

Hydraulic Fracturing Fluid Product Disclosure - HEIBY 18-8-66 1H

CHESAPEAKE

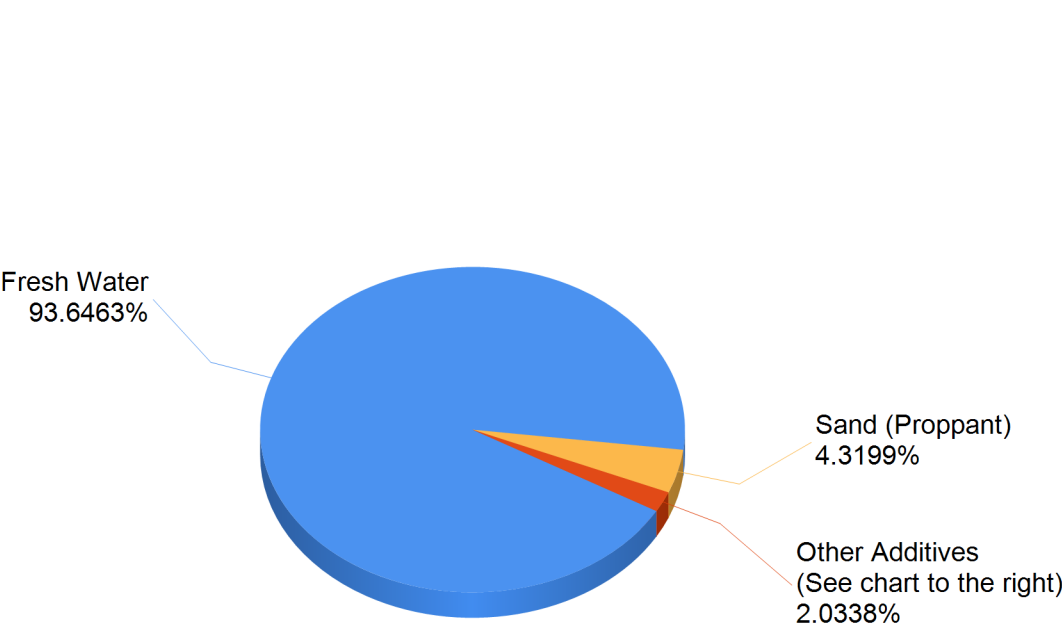


API #	0512334627	County	WELD	Fracture Date	12/28/2011
Surface Casing Depth (ft)	999	State	COLORADO	Proppant Mass Pumped (lbs)	1,210,769
True Vertical Depth of Well (ft)		Longitude	-104.828002	Water Volume Pumped (gals)	1,186,164
Play	NIOBRARA SHALE	Latitude	40.666856	Frac Fluid Volume Total (gals)	1,266,643
Well Type	HORIZONTAL	Lat/Long Projection	NAD 27	Total Fluid Mass Pumped (lbs)	11,343,957

