Disclosure of the Chemicals Used in Frac Fluids – What is Going On?

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GWPC UIC Meeting

Houston, TX

January 23-25, 2012

Veil Environmental, LLC

Topics for Discussion

- Disclosure of chemicals used in frac fluids
- Frac Focus website
- Federal activities
- State activities

The Ubiquitous Legacy of a Little-Known Substance

Hazards of DHMO

- Death due to accidental inhalation of DHMO, even in small quantities.
- Prolonged exposure to solid DHMO causes severe tissue damage.
- Excessive ingestion produces a number of unpleasant though not typically life-threatening side-effects.
- DHMO is a major component of acid rain.
- Gaseous DHMO can cause severe burns.
- Contributes to soil erosion.
- Leads to corrosion and oxidation of many metals.
- Often associated with severe weather events, such as thunderstorms and tsunamis.

Source: www.dhmo.org

What Is the Government Doing about DHMO?

- Even though the EPA, FDA, DHS, NOAA and other federal agencies are fully aware of DHMO, there is insufficient publicity of the potential risks
- State governments are not doing anything better about DHMO.
- **Could this be a sign of a government conspiracy?**

DHMO in Hydraulic Fracturing

- DHMO has been used in hundreds of thousands of frac jobs
- Frac companies have blatantly admitted that they are using DHMO, yet they continue to get away with it!

What Is This Mysterious Substance?

- DHMO = dihydrogen monoxide
- Also known as hydrogen hydroxide, hydronium hydroxide, or simply hydric acid

