

# THE TREATMENT ROOM



Water treatment specialist Judith Herschell examines the market for forward osmosis membranes in the oil and gas sector.

## FO gaining acceptance in new oil and gas plays

Forward osmosis (FO) suppliers have struggled to find their niche in the water treatment market. A labyrinth of technical challenges has slowed entry. None of the challenges has been as significant as the composition of the draw solution and, if needed, recovery and reuse of the solution. The three suppliers generally recognized as vying for market position are Hydration Technology Innovations, LLC. (HTI), Oasys Water (Oasys) and Modern Water (Modern).

All three began their market entry in the potable water treatment arena, with limited success. As the creativity of those tasked with developing the businesses increased, the industry that seems to hold opportunities and promise is oil and gas. There are various approaches and technical entry points from the suppliers, ranging from the concentration of reserve pit drilling water to the treatment of produced water to enhanced oil recovery (EOR).

FO has been successfully capturing the interest of academics and research laboratories for a number of years. In the industrial applications value space, FO technology providers have persevered to develop a market – until now. As an example, for the past 18 months, HTI, an early pioneer of FO, and Bear Creek Services have been testing and improving the Green Machine product offering. The FO/RO closed loop system based on inorganic salts as draw solute has performed satisfactorily on drilling mud (pit) waste water with potential in flow-back and moderate TDS produced water. Oasys has teamed with Select Energy Services, the exclusive operator of Oasys' technology in the Permian Basin through March 2014, to implement its technology, which incorporates an ammonium carbonate draw solution. Oasys has made its first sale in this sector at a hydraulic fracturing facility in West Texas. Its membrane brine concentrator will treat high saline produced water. Modern is investigating EOR as a market entry point in the industry. For this application, the two fluid streams typically used are seawater and produced water. To date, Modern hasn't conquered its first EOR sale but is in discussions with potential industry partners to develop this technique.

Newcomer Texas Sands Resources Partnership (TSRP), a group comprised of ERIN Consulting, Nu-H<sub>2</sub>O and Sandbox Energy Corporation, is also entering this market with a multi-stage approach. TSRP's focus is the treatment of produced oil-field wastewater. The treated water is reused on the well pad. The firm has completed successful field testing of the process and is aggressively pursuing the market. This oil field waste by-product is turned into fresh water through a four-stage process, removing oil, particulate and dissolved solids. The final stage of treatment is FO. The firm reports having at least 10 offers to install treatment plants in West Texas oil fields.

There are many benefits to FO. Some of these are:

- The membrane is a barrier to contaminants, including suspended solids and dissolved organic and inorganic constituents.
- The treatment systems operate at low pressure, yielding minimal irreversible membrane fouling.
- It has a reduced energy requirement, as compared to reverse osmosis systems.

A primary benefit of most of these approaches is minimizing the use of fresh water, thereby limiting trucking of water and associated issues such as damage to roads, decreasing carbon emissions and lowering costs to producers. It minimizes the volume of the waste stream and provides a supply of sustainable water in the field. However, the most significant issue with using fresh water for each frac' operation is the loss of water from our ecosystem. Every day, in the United States alone, there are approximately 2,000 rigs drilling for domestic tight gas. This results in billions of gallons of fresh water being removed from our water resources each day. This water is permanently lost from the environment, never to be used again. As fresh water is used many times over, the impact of this loss is much greater than indicated by the volume of water lost. Fresh water is one of the most valuable resources on the planet and is crucial for sustaining economic growth and development. In arid areas where there is competition for the available water, this often limits the expansion of industrial and agricultural industries.

The market forces in the oil and gas industry are ripe for an environmentally friendly solution to problems of water loss. FO may be just the solution as it reduces water sourcing, reduces water hauling, removes the cost of disposal and reduces energy consumption by 25-40 percent, thereby reducing the carbon footprint. And, a benefit from the perspective of the suppliers, this is an industry that moves much more rapidly than the municipal market and typically has the financial strength to implement solutions. In the effort to develop a technology, speed to market (and revenue) is often the difference between success and failure.

FO's traction in the oil and gas industry may be the key to unlock the door to growth and development in this sector and myriad others.

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