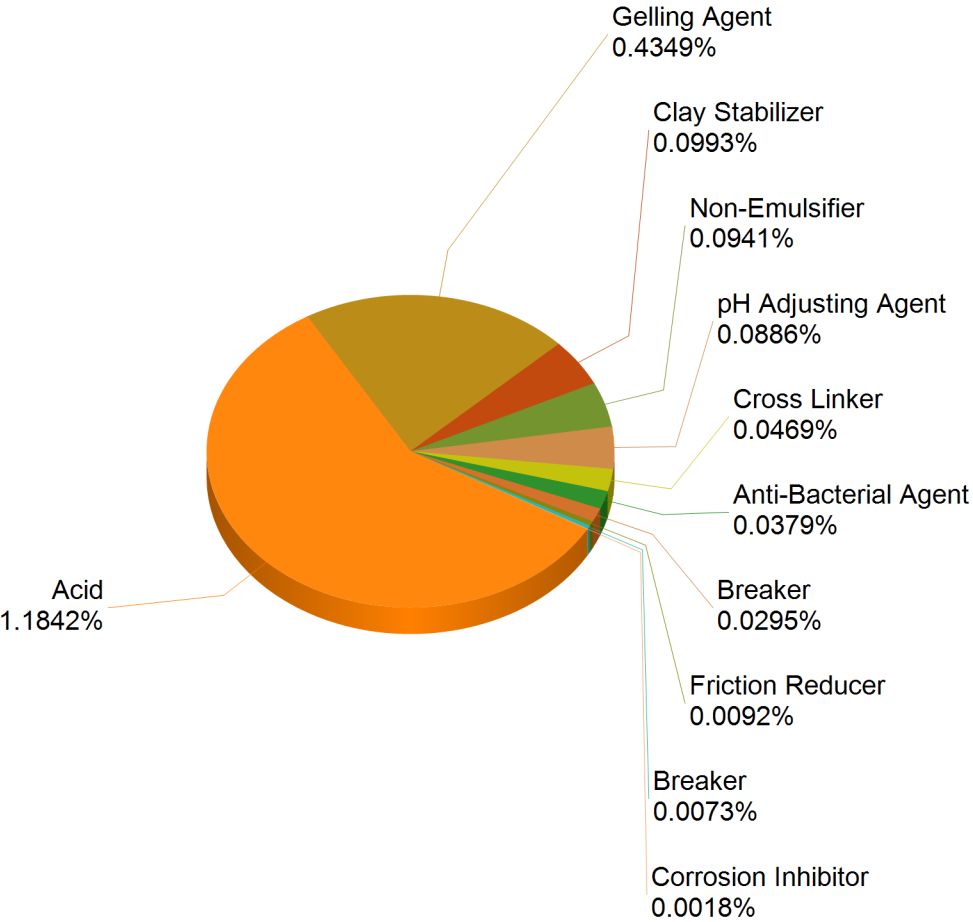
Product Type	Purpose	Downhole Result	Other Common Uses	Product Name	Total Volume Used in Well	Overall % by Total Volume
Water	Expand fracture and deliver sand	Some stays in formation while remainder returns with natural formation water as "produced water" (actual amounts returned vary from well to well)	Landscaping, manufacturing	Fresh Water	1,186,164	93.6463 %
Sand (Proppant)	Allows the fractures to remain open so the gas can escape	Stays in formation, embedded in fractures (used to "prop" fractures open)	Drinking water filtration, play sand, concrete and brick mortar	White Sand	54,718	4.3199 %
Acid Package Hydrochloric Acid Corrosion Inhibitor Iron Control	Helps dissolve minerals and initiate cracks in the rock	Reacts with minerals present in the formation to create salts, water, and carbon dioxide.	Swimming pool chemical and cleaner	15% HCl Acid	15,000	1.1842 %
	Prevents the corrosion of the pipe	Bonds to metal surfaces (pipe) downhole. Any remaining product not bonded is broken down by micro-organisms and consumed or returned in produced water.	Used in pharmaceuticals, acrylic fibers and plastics	DAP-923	23	0.0018 %
Gelling Agent	Thickens the water in order to suspend the sand	Combines with the "breaker" in the formation thus making it much easier for the fluid to flow to the borehole and return in produced water.	Cosmetics, baked goods, ice cream, toothpaste, sauces, and salad dressings	DWP-211	5,509	0.4349 %
Clay Stabilizer	Creates a brine carrier fluid	Reacts with clays in the formation through a sodium - potassium ion exchange. Reaction results in sodium chloride (table salt) which is returned in produced water.	Used in low-sodium table salt substitute, medicines, and IV fluids	DWP-913	1,258	0.0993 %
Non-Emulsifier	Used to break or separate oil / water mixtures (emulsions)	Generally returned with produced water, but in some formations may enter the gas stream and return in the produced natural gas.	Used in food and beverage processing, pharmaceuticals, and water treatment	DWP-937	1,192	0.0941 %
pH Adjusting Agent	Maintains the effectiveness of other components, such as crosslinkers	Reacts with acidic agents in the treatment fluid to maintain a neutral (non-acidic, non-alkaline) pH. Reaction results in mineral salts, water and carbon dioxide which is returned in produced water.	Used in laundry detergents, soap, water softener and dish washer detergents	DWP-204	1,122	0.0886 %
Cross Linker	Maintains fluid viscosity as temperature increases	Combines with the "breaker" in the formation to create salts that are returned in produced water.	Used in laundry detergents, hand soaps and cosmetics	CL-17	594	0.0469 %
Anti-Bacterial Agent	Eliminates bacteria in the water that produces corrosive by-products	Reacts with micro-organisms that may be present in the treatment fluid and formation. These micro-organisms break down the product with a small amount of the product returning in produced water.	Disinfectant; sterilizer for medical and dental equipment	DWP-944	480	0.0379 %

