The BAKKEN MAGAZINE

JUNE 2015 www.TheBakken.com

PRODUCTS & TECHNOLOGY

The New Name In Oil Recovery

By combining proven technologies into a unique skid-mounted package, NOV has created a new dynamic oil recovery system

By Luke Geiver

EXPLAINATION OF BENEFITS: WaterWolf inventor, Mark Wolf, at the control panel as he explains to a customer the unique, dynamic loop operating mode.
PHOTO: NOV COMPLETION & PRODUCTION SOLUTIONS

More than 10 million barrels of oil are lost in produced water every year. For unconventional oil producers or salt water disposal facility operators, oil lost to produced water injected into a disposal well is revenue uncaptured. With oil-linked entities looking to scrap out additional revenue streams from production already happening, many companies view water-based technology as a means to greater profit. National Oilwell Varco believes it has a technology capable of

TECH FOR EVERY DROP: Sample from the recovered oil line of a WaterWolf operating at a Saltwater disposal facility in Texas.
PHOTO: NOV COMPLETION & PRODUCTION SOLUTIONS

DAILY PRODUCTION: WaterWolf in Texas recovers 5-10 Barrels of oil per day for SWD operator.
PHOTO: NOV COMPLETION & PRODUCTION SOLUTIONS

'One of the really nice things about this equipment is it is all contained on a single skid, it can be ready to run in a single day.'

fulfilling the need of extracting more profit from a staple of the oil industry: water. After five years in the making, NOV has released a water treatment solution designed to filter water for increased oil recovery.

"There are a number of places around the world dealing with similar kinds of problems, and our technology is seen as having international implications," Roby says. "But we'd love to be able to say that it was first proven in North Dakota."

Although the WaterWolf system has yet to be deployed in the Bakken shale play, NOV (and many other entities) have the Williston Basin in their future product deployment plans. Already tested in Wyoming, Texas, California and the Gulf of Mexico, the unique system highlights the role oil industry veterans and major energy ser-

The BAKKEN MAGAZINE

SKID OPTIONS: The WaterWolf Dynamic Oil Recovery system combines desanding and deoiling hydrocarbons with the non-shearing action of NOV's Moyno progressing cavity pumps.
PHOTO: NOV COMPLETION & PRODUCTION SOLUTIONS

vice firms can play in tweaking tried-and-true techniques to service both new and old oilfield dilemmas. For any sector of the Williston Basin looking for water-based solution equipment capable of filtering produced water or sifting barrels of oil from large water sums, the WaterWolf system could represent one of the best new technology offerings in the play.

WaterWolf's Origin

According to Mark Wolf, inventor of the WaterWolf system and an oil industry veteran of more than 25 years, the name of NOV's new water treatment equipment offering was an accident. At first, he says, "we decided to call it dynamic oil recovery." But, the marketing team wanted more, he says. "They [the marketing team] threw up their hands and said to "give us something better.""

After offering up the name, the marketing team was onboard and excited. Given Wolf's time spent in offshore and onshore oil and gas fields working with producers and water teams to help with filtration techniques, the name seems fitting.

The technology is based on the hydrocyclone, a system used to spin and separate suspended solids and oil molecules from water, and the progressive cavity pump, a system that moves fluids through a series of small cavities in a continuous process. Hydrocyclones have been used offshore for roughly 25 years and progressive cavity pumps have been in use since the 1930s. "My offshore customers kept telling me the same problems they were having with their hydrocyclones," Wolf says.

The BAKKEN MAGAZINE

"They were having to put secondary and tertiary pieces of equipment behind them to get the quality of water output they needed."

The inefficiencies of hydrocyclones stem from their need for continuous flow. "They need constant steady state conditions," Wolf says. To create the steady, continuous flow of water through the system, Wolf added a progressing cavity pump to create a closed treating-loop effect. Although the water coming from outside the system may feed into the hydrocyclone at inconsistent rates and pressures, the presence of the pump and the creation of a continuously pumped loop helps the hydrocyclone operate efficiently and remove suspended solids and oil molecules out of the water stream at an acceptable rate. The system is mounted on a skid and can treat up to 16,000 barrels of water per day. Recovered oil from the system is left untreated by chemicals and can be redirected directly into the separation process, according to NOV. The unit utilizes two hydrocyclones, one for desanding and another for deoiling, to create a water stream free from solids and oil.

The hydrocyclone uses the principal of centrifical force to spin a stream of water. Molecules that are lighter, or heavier than the weight of water, will be moved to the inside or outside of the stream and made available for removal. Wolf likens the process to filling up a water bucket with soap and a garden hose. Water fed from the hose that hits the edge of the bucket forces the water to spin. When soap, typically lighter than water, is added to the mix, it travels to the center of the spinning water body. "The same thing happens with oil because oil is lighter than water and it all collects in the center," he says. In the WaterWolf system, produced water is spun within the hydrocyclone and fed with new produced water through the progressive cavity pump. The oil is then suspended into the middle of the horizontal water column and siphoned out.

"NOV actually already had a progressing cavity pump line. We presented it [the WaterWolf system idea] to the management team. They gave us the go-ahead and some funding to get it out and run a test," Wolf says, on his early days with NOV. After receiving great results, the team moved into the launch phase and has since deployed the system in oilfields in the Eagle Ford and Wyoming along with a handful of saltwater disposal well sites. Operators and SWD facilities looking to produce more oil from produced water have each purchased and installed the system.

Teeth Behind The WaterWolf System

Despite the current oil activity slowdown, the saltwater disposal industry is still thriving. Current wells, along with new wells, all produce water that needs to be disposed. In the Bakken, the NOV team views the SWD market as a major opportunity for the deployment of the WaterWolf system. They have even developed an optimized SWD facility based on the system. Because most SWD facilities remain profitable depending on the amount of crude oil recovered from the produced water before it is disposed of, the WaterWolf system is attractive, NOV believes. According to Wolf, a typical saltwater well injects 20,000 barrels of produced water per day. For every 10,000 barrels of water, roughly 10 barrels of oil are present. "That means that they are losing 20 barrels of oil per day into the disposal well," he says, if no treatment method is used.

In addition to SWD wells, NOV also believes operators looking to increase their total oil production volumes can and will install the WaterWolf DOR system. "One of the really nice things about this equipment is it is all contained on a single skid, it can be ready to run in a single day. It only needs electrical power and piping connections," he said. The typical payback period for the system is based on chemical savings, oil recovery and the reduction of injection well maintenance, and can be recouped in roughly 9 to 10 months.

After years of listening to customer complaints about water treatment systems, Wolf says he is excited for the system's possibilities. Both Wolf and NOV are happy with the unique name, but have already seen that clients are more enthusiastic about the technology's performance in the field.

Author: **Luke Geiver**
Editor, *The Bakken* magazine
701-738-4944
lgeiver@bbiinternational.com
pmiller@bbiinternational.com