

WATER DESALINATION REPORT

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Research

BIOMIMETIC MEMBRANE ANNOUNCED

Researchers at the University of Illinois at Urbana-Champaign have developed a new membrane that combines the advantages of both the biological and polymeric worlds. Lab tests have determined that the membrane has improved salt rejection characteristics and can operate at a specific flux more than 10 times higher than polymeric membranes currently available.

Manish Kumar, a PhD candidate leading the research, was quick to point out that the membranes are still being evaluated at an experimental level and currently exist as small, membrane-enclosed sacs, or vesicles. "Our work has proven the concept that it is possible to incorporate a working biological molecule into a polymeric membrane. The next step is to make a bigger, flat-sheet membrane that can be pilot-tested," he said.



Polymeric membrane with and without Aquaporins

The U of I team, led by Professors Mark Clark and Julie Zilles, worked with the University of Basel (Switzerland) to make the membrane with a polymer that self-assembles into the hollow vesicles. While it is assembling, a protein found in *Escherichia coli* bacteria is added to improve its performance characteristics.

Kumar got the idea by considering how a human kidney efficiently transports water through a membrane using proteins called 'aquaporins' that act as water channels. The channels allow for the single-file transport of water in much the same way a single-file column of people passes through a narrow corridor faster and more efficiently than a crowd.

"Biological membranes aren't very stable and can't operate the pressures necessary for desal processes, so we looked for ways to duplicate nature using aquaporins integrated in a stronger, more stable polymeric membrane.

The result is a membrane that is not diffusion-limited," Kumar noted.

Formerly an engineer with MWH, Kumar returned to his alma mater for a PhD in 2006 and knows there's much work still to be done. He estimates that it could be two years before it is determined how the concept could be applied to a full-scale, flat-sheet membrane.

In addition to its desalination potential, the team is investigating pharmaceutical applications for the membrane.

(Diagram from Striech et al, *Nachrichten aus der Chemie* 2004, 52:126-130)

California

MAYOR AND COUNCIL AT ODDS OVER REUSE

What do Paris Hilton and the 'yuck factor' have in common? Answer: It's time to just stop talking about both of them!

While defending his veto of San Diego city council's 5-2 authorization of a one-year water reclamation demonstration project, Mayor Jerry Sanders issued a fact sheet entitled "Mayor Vetoes Council's 'Toilet to Tap' Plan."

Newspaper articles and politicians continue to refer to indirect potable reuse (IPR) as the "yuck factor," "toilet to tap," "recycled sewage" or other denigrating terms because it makes for a good headline and generates opposition to the idea.

The facts Mayor Sanders lists are the public's repeated rejections of attempts to implement IPR over the past 15 years and the lack of funding for the study – he says it will cost \$10-\$15 million despite the fact that no estimate has yet been prepared.

Over the next two days, San Diego's city council will consider overriding the Mayor's veto. The pilot project would prove the technology and help determine its actual cost, with the results used to determine whether the city would ultimately construct a full-scale facility.

The Mayor's repeated stigmatizing references to IPR only serve to confuse the public and make it harder for them to accept. CH2M Hill's Linda Macpherson summarized the situation, telling *WDR*, "We don't recycle sewage – who would do that? We create water. We create water. We use technology to create various qualities of water; water that is safe to discharge to the environment, or water to irrigate food crops, or to drink and for use in high tech applications requiring water that exceeds drinking water standards."

Marco Gonzalez, a local attorney representing the Surfrider Foundation and San Diego Coastkeeper accused Sanders of playing politics and demonstrating a total lack of leadership. "Water supply is too important an issue, and quite frankly, we need it too badly to make it a political football," he said.

In our urbanized world, our water becomes your water becomes my water. It is the quality of water we produce that is important -- not the source.

Caribbean

BVI GOVERNMENT WANTS PLANT

Consolidated Water Co (CWCO) filed a Form 8-K late last week, advising shareholders of a disagreement with the British Virgin Islands (BVI) government over its Boughers Bay desalination plant. The 1.7 MGD (6,434 m³/d) SWRO plant is located on the island of Tortola and has been operated by CWCO and its local partner since its 1990 commissioning.

