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In Fracking's Wake

Some companies love that dirty water, because it means more money for cleaning it up

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Joe Duty

BY THE TRUCKLOAD With fracking's growth, tankers unloading wastewater keep a Texas recycling site busy

The growing volume of dirty water produced in shale-gas drilling has triggered a gold rush among water-treatment companies.

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Energy companies increasingly are drilling for natural gas using hydraulic fracturing, or fracking. In this process, water mixed with sand and chemicals is pumped into a well under high pressure; the mixture fractures the rock, allowing the gas to escape. Huge amounts of water are used, and about 10% to 40% of it emerges after a frack job, laced with a variety of contaminants.

Even as the volume of dirty water grows, the traditional methods of disposal are narrowing. Several states are considering or have recently imposed limits on wastewater disposal underground or in streams. Meanwhile, record drought in some drilling areas is making access to fresh water for drilling more difficult, costly and unpopular.

The net result: "For the first time there's a strong driver for technology" to clean up the wastewater from mines so it can be reused, says Laura Shenkar, founder of the Artemis Project, a water-technology consulting firm. Dozens of water-treatment companies have started up in the past year or so, and many of the more established companies are adapting their techniques for use in the shale-gas industry. How many of those companies the market can support remains to be seen.

Plenty of Options

Companies are using several different approaches to shale-gas wastewater treatment.

Well, Hydrated

Water going into and out of a typical shale-gas well in the Marcellus shale

80,000 gallons

Water needed for drilling

3.8 million gal.

Water needed for hydraulic fracturing

1 million gallons

Fracking water that returns to the surface

200

Trucks needed to transport one million gallons

Sources: Department of Energy; Argonne National Laboratory

Ecosphere Technologies Inc., based in Stuart, Fla., is one of the dominant providers of water treatment for the shale-gas industry, according to Lux Research, a technology research and consulting firm. The company's technology avoids the use of chemicals typically employed to treat wastewater.

Ecosphere's process forces dirty water through pipes where ozone breaks down contaminants with the help of sound waves, electrically charged particles and changes in pressure. No waste is created in the process, because while the technology renders contaminants harmless it doesn't filter anything out.

Another strong competitor for new business, according to Lux analyst Brent Giles, is WaterTectonics Inc., based in Everett, Wash. The company uses a process called electric coagulation, in which an electric charge forces contaminant particles into clumps that can be removed after they either rise to the surface of the water or sink to the bottom. The process avoids the use of chemicals, but it does produce waste that has to be disposed of.

Another company, Altela Inc., based in Albuquerque, N.M., earned a spot on Artemis Project's 2011 list of the 50 most innovative water-technology companies in the U.S. Its technology mimics rainmaking. Wastewater is heated to the point of evaporation, which produces clean water in the form of vapor, leaving contaminant particles behind. The vapor is then condensed back into liquid form.

The basic process, called thermal distillation, isn't new, but Altela has found a way to make it more efficient, by capturing the heat generated by condensation and using it for evaporation. Ned Godshall, the company's chief executive, says Altela's method uses a third of the energy typically required for conventional thermal distillation.

Do It Yourself

One potential drag on the use of all these technologies: Some drillers have started to simply reuse their wastewater without fully treating it. But it isn't clear how much of a factor that will be. Many technology companies and some researchers argue that there is a limit to such recycling because it doesn't clean the water enough for it to be used repeatedly and still be effective. The particles in dirty water can damage equipment and block the release of gas from the shale.

"When I learned in early 2010 that they were going to recycle, I thought they were going to do a real heavy-duty treatment" before reusing the water, says John Veil, who analyzed water treatment for the oil and gas industry for many years at the Argonne National Laboratory, and now does so at his own consulting firm. "They are not. All they are doing is getting out the big sand grains in a [filtering] process as simple as pouring the water through pantyhose."

Cleaning Up?

A rundown of selected technologies for treating contaminated fracking water

BAG FILTERS

How they work: Sand and grit is trapped in a filter, while the rest of the water comes through.

Pros: Cheap.

Cons: Leaves all the other pollutants in the water.

CHEMICAL PRECIPITATION

How it works: Chemicals are added into the water; the chemicals precipitate metals into insoluble form, and the metals are then removed.

Pros: Widely used; relatively cheap.

Cons: Does not remove salt; generates a sludge requiring disposal.

ELECTRIC COAGULATION

How it works: Charged particles attach to metals and separate them from water; the pollutants are then skimmed off.

Pros: Avoids the use of chemicals for treating water.

Cons: Does not remove salt; not widely used for large scale applications; generates a sludge requiring disposal.

Sources: WSJ reporting; David Yachemir, Penn State Marcellus Center for Outreach and Research

COMBINATION

Several methods such as adding ozone, ultrasound, electricity and pressure

How it works: Oxygen molecules change the composition of pollutants, making them less harmful.

Pros: Almost no waste is created; destroys bacteria.

Cons: Does not remove salt.

DISTILLATION

How it works: Uses heat to evaporate fresh water.

Pros: Only method that removes salts from waters with high concentration of solids.

Cons: More expensive as it has high energy input and may require pretreatment to remove metals.

MEMBRANE FILTRATION

How it works: A nano filter is used to remove metals.

Pros: Can effectively reduce metals and to some degree salts; requires little or no pre-treatment.

Cons: Filter media may need to be replaced frequently, raising costs.

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