

Disclosure of Hydraulic Fracturing Chemicals

Regulatory Requirement for Fracking
Chemicals

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Hydraulic fracturing, also known as fracking, allows the recovery hydrocarbons from unconventional sources, such as reserves located in low permeability formations (e.g. shale, tight sand). The extraction of oil or natural gas from unconventional sources can be achieved with the injection of a highly pressurised fluid-and-proppant mixture that will form fractures in the ground. These fractures are kept open with the help of a proppant, such as sand, to allow the hydrocarbons to flow in the well and be pumped out of the ground. Hydraulic fracturing is a highly debated topic, and some concerns exist about the possible injection of chemicals into the ground, and the nature of those chemicals. Understanding the role of chemicals used in hydraulic fracturing activities and the applicable regulatory frameworks is important to address those concerns. The following white paper provides an overview of chemicals used in hydraulic fracturing, followed by a description of the regulatory framework relevant to the use and disclosure of chemicals for hydraulic fracturing in Europe and in the USA.

1.0 Chemicals Used in Hydraulic Fracturing

Hydraulic fracturing fluids pumped into the wells are mainly composed of water (approximately 90%), proppants (approximately 8 to 9.5%) and chemicals (0.5 to 2%), which perform several functions (Figure 1, Table 1). The composition of those fluids is unique to every well, and it varies based on the geology of the area, characteristics of the well and production objectives (Maule et al. 2013; NOGPA 2012; Dundon et al. 2015).

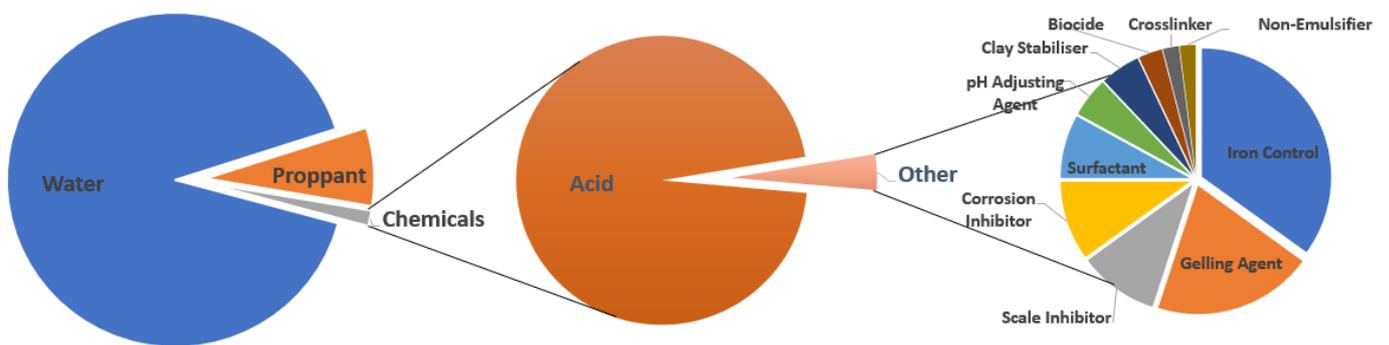


Figure 1. Example of Hydraulic Fracturing Fluid Composition
Source: Adapted from Gray Reed & McGraw LPP 2017

Table 1. Types of Chemicals Used in Hydraulic Fracturing

Chemical Type	Function	Examples of Chemicals Used
Acid	Prevent deposits, help dissolve minerals and initiate cracks in rock	Hydrochloric acid, citric acid, formic acid
Biocide	Prevent bacterial growth in the water, which can lead to corrosion of equipment and pipes	Glutaraldehyde, quaternary ammonium chloride
Clay Stabiliser	Prevents clay from swelling or shifting temporarily or permanently, by locking down clays in the shale structure	Sodium chloride, choline chloride
Corrosion Inhibitor	Prevents corrosion of pipes and product stabiliser	Methanol, acetaldehyde, isopropanol, formic acid
Crosslinker	Maintains fluid viscosity as temperature increases and product stabiliser	Potassium metaborate, boric acid, ethylene glycol, borate salts
Gelling Agent	Thickens water to suspend proppant (sand)	Guar gum, petroleum distillate, ethylene glycol
Iron Control	Prevents precipitation of metal oxides	Citric acid, acetic acid, thioglycolic acid
Non-Emulsifier	Prevent formation of emulsions in the fracture fluid and product stabiliser	Lauryl sulfate, isopropanol
pH Adjusting Agent	Adjust pH of fluid to maintain effectiveness of other components, such as crosslinkers	Sodium carbonate, potassium carbonate, sodium hydroxide, acetic acid
Scale Inhibitor	Prevent scale deposits in the pipes and in formation	Sodium acrylate, phosphoric acid salt
Surfactant	Increase viscosity of fracture fluid, reduce surface tension between rock and fluid and help improve fluid recovery from well after hydraulic fracturing activities	Ethoxylated alcohols, ethanol, naphthalene, isopropyl alcohol

