



BLM Forum: Hydraulic Fracturing

**Mike Eberhard,
Technical Professional Manager,
Rockies**

**Denver, Colorado
April 25, 2011**

HALLIBURTON

Halliburton Overview: 2010

Contributions to the state of Colorado

- \$96 million paid in wages
- \$3.7 million paid in payroll tax
- \$642,000 paid in property tax
- \$111 million spent with local suppliers
- 25% of that spend with small and diverse suppliers
- Nearly \$100,000 in Company charitable contributions

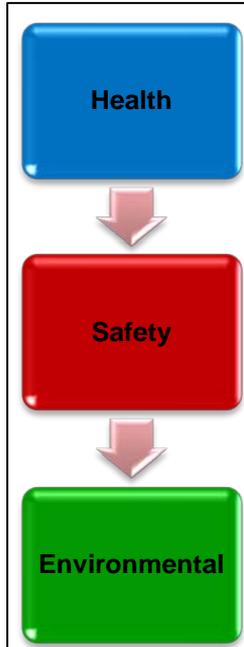
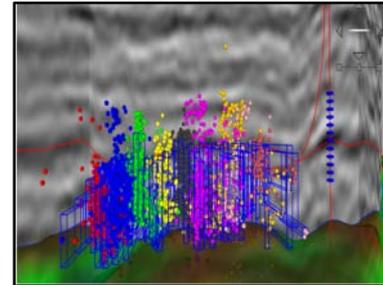
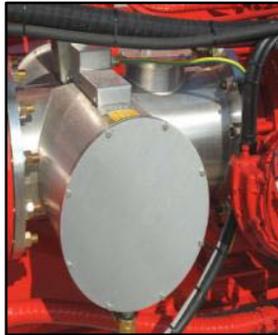
**CO 2010
FAST
FACTS**



Approx. data as of Dec. 31, 2010

Environmental Technology Evolution

CleanSuite™ System of Advancements



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Hydraulic Fracturing

An "overnight" triumph of science and engineering, 60-plus years in the making. Today, it's being used to redefine what's possible in accessing clean-burning energy resources deep underground. What will it help us do tomorrow? Click around to find out.

Hydraulic Fracturing 101

Sand, water and pressure: the basic components of building a great sandcastle, and the same ones being used today to spur a revolution in the way Americans access and utilize clean-burning energy resources confined deep underground.

At the forefront of this revolution is a technology known as hydraulic fracturing, a well stimulation practice first pioneered by Halliburton in the 1940s —

In-Focus: What's in the Fluids?

Even though sand and water typically comprise more than 99.5 percent of the fluid system used in fracturing, getting that fluid to formations thousands of feet underground requires advanced chemistry and engineering to do things like:

- Fight the growth and buildup of bacteria in the fluid and the wellbore.

CleanSuite™ Technologies

Halliburton invests considerable time, energy and resources in engineering solutions that set new standards for environmental safety — all while helping our customers do more by using less.

- CleanStim™ Formulation, a fracture fluid system comprised of materials sourced entirely from the food industry.



Fluid Technology

CleanStim™ Formulation

Sand, water, pressure and ... food? Meet Halliburton's new CleanStim™ formulation, a first-of-its-kind fracturing system made from materials sourced entirely from the food industry.



Hydraulic Fracturing Microsite

Mechanical Solutions

CleanStream® Service

Controlling the growth of bacteria is key to promoting the flow of energy and preventing corrosion. Thanks to CleanStream® service, now it's a job that can be done by using UV-light instead of additives.



