see at the end of the runway is the Hyperion Water Reclamation Plant, the city's oldest and largest wastewater treatment facility. Today's 450 MGD (1.7 million m^3/d) facility bears little resemblance to the plant that was originally built in 1925. Besides the cluster of 36 circular clarifiers, the plant's most distinguishing visible characteristic is its group of twenty, 83 foot (25m) diameter, 110 foot (33m) egg-shaped digesters that biologically degrade the biosolids (sludge) produced by the plant.

During the 15-days it takes microbes to consume half the digester solids and destroy pathogens, they release methane gas that is used as fuel in an existing biogas cogeneration facility. Exelon Corporation is currently adding a second cogen plant that, when the project is competed later this year, will produce more than 173 million kWh/yr and 70,000 lbs/hr (32T/hr) of steam; enough to supply 100 percent of the Hyperion facility's requirements.

Last week, Evoqua announced that it has been selected to provide a boiler feedwater makeup system for the new, 350 psi (24 bar) boiler. According to Bill Malone, Evoqua's local sales manager, the company will furnish its PTI multimedia pretreatment filters and a Vantage Series two-pass RO system with Hydranautics membranes operating at 75 percent recovery. The permeate will undergo additional polishing in a mixed bed resin using customized Evoqua FlexMate deionization tanks and regenerated off-site at Evoqua's Los Angeles service facility.

Excelon's Constellation New Energy is delivering the $227 million project under a design-build contract and will operate the cogen facility for ten years. Vanderweil is the project engineer is providing permitting and other support services.

Company News

Startup reconfigures its floating SWRO

Since *WDR* first looked at the SAROS (swell activated RO system) in late 2014, the system has undergone a complete redesign. At that time, the prototype relied on a seawater-filled pendulum that rocked with the wave action to create energy to power a small, 160 GPD (600 L/d) SWRO system.

The three University of North Carolina at Charlotte graduates that developed, built and tested the original units

Desal Costs

Capacitive deionization versus BWRO

Voltea, the Netherlands-based supplier of capacitive deionization systems, has prepared a technical analysis that compares three of its standard CapDI systems to identically-sized brackish water RO systems operating on the same feedwater. The analysis also includes a cost of ownership supported by field data from various installation sites for feedwater with a 2,000 mg/L TDS at 50°F (10°C) and RO membranes of various ages.

Production Capacity	4.5 gpm (17.0L/m)		11.2 gpm (42.4 L/m)		26.2 gpm (99.2 L/m)	
Process	CapDI	RO	CapDI	RO	CapDI	RO
Total Annual Cost	$7,089	$15,560	$17,689	$26,060	$41,016	$43,198
Energy	25.00%	20.38%	24.95%	27.56%	25.16%	33.53%
Wastewater	23.66%	55.83%	23.60%	55.89%	23.81%	51.89%
Membrane (Module) Repl	(30.91%)	2.77%	(30.96%)	3.74%	(30.71%)	5.27%
CIP / Maintenance	20.44%	21.02%	20.48%	12.82%	20.31%	9.32%

Annual Cost of Ownership Comparison CapDI versus RO

According to Voltea's Heather Leighow, "CapDI has often competed with RO in all aspects of the business, from capital and operating expenses to operational efficiency and water recovery. Our CapDI technology costs have now reached parity with that of RO, and this document details all of these aspects, and shows it to consistently have an advantage on all aspects of a project."

The full technical and economic analysis is available for downloading at http://tinyurl.com/zymyc3q.

are still at it, but SAROSv2 has been completely redesigned. The system now employs a point absorber wave energy converter (WEC) that is more efficient at generating power under much wider range of wave conditions, and the RO unit has been moved to shore.

"Most of our work has been focused on developing a WEC that pumps seawater to shore through a small rubber hose at about 200 psi [13.8 bar]. There, we use a pressure intensifier to boost the pressure to 800 psi [55 bar] to feed to the RO, which will produce up to 3,500 gpd of permeate at 15 to 25 percent recovery," said Justin Sonnett, the research director and one of the company's co-founders.

He said that they have successfully conducted the first seawater tests of the new WEC earlier this month and will continue to optimize the unit while seeking collaborative efforts with other researchers, organizations and strategic partners.

In brief

Ecolab, the parent company of **Nalco Water**, announced late Friday afternoon that has has made a minority equity investment in **Aquatech International**, the Pennsylvania-based water treatment plant company. Unconfirmed reports have said it was a 40% stake, with an option to acquire the remainder of the business.

In the second year of a three-year, $1.86 million R&D collaboration, **Aquaporin Asia** and Germany's Berghof Membrane Technology have announced the joint development of an aquaporin-based biomimetic forward osmosis membrane with a tubular geometry. Industrial test bedding of the membrane is planned, and the project is supported with funding by the Singapore National Research Foundation and administered by PUB.

The Northwest Membrane Operator Association (NWMOA) will hold a workshop entitled "**Membrane Plant Upgrades"** on 30 August in Ogden, Utah. Visit www.nwmoa.com.

Last week, **Evoqua** CEO Ron Keating summarized the status of the company's Nexed electrochemical desalination process, noting that it has been commercialized for industrial and brackish water applications, although development of a seawater system is ongoing. He said that a seawater pilot unit has recently been commissioned and "an entire pipeline of R&D will follow the pilot work, which we believe will dramatically enhance its performance."

The Southeast Desalting Association (SEDA) will hold a one-day workshop on "**Brackish and Seawater RO Operational Variances"** on 13 October in Gibsonton (Tampa), Florida. For information, visit: http://tinyurl.com/lu6ky3n.

CH2M has been awarded the contract to provide consultancy services for a proposed 136,380 m^3/d (36 MGD) SWRO on Singapore's Jurong Island. PUB is said to be evaluating the feasibility of co-locating the plant with a power plant The project, which is expected to be built in 2020, will be the fifth large-scale seawater desal plant in Singapore.

Mitusbishi Electric will conduct a pilot test of its ozone backwashed Eco-MBR utilizing **Asahi Kasei's** ozone-resistant low-pressure membranes under an MoU signed with Singapore's Sembcorp Industries. The tests are to be conducted as part of Singapore's Industrial Living Lab initiative.

Oman Power and Water Procurement Company (OPWP) has indicated that it intends to award the 80,000 m^3/d (21.1 MGD) **Sharqiyah SWRO** project. Full commercial operation is scheduled for the second quarter of 2020.

The American Membrane Technology Association (AMTA) will hold a workshop entitled **"Membrane Processes: Present & Future in Ohio"** on 25-27 October in Columbus, Ohio. For information, visit: http://tinyurl.com/gocsnrh.

People

Leo Tua Parra has been appointed as sales manager for the Americas for Piedmont Pacific, the coupling and cartridge filter housing manufacturer. With over 10 years of experience with membrane and desal systems, he will be supporting Piedmont business and distributors in North, Central and South America and may be contacted at: leo.tuaparra@piedmontpacific.com.

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