(Sources : FracFocus 2018, NOGEPa 2012, Maule et al. 2013)

2.0 Chemical Disclosure Regulations for Hydraulic Fracturing

The regulatory framework for the use and disclosure of chemicals for hydraulic fracturing activities in the European Union (EU) and in the United States of America (USA) is summarised below.

2.1 Europe

In January 2014, the European Commission issued a Recommendation on mining principles for the exploration and production of hydrocarbons (such as shale gas) using high-volume hydraulic fracturing (2014/70/EU). The Commission recognises that Member States can determine the conditions for extracting energy resources, provided that they respect the need to protect the environment. Article 7 of this Recommendation outlines the general and environmental EU legislation that applies to hydraulic fracturing activities. The key frameworks that are relevant for the use and disclosure of chemicals are the following:

- **Water Framework Directive (2000/60/EC)**
Under the Water Directive Framework, hydraulic fracturing operators must obtain authorisation if water is required to be taken from a ground source, either temporarily or

permanently. In addition, this framework prohibits direct discharge of pollutants into groundwater.

- **Groundwater Directive (2006/118/EC)**

The Groundwater Directive was developed in response to requirements of Article 17 of the Water Framework Directive. The Directive outlines groundwater provisions which require Member States to implement measures to prevent or limit the input of pollutants into groundwater.

- **Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) (Regulation (EC) No 1907/2006)**

Under REACH, all chemicals manufactured or imported in volumes of more than one tonne per year must be registered. For each substance registered, a technical dossier which provides information on the properties and hazards of the substance must be submitted. To be in compliance with REACH, companies must identify and manage risks linked to the substances, while demonstrating to the European Chemicals Agency (ECHA) how the substances can be used safely. ECHA provided guidance on how to report substances used in hydraulic fracturing under REACH.

- **Biocidal Products Regulation (BPR) (Regulation (EU) No 528/2012)**

The BPR applies to all biocidal products that are made available on the European market. All biocidal products require an authorisation before they can be placed on the market, provided that all of the active substances included in the product have been previously approved. This requirement applies to any biocidal products that are used in hydraulic fracturing fluids.

The EU's environmental frameworks listed above were developed before the implementation of high-volume hydraulic fracturing projects in Europe. Therefore, some information within the current frameworks, such as the disclosure of chemical information, is not comprehensively addressed. However, the 2014 Recommendation provides minimum principles which must be met to support Member States who wish to carry out hydraulic fracturing activities while ensuring that the public is informed and that public health and the environment are safeguarded. Article 10.1 of the Recommendation stipulates that Member States are responsible to ensure that the use of chemical substances is minimised, and that manufacturers, importers and downstream users of chemicals used in hydraulic fracturing identify this use when complying with their REACH obligations. In accordance with Article 15(a), each Member State is responsible to ensure that operators publicly disseminate information on chemical substances used, including CAS numbers of all substances, safety data sheets and substance's maximum concentration in the fracturing fluid.

Implementing the EU legislative framework in the UK

The United Kingdom Onshore Oil and Gas (UKOOG) is an organisation representing the oil and gas industry, and has issued guidelines covering best practices for shale well operations in the UK. These guidelines include recommendations related to fracturing fluids and water management, where it is recommended that chemical additives be disclosed on the UKOOG website for every well (UKOOG 2016). However, those guidelines do not constitute a regulatory requirement.

Before operating a well, operators must receive authorisations from the planning and environment agencies. As part of the permitting process, operators are required to carry out an environmental risk assessment (ERA) to assess human health and environmental risks associated with the hydraulic fracturing operations. This ERA should include a list of chemicals to be used and a characterisation of their potential environmental and human health hazards (DECC 2015). To

support the EU Groundwater Directive, the Joint Agencies Groundwater Directive Advisory Group (JAGDAG) issued a guidance document which outlines the recommended methodology to determine whether substances are considered hazardous in relation to groundwater (JAGDAG 2012). The Environment Agency uses this guidance to assess substances and publish a list of substances considered hazardous, which should be considered when conducting an ERA and which is used to issue permits for all new activities that may lead to the discharge of hazardous substances to groundwater (UK Environment Agency 2017).