Chemical formula = H_2O

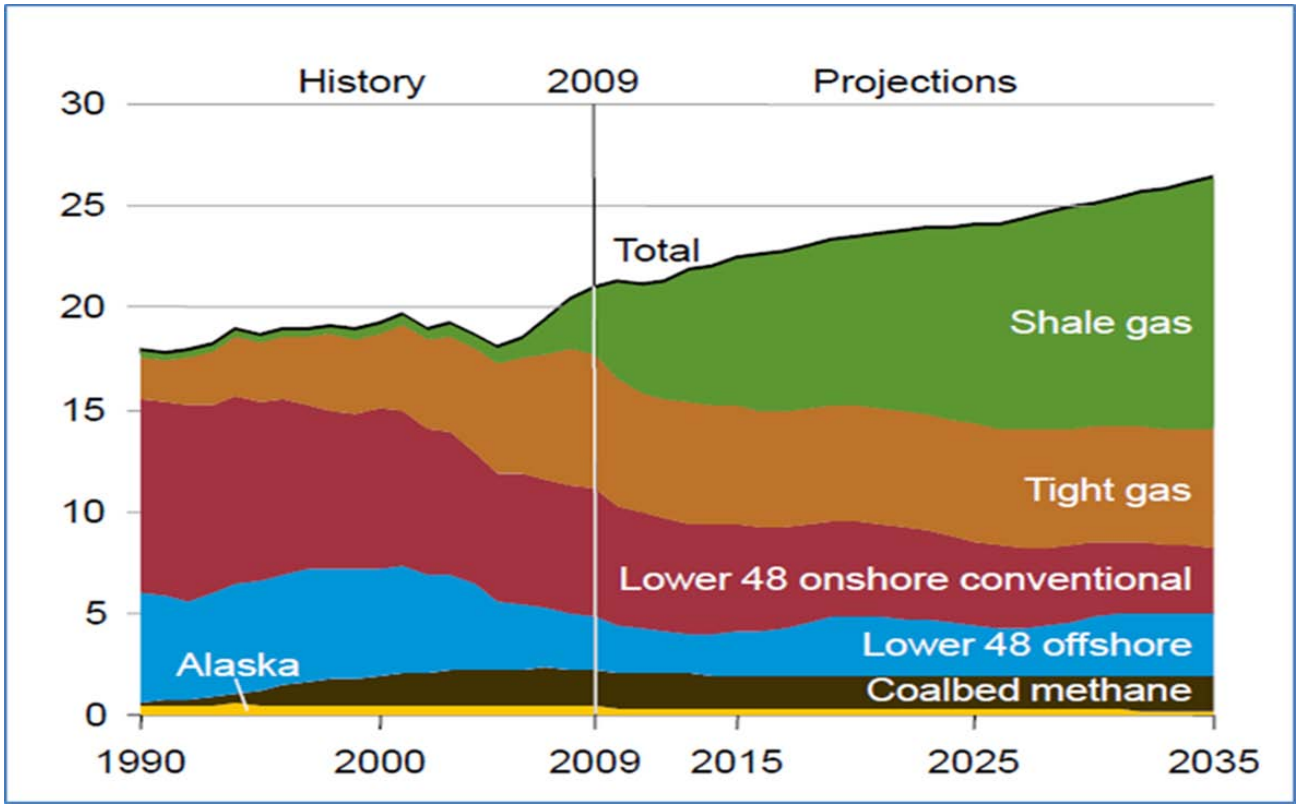
Water

Historical Trivia about Fracturing

- First U.S gas well drilled in 1825 in Fredonia, NY
- First frac job (not hydraulic) in 1858 in Fredonia
  - Used black powder in multiple stages
- Ohio used nitroglycerin to crack rock
- First commercial hydraulic fracturing job took place in 1949 in Velma, OK
- First hydraulic fracturing (HF) of gas shale formations began in the 1980s in the Barnett Shale in Texas
- Use of nuclear explosions for fracturing
  - Project Gasbuggy exploded nuclear device in NM in 1967
    - Resulting gas was too radioactive to use
  - Later tests (Project Rulison and Rio Blanco) did not show good results either

Why Is HF Used?

- Creates a network of cracks in an otherwise dense rock
- Allows natural gas to flow from source rock to a collection well
- Most, if not all, shale gas wells must be fracced in order to produce economic quantities of gas
- Without HF, shale gas goes away



Source: DOE/EIA Annual Energy Outlook 2011

Disclosure of Chemical Additives

- One of the most contentious issues surrounding HF is that companies have not historically shared detailed information with regulators or the public on which chemicals are actually used in frac jobs
- Even if the chemicals used are not harmful, the public has concerns over the unknown and does not trust the industry to safeguard them
- Type of information wanted:
  - Name of chemical
    - Trade name (e.g., Belieu Chemicals 458R)
    - What is really in it (e.g., polymer, water, mineral spirits)
  - Why it is used (e.g., prevent scale formation)
  - How much is used in that well
    - total quantity (gallons, lbs)
    - Concentration (ppm, mg/L)
  - Is it harmful to human health?

Material Safety Data Sheets (MSDSs)

- The Occupational Safety and Health Administration (OSHA) requires an MSDS for any product that contains hazardous or carcinogenic materials of specific threshold values (1.0% and 0.1% respectively) but not for all chemical products. Some products have multiple ingredients, some of which are considered hazardous or carcinogenic chemicals, while other ingredients are considered nonhazardous or inert.
- Persons reading MSDSs may find that less than 100% of the ingredients are listed on the MSDS.
  - Often when a chemical is diluted with water to make a final product, the water is not listed on the MSDS
  - There will be occasions where the additive supplier will claim a particular ingredient is a “trade secret”. The trade secret claim may apply to the name of the ingredient or its concentration in the additive or both.

Example MSDS

- Selected sections of the MSDS for NALCO EC 6116A are shown here

NALCO

SAFETY DATA SHEET

PRODUCT

EC6116A

EMERGENCY TELEPHONE NUMBER(S)
(800) 424-9300 (24 Hours) CHEMTREC

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME :	EC6116A
APPLICATION :	BIOCIDE
COMPANY IDENTIFICATION :	Nalco Company 1601 W. Diehl Road Naperville, Illinois 60563-1198
EMERGENCY TELEPHONE NUMBER(S) :	(800) 424-9300 (24 Hours) CHEMTREC

NFPA 704M/HMIS RATING
HEALTH : 3 / 3* FLAMMABILITY : 1 / 1 INSTABILITY : 1 / 1 OTHER :
0 = Insignificant 1 = Slight 2 = Moderate 3 = High 4 = Extreme * = Chronic Health Hazard

2. COMPOSITION/INFORMATION ON INGREDIENTS

Our hazard evaluation has identified the following chemical substance(s) as hazardous. Consult Section 15 for the nature of the hazard(s).

Hazardous Substance(s)	CAS NO	% (w/w)
Dibromoacetonitrile	3252-43-5	1.0 - 5.0
2,2-Dibromo-3-nitrilopropionamide	10222-01-2	10.0 - 30.0
Polyethylene Glycol	25322-68-3	30.0 - 60.0

9. PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE	Liquid
APPEARANCE	Clear Colorless Amber
ODOR	Mild, Disinfectant
SPECIFIC GRAVITY	1.20 - 1.30 @ 73 °F / 23 °C
DENSITY	10.0 - 10.8 lb/gal
SOLUBILITY IN WATER	Complete
pH (100 %)	1.5 - 5.0
VISCOSITY	138 cps @ 68 °F / 20 °C
POUR POINT	-49 °F / -45 °C
FREEZING POINT	-58 °F / -50 °C
BOILING POINT	> 158 °F / > 70 °C Decomposes
VAPOR PRESSURE	< 0.1 mm Hg @ 70 °F / 21 °C
VOC CONTENT	9.85 % EPA Method 24