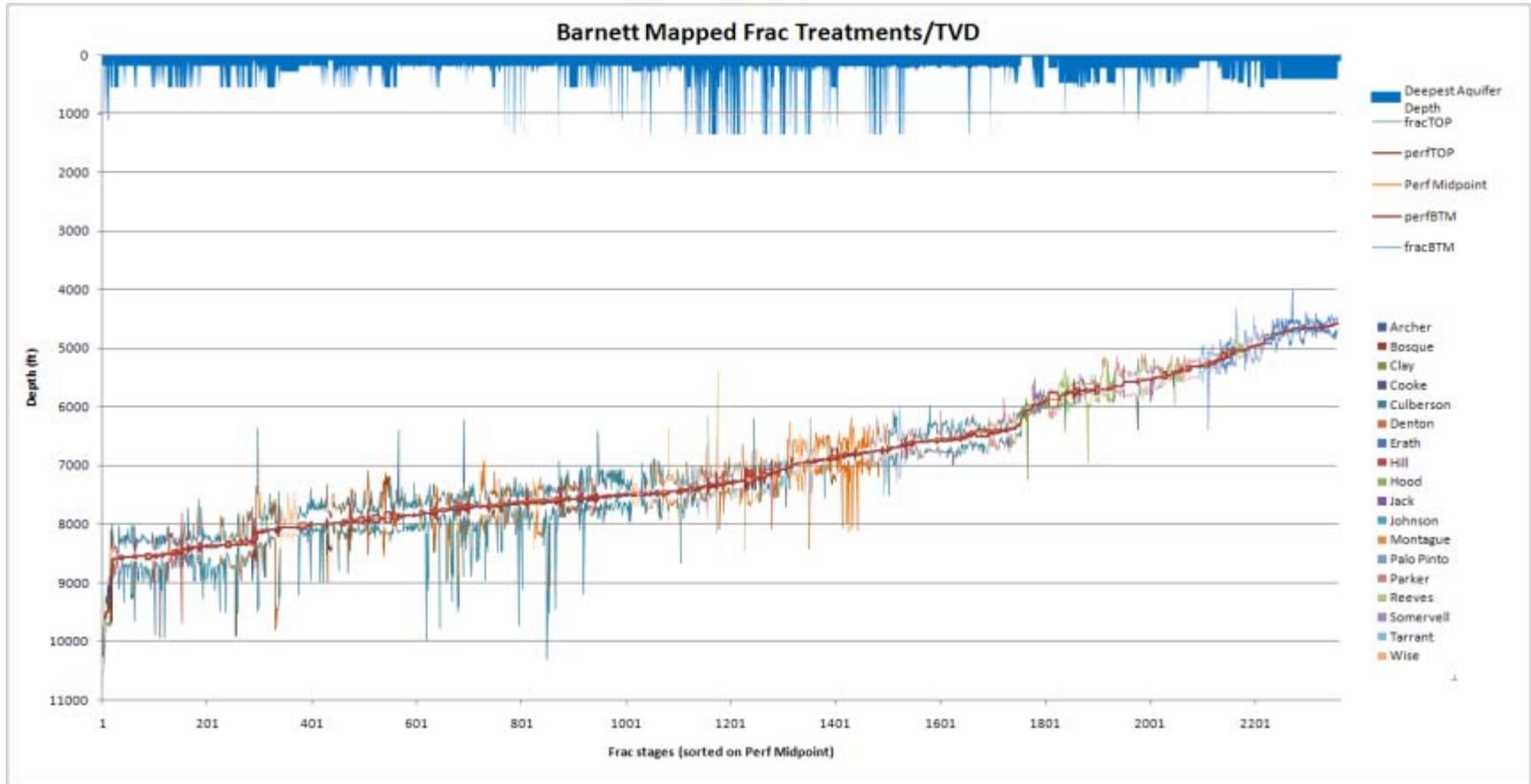
Fracture Optimization

Fracture Mapping

Halliburton's advanced Fracture Mapping service allows our customers to access real-time, three-dimensional data on the direction, height and distance of fractures below.



