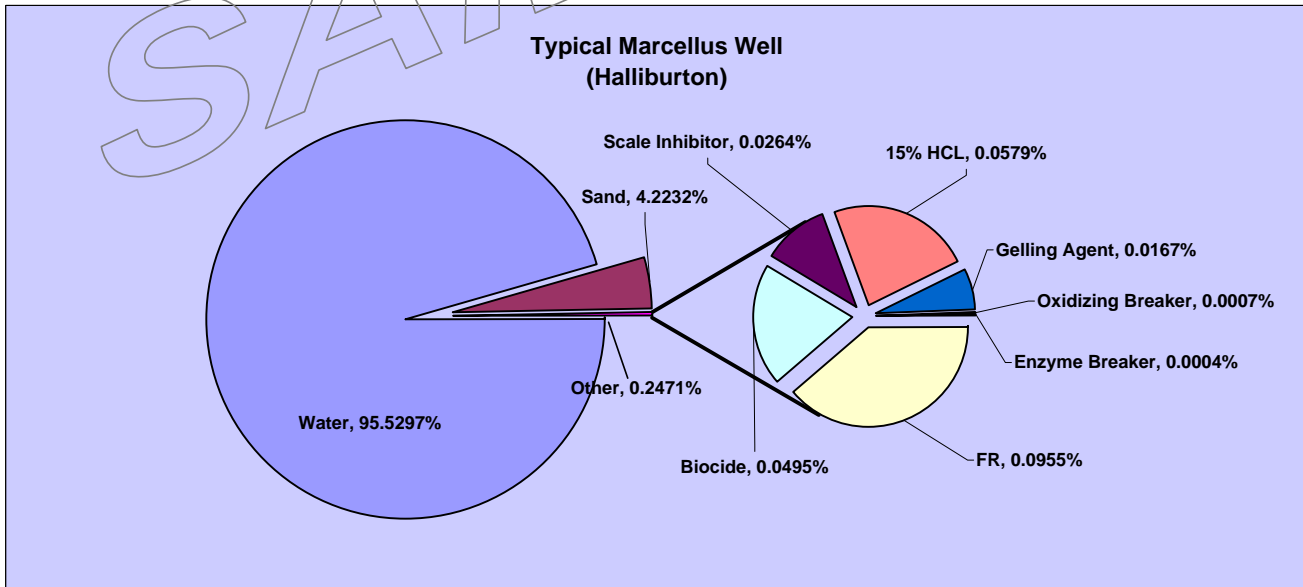




Typical Marcellus Well (Halliburton)

Product Name	Additive	Purpose	Use and Dilution	Volume per well (10 stages)	Overall %
Water	Carrier Fluid	Creates fracture network in shale and carry sand to the formation	Approximately 4 million gallons per well	4,127,000 gal	95.5297%
Sand	Sand	Enables fractures to remain open and allow gas to escape into the wellbore	Approximately 4 million pounds per well	182,446 gal	4.2232%
FR	Friction Reducer	Reduces friction between pipe and fluid	Diluted at one gallon per 1,000 gallons of water	4,127 gal	0.0955%
Biocide	Antimicrobial Agent	Eliminates bacteria in water sources	Diluted at one-half gallon per 1,000 gallons of water	2,137 gal	0.0495%
Scale Inhibitor	Scale Inhibitor	Prevents scale deposits	Diluted at one gallon per 1,000 gallons of water	1,142 gal	0.0264%
15% HCL	Acid	Dissolves cement and minerals in the perforations (non-diluted)	250 gallons per stage (non-diluted chemicals)	2,503 gal	0.0579%
Gelling Agent	Viscosifier	Creates viscosity to ensure sand is transported into the fractures	Diluted at five gallons per 1,000 gallons of water	720 gal	0.0167%
Oxidizing Breaker	Breaker	Adds viscosity to the fluid	Diluted at one-quarter gallon per 1,000 gallons of water	31 gal	0.0007%
Enzyme Breaker	Breaker	Reduces viscosity of the fluid	Diluted at one-quarter gallon per 1,000 gallons of water	15 gal	0.0004%





	Common Name & Supplier	Supplier Chemical Name	Common Description	Hazardous Component listed on MSDS	Purpose	Hazardous Component Weight % of Chemical	Component loading gal/1000 gal	Gal Hazardous Component / stage	Concentration Hazardous Component of Total Stage Fluid			
									by % Vol	by % Weight	ppm	
Halliburton	15% HCl Mixture (Halliburton)	28% HCL	HCl Acid	Hydrochloric Acid	Dissolves cement and minerals in the perforations	28%	442	247.52	0.0571%	0.0671%	671	
		HAI-OS	Corrosion Inhibitor	Propargyl Alcohol	Protects casing	10%	2	0.4	0.0001%	0.0001%	1	
				Methanol		60%		2.4	0.0006%	0.0007%	7	
		*Total 15% HCl system volume is 2,000 gallons per frac stage								TOTAL	0.0577%	0.0679%
	Friction Reducer (Halliburton)	FR-66	Friction Reducer	Hydrotreated light petroleum distillate (non-diesel, BTEX free)	Reduces friction between pipe and fluid	30%	1	120	0.0277%	0.0293%	293	
									TOTAL	0.0277%	0.0293%	293
	Bactericide (Halliburton)	BE-9	Biocide	Tributyl tetradecyl phosphonium chloride	Eliminates bacteria in water sources	10%	0.5	20	0.0046%	0.0045%	45	
									TOTAL	0.0046%	0.0045%	45
	Scale Inhibitor (Halliburton)	LP-65	Scale Inhibitor	Ammonium chloride	Prevents scale deposits	10%	0.25	10	0.0023%	0.0027%	27	
									TOTAL	0.0023%	0.0027%	27
WaterFrac G System (Halliburton)	LGC-35 CBM	Gelling Agent	Polysaccharide	Adds viscosity to fluid	30%	4.89	22	0.0050%	0.0051%	51		
			Paraffinic Solvent		30%		22	0.0050%	0.0051%	51		
	Breaker	Oxidizing Breaker	Sodium Persulfate	Reduces viscosity of the fluid	100%	0.02	0.3	0.0001%	0.0001%	1		
	GBW-30	Enzyme Breaker	Hemicellulase Enzyme		15%		0.04	0.1	0.00002%	0.00002%	0.2	
								TOTAL	0.0100%	0.0104%	104	

*Total WaterFrac G system volume is 14,700 gallons per frac stage