Chemical Disclosure Registry

- MSDSs provide some but not necessarily all of the information that regulators and the public want or need
- In April 2011, the Ground Water Protection Council and the Interstate Oil and Gas Compact Commission opened a new online system to host information about the chemical additives used in frac fluids and their ingredients
  - Data entry is voluntary and is done by the gas companies
- Any interested person can visit the website and search for data on a specific well
- As of January 19, 2012, data had been entered on more than 10,100 wells representing 69 companies

www.fracfocus.org

Frac Focus Homepage

Example of Registry Record for Well in Texas

Trade Name	Supplier	Purpose	Ingredients	Chemical Abstract Service Number (CAS #)	Maximum Ingredient Concentration in Additive (% by Mass)**	Maximum Ingredient Concentration in HF Fluid (% by Mass)**
Fresh Water		Carrier/Base Fluid				88.91745%
Sand (Proppant)		Proppant				10.21351%
Acid, Hydrochloric 15pct	SCHLUMBERGER TECHNOLOGY	Acid	Hydrogen Chloride	007647-01-0	15.00%	0.10746%
L058	SCHLUMBERGER TECHNOLOGY	Iron Control Agent	Sodium Erythorbate	006381-77-7	100.00%	0.00062%
A264	SCHLUMBERGER TECHNOLOGY	Corrosion Inhibitor	Methanol (Methyl Alcohol)	000067-56-1	40.00%	0.00099%
			Aliphatic acid	N/A	30.00%	0.00074%
			Aliphatic alcohols, ethoxylated # 1	N/A	30.00%	0.00074%
			Propargyl Alcohol (2-Propynol)	000107-19-7	10.00%	0.00025%
SCALETROL 7208	BJ SERVICES COMPANY U S A	Scale Inhibitor	Ethylene Glycol	000107-21-1	25.00%	0.00483%
			Diethylene Glycol	000111-46-6	5.00%	0.00097%
ALPHA 114	BJ SERVICES COMPANY U S A	Anti-Bacterial Agent	Glutaraldehyde (Pentanediol)	000111-30-8	15.00%	0.00271%
			Dimethyl benzyl ammonium chloride	000139-08-2	5.00%	0.00090%
J580	SCHLUMBERGER TECHNOLOGY	Gelling Agent	Carbohydrate polymer	N/A	100.00%	0.01305%
	GY					
B315	SCHLUMBERGER TECHNOLOGY	Friction Reducer	Petroleum Distillate Hydrotreated Light	064742-47-8	30.00%	0.00797%
			Aliphatic alcohol polyglycol ether	N/A	1.50%	0.00040%
J218	SCHLUMBERGER TECHNOLOGY	Breaker	Ammonium Persulfate	007727-54-0	100.00%	0.00037%
J532	SCHLUMBERGER TECHNOLOGY	Cross Linker	Aliphatic polyol	N/A	40.00%	0.00017%
			Sodium Tetraborate (Sodium Tetraborate Decahydrate)	001303-96-4	30.00%	0.00013%

Chesapeake Well, Bing 2H, Tarrant County, Texas (Frac Date 3/21/11)

Federal Legislative/Regulatory Actions on HF

- Hydraulic fracturing is considered by the industry and by state regulatory agencies as part of the drilling process and not an Underground Injection Control (UIC) activity
- In a series of court cases more than a decade ago (LEAF vs. EPA), an NGO challenged Alabama over not requiring UIC permits for frac jobs
- The Energy Policy Act of 2005 included language that clearly excluded hydraulic fracturing from the UIC program
  - Nicknamed the "Halliburton loophole"
- In 2009, bills were introduced into both the House and Senate that would remove the 2005 language and require that hydraulic fracturing be covered by a UIC permit and require disclosure of the chemicals used in frac fluids
  - House bill HR 2766
  - Senate bill S 1215
  - Neither bill passed

Federal Legislative/Regulatory Actions on HF (2)

- In 2011, similar bills were introduced into both the House and Senate House bill
  - HR 1084
  - S 587
  - Neither bill has moved yet
- EPA study on HF and drinking water
- DOE Secretary of Energy Advisory Board studies
- Dept of Interior
  - 10/11 - announces that it plans to issue a proposal soon requiring companies to reveal the chemicals they use in HF when working on federal lands
  - 1/12 – BLM's Michael Nedd indicates that a proposal may be out in the next few months

