Common Hydraulic Fracturing Questions and Answers

What is "shale gas" or "shale oil formations"?

Natural shale gas and oil shale reserves are gas/oil deposits trapped in dense shale rocks. The U.S. Energy Information Administration (2011) reports there are 750 trillion cubic feet of known recoverable shale gas and 24 billion barrels of recoverable shale oil within the lower 48 states. Natural shale gas and shale oil reserves are being targeted for production to reduce the United States' dependence on foreign oil.

What is hydraulic fracturing and the process for recovering shale gas/oil?

Hydraulic fracturing or **"fracking"** is a part of the drilling process used to access deposits of shale gas/oil. It is used to increase the amount of shale gas/oil that is recoverable within deposits of dense shale rocks. The first step in shale gas/oil recovery is exploration. Exploration involves a variety of different techniques to determine if shale gas/oil is present. Once a deposit has been determined to be recoverable, the drilling process begins. A well is drilled to reach the depth of the shale gas/oil deposits. The well itself remains vertical until the required depth is reached. Once the deposit has been located the well is then turned horizontal to reach the deposits. The horizontal part of the well is perforated pipe casing to allow for the hydraulic fracturing process and flow and pumping of natural shale gas/oil from deposits.

After the well is drilled and casing is put in place, hydraulic fracturing begins. A combination of sand and water (98%) and other additives (2%) is pumped down the well at high pressures to fracture the shale and inject sand into shale cracks. The process is continually monitored to ensure optimal well safety and increased fracturing processes. The process may be repeated multiple times to reach the maximum footage of the deposit. The water, sand, and other fluids are then pumped back up to the surface for disposal or treatment for re-use. The sand stays within the shale to keep fractures open (Menghini, 2011).

The horizontal drilling allows access to several deposits by one well. If horizontal drilling wasn't used, there would be several drills required in one location. Horizontal drilling reduces environmental impact by allowing one well to access several deposits. Less wells means less drillings, pipelines, and roads for well locations (2011).

I've seen the video on people's water catching on fire, how is this possible?

In a segment from the movie "Gasland" an individual lights a flowing kitchen faucet on fire. The homes shown in the film were located in Colorado. State of Colorado Oil and Gas Conservation Commission released a statement dispelling the myths of the film. The fact sheet concluded that the water in these homes contained a mixture of biogenic (biological generated) and thermogenic methane that "was not related to oil and gas activity" (COGCC, nd).

Does hydraulic fracturing cause groundwater contamination?

Hydraulic fracturing has been occurring for an estimated 65 years (IPAA, 2013). According to the IPAA, and based on testimony by Lisa Jackson, EPA Administrator to the U.S. Senate there have been no known and proven groundwater contamination events in the U.S. as a result of hydraulic fracturing activities.

Groundwater is protected by several controls in the well drilling and hydraulic fracturing process. The shale gas/oil deposits are usually thousands of feet below groundwater aquifers being pumped for domestic and municipal water. The wells are constructed and designed to ensure isolation of the wellbore. The wellbore is surrounded by several layers of steel casing and cement (Menghini, 2012).

How is hydraulic fracturing regulated?

The entire process of hydraulic fracturing from well construction to shale gas/oil production is regulated by both federal and state agencies. At the federal level, the entire process regulated by the Clean Water Act (water resource protection), Occupational Safety and Health Administration (worker health/safety and chemical disclosure), and the Community "Right to Know" Act (substance reporting). All processes are subject to inspection and enforcement by regulating federal agencies. Individual state laws regulate the process of hydraulic fracturing within their state (IPAA, 2013).

What additives or chemicals are used?

Only about 2% of the fluid used in hydraulic fracturing is additives, the other 98% is a mixture of sand and water. Most of the chemicals used in the process are to protect the well casing and to improve the fracturing of the rock. The majority of these chemicals are used in household materials. For more information on the chemicals and additives used in hydraulic fracturing, visit www.fracfocus.org, this is a voluntary website that contains all the information about chemicals being used in the hydraulic fracturing at each indiviudal well site.

References:

Colorado Oil and Gas Conservation Commission (COGCC). (n.d.). Gasland Statement. Retrieved from http://cogcc.state.co.us/library/GASLAND%20DOC.pdf

Independent Petroleum Association of America (IPAA). (2013). Energy In Depth Website. Just the Facts. Retrieved from http://www.energyindepth.org/just-the-facts/

Menghini, J. (2012). Hydraulic Fracturing 101 Presentation.

U.S. Energy Information Administration. (2011). *Review of Emerging Resources: U.S. Shale Gas and Shale Oil Plays.* Retrieved from http://www.eia.gov/analysis/studies/usshalegas/pdf/usshaleplays.pdf

Product	Main Ingredient	Purpose	Other Common Uses
Water		Expand fracture and deliver sand.	Municipal, agricultural, manufacturing, etc.
Sand		Props the fractures open so that oil/gas can escape.	Drinking water filtration, play sand, concrete and brick mortar.
Acid	Hydrochloric acid or muriatic acid.	Helps dissolve minerals and initiate cracks in the rock.	Swimming pool chemical and cleaner.
Antibacterial agent	Glutaraldehyde	Eliminates bacteria in the water that produces corrosive by-products.	Disinfectant; Sterilizer for medical and dental equipment.
Breaker	Ammonium persulfate	Allows a delayed breakdown of the gel.	Used in hair coloring, as a disinfectant, and in the manufacture of common household plastics.
Corrosion inhibitor	N, n-dimethyl formamide	Prevents the corrosion of the steel pipe.	Used in pharmaceuticals, acrylic fibers and plastics.
Crosslinker	Borate salts	Maintains fluid viscosity as temperature increases.	Used in laundry detergents, hand soaps and cosmetics.

Table from Menghini, J. (2012)