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Meeting

Mystery of fracking chemicals worries Californians

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SACRAMENTO, Calif. -- Energy companies across California are injecting a mysterious mix of chemicals into the ground to tap oil deposits while frustrating attempts to regulate the controversial process, known as hydraulic fracturing.

The procedure has drawn the greatest attention in the Rocky Mountain West and Northeast, where states have debated moratoriums to develop regulations after toxic chemicals were found in nearby drinking water. But a quieter battle is being waged in the Golden State, which could be a candidate for increased "fracking" because of its unique geology. Last year, the energy industry scuttled a bill that would have enlisted California in the growing ranks of states that require companies to disclose what they put into the ground. At least nine states have such guidelines.

Meanwhile, the Brown administration, which has been trying to ease regulation of the energy industry, has yet to draw up any rules on the extraction method.

State regulators say existing environmental laws protect the state's drinking water but acknowledge they have little information about the scale or practice of fracking in California, the fourth-largest oil producing state in the nation. That has created mounting anxiety in communities from Culver City to Monterey, where residents are slowly discovering the practice has gone on for years, sometimes in densely populated areas.

"The communities have been left on their own to figure this out," said Lark Galloway-Gilliam, executive director of Community Health Councils, a health advocacy group that sued a Texas oil company and Los Angeles County over oil extraction near Baldwin Hills. "We are looking to our regulatory agencies to protect us, and they are scratching their heads and turning a blind eye."

Nationwide, fracking is driving an oil and natural gas boom. Energy companies are using the procedure to extract previously unreachable fossil fuels locked within deep rock. The industry is touting the potential of fracking in California to tap the largest oil shale formation in the continental United States, containing 64 percent of the nation's deep-rock oil deposits.

State regulators said fracking here is "radically different" from drilling in the Rocky Mountain West, Mid-Atlantic region and Northeast, where operators inject millions of gallons of chemical-laced water and

sand to break apart rock and release natural gas. In California, the process has long been performed for shorter duration with much less water to loosen crude in depleted oil wells.

"We believe it is a safe practice," said Tupper Hull, a spokesman for the Western States Petroleum Association. "It is not a new technology. It is a tested, proven technology."

Others disagree, expressing concerns about potential effects to the environment and public health.

Hydraulic fracturing has been used on thousands of wells in California, according to the Environmental Working Group, a Washington-based organization critical of the energy industry. Environmentalists are suing the federal government to prevent oil companies from fracking on public lands in Monterey and Fresno counties. Lawmakers have revived the disclosure bill that stalled last year after objections by Halliburton, one of the world's largest oil field service companies and a pioneer of hydraulic fracturing. They also have introduced legislation that would require oil companies to notify landowners before fracking near their properties.

In a statement, Halliburton said it was working with lawmakers on a compromise bill that would increase disclosure of fracking chemicals while protecting its proprietary "recipes."

Hoping to boost the state's sluggish economy, the Brown administration has eased rules for oil drilling in California, firing two top regulators last year over permitting delays. Though regulators said they monitor drilling operations "quite thoroughly" under existing law, they acknowledged the need for more disclosure of what chemicals are used in oil production.

Last year, after a three-year study, the U.S. Environmental Protection Agency said fracking was the likely cause of contaminated well water in Wyoming. The agency is also investigating contamination in Pennsylvania, where at least 18 families' wells were tainted with methane and chemicals after fracking began nearby. (The industry, and even some environmentalists, have recently blamed poor well construction for water contamination in some cases, not the fracking process itself.) Ohio regulators unveiled tougher drilling rules this month after concluding that fracking operations probably induced a dozen earthquakes there.

California lawmakers said they took up the issue after watching "Gasland," an Academy Award-nominated documentary that shows homeowners in Colorado lighting their tap water on fire.

State Sen. Fran Pavley, D-Agoura Hills, chairwoman of the Committee on Natural Resources and Water, wrote to state regulators last year asking basic questions: Where does fracking take place; How often is it used; And what are the potential risks?

Regulators had few answers, saying they had "limited data" because the state has no reporting requirements.

"I was very surprised," Pavley said in an interview. "You would hate to find out after the fact that we had not done the minimum to protect the people we took an oath to protect."

Assemblyman Bob Wieckowski, D-Fremont, introduced a bill that would require oil companies to disclose where they employ the process, what chemicals they use and how much water they pump. In a legislative hearing last year, the lawmaker described it as a "deliberately modest step."

"We're not stopping drilling; we're not screwing up the permitting process," Wieckowski said. "We're just allowing the regulators to have some information so we don't get letters back to senators saying, 'We don't know what's going on.' "

The energy industry balked. Among the chief opponents was Halliburton. As it has elsewhere, the company argued that full disclosure of the chemicals in its fracking fluid would compromise valuable trade secrets.

Although it never registered as an official opponent, Halliburton and its lobbyists ran a quiet campaign to weaken the legislation, meeting privately with lawmakers and state agencies.

During a committee hearing last year, Pavley told her colleagues that she had heard rumors of Halliburton's opposition and asked if anyone in the audience was representing the service company.

Lobbyist Terry McGann, of the powerful California Strategies firm, stepped to the microphone.

"They do want to protect the tens of millions of dollars in investments they've made for their particular combination," he said.

State Sen. Joe Simitian, chairman of the Environmental Quality Committee, called on Halliburton to be more candid and avoid what he called a "silent campaign of opposition."

McGann was conciliatory, saying the company was not opposed to a disclosure bill. He offered to follow up with Pavley privately, in her office.

The bill later stalled.