Initially covered under a long-term water purchase agreement, the plant has been operating and selling water to BVI Water and Sewer on a month-to-month basis for the last eight years. The parties have been engaged in ongoing discussions over a new agreement. However, the BVI government has recently filed a lawsuit in which they now claim ownership of the plant.

Although CWCO continues to operate the plant and says it is willing to continue discussions, the government is refusing to pay invoices. While the government's claimed ownership of the plant is not a new development, the new lawsuit formalizes its position.

CWCO's filing notes that the past due invoices, interest and legal fees have resulted in a \$6.2 million receivable.

As a result of the dispute, CWCO is concerned it may not be able to obtain a water supply agreement from the BVI Government for its new \$8 million Bar Bay plant, located on the other side of the island.

United Kingdom

IDE PULLS LONDON STOCK LISTING

Israeli desalter IDE has pulled its float on the London Stock Exchange just two weeks after announcing the plans. The move was forced by the "prevailing global market conditions." These same conditions - the difficulties in the global credit markets - also forced American Water to cancel its proposed initial public offering on 14 November.

By strange coincidence IDE then announced its IPO on 15 November, stating that it was being advised by Goldman Sachs and Merrill Lynch on the listing - the same two banks who were advising American Water to pull its float.

In a statement to the stock exchange IDE said: "IDE and its shareholders will continue to review the suitability of the market conditions for successful completion of the Offer and, if appropriate, will issue a further announcement in respect of the Offer in due course." Some of the \$200 million the company wished to raise in the offering was earmarked for its 330,000 m³/d (87 MGD) Hadera seawater desalination project, whose financing closed last month.

Australia

GOLD COAST SWRO GETS NEW CTO

GHD's Gary Crisp has been seconded to SureSmartWater (SSW) as chief technology officer for its 125 ML/d Gold Coast SWRO Plant at Tugin. Crisp will manage technical aspects of the project and will sit on the Alliance Project Management Board serving as the SSW project manager in the alliance.

"I have relocated to Gold Coast and so far, have found the work very rewarding. I'm able to use my background in civil engineering along with my desalination and project management experience. I plan to keep my finger on the pulse of desalination in Australia by continuing to do some work for GHD," he told *WDR*.

Global MEMBRANES PROVIDE EMERGENCY RELIEF

More than one billion people around the world are without access to a safe drinking water supply and one of the Millennium Development Goal health targets is to halve that number by 2015. SkyJuice Foundation, an Australian not-for-profit organization, is doing its part to meet that target using ultrafiltration (UF) membrane technology in remote, rural areas around the world.

The organization has jointly developed and patented a low-pressure UF membrane system able to produce 10,000 to 20,000 L/d (2,650 to 5,300 gpd) of potable water. The actual production depends on the raw water turbidity, but units are capable of reducing turbidities from 400 NTU to less than 0.1 NTU. Known as the SkyHydrant, the system is also able to remove bacteria and most pathogens without using electricity or chemicals.

Rhett Butler, SkyJuice's founder and chairman, told *WDR*, "We buy the membranes from Memcor and jointly share the IP on the SkyHydrant design. Although they have no direct or indirect involvement in SkyJuice, Memcor has been a great technical supporter, and some of their employees have volunteered to work on installations for tsunami projects. The SkyHydrant is not a commercial product and we act as a 'market' facilitator to get units and systems into NGOs."

Three hundred units have been installed in 16 countries, often in response to natural disasters, where an emergency water supply is required. Siemens' Lisa Sorgini told us her company recently purchased ten units from SkyJuice that it gifted to the Mexican government for victims of the last month's flooding in Villahermosa. She said several of the units were started up last week.

SkyHydrant units can be operated individually or multiple units can be manifolded together for larger capacities. A feedwater tank elevated 1m (3.3 ft) above the unit provides the necessary operating pressure and if a feed or transfer pump is required, the unit can be fitted with a solar power panel or windmill. Most systems are furnished with chlorine disinfection to ensure a safe water supply.

All operating and membrane cleaning functions are simple and manual, and use no consumables. The



Skyhydrant Installation - Membrane module is mounted vertically on the side of the building

treatment cost to produce potable water is less than \$1.00 per person per year, and may be as low as \$0.20 for some installations. A single 15kg (33 lb) unit can usually be set up and operational in less than an hour. A 1-1/2 minute proprietary manual membrane cleaning process is usually done every 1 to 12 hours of operation, depending on raw water turbidities.

