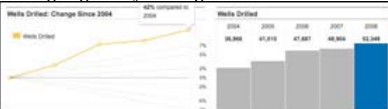


Underused Drilling Practices Could Avoid Pollution

by *Abraham Lustgarten*
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Drilling Regulatory Staffing in Your State

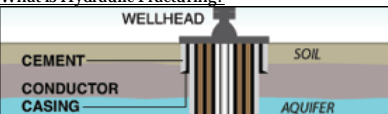


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Versions of this story were published in the [Albany Times Union](#) [1] and the [Times Herald-Record](#) [2].

As environmental concerns threaten to derail natural gas drilling projects across the country, the energy industry has developed innovative ways to make it easier to exploit the nation's reserves without polluting air and drinking water.

Energy companies have figured out how to drill wells with fewer toxic chemicals, enclose wastewater so it can't contaminate streams and groundwater, and sharply curb emissions from everything from truck traffic to leaky gas well valves. Some of their techniques also make good business sense because they boost productivity and ultimately save the industry money -- \$10,000 per well in some cases.

Yet these environmental safeguards are used only intermittently in the [32 states](#) [3] where natural gas is drilled. The energy industry is exempted from many federal environmental laws, so regulation of this growing industry is left almost entirely to the states, which often recommend, but seldom mandate the use of these techniques. In one Wyoming gas field, for instance, drillers have taken steps to curb emissions, while 100 miles away in the same state, they have not.

The debate over the safety of natural gas drilling has intensified in the past year, even as the nation increasingly turns to cleaner-burning natural gas as an alternative to oil and coal. In Congress, one group of politicians is writing a climate bill that would encourage the use of more natural gas, while another group is pushing a bill that would put a key part of the process under federal regulation and force the disclosure of chemicals used in the drilling process. Neither bill addresses the question of how to encourage energy companies to use existing techniques that lower the risks of environmental damage.

Interviews with state officials and industry executives in states across the country show the industry tends to use these environmental safeguards only when political, regulatory, cost or social pressures force it to do so.

When states have tried to toughen regulations aimed at protecting the environment or institutionalizing these practices, energy companies have fought hard to defend the status quo. They argue that current laws are sufficient, that mandating practices imposes specific solutions on regions where they may not work best, and that the cost of complying with additional laws and safeguards would bankrupt them.

"Sometimes environmental considerations aren't the same as the public considerations, and many times the economic considerations don't fit," said David Burnett, an associate research scientist at Texas A&M University's Global Petroleum Research Institute and a founder of Environmentally Friendly Drilling, a government and industry-funded program that identifies best practices and encourages their use. "There could be better management practices used. We have to find a balance."



Abraham Lustgarten/ProPublica

Michael Freeman, an attorney at the environmental group Earthjustice, says there is no escaping some damage from drilling. But if the best available precautions were routinely followed, environmental harm could be minimized and the industry may face less resistance from the public as it taps the vast new gas deposits that have been discovered in recent years.

"It would certainly address a lot of people's concerns," Freeman said. "But the government agencies that regulate the oil and gas industry need to be aggressive about making them clean up their act."

Good Chemistry

Few notions have sparked more hope among environmentalists than the possibility of replacing toxic chemicals used in drilling with what are being called "green" or non-toxic drilling fluids.

A review of scientific documents and interviews with drilling companies and the chemists who supply them shows that the transition is more than theoretical. It's starting to happen.

EnCana, a Canadian company that operates on both sides of the border, recently said it stopped using 2-Butoxyethanol, a solvent that has caused reproductive problems in animals. BJ Services, one of the largest fracturing service providers in the world, has discontinued the use of fluorocarbons, a family of compounds that are persistent environmental pollutants.

Neither company would say what it is using to replace these chemicals. But a presentation made by Denver-based Antero Resources and obtained by ProPublica says that plant-based oils are occasionally replacing mineral oil and that soy can replace some toxic polymers. David Holcomb, director of research for the Texas-based drilling chemistry company Frac Tech, offered more specifics: He uses orange citrus to replace some solvents, and palm oil in place of a common slicking agent that has been prohibited in Europe but is still allowed in the United States.

The "single biggest move" the industry has made to reduce the toxicity of its fluids, according to David Dunlap, chief operating officer for BJ Services, is phasing out diesel fuel, a solvent that contains the potent carcinogen benzene.

