EMERGING TECHNOLOGY AWARDS

Fresh Water on the Cheap

INNOVATOR: IDE Technologies. Boris Liberman, vice president and chief technology officer.

INNOVATION: Energy-efficient reverse osmosis desalination.

IMPACT: Several big plants in Israel use the technology to help meet the semi-arid nation's water needs.

BORIS LIBERMAN

PRESSURE TECHNOLOGY

QUENCHING an Enormous Thirst

IDE's high-pressure membranes makes potable water more affordable.

STORY BY JOHN KOSOWATZ • ILLUSTRATION BY ZINA SAUNDERS

Water scarcity is happening in many more places around the globe, including the U.S. where western states have been dealing with long-term drought. Israel, however, pressed between deserts and the Mediterranean Sea, now produces more than enough water for its needs. Advanced desalination technology is the reason.

Seawater desalination is often a technology of last resort, due to the high energy costs needed to power the industrial-sized plants. Israel's IDE Technologies offered an alternative to thermal technology: reverse osmosis. Israel's Water Desalination Administration had committed to an ambitious program to develop 750 million cubic meters of drinking water by 2020 using reverse osmosis (R.O.). In 2005 IDE opened its first R.O. plant in Ashkelon, followed by another at Hadera, both pushing the envelope for large-scale R.O. production and at one of the world's lowest prices.

Sorek, IDE's third plant and the world's largest seawater desalination plant at 624,000-cubic-meter per day, takes the concept even further, combining design and operating efficiencies proven in Ashkelon and Hadera with material and technological improvements that cut both construction and operating costs. At high pressure, R.O. plants push pretreated water through a series of membranes fitted with pores small enough to allow fresh water to move through and hold salt ions and other impurities back. They are notorious energy hogs.

IDE's plant design changed that. The Ashkelon plant features horizontal centrifugal axially split high-pressure pumps, optimized for highest efficiencies and greater flexibility under differing operational modes. That allows all of the trains

to remain operational even when production is reduced during the day when electricity prices are higher. Operating pressure ranges from 74 bar to 49 bar.

At Sorek, IDE radically redesigned the R.O. trains, using large-diameter 16-inch membranes placed in a vertical array. Large R.O. plants typically have horizontal arrays of standard 8-inch membranes. The alignment fit a smaller plant footprint and helped slash construction and operating costs. The larger membranes are structurally stronger than the 8-inch membranes, but perform to the same standards with a flow rate 4.3 times larger under the same feed pressure and operating conditions.

"At Sorek, the vertical arrangement of the pressure vessels diminished the footprint and the cost of water," said Boris Liberman, IDE vice president and chief technology officer. IDE holds patents on the technology.

Verticality also doubles with operational benefits. R.O. membranes are prone to biofouling, and need to be cleaned regularly. Stacking them vertically allows gravity to naturally drain the wastewater.

"We have shorter cleanup and startup," Liberman said. "We can reach higher recovery and gain more product without chemicals."

New technology and lower prices have attracted interest from water-thirsty regions around the globe. San Diego, Calif., constructed a 50-million-gallon-per-day R.O. plant similar to Sorek, now operating in Carlsbad. A bit further up the coast, Huntington Beach is moving toward final approval of another R.O. plant. ME

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