"Our goal is to ensure 'pure water for every child,' and we continue to foster relationships with NGOs and international agencies to expand the availability of clean safe potable water for children and communities throughout the world," said Butler.

Those wishing to donate to the foundation can visit www.skyjuice.com.au

Technical Reference

DESALTERS BOOKSHELF

Fouling in Membranes and Thermal Units by Roya Sheikholeslami; Balaban Desalination Publications; 242 pages; €89 (\$130); www.desline.com/Roya%20flyer.pdf. The subtitle to this book – “A Unified Approach – Its Principles, Assessment, Control and Mitigation” – describes its broad approach to the fundamental and practical aspects of fouling phenomena encountered in heat exchanger practice and membrane processes. Dr Sheikholeslami is the chair of chemical process engineering for the University of the Edinburgh.

Advances in Underground Pipeline Design, Construction and Management by Jey K. Jeyapalan; Jeyapalan & Associates; 362 pages; \$250; home.earthlink.net/~jkjeyapalan/intro/. According to the author, seventy-five percent of water and wastewater utilities total budget is spent designing, constructing and managing its underground pipe network. This book’s stated goal is to familiarize readers with the state-of-the-art in pipeline design, construction and asset management and to alert them to common problems. Dr Jeyapalan is a former civil engineering professor and now serves as an independent consultant specializing in pipelines and underground structures.

Reverse Osmosis and Nanofiltration by AWWA M46 Subcommittee; American Water Works Association; 226 pages; \$105 (non-members), \$70 (non-members); www.awwa.org/bookstore/productDetail.cfm?ItemNumber=4240. This manual provides an overview of RO and NF technologies with chapter topics covering theory applications, design, equipment, installation, and O&M. Operators, engineers, educators and students will find this to be an excellent reference. The subcommittee members and authors for this addition included Bob Bergman (chair), Brent Alspach, Rob Huehmer, Scott Freeman and Nikolay Voutchkov.

IN BRIEF

RosTek Associates’ Ian Watson told *WDR* that his firm has been appointed to provide consulting engineering services for the development of Namibia Water Corp’s (NamWater) 45 ML/d (11.9 MGD) SWRO plant. The firm will assist in the evaluation and selection of preferred bidders, prepare technical specifications and

performance requirements, and oversee commissioning of the plant.

West Basin Municipal Water District has agreed to lease a location for a 0.25 MGD (950 m³/d) SWRO demonstration plant at the Los Angeles Conservation Corps’ SEA Lab in Redondo Beach. The building is a decommissioned pump house formerly owned by the nearby AES power plant.

Based on the success of its recent one-day technology seminar in Dubai covering new innovations and products in membrane filtration, **Hydranautics** has decided to hold the event annually in the UAE. The company also said it will schedule similar events in other regions.

Energy Recovery Inc (ERI) will demonstrate its instructional computer program simulating the pressures, flows and salinities of a SWRO process equipped with a pressure exchanger ERD on 11 December at the Hilton Hawaiian Village in Honolulu in conjunction with AMTA’s Technology Transfer Workshop.

JOBS

GE Infrastructure’s Water Division is searching for qualified candidates for the following positions:

- Electrical Controls Engr (Minnetonka, MN)-Job #595611
- Project Engr for Boston (Watertown, MA)-Job# 756999
- Project Engineer (Toronto, ON)-Job #721526

For more information and to apply, please visit us at GECareers.com and search listings by corresponding Job#. We are an equal opportunity employer.

ITT C’treat Offshore, the world’s leading provider of water treatment equipment for the offshore energy market, seeks qualified project engineers at its facility in The Woodlands, TX. Contact Tom Vanden Heuvel, General Manager at Thomas.vandenheuvel@itt.com if you have any questions. Apply at www.ctreat.com

Aquatech International Corporation is currently recruiting for a Marketing Manager for our Headquarters’ located in Canonsburg, PA. Please visit our website at www.aquatech.com for a detailed job description and forward your resume to jobs@aquatech.com