

## Fracking



Hydraulic fracturing, more commonly known as fracking, is a process of drilling deep wells and injecting pressurized fluid containing a mixture of water, sand, and chemicals into shale rock to facilitate the removal of natural gas or oil.

## Description



Fracking has undergone many technological changes in the past 60 years. The most common process in use since the late 1990s is called horizontal slickwater fracking. It begins by drilling a vertical well 1-2 miles (1.6-2.3 km) into the earth. When the well hits the shale in which natural gas or oil is thought to be trapped, the well curves and becomes a horizontal well running along the shale that is to be fractured. Once drilled, the entire well is encased in steel and cement to prevent the fracking fluid, from seeping into the earth. Multiple horizontal wells can come off a single vertical shaft.




Aerial view of a drilling rig at a fracking site in Midland, Texas. (Julie Dermansky/Science Source)(Julie Dermansky/Science Source)

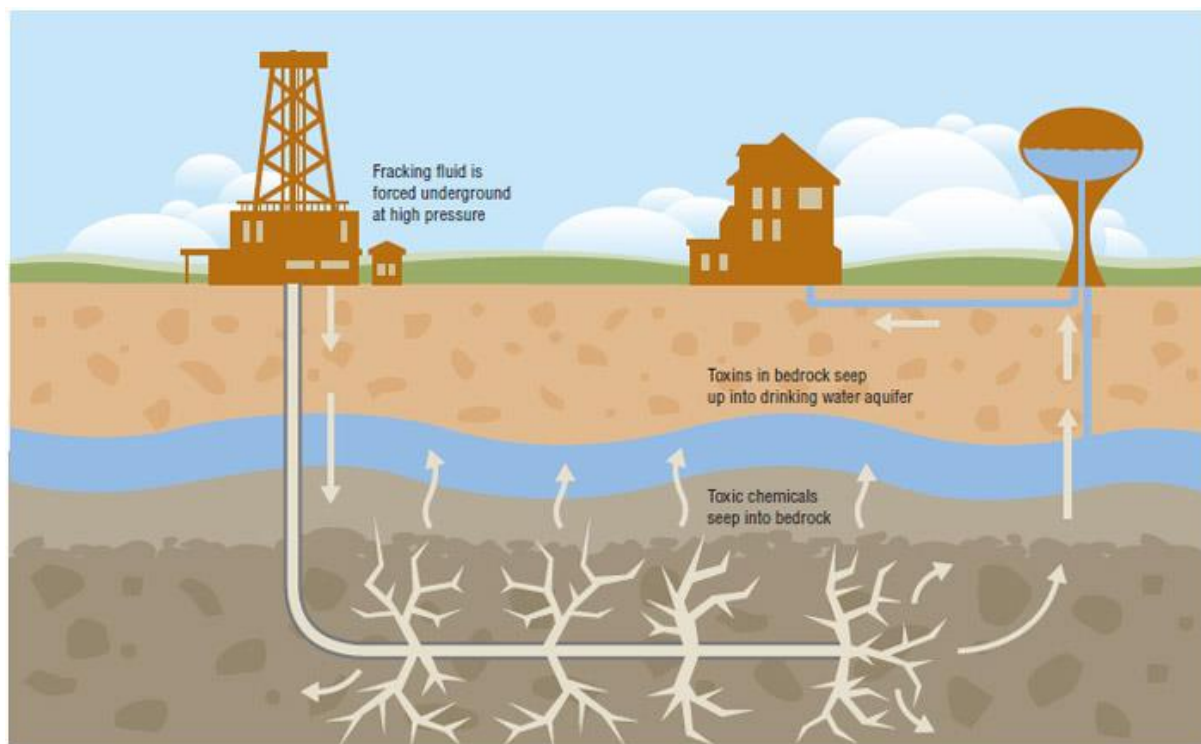
Explosives are placed along the horizontal sections of the well to create small holes in the casing that allow trapped gas to flow up to the surface. The fracking fluid, called slickwater, is then pumped into the well under tremendous pressure, sometimes as much as 9,000 pounds per square inch (62,050 kilo-pascals). Slickwater is about 99% water and sand or ceramic particles. The remaining 1% consists of chemicals such as detergents, lubricants, acids, alcohols, and disinfectants added to reduce friction and prevent corrosion. The purpose of the sand or ceramic particles is to prop open tiny cracks in the shale that open up under pressure once the fluid is removed. These cracks allow the trapped gas or oil to escape the shale and be collected.

The water that was in the cracks of the shale, called formation water, is pumped out. It often is salty and has picked up contaminants such as radioactive material, heavy metals, hydrocarbons, and other toxins. It is either stored on site in pits where it evaporates or is injected deep into the ground. Disposal of this water is a major concern to environmentalists.

