THE McILVAINE COMPANY

Desalination Component Insights
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FEDCO Wins Ras Az Zawr Energy-Recovery Contract

The energy-recovery device (ERD) contract for the reverse-osmosis (RO) section of the giant Ras Az Zawr (Ras Azzour) desalination project in Saudi Arabia has been awarded to Fluid Equipment Development Co (FEDCO).

The company says these will be the largest and most efficient turbine-based ERDs ever deployed in an RO system. Permeate output is around 306,000 m^3/d.

There will be 17 trains and each unit will be constructed in super duplex 2507 SS. Due to the highly saline feedwater in the Arabian Gulf, the recovery will be a little lower than typical.

Eli Oklejas, president of Michigan-based FEDCO, says that the company's main competitor was Energy Recovery Inc, which offered its pressure exchangers and turbochargers.

"Needless to say, it has been a long process to secure the order," said Oklejas, "but we are very happy to be working with both Doosan Heavy Industries and Saline Water Conversion Corporation (SWCC) again."

FEDCO is also supplying its ERDs for the 240,000 m³/d Jeddah III RO facility for SWCC and Doosan.

Dow to Build FilmTec RO Factory in Saudi Arabia

Dow Water & Process Solutions announced on 26 July 2011 that it is going to manufacture FilmTec™ reverse-osmosis (RO) elements in Saudi Arabia.

The proposed best-in-class factory would secure local supplies of technologies for water desalination and reuse for potable, non-potable and industrial water serving Saudi Arabia, the Middle East and North Africa region and emerging markets worldwide.

"This new water facility and our collaboration with the King Abdullah University of Science & Technology, coupled with our new world-class water technology center in Tarragona, Spain, are clear examples of Dow's continuing investment in technologies and production capacity to meet the growing challenges for clean and affordable water supply," said Ian Barbour, Dow Water & Process Solutions general manager.

Siemens Turns Seawater into Drinking Water for Half the Energy

Having completed early tests of an energy-saving method for turning saltwater into clean drinking water, Siemens is preparing to take its technology to the product development phase.

The technology, which uses half as much energy as other desalination processes, was tested at a demonstration plant built in Singapore. Siemens now plans to set up a full-scale system in cooperation with Singapore’s national water agency PUB by 2013.

Singapore, an island nation, is one of many parts of the world in which seawater is becoming an increasingly important source of drinking water. However, desalination is an extremely energy-intensive process.

“Our new technology marks a revolution in seawater desalination,” said Ruediger Knauf, vice president of Siemens Water Technologies’ Global R&D. “The results of our pilot facility show that the new process not only functions in the laboratory but also on a larger scale in the field. Because of its high energy efficiency and thus good CO_2 footprint, electrochemical seawater desalination can play a major role in regions suffering from freshwater shortages.”

Instead of using reverse osmosis, which requires high-pressure pumps to force water through semi-permeable membranes, the Siemens process relies on electrochemical desalination. The process combines electrodialysis (ED) and continuous electrodeionization (CEDI), both applying an electric field to draw sodium and chloride ions across ion exchange membranes and out of the water. As the water itself does not have to pass through the membranes, the process can be run at low pressure and hence low power consumption.

Although the project did not reach its target energy consumption of 1.5 kWh/m³, the demonstration averaged 1.8 kWh/m³, compared to conventional consumption which is typically 3.4-4.8 kWh/m³. Siemens researchers believe further improvements can still be made to lower this level even further. Assisted by a Singapore Environment & Water Industry Development Council grant, Siemens began R&D efforts in Singapore on 1 October 2008, and produced a 50 m³/d demonstration unit treating seawater. Three ED units and three CEDI units were designed and constructed in a plate-and-frame configuration. A significant component of the desalination system was the ion-exchange (IE) membrane used; commercially available membrane materials were utilized, but were less favorable for seawater desalting due to high resistance and other properties. Another major design element was the inter-cell pair spacer, manufactured with a 0.38mm channel thickness. Spacer materials and production methods were sub-par for protecting against cross-leakage between concentrate and dilute compartments; a fairly significant energy penalty was taken as a result of these inefficiencies. The average feed water conductivity was 43.5 mS/cm or approximately 32,000 ppm total dissolved solids (TDS), while the average product water conductivity is 0.96 mS/cm, or about 500 ppm in TDS. Overall desalting system recovery rate was set to operate at 30 percent as this was determined to be the most optimal for attempting to reach the low-energy target. Siemens has numerous initiatives underway that will significantly improve upon the demonstration unit performance and is preparing for commercialization of this technology.