As a summary, the implementation of the 2014 EU Recommendation in the UK is being implemented by the various regulatory agencies, advisory groups and is supported by industry associations.

2.2 USA

Currently, hydraulic fracturing is exempt of most federal regulations in the USA, including the Safe Drinking Water Act (SDWA) and the Clean Water Act (CWA) (Maule et al. 2013; Callies 2015). There is a federal requirement for reporting release of hazardous and toxic chemicals through the Emergency Planning and Community Right to Know Act (EPCRA) and the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA). Pursuant to EPCRA, facilities meeting certain threshold requirements, hydraulic fracturing operators, must make information about on-site chemicals and Material Safety Data Sheets (MSDS) available to the public. Hydraulic fracturing operations do not typically meet the requirements for EPCRA reporting, however some of the chemicals used in hydraulic fracturing are classified as hazardous under CERCLA, which requires that releases of hazardous chemicals, such as hydrochloric acid, into the environment are reported (US EPA 2018).

In 2017, the Fracturing Regulations are Effective in State Hands (FRESH) Act (S. 334) was introduced to guarantee that states have exclusive authority to regulate hydraulic fracturing activities within state boundaries. This bill is currently in the United State Congress and must be passed by the House and Senate, and then signed by the President to become law (US Congress 2017). The FRESH Act was previously introduced in 2012, 2013 and 2015, but was not enacted. However, with the anticipation of the potential enactment of the FRESH Act, many states have implemented fracturing disclosure laws. Reviews of several State Laws have noted the range of disclosure requirements, including whether the information is made available to the public, what information is disclosed and options for maintaining some of the chemical composition confidential (Konschnik and Dayalu 2016; Dundon et al., 2015; Callies 2015; Murrill and Vann 2012).

For example, Texas enacted the Hydraulic Fracturing Chemical Disclosure Rule, which requires disclosure of hydraulic fracturing chemicals on a public chemical disclosure platform, FracFocus, and in filings to the regulatory authority (Texas Railroad Commission). However, provisions for confidentiality and trade secret protection are embedded in the legislation, which allows operators to maintain the identity of certain chemicals secret, provided that the chemical family of the substance is provided. In other states, such as West Virginia and Michigan, there are no trade secret provisions in the State disclosure law (Murrill and Vann 2012; Maule et al. 2013, Gray Reed & McGraw LPP 2017).

The FracFocus platform was created in 2011, by the Groundwater Protection Council and the Interstate Oil and Gas Compact to make well-specific information on reported chemicals accessible to the public. Although it was initially created as a voluntary disclosure tool, the website is now used

by more than 20 states as the information system required or recommended for chemical disclosure, through the implementation of state laws for hydraulic fracturing fluids (Konschnik and Dalayu 2016; FracFocus 2018, ALEC 2016). As of May 2018, there is currently data available on more than 125,000 registered wells in the USA (FracFocus 2018).

3.0 Summary and Recommendations

A small percentage of chemicals is present in hydraulic fracturing fluids. Those chemicals fulfil various functions, and the fluid composition is generally unique to every well. Hydraulic fracturing activities are subject to several environmental and chemical legislations and operators must comply with applicable legislation in the jurisdiction in which they operate. In the EU, there are several environmental and chemical laws that apply, chemical disclosure delegated to Member States through the 2014 Recommendation. In contrast, in the USA, hydraulic fracturing is exempt from most federal environmental legislation, and therefore, several states have been implementing their own legislation, including disclosure laws.

The EU and USA regulatory frameworks result in varying levels of chemical information disclosure in EU Member States and in various States across the USA. As a best practice, it is recommended that chemical manufacturers disclose the composition of hydraulic fracturing chemicals to operators through the safety data sheets, to support operators in meeting applicable regulatory requirements. At a minimum, the list of chemical substances used with associated CAS numbers, function and substance's maximum concentration in the fluid should be made available. Operators should be aware of chemical disclosure requirements in the jurisdiction(s) in which they operate, and provide the relevant information to regulatory agencies, and the public, as required.

For more information, contact

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