FLORIDA ENERGY FORUM

The Facts on Hydraulic Fracturing

The hydraulic fracturing process, also known as "well stimulation," is vital to extracting natural gas from geological formations in Florida. Over the course of **nearly 70 years, well stimulation has been researched, advanced and used across the United States** as a safe and effective method to create tiny cracks in the targeted formation that allow natural gas to flow freely into a wellbore and up to the earth's surface.

The Well Stimulation Process

Well developers begin the stimulation process once a well has been drilled to a desired vertical and horizontal depth, with a series of steel pipes, called casing strings, cemented in place along the length of the wellbore. The steel and cement isolate the well from the surrounding geology and groundwater zones found above. **Groundwater sources are typically located one to two miles above the formation.**

Hydraulic fracturing has been used to produce oil and natural gas since 1949. The process involves pumping a mixture made up of 99.5% water and sand, and a minimal amount of additives, into the ground under high pressure. The solution opens tiny fractures in the rock to allow a pathway for the oil and gas to enter the wellbore. It typically takes about a week to complete a hydraulic fracturing operation.

A device known as a perforating gun is first lowered into the well to a designated location in the shale, and a charge is fired down the well from a wire at ground surface to perforate the steel casing, cement and the rock formation. This perforation stage creates small cracks, or fractures, in the rock.

A mixture of water, sand and chemicals is then injected into the wellborn under high pressure. The sand holds open the cracks in the rock to allow the well to produce natural gas. **Water and sand make up 99.5% of the fluid injected into the well**, and the chemicals used in the process – both small in number and dilute in concentration – can be found in many household items (see page 2).

Once the first zone of the well has been perforated and stimulated, a rubber plug is placed to isolate that area from the rest of the horizontal wellborn. The perforation and stimulation process then continues multiple times along the length of the formation to make the well as productive as possible. A bit is lowered into the well after the process is completed to drill out the rubber plugs and allow gas to flow to the surface.

Completing the Process

At the completion of the stimulation process, approximately 20-30% of the water flows back up the wellbore, where it is collected and typically stored in tanks. Water can be treated and conveyed to another well site through a temporary water line and pumping system, or put into trucks and transported to another well location awaiting well stimulation.

Water can also be stored on a drilling pad and used for multiple wells at that location. Over the productive life of the well, additional "produced" water slowly comes to the surface, where it is collected in on-site storage tanks and transported to permitted treatment facilities.

FAST FACTS

- A 2009 study by the Groundwater Protection Council, a non-profit organization of state groundwater regulators, found the chance for contamination of drinking water sources from the well stimulation process to be one in 200 million.
- The industry developed FracFocus.org to provide detailed information on hydraulic fracturing operations at wells across the country, including the capability to search for county-specific wells completed by individual natural gas operators.

www.flaenergyforum.com

Water Treatment Regulations in Florida

The state Department of Environmental Protection developed **stringent wastewater treatment requirements** for the oil and gas industry. Permits are required by the National Pollution Discharge Elimination System to ensure compliance with water quality standards. The Florida Department of Health also regulates wastewater treatment.

Protecting Groundwater

Agencies in Florida enforce equally stringent regulations to protect groundwater during both the drilling and well stimulation processes. Oil and natural gas wells require multiple, redundant layers of steel casing and cement as well as strict quality control procedures to protect groundwater sources.

FLORIDA ENERGY FORUM

The Facts on Hydraulic Fracturing

There are **no confirmed cases of drinking water contamination** related to the stimulation of an oil or natural gas well since hydraulic fracturing's inception in the 1940s. In April 2009, the Ground Water Protection Council stated that the chances of groundwater contamination due to this process are as low as 1 in 200,000,000.

Regulations of Water Withdrawals

Water use in the well stimulation process is regulated in Florida by the state DEP and the Water Management District, with approval required for every withdrawal from streams or rivers.

Each Water Management District implements a Minimum Flows and Levels Program, limiting withdrawals to a fraction of a waterway's normal flow to **protect aquatic life and the water resources**. Water is either trucked or piped to drilling locations, where it is stored in secure, lined impoundments or tanks for use in the fracture process.

According to the U.S. Geological Survey, nationally the average well uses 4 million gallons of water. This amount is just **1% of the amount used daily in Florida's recreational irrigation**, such as golf courses.

Continuing Development of New Technologies

Oil and natural gas companies throughout the country are at the forefront of advancing well technologies and procedures.

This involves research into additives that are biodegradable and do not bioaccumulate in the environment, including ingredients found in many foods. Guar gum, a thickener used in dairy products, baked goods and ketchup, is used as a friction reducer in the well stimulation process, while citric acid, used in the production of soft drinks and wine, is effective in controlling iron in a wellbore. Research continues to enhance recycling capabilities and identify effective biodegradable additives.

Common Well Stimulation Additives

Between five and ten additives are commonly used to stimulate an oil or gas well, making up between .05 and .5% of the total injection into the well. The list below identifies many of them; the right column lists their common uses

Chemical	Purpose	Common Household Product
Acids	Helps dissolve minerals and initiate fissure in rock (pre-fracture)	Swimming pool cleaner
Glutaraldehyde	Eliminates bacteria in the water	Disinfectant, Sterilizer for medical and dental equipment
Sodium Chloride	Allows a delayed breakdown of the gel polymer chains	Table Salt
N, n-Dimethyl formamide	Prevents the corrosion of the pipe	Used in pharmaceuticals, acrylic fibers and plastic
Borate salts	Maintains fluid viscosity as temperature increases	Used in laundry detergents, hand soaps and cosmetics
Polyacrylamide	Minimizes friction between fluid and pipe	Water treatment, Soil conditioner
Petroleum distillates	"Slicks" the water to minimize friction	Makeup remover, laxatives and candy
Guar gum	Thickens the water to suspend the sand	Thickener used in cosmetics, ice cream and toothpaste
Citric Acid	Prevents precipitation of metal oxides	Food additive, lemon juice
Potassium chloride	Creates a brine carrier fluid	Low-sodium table salt substitute
Ammonium bisulfite	Removes oxygen from the water to protect the pipe from corrosion	Cosmetics, food and beverage processing, water treatment
Sodium or potassium carbonate	Maintains the effectiveness of other components, such as crosslinkers	Washing soda, detergents, soap, water softener, glass and ceramics
Proppant	Allows the fissures to remain open so the gas can escape	Drinking water filtration, play sand