Abstracts for Barcelona Conference Due by End of September

DESALINATION FOR THE ENVIRONMENT CLEAN WATER AND ENERGY is slated for April 23–26, 2012 in Barcelona, Spain.

This conference on desalination for the environment will be devoted to advances towards providing fresh water for all, at affordable cost and at economical energy requirements. With limited and depleting natural sources, desalination can supplement some of the critically lacking amounts of water needed for sustainable development. Its place in the water cycle will be discussed.

Processes, Problems, Technological Advances

Feedwater pretreatment for desalination
Seawater desalination by reverse osmosis
Brackish water desalination
Nanofiltration, ultrafiltration, microfiltration in water treatment processes
Removal of specific compounds
Membrane performance and maintenance
Pre-treatment and post-treatment of desalinated water
Recent developments in desalination
Advanced wastewater treatment
Desalination and renewable energy sources
Energy recovery technology
Thermal seawater desalination
Corrosion and scaling
Materials selection

Abstracts are Due September 30, 2011

Please submit your abstract online at: **www.desline.com/congress/barcelona/abstract-submission.**

http://www.desline.com/congress/barcelona/call-for-papers.shtml

Title: New Trends in Selection of Metallic Material for Desalination Industry

This paper gives two examples of the recent use of new stainless steels in desalination water industry. The first concerns the materials used for the walls of thermal process evaporation cells. In the past, carbon steel, clad steels, copper-nickel alloys, or austenitic stainless steel grades such as 316L were the primary recommended materials. More recently the duplex grades UNS S32304 and UNS S32205 have been selected for this application. This paper provides some of the technical reasons, which brought about this change in the choice of materials selected. Initially, the results of an extensive corrosion study, performed in a representative environment for evaporation cells and including both duplex and austenitic grades, are presented and discussed. Then a joint corrosion testing program conducted in cooperation with a well established desalination plant designer and run under actual plant conditions is outlined. The results of these field tests led to the development of a new concept for evaporation cells based on utilizing duplex stainless steels. In the second part of the paper, the properties of the new lean duplex UNS S32202 are presented and compared with those of 304L. Potential applications in

moderately aggressive environments, such as potable or drinking water, are discussed.

Additional Article Information

Person Information

- Baudu, Veronique - Industeel
- Boillot, Pauline - Industeel
- Gagnepain, Jean-Christophe - Industeel
- Peultier, Jerome - Industeel

Application Sequencing

221310 - Water Supply & Irrigation Systems

Company	Product	Process		Text Descriptor
• Industeel	• Alloy Steel	• Desalination	• Corrosion	• Article

PUB Singapore is Testing Dow's 16-inch FILMTEC Membrane Module

Dow Water Solutions and PUB, Singapore's national water agency, signed an agreement in October to test-bed Dow's next-generation FILMTEC™ membranes for use in water reclamation.

The joint collaborative research effort, which commenced at PUB's Bedok NEWater plant, is expected to validate preliminary data indicating that Dow's newer 16-inch FILMTEC membrane modules are more efficient in water reclamation than current standard 8-inch modules. Once validated, the next-generation membrane technology will allow for more efficient and affordable water reclamation and reuse processes at large-scale treatment facilities.

The 16-inch FILMTEC Reverse Osmosis membrane elements from Dow have an active surface area of 1,725 square feet – more than four times that of the standard 8-inch element currently used in full-scale reverse osmosis systems for water reuse. The increase in active surface area will greatly decrease the number of membrane elements needed for the same quantity of reclaimed water, reducing the system's footprint and equipment needs and providing capital cost savings for plant operators. The reduction in the number of reverse osmosis elements and trains also is expected to deliver savings in maintenance and operation costs due to a seven-fold decrease in the number of permeate o-ring seals.

The joint effort involved building an advanced reverse osmosis system. PUB and Dow Water Solutions are conducting a controlled parallel study of the 16-inch FILMTEC membranes versus a conventional 8-inch reverse osmosis system to evaluate key aspects of membrane performance. The companies are examining the handling (membrane loading and unloading), transportation and storage of the larger-diameter membranes; ways to balance capital and operating costs; and optimum system design parameters. The system features a secure, remote monitoring data acquisition capability.

Life Cycle Cost Calculation Software for Storage Tanks shows that Stainless Can be Best

Industeel has created a user friendly software program which provides a comparison of investment and life cycle costs for storage tanks.

The CalRes software has been developed to facilitate a quick comparison of the initial investment cost for high capacity storage tanks fabricated from different materials, including coated carbon steel and stainless steel grades. The program also allows you to compute a detailed cost analysis of the maintenance costs over the expected life of the equipment.