Breaker	Allows a delayed break down the gel	Reacts with the "crosslinker" and "gel" once in the formation making it easier for the fluid to flow to the borehole. Reaction produces ammonia and sulfate salts which are returned in produced water.	Used in hair coloring, as a disinfectant, and in the manufacture of common household plastics	DWP-903	374	0.0295 %
				DWP-975	92	0.0073 %
Friction Reducer	"Slicks" the water to minimize friction	Remains in the formation where temperature and exposure to the "breaker" allows it to be broken down and consumed by naturally occurring micro-organisms. A small amount returns with produced water.	Used in cosmetics including hair, make-up, nail and skin products	DWP-621	117	0.0092 %

Hydraulic Fracturing Fluid Breakdown by Volume



Details for the Other Additives worth 2.0338% of Total Volume



Hydraulic Fracturing Fluid Product Component Information Disclosure - HEIBY 18-8-66 1H
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Supplier	Product Type	Product Name	Total Product Pumped (gals)	Total Product Mass (lbs)	Component Listed on MSDS	Chemical Abstract Service Number (CAS #)	MAXIMUM Component Concentration of Product (% by Mass)	MAXIMUM Component Mass Pumped (lbs)	MAXIMUM Component Concentration Pumped (% by Mass)	MAXIMUM Parts per Million (PPM) by Mass
	Proppant	White Sand	54,718	1,210,769	Crystalline Silica (Quartz Sand, Silicon Dioxide)	014808-60-7	100.00%	1,210,769	10.67325%	106,733
CALFRAC	Acid	15% HCl Acid	15,000	135,270	Water	007732-18-5	85.00%	114,980	1.01357%	10,136
					Hydrochloric Acid	007647-01-0	15.00%	20,291	0.17887%	1,789
	Non-Emulsifier	DWP-937	1,192	9,423	Citrus Terpenes	094266-47-4	60.00%	5,654	0.04984%	498
					Isopropanol (Isopropyl Alcohol, Propan-2-ol)	000067-63-0	20.00%	1,885	0.01661%	166
					Triethylene glycol	000112-27-6	20.00%	1,885	0.01661%	166
	Cross Linker	CL-17	594	5,952	Zirconium Complex	N/A	40.00%	2,381	0.02099%	210
	Anti-Bacterial Agent	DWP-944	480	4,970	Polyethylene Glycol	025322-68-3	70.00%	3,479	0.03067%	307
					2,2-Dibromo-3-Nitrilopropionamide	010222-01-2	40.00%	1,988	0.01752%	175
	pH Adjusting Agent	DWP-204	1,122	9,556	Formic Acid	000064-18-6	13.00%	1,242	0.01095%	110
	Breaker	DWP-903	374	3,279	Ethylene Glycol	000107-21-1	30.00%	984	0.00867%	87
					Hemicellulase Enzyme	009012-54-8	1.00%	33	0.00029%	3
		DWP-975	92	1,520	Ammonium Persulfate	007727-54-0	100.00%	1,520	0.01340%	134
					Cured Resin	N/A	24.00%	365	0.00322%	32

CALFRAC	Corrosion Inhibitor	DAP-923	23	169	Methanol (Methyl Alcohol)	000067-56-1	60.00%	101	0.00089%	9
					Fatty Acids	N/A	30.00%	51	0.00045%	4
					Modified Thiourea Polymer	068527-49-1	30.00%	51	0.00045%	4
					Polyoxyalkylenes	N/A	30.00%	51	0.00045%	4
					Propargyl Alcohol (2-Propynol)	000107-19-7	10.00%	17	0.00015%	1
					Olefin	N/A	5.00%	8	0.00007%	1
	Friction Reducer	DWP-621	117	1,026	No Hazardous Components	NONE			0.00000%	0
	Gelling Agent	DWP-211	5,509	46,000	No Hazardous Components	NONE			0.00000%	0
	Clay Stabilizer	DWP-913	1,258	11,555	No Hazardous Components	NONE			0.00000%	0

All component information listed was obtained from supplier Material Safety Data Sheets (MSDS). The Occupational Safety and Health Administration (OSHA) sets the criteria for the disclosure of this information. Please note that Federal Law protects "proprietary", "trade secret", and "confidential business information" and the criteria for how this information is reported on an MSDS is subject to 29 CFR 1910.1200 (i). As a result, the Operator does not have the legal authority to disclose any supplier "proprietary", "trade secret", or "confidential business information".