

## Drillers Recycle Flowback for Fracking

by Sue Smith-Heavenrich

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Extracting gas from Marcellus Shale requires lots of water – an average of four million gallons per well, says David Yoxtheimer, a hydrogeologist and extension associate with Penn State's Marcellus Center for Outreach and Research. Yoxtheimer, joined by Range Resources water operations manager Tony Gaudlip, addressed water use and recycling during a recent webinar on water use and recycling in Marcellus drilling.

Yoxtheimer listed three major water issues confronting the industry: water sources, storage of fresh water and frackfluid, and treatment and disposal of waste fluids. Initially, the industry used public water supplies, Yoxtheimer said. As Marcellus exploration and production evolved, surface water became a primary supply for the drillers. But drillers are looking at alternatives.

“Some companies are using abandoned mine drainage,” Yoxtheimer said. “Others are using treated wastewater, and some companies are considering things such as cooling waters from power plants.”

Operators drilling in the Susquehanna River Basin must obtain a permit from the Susquehanna River Basin Commission (SRBC) for any water they withdraw. The problem, Yoxtheimer pointed out, is that obtaining a permit may take up to a year. Another thing drilling operators need to pay attention to is the new treatment standards that will go into effect in January. These standards lower the amount of total dissolved solids, chlorides, strontium and bromium that will be allowed in wastewater effluent discharged into the environment.

### **Recycling Options**

For the past year, Range Resources has been recycling their flowback rather than sending it to a waste disposal facility. Reusing the water has resulted in a savings of \$200,000 per well, about 5 percent of the total drilling cost.

The engineers needed to consider a lot of things before putting recycled flowback down the borehole, said Tony Gaudlip. One consideration is pumping pressure – horizontal wells require about 80 to 100 barrels of water per minute to fracture the rock. Another is the chemicals needed to fracture the rock. The Marcellus shale requires different chemicals than used in shale wells in other parts of the country, Gaudlip said.

Range evaluated the chemicals they were using in their slickwater fracturing: a friction reducer, corrosion inhibitors and a bactericide. “We decided to challenge the water quality requirements for drilling,” Gaudlip said. Their first question: what would happen if they simply reuse the flowback?

“Initially we took the flowback and the brine, mixed it all together and pumped it downhole,” Gaudlip said. Then they watched the dials and gauges, looked at bacterial growth and scaling, and analyzed fluid stability. “We saw some increase in friction, but that was manageable,” Gaudlip said. What they didn't see was scaling. Nor did they see an elevation of the total dissolved solids (TDS) levels. Conventional wisdom expected those levels to climb higher with each reuse, Gaudlip noted.

What this meant for Range Resources was that they could reuse their fluids with minimum – or no – treatment. With only 10 percent of the flowback returning in each well, Range found that they could easily reuse all of the flowback. They dilute the flowback in a new mix that's three-quarters fresh water combined with one-quarter reused waste fluids.

Gaudlip admitted that they have had some issues with holding the flowback in pits, particularly with bacterial growth. He attributed some of the problems to the levels of polyacrilamides and solids. Now, Gaudlip said, the company sends their flowback fluids to Eureka Resources LLC, a facility that clarifies the water for them.

Eureka Resources, located in Williamsport, runs flowback and drilling wastewater through NOMAD units (developed by Aqua-Pure in Calgary, Canada). They add chemicals to raise the pH, and a floccing agent that helps settle the solids. Gaudlip said they also add chlorine, to control bacteria, before trucking the recycled water back to the well pad where it is stored in a pit until reused in fracking.

The idea behind reusing drilling waste fluid was two-fold: to reduce the amount of water withdrawn from the rivers and streams, and to reduce the amount of truck traffic hauling both fresh and wastewater on the road. "We're currently trucking the flowback 35 miles to the treatment facility," Gaudlip said. "That's not an ideal situation for either the residents or our pocketbook."

Long term plans call for Range Resources to incorporate mobile water treatment units at their drilling sites. But that's still a few months off, says Matt Pitzarella, Range Resource Public Affairs Director for the Marcellus region.

In an email to *Broader View Weekly*, Pitzarella wrote, "We haven't committed to a particular process, partner or company, but our plans are to explore mobile treatment solutions, in concert with centralized treatment facilities and some deep underground disposal." Range Resource's ultimate goal, he said, is to maintain zero liquid discharge in Pennsylvania's surface waters. "Right now we are the only industry held to this standard."

### **Learn More**

The Penn State webinar "Water Use and Water Re-use/Recycling in Marcellus Shale Gas Exploration and Production" is archived at <http://extension.psu.edu/naturalgas/webinars/recorded/water-use-and-water-re-use-recycling-in-marcellus-shale-gas-exploration-and-production>.