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Systems Treat, Reuse Flow-Back Water

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Applying advanced water treatment systems, the industry is increasingly recycling and reusing the water flowed back after hydraulically fracturing wells in unconventional resource plays. Onsite water treatment technology provides multifold benefits, including a reduced dependency on fresh water for fracturing jobs in tight reservoirs, minimizing truck traffic and emissions, and reducing disposal costs. Water issues are particularly pressing in areas such as the Marcellus Shale in the Northeast and in drought-stricken regions in the Southwest, where activity in the Eagle Ford, Wolfberry and other unconventional plays is booming.

Mobile water treatment was applied in the industry initially to treat the water co-produced from conventional higher-permeability reservoirs as well as generated during coalbed methane dewatering operations, but the technology is coming of age in unconventional plays, where multistage hydraulic fracturing operations typically require millions of gallons of water per well. The rapid acceleration of onsite treatment in mobile units is being augmented by a flurry of developments and announcements of technological breakthroughs from established global service companies and newer companies backed by industry insiders.

Expanding Fleet

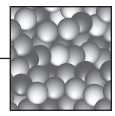
Following the arrival of its first two treatment units last summer, Zephyrhills, Fl.-based Hydrozonix LLC is expanding its fleet to service fracturing operations in the Permian Basin and the Marcellus Shale, says President Aaron Horn. Expansion into the Fayetteville Shale is planned early this year, he adds, with the company planning to build two units each quarter over the next two years, depending on market demand.

Each EF80™ unit can treat 80 barrels per minute during live fracturing operations as well as during post-frac flow back, he says. Hydrozonix has an exclusive license with Ecosphere Technologies in the domestic oil and gas market to use the Ozonix™ Technology, which is a patented advanced oxidation process incorporating ozone, hydrodynamic cavitation, acoustic cavitation, and electro-chemistry for microbial control and scale inhibition, Horn explains.

At each fracturing location, water entering the EF80 is homogenized through static mixers that also begin hydrodynamic cavitation, according to a Hydrozonix explanation of the process. High temperatures and pressures from bubble collapse cause thermochemical decomposition and produce highly reactive hydroxyl radicals.

After passing through a mesh screen and eight pumps, the water is injected with ozone to kill bacteria and oxidize heavy metals. Flash reactors then accelerate ozone blending before the water enters an Ozonix reactor, where ultrasonic

Hydrozonix LLC is expanding its fleet of EF80™ treatment units to service fracturing operations in the Permian Basin and the Marcellus Shale, with the company planning to build two units each quarter over the next two years, depending on market demand. Each EF80 unit can treat 80 bbl/minute during fracturing and post-frac flow back. The systems use the patented Ozonix™ oxidation process that incorporates ozone, hydrodynamic cavitation, acoustic cavitation, and electro-chemistry for microbial control and scale inhibition.



transducers create cavitation and generate thermochemical decomposition and hydroxyl radicals, according to Horn.

"Electricity is used to precipitate hardness salts in the fluid. Ultrasound breaks apart the salts into nano-sized suspended particles that inhibit scale," he says. "The electrical field also reacts with oxygen in the water to create more hydroxyl radicals that further oxidize bacteria."

Finally, water from the reactor goes through a large section of static mixers and electrodes to further augment treatment, Horn says. In the end, water free of bacteria and scaling tendencies is pumped out of the system and is ready for use. "We can support essentially any pumping rate a company might have in unconventional shale plays," Horn says.

The technology breaks down organics and hydrocarbons into water and carbon dioxide. The technology inhibits scale deposition during the fracturing and flowback operations, he says, adding that different methods have to be used to inhibit scale after wells are placed in production.

The technology has been used on smaller units by another company in the Fayetteville Shale for the past two years, Horn says. The newer and larger EF80s are generating optimal results for one large operator in the Permian Basin, where water treatment and reuse are paramount issues for operators facing water constraints because of the ongoing drought in Texas.

The EF80s double duty of treating water during fracturing and converting flow back for ready reuse in other frac jobs is especially appealing to operators, Horn says. "This is a 'green' process with no waste stream," he insists. "We are eliminating the need to use certain chemicals that are causing a lot of fuss in the press, although beliefs regarding the adverse effects of these chemicals are driven more by perception than reality. We remove liquid biocides from the equation and replace them with a process that is safe and made just in time during fracturing."

The company can save operators the cost of bringing biocides and scale inhibitor to location, he says. Eliminating biocide and scale inhibitor can save operators $0.20 to $0.65 a barrel at times, Horn adds. "We have streamlined the logistical process for operators by providing real-time treatment on location," he states.

Ultimately, cost benefits vary depending on whether operators have access to inexpensive disposal such as the availability of disposal wells in the Permian Basin or face constraints in the Marcellus. "In certain areas, such as the Marcellus, we can save operators a ton of money," Horn insists. ❐