

Technology Brief

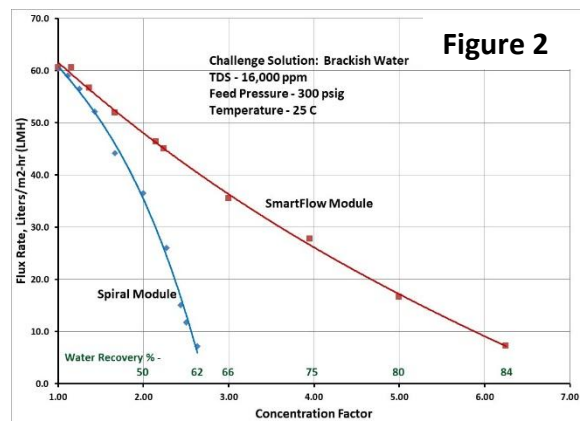
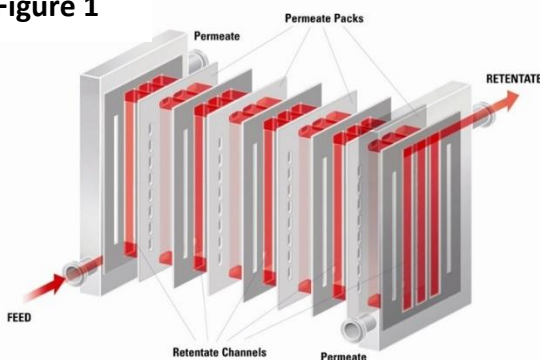
Enhanced Water Recovery from Produced water for Reuse/Recycle by High Performance Membrane Filtration system

Produced water or brine represents the largest wastewater stream from oil and gas production. Certain recovery techniques, such as hydraulic fracturing, can also require large amounts of water to stimulate subsurface formations for petroleum or gas production. A proper treatment of produced water is necessary to address the environmental concerns in disposal of produced water as well as to reduce costs of freshwater makeup in production operations by recycling treated water. Water produced in oil and gas production operations contains high concentration of salts and solids that must be removed for water disposal and/or recycling in cost-effective production.

Nanofiltration (NF) and/or reverse osmosis (RO) membrane technology is often used to produce clean water and concentrated brine with retaining salts. Possible water recovery by conventional NF/RO membrane module technology is, however, limited as the dissolved salts start precipitating after reaching solubility limit clogging porous spacers in the modules. To circumvent such fouling of modules, Techverse Inc. offers SmartFlow Technologies' patented "open channel[®]" membrane module technology suitable for handling fluids with high suspended solids content and high viscosity. As shown in the Figure 1 illustration, the "open channel[®]" module technology provides a uniform flow pattern throughout the membrane module utilizing 100% of the membrane surface area. Equal fluid path length and flow resistance in all flow channels avoids channeling and dead spots with uniform flow velocity over all the membrane surfaces. This module design provides greater water recovery as well as higher solids concentration brine than possible with conventional membrane module formats such as spiral wound and hollow fiber modules.

In a research project representing typical produced water composition, SmartFlow membrane modules were demonstrated by Techverse to produce 84% water recovery compared to 62% by conventional spiral wound membrane modules using same NF membrane as shown in Figure 2. For target applications, Techverse will provide an overall low-cost, two-step, process combining conventional membrane modules with SmartFlow membrane modules for high water recovery.

Figure 1



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