Diesel was once a common solvent used in [hydraulic fracturing](#) [4], the process where water, sand and chemical additives are pumped underground at high pressure to break apart rock and release gas. In some fracturing jobs -- like those in the Marcellus Shale in Pennsylvania and New York -- more than 40,000 gallons of fracturing chemicals can be used at a single well.

Today, many companies have replaced diesel with mineral oil, a less toxic hydrocarbon solvent, in most of their fracturing solutions. The shift began in 2003, after the EPA pressed the nation's dominant fracturing companies to voluntarily eliminate diesel from some of their fluids.

"It sounds like a simple thing, but it's the largest single volume other than water that is used in a frack job," said Dunlap, whose company is being acquired by Baker Hughes, the international drilling company. BJ no longer uses diesel in its fracturing fluids, Dunlap said, though it may still be used in other applications.

Despite these improvements, it is still difficult to say how safe the drilling and fracturing fluids are for people, and for the environment. The EPA says "green" chemistry should not be dangerously toxic and should not build up in plants or organisms. But because there are no laws that dictate what chemicals can be used for drilling on U.S. soil -- and because most companies still keep the exact makeup of their fluids a secret from state and federal regulators -- the definition of "green" remains subjective. "Green" is often shades of gray.

New York's Department of Environmental Conservation raised the "green" issue in its new environmental review for drilling in the Marcellus Shale. The report said that while non-toxic fracturing fluids would be preferable, "it may not be feasible to require the use of 'green' chemicals because presently there is no metric or chemicals approvals process in place in the U.S."

Actually, such standards do exist, but only for the fracturing fluids used in offshore drilling. Both European law and the regulations of the U.S. Minerals and Management Services dictate that chemicals used in the North Sea and the Gulf of Mexico must be safe enough that they won't kill fish and other organisms if they are dumped overboard.

"You can always do it," said BJ Services' Dunlap, whose company has been a leader in innovating sustainable materials. But, Dunlap said, the chemistry costs more, and is justifiable to his shareholders only because the regulations for offshore drilling left no choice.

"There are places around the world where the type of adherence is not required," he said, "and where the cost of using those chemicals is something operators are not required to pay for."

A Breath of Air

The natural gas industry has also found ways to reduce the greenhouses gases and volatile organic compounds it contributes to ozone pollution and climate change.

Although natural gas burns cleaner than other fossil fuels, the drilling and production of oil and gas is responsible for some 18 percent of the world's human-caused emissions of methane, a greenhouse gas that is the main component of natural gas, according to the Environmental Protection Agency. More methane is produced in the U.S. than anywhere else in the world except Russia.

Under the guidance of an EPA program, EnCana, the Canadian oil and gas giant, is curbing those methane emissions -- and might save money doing it. Using infrared cameras, the company finds and seals methane leaks on wells and pipelines that would otherwise be invisible, sharply curtailing levels of some of the most dangerous heat-trapping atmospheric gases. According to Richard Haut, project director for the Houston Advanced Research Center, a partner on the Environmentally Friendly Drilling Project, such programs could pay for themselves within two years, and then turn a profit as the extra gas captured goes to market.

The industry has also found ways to reduce another set of dangerous emissions that has been blamed for air quality problems in Texas, Wyoming and Colorado, among other places: CO2 from trucks and processing plants and the ozone-causing volatile organic compounds. Last winter, when tests showed that high ozone levels had put sparsely populated Sublette County, Wyo., out of compliance with federal air quality laws normally applied to the nation's big cities, the industry took a number of straightforward steps to curb the pollution.

Questar Exploration and Production, a prominent Rocky Mountain drilling company, eliminated 62,000 truck delivery trips and the diesel exhaust that came with them by building a network of pipes to transport its fluids.

EnCana began using natural gas instead of diesel fuel to power its 150-foot-tall drilling rigs, a seemingly small change that resulted in 85 percent less volatile organic compounds being spewed into the air. EnCana also installed other, less polluting new equipment, including refinery-grade combustors.

Doug Hock, a spokesman for EnCana, said the company has spent some \$25 million on such efforts since 2005.

"Technology is the key driver in all of this," Hock said. "It is important for policymakers to first understand the technology being used and secondly, allow operators the flexibility for further innovation to occur. This, rather than blanket mandates, will ensure continued reductions in impacts."

But the industry's efforts in Sublette County were triggered by an aggressive push by the federal government.

