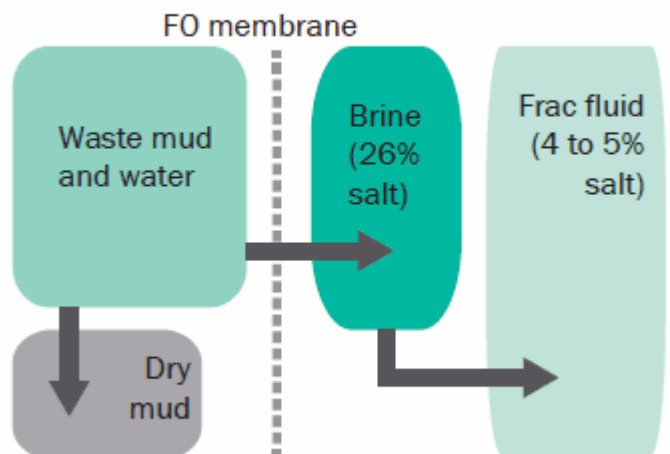




The race to commercialize forward osmosis

- From: [Vol 2, Issue 3 \(March 2011\)](#)
- Category: [General](#)
- Region: [Americas](#)
- Country: [United States](#)
- Related Companies: [CH2M Hill](#), [HTI](#) and [Oasys](#)

FROM WASTE MUD TO FRAC'ING FLUID: HOW IT WORKS



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HTI forges ahead in the industrial market, while Oasys looks for pure water solutions

Membrane manufacturer HTI is launching the large-scale commercialization of forward osmosis (FO), as a low energy means of diluting concentrated solutions such as produced water, but competitor Oasys Water thinks it has spied a bigger opportunity in using FO to make potable quality water.

The process relies on the natural propensity of a weak solution to dilute a strong solution when separated by a semi-permeable membrane. HTI uses this principal to dilute strong solutions such as concentrated rehydration drinks, oil field produced water, and potentially fruit juice concentrate. Oasys on the other hand uses the principal to draw freshwater from seawater or brackish water using a strong solution of ammonium carbonate, which can then be separated out to give fresh water by applying heat.

“The low-hanging fruit for forward osmosis is where the draw solution already exists, its already available, and can be utilized for beneficial purpose,” said Mark Lambert, HTI’s director of corporate development.

A prime example of this is the frac’ing industry. HTI’s joint venture with Bear Creek Services finds a new use for the waste mud from drilling wells, and the concentrated brine drillers mix with freshwater to create frac’ing fluid.

“All that dirty drilling mud, chemicals, water that’s sitting in the reserve pit is typically hauled away today to a disposal well,” Lambert said. “And it’s 90 percent water.”

Frac’ers dilute brine with freshwater because shale gas is often trapped in ancient, salty sea beds. It’s important to match the salt content of the frac fluid with that of the shale formation, or else the well may swell up and close.

HTI uses the brine as a draw solution to pull freshwater out of the reserve pit.

“We’re dewatering the mud pit, sucking freshwater out of the mud pit across the membrane using the brine as a power supply, diluting the brine for them and giving them back frac fluid,” said Lambert.

Not only does this process reduce the hauling volume of waste mud by as much as 90 percent, it also replaces about a quarter of the freshwater needed to frac each well.

HTI is looking at a variety of applications for dewatering various substances, from sewage sludge to orange juice.

CH2M Hill desalination expert Rob Huehmer is particularly optimistic about FO’s potential in the food and beverage industry.

“If you’re looking to concentrate something, it’s probably a great technology today and ready for primetime,” he commented.

Meanwhile, Oasys has announced it is in the process of testing its FO systems and will be going to market later this year.

“What makes Oasys unique is the draw solution and recovery,” said Lisa Sorgini, sales manager at Oasys Water. “Our process allows us to treat highly saline waters at a fraction

of the cost of available technologies, and recover that solution with the use of low cost energy, such as waste heat or even natural gas.”

The company uses a process developed at Yale University, where researchers completed a pilot desal plant in 2007.

Oasys’ usage of ammonium carbonate as the draw solution, though, worries some onlookers.

“One of the challenges is that the rejection of ammonia of that membrane is not as high as it needs to be, so there’s back transport of ammonia into the feedwater, which would be the concentrated discharge to the sea,” said Huehmer. “It just would not be acceptable to any environmental groups to put excess free ammonia into the sea.”

Oasys is still circumspect about its strategic vision for FO. Nevertheless, Oasys has some well-respected backers. The company received \$10 million in Series A financing from Draper Fischer Jurvetson, Flagship Ventures and Advanced Technology Ventures in 2009.

“They’ve got a very viable process,” commented Tom Pankratz, the editor of Water Desalination Report. “It’s innovative - it has a potential to reduce energy consumption.”

FO could also be used in municipal desal plants and even in power generation. Norwegian firm Statkraft is engineering the FO process to create a 130-yard-high waterfall, which then can be harnessed using a turbine.

It will take time for all of these applications to gain traction in the marketplace. But HTI and Oasys both say the time is ripe for this cost- and water-saving technology.

“As with all new technologies, there are always skeptics,” commented Sorgini. “But surprisingly, the proponents seem to significantly outweigh this minority.”