



ADDITIVES
USED IN
FRACKING

As one of the worlds largest petrochemical companies, INEOS operates 65 manufacturing sites in 16 different countries. In the UK its sites are strictly Regulated by the Health Safety Executive (HSE), the Environment Agency (EA) and the Scottish Environmental Protection Agency (SEPA), under COMAH (Control Of Major Accidents Hazards) regulation. The company has a wealth of expertise in the safe use, handling and storing of chemicals and flammable, pressurised gases. Our sites operate to the highest environmental standards backed by sophisticated environmental systems and a strict monitoring and reporting regime. A clear priority on safety and high engineering standards means that INEOS brings something unique to this emerging industry.

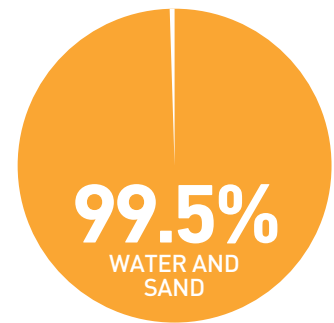


FRACTURE FLUID

Water	98%
Sand	1.5%
Chemicals	0.5%

CHEMICALS 0.5%

Gellant	0.32%
Acid	0.044%
Corrosion Inhibitor	0.032%
Friction reducer	0.032%
Clay Control	0.022%
Crosslinker	0.020%
Scale Inhibitor	0.015%
Breaker	0.013%
Iron Control	0.003%
Biocide	0.0006%



FRACKING FLUID IS 99.5% WATER AND SAND. THE OTHER 0.5% IS MADE UP OF BASIC ADDITIVES.

CHEMICAL ADDITIVES

Frack fluid is 99.5% water and sand and does not contain harmful concentrations of chemicals. Typically fewer than a dozen chemicals are used in a given mixture, these are dependent on the specific characteristics of the rock at each site. All chemical additives have to be disclosed and approved as safe by the Environment Agency or Scottish Environment Protection Agency. These additives are designed to improve the safety and performance of the frack, and typically include friction reducers, water purifiers, acids to dissolve minerals, and rust resistors to protect pipes. Many of these are found in higher concentrations in household items, or are used in the purification of our drinking water. All additives together account for less than half of one percent of the fluid. The additives used can include:



The additives in frack fluid are classified by the Environment Agency as non-hazardous in the proportions proposed.



GUAR GUM

Guar gum is used to thicken the water so that it can carry the sand more effectively. Guar is also used in cooking sauces, toothpaste and ice cream.



CROSSLINKERS

A crosslinker such as borate to maintain consistency of the fluid at temperature. Borate salts are used in soap and cosmetics.



BRINE

Brine, typically produced with potassium chloride. Potassium chloride is a low sodium table salt substitute.



SCALE INHIBITORS

Scale inhibitor such as ethylene glycol (0.01% of the fluid) to prevent scale. Ethylene glycol is used in antifreeze.



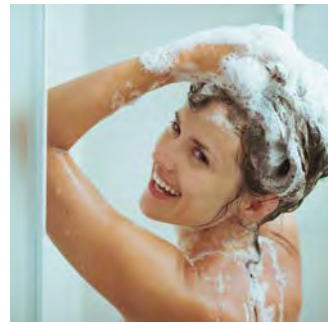
FRICTION REDUCERS

Friction reducers such as polyacrylamide allow the fluid to be pumped at a lower pressure than if water alone was used. Polyacrylamide is also used in water treatment and face creams.



HYDROCHLORIC ACID

Hydrochloric acid diluted to around 0.03% of the fluid is used to initiate cracks in the rock. Hydrochloric acid is used in food production, cleaning swimming pools, and is created naturally in the stomach.



BREAKERS

A breaker such as ammonium persulfate is used to maintain the consistency of the fluid. Ammonium persulfate is used in detergent and hair cosmetics. Isopropanol may also be used – this is used in antiperspirant.



CORROSION INHIBITORS

Corrosion inhibitors to prevent corrosion of the pipes and ensure the well stays sealed. Typically N,n-dimethyl formamide is used – used in pharmaceuticals. Citric acid may be used – used in food flavouring. Ammonium bisulfite – used in cosmetics and beverage production.



BIOCIDES

Biocides such as glutaraldehyde are used to prevent bacteria from forming. Glutaraldehyde is also used to sterilise medical and dental equipment.



ADJUSTING AGENTS

Adjusting agents typically use sodium carbonate to maintain the effectiveness of the other additives. Sodium carbonate is used in soap, water softener, glass and ceramics.

FURTHER FACTS:

■ **SEPA:** www.sepa.org.uk/customer_information/energy_industry/unconventional_gas/frequently_asked_questions.aspx

■ **Office of Unconventional Gas:** www.gov.uk/government/groups/office-of-unconventional-gas-and-oil-ougo

■ **DECC website:** www.gov.uk/government/organisations/department-of-energy-climate-change

■ **UKOOG:** www.ukoog.org.uk

■ **Frackland Blog:** www.frackland.blogspot.co.uk

■ **No Hot Air:** www.nohotair.co.uk/index.php/library

■ **ReFINE:** www.refine.org.uk

■ **Frac Focus:** www.fracfocus.org

■ **The Boom:** www.russellgold.net/books/the-boom

■ **US EPA:** www2.epa.gov/hydraulicfracturing

■ **PENN State University:** <http://stateimpact.npr.org/pennsylvania/tag/fracking/>

■ **Range Resources:** www.rangeresources.com

■ **CONSOL Energy:** www.consolenergy.com