EPA National Study on HF and Drinking Water

- Early 2010 – Congress urges EPA to undertake study of relationship between hydraulic fracturing (HF) and drinking water
- 4/10 – EPA's Science Advisory Board (SAB) meets in DC to discuss the scope of the project
- 7/10 – EPA recognizes that SAB has inadequate familiarity with HF and solicits nominations for an expert panel to assist SAB
- 1/11 – EPA announces membership of expert panel
  - Nearly all are from academia
- 2/11 – EPA releases draft study plan for HF study
- 3/11 – EPA holds series of 4 technical workshops to collect more information to support study
- 6/11 – EPA announces 7 study sites
- 11/11 – final study plan released
- Study to be completed in phases
  - Initial research results are expected by the end of 2012 with a goal for a final report in 2014

EPA Study on Well Contamination in Pavillion, WY

- 12/11 – EPA (ORD and Region 8) issued a draft report of its investigations into drinking water well contamination in a shallow gas field in Pavillion, WY
  - EPA conducted four sampling events between March 2009 and April 2011.
  - Ground water samples were collected from domestic wells and two municipal wells in the town of Pavillion
  - Detection of high concentrations of benzene, xylenes, gasoline range organics, diesel range organics, and total purgeable hydrocarbons in ground water samples from shallow monitoring wells near pits indicates to EPA that pits are a source of shallow ground water contamination in the area of investigation
  - Evaluation of deeper monitoring wells suggests to EPA that inorganic and organic constituents associated with hydraulic fracturing have contaminated ground water at and below the depth used for domestic water supply
- If the data and conclusions are correct, this would be the first documented case in which hydraulic fracturing directly contaminated drinking water
- Industry immediately objected to the study suggesting that data collection may not have been done accurately and that the gas formations at Pavillion are atypical and much shallower than the gas shale formations that are the subject of most of the national fraccing attention
- Stay tuned

DOE – Secretary of Energy Advisory Board Natural Gas Subcommittee

- Formed in 5/11
- Consists of 7 senior-level members who have extensive experience in national policy issues
- Two responsibilities:
  - Identify, within 90 days, any immediate steps that can be taken to improve the safety and environmental performance of fraccing
  - Develop, within six months, consensus recommended advice to the agencies on practices for shale extraction to ensure the protection of public health and the environment
- 8/11 - Initial report submitted
- 11/11 – 180-day report submitted

State Legislative/Regulatory Actions on HF

- Contrary to media reports, most states already had regulations or policies in place to oversee HF
  - Some regulate it separately
  - Some include it as part of drilling and well completion permitting
  - Alabama had developed UIC regulations for HF nearly a decade ago as an outcome of the LEAF vs. EPA lawsuits
  - Many require, at a minimum, submittal of MSDSs
- In the absence of conclusive federal activity on chemical disclosure requirements, several states have moved forward to establish new regulatory programs relating to HF and chemical disclosure

States with Regulations Concerning Public Disclosure of Frac Fluid Ingredients

- Regulations already adopted
  - Arkansas
  - Colorado
  - Louisiana
  - Michigan
  - Montana
  - Pennsylvania
  - Texas
  - Wyoming
- Proposed Regulations
  - California (proposed 2011, but stalled)
  - Nebraska (proposal soon)
  - New Mexico (proposed by industry association)
  - New York
  - North Dakota
  - Oklahoma (proposal soon)

Sources of Information for State HF Regs

- www.fracfocus.org
  - Ground Water Protection Council (GWPC) and Interstate Oil and Gas Compact Commission (IOGCC)
- http://groundwork.iogcc.org/topics-index/hydraulic-fracturing/hydraulic-fracturing-regulations

Conclusions

- Shale gas is an important contributor to the U.S. oil and gas market
  - Its importance and proportional contribution is growing yearly
- Nearly all shale gas is produced using horizontal wells that each must undergo HF
- The HF process involves lots of water and sand plus various chemical additives that allow for more productive and safer operations
- Historically, the industry has not disclosed that names of chemicals used, their ingredients, nor the concentrations/quantities used
- In April 2011, the GWPC and IOGCC opened the FracFocus website that allows gas producers to enter the frac chemical ingredients and quantities into a public website
- Federal legislative actions have not been finalized yet
- States have taken the lead on chemical disclosure
  - 8 states have adopted regulations
  - At least 6 other states now have proposed regulations under review