Fracture Height Determination Barnett



Kevin Fisher, "Data Confirm Safety of Well Fracturing"
The American Oil & Gas Reporter – July 2010

Water Management

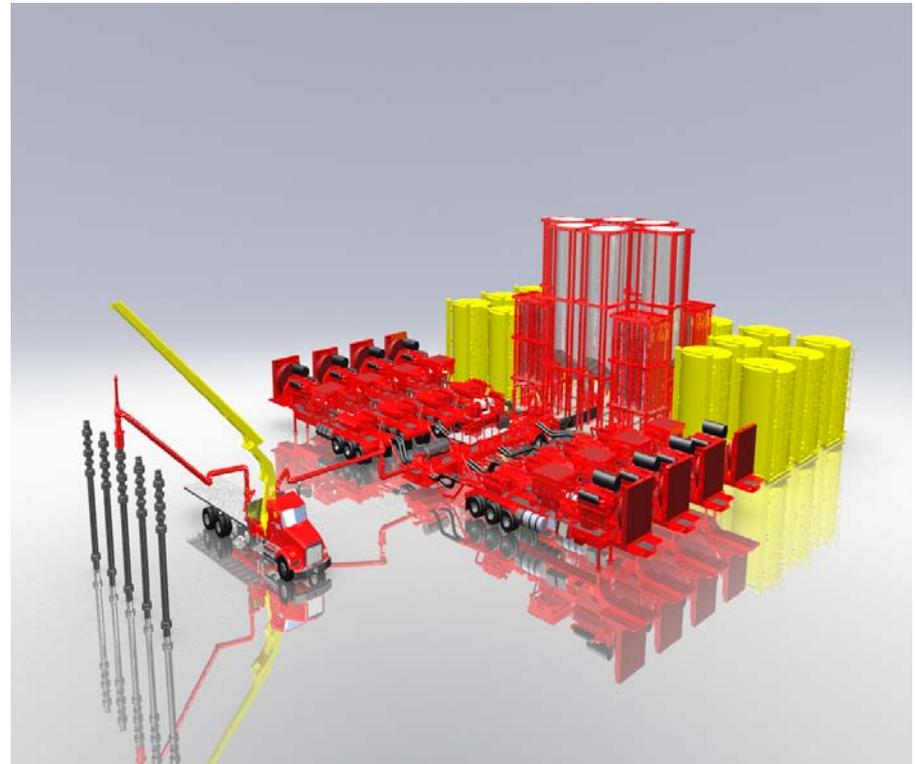
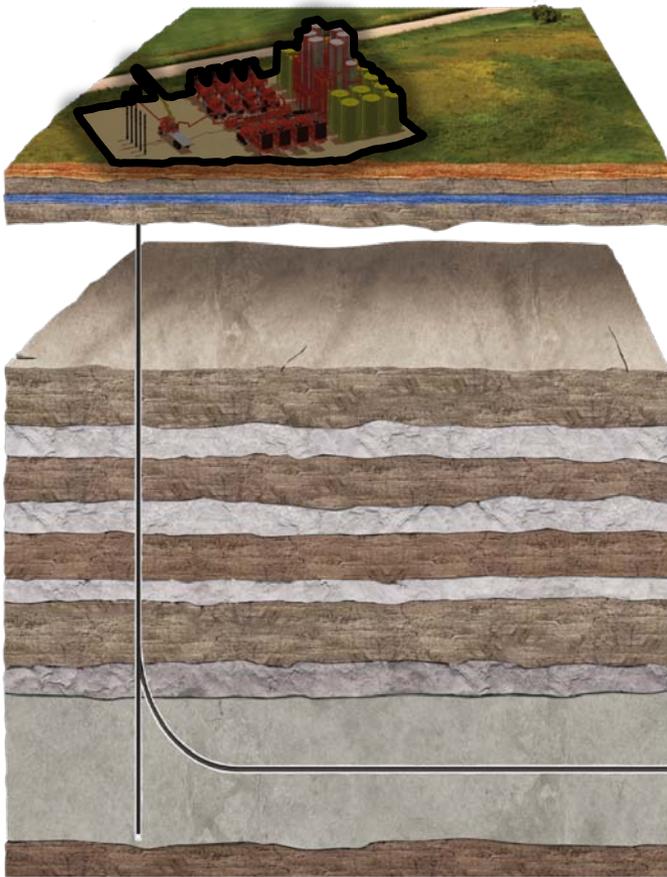
CleanWaveSM Water Treatment System

