

Gas drillers recycling more water, using fewer chemicals

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By Don Hopey, Pittsburgh Post-Gazette

Drillers plumbing the Marcellus Shale still use millions of gallons of water per well to bust up the deep subterranean rock strata and release the natural gas it contains, but more and more they're reducing the amount of chemical additives used in hydraulic fracturing and recycling wastewater.

And some are even considering pumping water from abandoned mines to augment their waste or "flowback" water for the next well's fracking job.

Those changes could eventually address some of the risks to water quantity and quality that environmental advocates raise, but they're also driven by drilling economics: Reducing the amounts of water and chemicals may cut the cost of developing one of the biggest unconventional shale gas plays in the world.

Look at the numbers: Each Marcellus Shale well uses 100,000 to 300,000 gallons of water for drilling and an average of 4 million gallons mixed with sand and chemicals to hydraulically fracture the shale and release the gas. Anywhere from 10 to 50 percent of that used fracking fluid, also known as "flowback water," is pushed back to the surface, along with dissolved metals and radiation, with the gas.

While the number of Marcellus wells drilled in the state is expected to climb steeply this year and for many years to come, increasing water use for drilling, Dave Yoxtheimer, hydrogeologist with Penn State University's Marcellus Center for Outreach and Research, said there's little chance, given the stream-withdrawal regulations in place, that the state will come close to running out of water. And drillers' water use per well is going down.

"The majority of companies are working toward reusing 100 percent of their flowback water for several reasons. Environmentally it makes sense, and economically it makes more sense, even though they have to treat some fairly significant dissolved solids," Mr. Yoxtheimer said.

He said some companies prefer to reuse the briny flowback water because it's "heavier" with dissolved solids, metals and salts and can more effectively fracture the shale.

Kelvin Gregory, assistant professor of civil and environmental engineering at Carnegie Mellon University, has studied Marcellus Shale gas extraction technologies and said treatment of the flowback water is a significant cost that is driving drillers -- like Range Resources, one of the state's biggest Marcellus operators -- to reuse wastewater.

According to Mr. Gregory and Range Resources, the company recycled 80 percent of its wastewater in 2009, at least 90 percent in 2010, and has set a goal of 100 percent for 2011. Chesapeake Energy and Atlas Energy, other big drilling operators in the state, also are moving in that direction, Mr. Gregory said.

And companies are looking at the potential for using water from abandoned mines if the recycled flowback water needs to be augmented, Mr. Gregory said.

Also much reduced in the Marcellus Shale drilling is the amount of chemical additives -- including biocides, corrosion inhibitors, acids and friction reducers -- mixed with water and sand to create the fracking fluid.

"Chemicals cost money," Mr. Yoxtheimer said. "The less the companies can use without compromising production, the more it would add to their bottom line."

He said companies coming into Pennsylvania from the Barnett Shale play in Texas initially used the same chemical recipe they used there but have since "fine-tuned" the proportions to match the differences in the shales.

Range Resources has reduced both the number and amount of chemicals it uses for fracking. The chemical parts of the fracking fluid dropped from one-half of 1 percent to approximately one-tenth of 1 percent.

"In Pennsylvania, you can frack with just about anything," Mr. Gregory said. "Of the 100 or so chemicals available, they were

3/1/2011

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adding just 10 or 20. Now it's down to just four or five."

"Range may be one of the more environmentally sensitive, but at some point it needs to do something with disposal," said Conrad Dan Volz, director of the University of Pittsburgh's Center for Healthy Environments and Communities and an assistant professor of environmental and occupational health.

"It's the soft underbelly of the industry here. There is not adequate treatment to handle all of the wastewater and it raises questions about why the DEP is continuing to hand out [drilling] permits."

But Scott Perry, director of the DEP's Oil & Gas Bureau, said new oil and gas drilling regulations that went into effect in early February will strengthen protections for the state's water resources.

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