The CalRes software is based on the American standard API 650 and the French CODRES code for the wall thickness calculation. These standards, developed for the storage of oil based products, may be used for storage tanks for other products or for other industries. The development of this software has been carried out with the technical assistance and the contribution of companies specializing in each stage of tank manufacture.

The configuration studied for the cost comparison program represents a vertical, cylindrical tank, with a flat bottom and a self-supporting cone or dome roof.

This program will show that in many cases the use of stainless steels for building storage tanks may constitute a very competitive solution when compared to building tanks in carbon steels which require protection by painting the external surface and coating the internal surface.

Due to the increased mechanical properties of duplex stainless steel grades, it is possible to reduce the tank wall thicknesses and consequently obtain important cost savings related to material, welding and erection costs. http://www.industeel.info/services/technical-support/calres.aspx.

IDA Exhibition and Conference is Only a Month Away- September 4 in Perth Au

The International Desalination Association (IDA) is the leading global organization dedicated to the advancement of desalination, desalination technology and water reuse. Founded in1985, it is the global hub of expertise, news and information, and professional development for the global desalination industry. Held every two years, the IDA World Congress is the world's premier event focused on desalination and water reuse, combining four days of Technical Sessions, an industry-leading Trade Exhibition, exclusive behind-the-scenes plant tours, and unequaled networking opportunities throughout the Congress week. The exhibition will be the largest in Congress history, featuring more than 90 exhibitors in three pavilions featuring 4900 square meters of exhibition space.

Exhibitors will include Koch Membrane, Siemens, Pentair, Pall, KSB, Aquatech, Dow and Ovivo. Industeel will also have a stand and be represented by:

•Yves Boudart: Sales Mgr Stainless Steels - yves.boudart@arcelormittal.com
•Dr. Jerome Peultier - Corrosion Expert – jerome.peultier@arcelormittal.com – 33-3-8580-5109
•Anthony Legisa: Industeel, Sales Manager Australia - anthony.legisa@arcelormittal.com

More details on the conference are found at:
http://www.mcilvainecompany.com/Decision_Tree/subscriber/Tree/UnivDB/totentry1.asp?ref=1810

$900 Million Market for Desal Components and Materials

The world seawater desalination capacity will grow by 50 percent from 2010 to 2015 when it will reach 100 million m^3/day. The annual additions of 8 million m^3/day will require an

investment of $2 billion/yr. This will require an annual investment in components and materials of $900 million. This conclusion was reached by aggregating the forecasts appearing in several McIlvaine market reports.

The component forecasts not only include the components needed for the additional capacity but those needed for replacement and repair at existing facilities.

Component Revenues for Desalination 2011-15

Component	Annual Sales ($ Millions)
Pumps	120
Valves	80
Macrofilters	20
Cartridges	10
Cross-flow Membrane Systems	200
Sedimentation & Centrifugation	20
Stainless Steel	120
Other Materials and Components	330

There is a substantial market for pumps. They deliver the seawater to the reverse osmosis (RO), Multi Effect Desalination (MED), or Multi Stage Flash installation (MSF) system. In the case of the (RO) system, they also are the equipment used for energy recovery.

All three of the processes have many stages and require a number of high priced valves due to the corrosive and other harsh conditions.

All three processes include filtration of the incoming seawater creating markets for macrofilters, cartridges and sedimentation & centrifugation systems. Reverse osmosis has become an increasingly popular method for desalinating seawater. It requires a substantial investment in cross-flow membrane systems.

The presence of chlorides and solids plus the temperatures and pressures required for the processes dictate the use of high quality materials for vessels, pipes, evaporators, clarifiers and other equipment. Stainless steel has become increasingly popular as a material to provide long life under these conditions.

There are continuing improvements in components and technologies which promise to reduce the cost of desalination. At the same time the cost of alternative sources of drinking water is climbing due to scarcity and pollution issues. Therefore the market for desalination components will continue to grow at more than 8%/yr.

Information for this analysis was obtained from the following McIlvaine reports:

Liquid Filtration and Media World Markets
http://www.mcilvainecompany.com/brochures/water.html#n006

Cartridge Filters: World Market
http://www.mcilvainecompany.com//brochures/water.html#nO24

RO, UF, MF World Market
http://www.mcilvainecompany.com/brochures/water.html#no20

Sedimentation & Centrifugation World Markets
http://www.mcilvainecompany.com/brochures/water.html#n005

Pumps World Market
http://www.mcilvainecompany.com/brochures/water.html#N019

Industrial Valves: World Markets
http://www.mcilvainecompany.com/brochures/water.html#n028

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http://www.mcilvainecompany.com/brochures/Free_Newsletter_Registration_Form.htm

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