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Race Is On to Clean Up Hydraulic Fracturing

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PARIS — Hydraulic fracturing, or fracking, has raised fears around the world that the procedure needed to coax shale oil and gas out of tightly packed rock could cause pollution damaging to human health.

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The process uses huge amounts of water, and environmentalists, landowners and others worry that drinking-water supplies could be contaminated.

“Our concern is with maintaining the quality of the water in our streams and preventing groundwater contamination,” said George Jugovic Jr., president of Citizens for Pennsylvania’s Future, an advocacy group.

But where environmentalists see risk, some entrepreneurs sense opportunity. With so much money at stake in this industry, businesses think that techniques that could ease concerns about water in fracking might prove valuable.

“Water is now emerging as a significant opportunity and risk for oil and gas companies,” said Laura Shenkar, an expert on corporate water strategy and technologies and founder of the Artemis Project, a consulting firm based in San Francisco.

Fracking came into widespread use during the past decade after technological advances, particularly the ability to drill horizontally deep underground. To frack a well, millions of gallons of water, chemicals and tiny particles of sand, quartz or ceramics are pumped into buried shale rock formations.

The high-pressure liquids crack apart the rock, and the sand holds open the fractures. This allows trapped gas to flow into the well and up to the surface.

Gas companies add several chemicals to the fracking water, including biocides to kill bacteria from deep underground, scale inhibitors to reduce minerals that clog pipes and lubricants for the smooth operation of pumps and other machinery. Having these substances in the water creates pollution potential.

Some of the injected fluids flow back to the surface. Additional water that naturally occurs in deep rock also comes out with the gas. This water can create problems, too, because it contains a lot of salt and sometimes has radioactive elements.

Activists worry that the fracking process itself could contaminate groundwater. But evidence so far indicates that mismanagement of this wastewater is a greater threat.

Start-ups, venture capitalists and large companies, including Veolia and Siemens, see riches in water cleanup and are developing and testing various technologies. They are also working in other areas besides shale gas, including Canada’s oil sands and the use of water to pressure oil out of wells.

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One of these companies is Ecosphere Technologies of Stuart, Florida, which uses ozone as a disinfectant to clean water in a process called advanced oxidation. The treatment, which does not use chemicals, can both eliminate the chemicals typically used for bacteria control and scale inhibition during fracking and recycle 100 percent of the water, according to Charles Vinick, the company's chief executive.

Ecosphere says it has cleaned more than two billion gallons of water and eliminated the need for more than 1.7 million gallons of chemicals at approximately 600 oil and [natural gas](#) wells in U.S. shale fields since 2008.

It is now adapting its techniques to oil and natural gas liquids production, which are more profitable than shale gas at present. These operations also produce dirty water that needs to be cleaned and recycled, Mr. Vinick said.

Some companies have created "turnkey solutions" that allow gas companies to clean water on site and to validate the results by testing. The validation step makes it particularly attractive, Ms. Shenkar said.

One of the biggest players in this market is WaterTectonics of Everett, Washington. The company has a global licensing agreement with Halliburton, one of the largest oil services companies, for the frack water treatment market and other applications.

WaterTectonics uses electric current to bind together contaminant particles, allowing them to be filtered from the water. From 2009 to 2011, the company's staff and finances more than tripled, according to the company.

"Our system has been deployed on dozens of projects across the United States and most major shale plays," said TJ Mothersbaugh, WaterTectonics' business development manager. "There are also near-term plans to take it to offshore and other international applications."

While Mr. Mothersbaugh acknowledges that the recent drop in gas prices had affected his company of late, he remains a frack water bull. "The opportunity in frack water treatment is a very large market that is predicted to grow at an accelerated rate over the next 10 years," he said.

A few companies think that trying to reduce the enormous amounts of water used in fracking could be a moneymaker.

Daniel Choi, an analyst at Lux Research, a Boston-based consulting firm that follows emerging technologies, estimates that by 2020, 260 billion gallons, or 984 billion liters, of water will be used to frack wells worldwide, a huge leap from the roughly 4.5 billion gallons this year.

Lack of water has already slowed shale gas drilling in drier states like Texas. During a summer drought in 2011, regulators suspended permits to withdraw water, limiting production in the Eagle Ford play, which is near San Antonio.

"The municipalities are starting to say that if we're having a drought and asking everyone to cut back, how can you possibly talk about using so much water?" Ms. Shenkar said.

But some companies are trying to prove this dire prediction wrong. GasFrac, based in Calgary, Alberta, is using a patented liquid petroleum gas gel instead of water as the primary fracking fluid.

After forcing the rock apart, the liquid fuel vaporizes and returns to the surface with the released natural gas. It can be recovered during natural gas treatment and sold as fuel or captured at the wellhead for reuse in fracking, said Nola Johnston, a sales and engineering assistant for GasFrac.

While technically a start-up, it's a monster baby. The company fracked 700 wells last year, mostly in Canada, in partnership with giant companies including Shell and Chevron. It's next big move will be into the United States, the company says.



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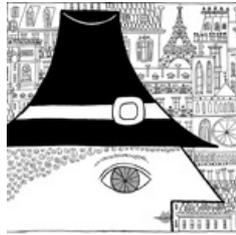
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