

WATER DESALINATION REPORT

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Company News

NOVEL BWRO DESIGN IMPACTS PERFORMANCE

Water Surplus' Dileep Agnihotri was one of the participants in GWI's 2019 Technology Idol in London. The subject of Dr Agnihotri's presentation was the Illinois-based company's Impact-RO™ process, in which the membrane flux is balanced across multiple BWRO stages using a novel staging arrangement without concentrate recycling, while improving membrane cleanability using a single feed pump.

The Impact-RO process did not take home the win that year, largely because the panel of judges did not understand all the details of its operation: it seems that some crucial details were withheld from the presentation while awaiting a key US patent to be granted. Since that patent has been issued, Agnihotri has unveiled all the operating aspects of the process in a presentation given at the recent Membrane Technology Conference in Florida.

The novel arrangement features a partial parallel feed flow to the second stage and an intermittent 'micro-disrupting' partial parallel feed flow to the third stage. As shown in the diagram below, the core concept involves the use of a single pump to send a parallel feed stream to all three stages.

"The primary feed is sent to the first stage, then a partial feed is blended with first-stage concentrate, and subsequently,

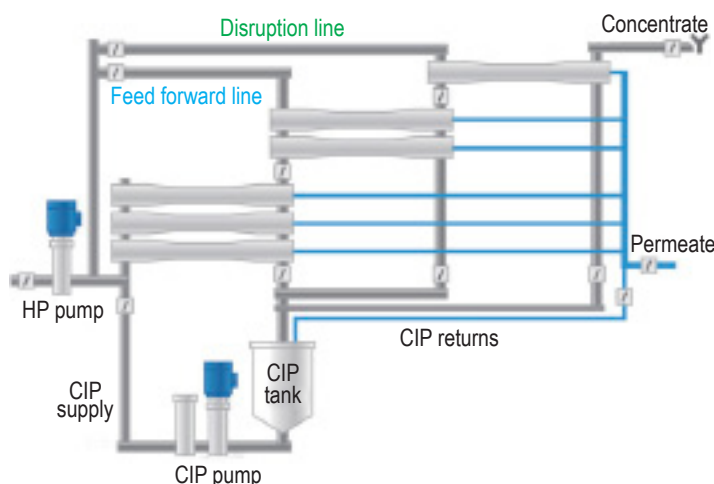
second-stage concentrate is blended with a partial feed. This arrangement provides one parallel supply with a partial-continuous flow to the second stage and a parallel supply as a partial-intermittent flow to the third stage," explained Agnihotri.

"This arrangement allows for flux balancing, boosting pressure to the subsequent stage, a reduction of first-stage pressure loss, and controlled disruption of the concentration polarization layer in the RO's scale-producing segment. Our approach reduces total cost by reducing energy consumption, membrane fouling and CIP frequency, while allowing operation at recovery rates that approach a water's saturation limit without increasing the OpEx of traditional BWRO systems."

To validate those claims, he presented pilot data, which shows that the flux-balancing feature reduces energy consumption by 4-10 percent. Perhaps more importantly, the data also indicates that during micro-disruption, the membrane's concentration polarization layer is temporarily diluted significantly, which shifts the solubility curve and allows the scale 'seeds' to be removed between their induction and precipitation cycles.

As most operators know, a multistage RO can present clean-in-place (CIP) challenges when using a typical, single-connection CIP unit in which the cleaning solution travels sequentially through three consecutive stages. Such an arrangement results in lower reaction rates in the trailing stages, since some of the cleaning chemistry is consumed as it moves from the lead to subsequent stages, and optimum cleaning velocities are impossible to achieve for all stages due to the staged design.

"This innovative approach elegantly addresses BWRO's most common operational and cleaning challenges, and it is available to upgrade an existing system to improve performance. In addition to having validated the data in a 100 gpm (6.3 L/s) pilot system, we now have several commercial installations in operation. Our units are running two to three times longer between CIPs and, at higher recoveries, with some systems operating at total recoveries of over 92 percent, with reduced CapEx and OpEx," notes Agnihotri.



Water Surplus' Impact-RO™ Flow Diagram

Company Profile

WATER SURPLUS IS MORE THAN JUST SURPLUS

In addition to the novel BWRO process described in the previous story, Water Surplus offers several other innovative technologies for both new and existing treatment plants. As its name suggests, the 30-year-old, Rockford, Illinois-based company also maintains a considerable inventory of surplus treatment systems in stock and ready to ship.

According to John Barelli, the company's president and founder, "We have over 1,000 water treatment assets in stock, including everything from RO, UF, UV and wastewater treatment systems, to filter media, ion exchange resin, RO elements, pressure vessels and cleaning chemicals.

"We are not simply resellers or auctioneers. Most of our surplus equipment is rebuilt and ready to run, and our in-

house technicians and engineers inspect, clean and refurbish every item, providing an availability advantage on projects that need quick delivery.

"Our roots have always been in sustainability and reuse; however, our expanded team has us transforming into a leading OEM offering customized systems for municipal and industrial water treatment projects. For foreign clients, we are also able to offer Exim Bank financing. *WDR* readers who have an asset to sell can contact us, and we'll have an investment recovery specialist help them decide the best way to turn the asset into cash."

The Water Surplus website includes the ability to conduct a search of its surplus inventory, and information on how the company goes about purchasing new equipment.

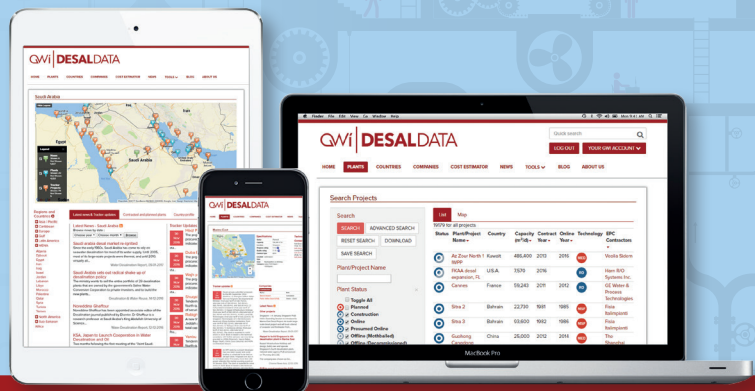
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