## Origins

The fracking process dates to 1947 but has been altered and extended multiple times. Fracking was in use 30 years before the federal government began its own research into the process in the 1970s. Horizontal slickwater fracking, the form used as of 2018, was first used in north-central Texas in 1998 in the Barnett Shale formation. Slickwater fracking allows for gas exploration in states such as Pennsylvania and Ohio, where the mountainous terrain contains gas deposits. Previously, the high cost of extraction coupled with the low market price of natural gas made it uneconomical to drill there. However, an upswing in natural gas prices and a push in the United States for energy independence stimulated interest in developing these gas shales. The Colorado School of Mines' Potential Gas Committee (PGC) estimated in 2017 that 3,100 trillion cubic feet of natural gas may be recoverable from shales.

In 2000, there were approximately 276,000 natural gas wells in the United States. That number was over 550,000 by 2016. The Department of Energy estimates that over 2 million oil and natural gas wells have been fracked in the United States.



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### Controversy

The hydraulic fracturing treatments used to stimulate gas production from shale have spurred concerns from the environmental lobby over excessive water consumption, drinking water and well contamination, and surface water contamination from both drilling activities and fracturing fluid disposal. Fracking has also been cited as the cause of earthquakes in Oklahoma, Ohio, and Texas, areas not normally prone to earthquakes. Drinking water wells contaminated with methane, benzene (a carcinogen), and other chemicals have been found near fracking sites. Respiratory disorders have been associated with the evaporation of toxic chemicals from open pits of contaminated water pumped out of the wells. Over 700 studies have looked at various health risks of fracking. About 80% of them found some negative impact on nearby residents. Current evidence suggests that women who live near fracking sites are more likely to have underweight babies. It is estimated that in 2014 15.3 million Americans lived within one mile of a hydraulic fracking well.

Pro-fracking advocates believe the benefits of fracking outweigh the risks. Fracking has substantially increased the U.S. energy independence and reduced the need for imported oil and gas, which has kept energy prices from rising. The industry provides 9.8 million jobs and generates \$1.2 trillion for the economy. Unemployment in areas that have opened to fracking has decreased

substantially. The oil and gas industry insists that adequate precautions are in place to make fracking safe.

## Public Health Role and Response



The Environmental Protection Agency (EPA) developd industry standards of safety to regulate waste water disposal as well as the effects the process will have for air, water, and soil quality. In April of 2012, the EPA announced new oil and natural gas air pollution standards, specifically addressing the threat of volatile organic compounds (VOCs) produced as a byproduct of fracking. There are also regulations governing new construction and disassembly of wells. Many states have enacted additional regulations. The U.S.-based Center for Environmental Health campaign called for fracking sites to be kept at least one mile away from schools, neighborhoods, hospitals, and other spaces where infants and children spend significant time until further research can eliminate the possibility of long-term exposure to harmful chemicals used in the process. However, with the election of Donald Trump in 2016, there began a concerted effort to roll back regulations on the oil and gas industry. Many of President Trump's appointees to the EPAP were former oil and gas industry executives with favorable views of increased drilling.

## Effects On The Environment

Most environmental concerns are related to the depth of a fracking well and disposal of fracking fluid. If the target shale is too close to the surface, contamination risks are significant, and the shale cannot be fracked and still meet EPA guidelines. Removing substances from shales runs the risk of causing structural geological weakness if the fracking well is not dug deep enough. Drilling shallow wells or blasting through certain geological features such as underground air pockets and unstable rock can sometimes cause small but measurable earthquakes. Conversely, wells that are too deep or that cut through the aquifer may have a higher level of leakage into drinking water.

Communities and environmental groups have challenged the safety of fracking especially as it related to groundwater infiltration of both typical industrial waste and the drilling fluid. The EPA has compiled a list of gases and compounds found in water near fracking sites that can prove contamination. In September 2012, diesel, methane, ethane, and phenol were found in aquifer water in Pavillion, Wyoming, near the Encana Corporation fracking facility. This was the first location where citizens in the town successfully proved drinking water had been contaminated as a result of fossil fuel drilling at the 140 natural gas wells surrounding the farming town.

The ecosystems near these facilities has become the focus of other environmental concerns, as runoff and improper disposal of waste could threaten vegetation, agricultural production, and

**waterway pollution.** Evaporation of contaminated bodies of water dissipates the concentration of chemicals and spreads the problem through acidification of rain and other precipitation. Although the oil and gas industry admits that any extraction process poses risks, just as offshore drilling does, it asserts the economic benefit to both companies and energy consumers is greater than the associated costs.

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