



A Citizen's Guide to Fracturing

The Citizen's Guide Series

EPA uses many methods to clean up pollution at Superfund and other sites. If you live, work, or go to school near a Superfund site, you may want to learn more about cleanup methods. Perhaps they are being used or are proposed for use at your site. How do they work? Are they safe? This Citizen's Guide is one in a series to help answer your questions.

What is fracturing?

Fracturing is a way to crack rock or very dense soil, like clay, below ground. It is not necessarily a cleanup method in itself. Rather, fracturing is used to break up the ground to help other cleanup methods work better. The cracks, which are called *fractures*, create paths through which harmful chemicals can be removed or destroyed.

How does it work?

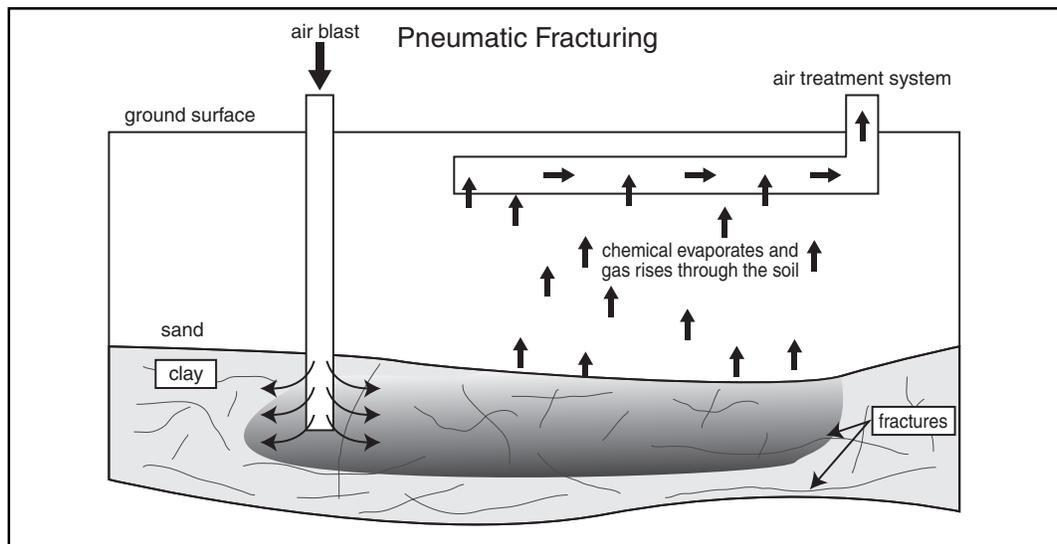
Harmful chemicals can travel deep below the ground surface. As a result, reaching the chemicals to clean them up can be difficult. Fracturing helps create paths through rock and dense soil to where the chemicals are located. Then the harmful chemicals can be pumped out of the ground through wells and treated (See *A Citizen's Guide to Pump and Treat* [EPA 542-F-01-025]). Or cleanup materials, like microbes and oxidants, can be pumped down into the polluted area to destroy the harmful chemicals (See *A Citizen's Guide to Bioremediation* [EPA 542-F-01-001] and *A Citizen's Guide to Chemical Oxidation* [EPA 542-F-01-013]). There are three ways to fracture soil and rock:

Hydraulic fracturing uses a liquid—usually water. The water is pumped under pressure into holes drilled in the ground. The force of the water causes the soil (or sometimes rock) to crack. It also causes existing fractures to grow larger. To fracture soil at greater depths, sand is pumped underground with the water. The sand helps prop the fractures open and keep them from closing under the weight of the soil.

Pneumatic fracturing uses air, to fracture soil. It also can help remove chemicals that *evaporate* or change to gases quickly when exposed to air. When air is forced into the soil, the chemicals evaporate and the gases are captured and treated above ground. (See the figure on page 2.)

Air can be forced into the ground at different depths within a hole. When air is forced near the ground surface, the surface around the holes may rise as much as an inch, but will settle back close to its original level. In both pneumatic and hydraulic fracturing, equipment placed underground directs the pressure to the particular zone of soil that needs to be fractured.





Blast-enhanced fracturing uses explosives, such as dynamite, to fracture rock. The explosives are placed in holes and detonated. The main purpose is to create more pathways for polluted groundwater to reach wells drilled for pump and treat cleanup.

Is fracturing safe?

When properly used, fracturing is a safe way to help cleanup methods work better. Before fracturing is used, EPA studies the site and tests the method to confirm it can work.

EPA does not conduct fracturing near underground pipelines or above-ground structures that can be damaged.

How long will it take ?

Fracturing rock and soil does not take very long. It may only take a few days. However, even with the help of fracturing, actual cleanup may take months or years. The time it takes to clean up a site depends on several factors:

- size and depth of the polluted area
- types and amounts of harmful chemicals present
- type of soil or rock
- cleanup method used



For more information

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Further information also can be obtained at www.cluin.org or www.epa.gov/superfund/sites.

Why use fracturing?

Fracturing is used to help reach chemicals in rock and dense soil so they can be cleaned up faster. It offers a way of reaching pollution deep in the ground where it would be difficult or costly to dig down so far. Fracturing can reduce the number of wells needed for certain cleanup methods, which can save time and reduce cleanup costs. Often fracturing is used to help clean up *non-aqueous phase liquids* or *NAPLs*—chemicals that don't dissolve readily in the groundwater. NAPLs are difficult to clean up where there are few fractures in the ground. Fracturing has been used in cleanups at many sites throughout the country.

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