A new water treatment service that goes where our customers go – and helps them recycle their water while it's there



Footprint

Reinventing Delivery Mechanisms



Public Access to Well-Specific Chemical Data

- New U.S. online database offering standard reporting format for all operators to disclose hydraulic fracturing chemicals used on a well-specific basis
- Public access with search options
- Educational material
- Halliburton fully supports and participates in this registry
- <http://fracfocus.org/>

| Hydraulic Fracturing Fluid Product Component Information Disclosure | | | | | | | |
|---|------------------|------------------|--|--|--|--|----------|
| Fracture Date: | 1/26/2011 | | | | | | |
| State: | Texas | | | | | | |
| County: | Wheeler | | | | | | |
| API Number: | 42-483-33102 | | | | | | |
| Operator Name: | Apache Corp | | | | | | |
| Well Name and Number: | Stiles 16 #1016H | | | | | | |
| Longitude: | -100.090508 | | | | | | |
| Latitude: | 35.459572 | | | | | | |
| Long/Lat Projection: | NAD27 | | | | | | |
| Production Type: | Gas | | | | | | |
| True Vertical Depth (TVD): | 13,651 | | | | | | |
| Total Water Volume* (gal): | 6,224,064 | | | | | | |
| Hydraulic Fracturing Fluid Composition: | | | | | | | |
| 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)** | Comments |
| Water | BHI | Carrier | Water | 7732-18-5 | 100.00% | 93.89335% | |
| Prime Plus | BHI | Proppant | Quartz (SiO2) | 14808-60-7 | 100.00% | 5.33749% | |
| Mineral Oil | BHI | Solvent | Mineral Oil | 8042-47-5 | 100.00% | 0.01149% | |
| GBW-5 | BHI | Breaker | Ammonium Persulfate | 7727-54-0 | 100.00% | 0.00918% | |
| Alpha 1427 | BHI | Biocide | Glutaraldehyde | 111-30-8 | 30.00% | 0.00469% | |
| | | | Quaternary Ammonium Chloride | 7173-51-5 | 10.00% | 0.00156% | |
| | | | Alkyl Dimethyl Benzyl Ammonium Chloride (C12-16) | 68424-85-1 | 7.00% | 0.00109% | |
| | | | Ethanol | 64-17-5 | 5.00% | 0.00078% | |
| ClayCare | BHI | Clay Control | Water | 7732-18-5 | 60.00% | 0.00937% | |
| | | | Choline Chloride | 67-48-1 | 75.00% | 0.07684% | |
| FRW-20 | BHI | Friction Reducer | Water | 7732-18-5 | 30.00% | 0.03073% | |
| | | | Hydrotreated Light Distillate | 64742-47-8 | 30.00% | 0.03527% | |
| NE-900 | BHI | Non-emulsifier | Methanol | 67-56-1 | 30.00% | 0.01406% | |

Hydraulic Fracturing Microsite

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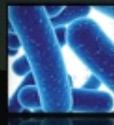
Fluids Disclosure

Fracturing 101

Glossary

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In Focus: What's In The Fluids?



We are providing information about the additives that go into our fracturing solutions along with the chemical constituents that comprise the additives. Ultimately, we plan on providing data to more states.

- + Pennsylvania Water Frac Formulation
- + Pennsylvania Hybrid Frac Formulation
- + Northeast Foam Frac Formulation

+ Click the plus sign to explore disclosure

Halliburton pioneered fracturing technology in the mid-1940s, and has always supported and complied with state and federal requirements promoting disclosure of additives that typically comprise less than one-half of 1percent of our solutions.

