

## What is FO?

Forward Osmosis (FO) is a membrane technology which uses membranes with similar selectivity to those used in reverse osmosis, but instead of applying high pressure to squeeze water from a solution; FO uses a solution with high osmotic potential to draw water through the membrane from a solution of low osmotic potential, just like plants do.



*Green Machine is a portable, modular and scalable system*



*Untreated reserve pit water (on left), and reclaimed water using the Green Machine*



green  machine

**HTI is the world leader in forward osmosis technology,** and manufacturer of the proprietary OsMem™ line of advanced membrane products used in the development of water separation systems. HTI has developed solutions for water treatment in extremely challenging environments such as oil and gas exploration operations.

HTI's Forward Osmosis OsMem membranes allow water to separate from virtually all contaminants as it migrates through the membrane by the natural process of osmosis. In the Forward Osmosis process, water molecules flow through HTI's OsMem membrane powered by a draw solution rather than high pumping pressures found in many traditional filtration systems. Because of HTI's OsMem membrane, Forward Osmosis filtration systems are energy efficient, relatively low-cost and capable of filtering highly contaminated dirty water.

**HTI and Bear Creek Services have developed the Green Machine, a unique environmentally-friendly water reclamation process for the oil and gas industry.**

The Green Machine is the first energy efficient system for recycling the millions of gallons of fresh water used daily in the oil and gas drilling process. "The Green Machine's technology has revolutionized wastewater reclamation," said Walt Schultz, CEO of HTI and a Director of HBC Systems

## The Environmental Impact

One of the largest opportunities for the application of HTI's filtration technology is seen in reclaiming and recycling wastewater from oil well drilling. HTI has developed an alternative energy-driven means of cleaning drilling pit water and oil well completion water. The technology reclaims E & P wastewater by using a unique filtration technology and harnessing a chemical energy source required by downstream processes, a cost and resource that is already being consumed on each well. Application of this technology saves money and reclaims millions of barrels of water that are normally injected in deep disposal wells and forever lost from the fresh water cycle. Fresh water is utilized in all phases of well life: drilling, completion, stimulation and production. Most of the source water for these activities comes from fresh water wells, the same aquifers that many municipalities, rural communities, and farmers use, or surface water from rivers, lakes, ponds and streams. Each stage of well completion can consume an additional 500,000 gallons of fresh water. On average, a single well can consume over 4-5,000,000 gallons of fresh water that will never see its way back to the fresh water cycle.

**In the United States,** there are approximately 2,000 drilling rigs drilling for domestic tight gas every day resulting in a loss of billions of gallons of freshwater per day – never to be used again. Up to 150 tanker-truck loads can be required to haul a single drilling pit worth of wastewater to a disposal well, and the same is true after each completion stage.

**HTI's technology has the power to save water, reduce drilling costs, and reduce environmental impact.**



Applying HTI's Forward Osmosis's Technology to  
**Water Reclamation in Oil and  
Gas Drilling Operations**

Introducing a new oilfield wastewater reclamation system called the

**green**  **machine**



**AnyWater AnyWhere®**

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