Before the U.S. Bureau of Land Management allowed more drilling in the Jonah Field, one of the gas development areas on public land in Sublette County, the companies had to agree to reduce their emissions there. Companies understood that if they did not agree to the BLM's conditions in the Jonah Field they might not get more permits to drill in other parts of Sublette County. "There is kind of a big hammer hanging over their heads," said Chuck Otto, the BLM field manager there.

Dirty Water

One of the most challenging environmental problems associated with drilling is disposing of its wastewater, which is typically laced with heavy metals, chemicals and hydrocarbons. Usually the waste is collected in open, dirt-brimmed waste pits where it sits until it's hauled off to treatment facilities or injection wells. In the meantime, the fluids can evaporate or seep into the

earth, or overflow if rain or snow overfills the pit.

A 1992 congressional report found that one of "the greatest opportunities" to prevent this type of pollution is something called a closed loop system, a series of pipes that gathers the waste as it comes out of a gas well, separates some of the water for reuse, and confines the concentrated leftovers in a steel tank. According to EPA findings quoted in the report, closed loop systems can reduce the volume of drilling fluids -- and the chemicals used -- by more than 90 percent. Because the waste is enclosed, chemicals can't evaporate, fluids are less likely to spill and permanent pits aren't needed.

Closed loop systems are rarely required in state regulations, but they are increasingly used, in part because they can save money for the companies that use them.

A 2001 case study by the Texas Railroad Commission, which regulates gas drilling in Texas, focused on a small gas producer that tested such a system. Building the pipes and tanks cost the company more initially, according to the report, but the company -- which it did not name -- didn't have to construct a waste pit, remediate the land when it finished drilling, haul its toxic materials to a disposal site or pay the slew of environmental fees levied by the state. According to the Railroad Commission, the company saved at least \$10,000 for each gas well that was connected to the closed loop system. At that rate, the savings from the use of such a system on all the roughly 4,500 wells in Sublette County could tally \$45 million.

Yet the industry continues to fight laws that would lead to increased use of closed loop systems.

In 2008 New Mexico Gov. Bill Richardson's administration passed some of the nation's strongest rules prohibiting the use of unlined waste pits and thereby encouraging the use of a closed-loop system as an alternative. The regulation was inspired by a study that found that leaks or seepage from waste pits had contaminated water supplies in some 400 cases.

The industry mounted a public relations, lobbying, and legal war to stop the law, claiming that it would weigh down business with excessive costs that would ultimately result in lost jobs. In early 2009, Richardson relented and directed his administration to relax several of the rule's requirements and timelines.

What Spurs Change?

When change does happen, it is usually foisted on the industry by excessive costs, fear of catastrophe, or regulations.

Chesapeake Energy began a pilot program to recycle wastewater from its Texas wells after drought and aquifer depletion threatened the industry's water supply there. The pressure to reuse rather than dispose of wastewater also may have been increased by a series of earthquakes this year near Dallas. Researchers said the earthquakes may have been caused by the company's normal disposal process: injecting wastewater underground.

Drillers in the Marcellus Shale in Pennsylvania speeded up their search for new water recycling technologies last year, after Pennsylvania's Department of Environmental Protection sharply limited treatment plants from accepting large quantities of drilling waste. Range Resources now recycles much of the wastewater from its Pennsylvania wells. "In the long term the biggest problem is going to be wastewater treatment," said spokesman Matt Pitzarella. "And we have to figure out how to deal with it."

Asked why his company pursued "green" drilling and fracturing fluid innovations for drilling in the North Sea -- products that it now sometimes uses onshore too -- BJ Services' Dunlap was unequivocal: The law made him do it.

"It's because of local regulations," Dunlap said. "That's typically what drives us to develop and bring to market these environmentally friendly products."

But given the choice, energy companies prefer that they, rather than government regulators, decide when, where or whether to use the environmentally friendly technologies they've developed. They oppose state-wide or regional mandates, arguing that a best practice may be less effective -- or less affordable -- in one place more than another. They also say that formal regulations can institutionalize technologies that may later be proved ineffective, or could be improved on.

"No matter what we do we are capitalists here in the U.S.," said Richard Haut, the Houston Advanced Research Center project director. "We do have to look for a balance between environmental issues and development."

1. <http://www.timesunion.com/AspStories/story.asp?storyID=877716>
2. <http://www.recordonline.com/apps/pbcs.dll/article?AID=/20091214/NEWS/912140331>
3. <http://www.propublica.org/special/map-number-of-producing-gas-wells-708>
4. <http://www.propublica.org/special/hydraulic-fracturing-national>

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