FRACTURING FLUID ADDITIVES, MAIN COMPOUNDS, AND COMMON USES.

| Additive Type | Main Compound(s) | Purpose | Common Use of Main Compound |
|---------------------|------------------------------------|---|--|
| Diluted Acid (15%) | Hydrochloric acid or muriatic acid | Help dissolve minerals and initiate cracks in the rock | Swimming pool chemical and cleaner |
| Bicide | Glutaraldehyde | Eliminates bacteria in the water that produce corrosive byproducts | Disinfectant; sterilize medical and dental equipment |
| Breaker | Ammonium persulfate | Allows a delayed break down of the gel polymer chains | Bleaching agent in detergent and hair cosmetics, manufacture of household plastics |
| Corrosion Inhibitor | N,N-dimethyl formamide | Prevents the corrosion of the pipe | Used in pharmaceuticals, acrylic fibers, plastics |
| Crosslinker | Borate salts | Maintains fluid viscosity as temperature increases | Laundry detergents, hand soaps, and cosmetics |
| Friction Reducer | Polyacrylamide | Minimizes friction between the fluid and the pipe | Water treatment, soil conditioner |
| | Mineral oil | | Make-up remover, laxatives, and candy |
| Gel | Guar gum or hydroxyethyl cellulose | Thickens the water in order to suspend the sand | Cosmetics, toothpaste, sauces, baked goods, ice cream |
| Iron Control | Citric acid | Prevents precipitation of metal oxides | Food additive, flavoring in food and beverages; Lemon Juice ~7% Citric Acid |
| KCl | Potassium chloride | Creates a brine carrier fluid | Low sodium table salt substitute |
| Oxygen Scavenger | Ammonium bisulfite | Removes oxygen from the water to protect the pipe from corrosion | Cosmetics, food and beverage processing, water treatment |
| pH Adjusting Agent | Sodium or potassium carbonate | Maintains the effectiveness of other components, such as crosslinkers | Washing soda, detergents, soap, water softener, glass and ceramics |
| Proppant | Silica, quartz sand | Allows the fractures to remain open so the gas can escape | Drinking water filtration, play sand, concrete, brick mortar |
| Scale Inhibitor | Ethylene glycol | Prevents scale deposits in the pipe | Automotive antifreeze, household cleansers, and de-icing agent |
| Surfactant | Isopropanol | Used to increase the viscosity of the fracture fluid | Glass cleaner, antiperspirant, and hair color |

Note: The specific compounds used in a given fracturing operation will vary depending on company preference, source water quality and site-specific characteristics of the target formation. The compounds shown above are representative of the major compounds used in hydraulic fracturing of gas shales.

**Chemicals Used by Hydraulic Fracturing Companies in Pennsylvania
For Surface and Hydraulic Fracturing Activities
Prepared by the Department of Environmental Protection
Bureau of Oil and Gas Management
Compiled from Material Safety Data Sheets obtained from Industry**

| | |
|--|--------------------------------|
| 1,2,4-Trimethylbenzene | Glycol Ethers (includes 2BE) |
| 1,3,5-Trimethylbenzene | Guar gum |
| 2,2-Dibromo-3-Nitropropionamide | Hemicellulase Enzyme |
| 2,2-Dibromo-3-Nitropropionamide | Hydrochloric Acid |
| 2-butoxyethanol | Hydrotreated light distillate |
| 2-Ethylhexanol | Hydrotreated Light Distilled |
| 2-methyl-4-isothiazolin-3-one | Iron Oxide |
| 5-chloro-2-methyl-4-isothiazotin-3-one | Isopropanol |
| Acetic Acid | Isopropyl Alcohol |
| Acetic Anhydride | Kerosine |
| Acie Pensurf | Magnesium Nitrate |
| Alcohol Ethoxylated | Mesh Sand (Crystalline Silica) |
| Alphatic Acid | Methanol |
| Alphatic Alcohol Polyglycol Ether | Mineral Spirits |
| Aluminum Oxide | Monoethanolamine |
| Ammonia Bifluoride | Naphthalene |
| Ammonia Bisulfite | Nitrotriacetamide |
| Ammonium chloride | Oil Mist |
| Ammonium Salt | Petroleum Distillate Blend |
| Ammonia Persulfate | Petroleum Distillates |
| Aromatic Hydrocarbon | Petroleum Naphtha |
| Aromatic Ketones | Polyethoxylated Alkanol (1) |
| Boric Acid | Polyethoxylated Alkanol (2) |
| Boric Oxide | Polyethylene Glycol Mixture |
| Butan-1-01 | Polysaccharide |
| Citric Acid | Potassium Carbonate |
| Crystalline Silica: Cristobalite | Potassium Chloride |
| Crystalline Silica: Quartz | Potassium Hydroxide |
| Dazomet | Prop-2-yn-1-01 |
| Diatomaceous Earth | Propan-2-01 |
| Diesel (use discontinued) | Propargyl Alcohol |
| Diethylbenzene | Propylene |
| Dodecylbenzene Sulfonic Acid | Sodium Ash |
| E B Butyl Cellulosolve | Sodium Bicarbonate |
| Ethane-1,2-diol | Sodium Chloride |
| Ethoxylated Alcohol | Sodium Hydroxide |
| Ethoxylated Alcohol | Sucrose |
| Ethoxylated Octylphenol | Tetramethylammonium Chloride |
| Ethylbenzene | Titanium Oxide |
| Ethylene Glycol | Toluene |
| Ethylhexanol | Xylene |
| Ferrous Sulfate Heptahydrate | |
| Formaldehyde | |
| Glutaraldehyde | |