Much of this information has been available to the public for quite a while – although it tends to be hard to find and even tougher to understand. This site aims to change that by providing the additives in our fracturing solutions, listing the constituents and combining some of them into a more comprehensive list of industrial uses.

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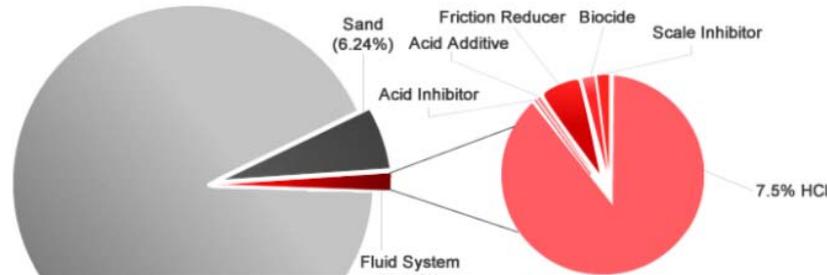
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Additives

[Additives](#) | [Overall Percentage](#) | [Constituents](#)

| Product Name | Additive | Purpose | Concentration | U.S. MSDS |
|--------------|---------------|--|------------------|---|
| BE-9 | Biocide | Prevents or limits growth of bacteria that can cause formation of hydrogen sulfide and can physically plug flow of oil and gas into the well | 0.3 gal/1000 gal |  |
| FE-1A | Acid Additive | | | |

Overall Percentage



Constituents

[Additives](#) | [Overall Percentage](#) | [Constituents](#)

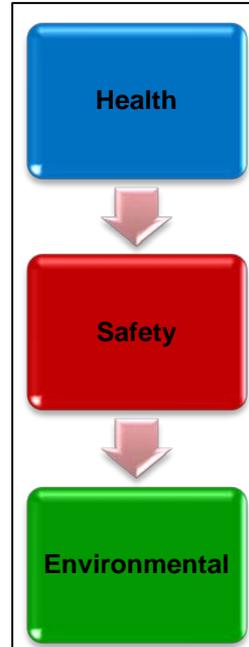
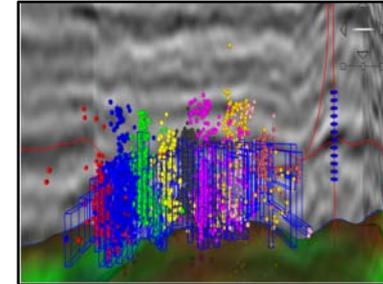
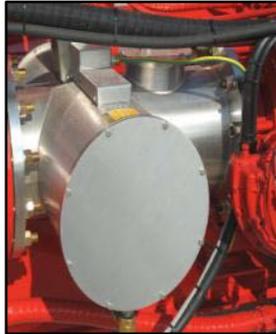
Constituents are the individual components used to form the additives described above.

In the table below, we identify these associated components, disclose their specific Chemical Abstracts Service (CAS) identification numbers, and list several prominent common uses for each.

| Constituent Name | Generic Name | CAS Number | Common Use | Hazardous as Appears on MSDS |
|--|---------------------------|------------|--|------------------------------|
| Acetic Acid | Organic Acid | 64-19-7 | Processed Fruit, Cheese, Meat and Poultry | Yes |
| Acetic Anhydride | Anhydride | 108-24-7 | Agricultural Microbiocide Agent | Yes |
| Acetophenone, Thiourea, Formaldehyde Polymer | Modified Thiourea Polymer | 68527-49-1 | Industrial Acid Corrosion Inhibitor for Cooling Towers and Boilers | No |
| Alcohol, C14-C15 Ethoxylate | Polyoxyalkylene | 68951-67-7 | Liquid Detergent, Disinfectant Toilet Cleaner, Stain Remover | No |

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