

PacWest FRACDB

Product Overview

January 12, 2012

TERMS & CONDITIONS

Information furnished in all reports produced by PacWest may be used by Client for internal purposes, as Client deems beneficial, as long as due care is taken to hold the information confidential within Client's organization and PacWest is not liable for the information provided.

All rights to the information remain with PacWest. PacWest represents that it will not breach any obligation of confidentiality with respect to information contained in the study. PacWest will maintain in confidence and not disclose any information related to Client, without prior written consent of the Client. PacWest will not disclose to any person, including, without limitation, any of the Client's competitors or suppliers, the fact that Client has engaged PacWest in this project scope, the scope of the assignment or any other information relating to Client.



PacWest Consulting Partners
920 Memorial City Way, Suite 160
Houston, TX 77024

FracDB is a proprietary database of fracs and frac chemicals that can be used to conduct sophisticated technical and market analysis

Background & Objectives

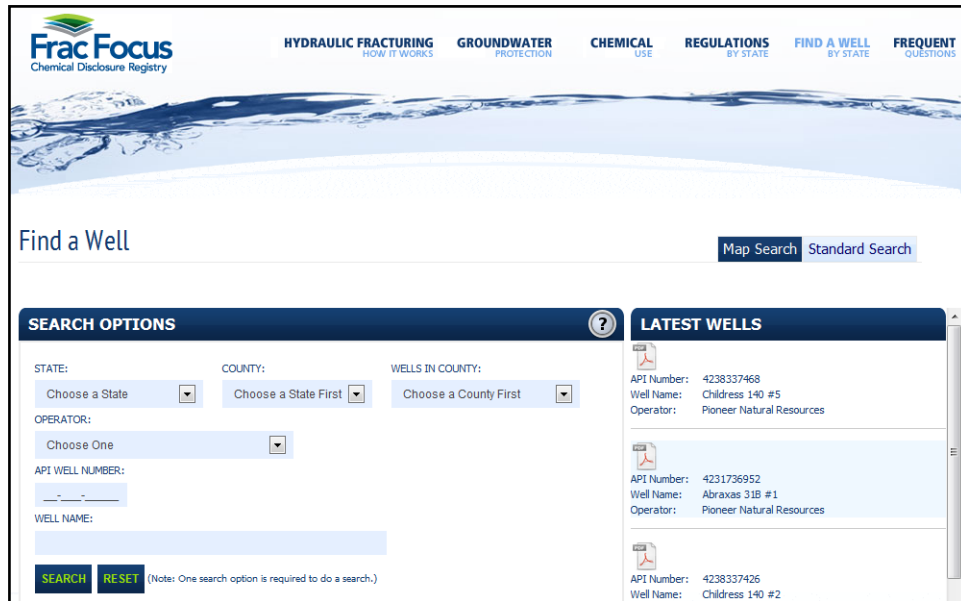
- The PacWest FracDB is a database of US fracs and frac chemicals, built into a rich, structured data set
- The dataset is expected to contain data from roughly 10,000 fracs within the next month (currently includes nearly 9,000 fracs but there is a 1 to 2 month lag in data acquisition)
- The FracDB is a sophisticated tool that can be used to run a variety of analyses:
 - Regional peer frac design and practices
 - Pressure pumping / frac market share and customer relationships
 - Completion chemicals market analysis
 - And many other analyses

The FracDB is built from publicly available data that comes directly from E&Ps via the FracFocus website

Source of Data

- The primary data source for the FracDB is the FracFocus website (www.fracfocus.org), a joint project between the Ground Water Protection Council and the Interstate Oil and Gas Compact Commission
- We are assessing the inclusion of additional sources of data

FracFocus User Interface



FracFocus Data Sheet

Hydraulic Fracturing Fluid Product Component Information Disclosure							
Fracture Date:	9/21/2011						
State:	Wyoming						
County:	Sweetwater						
API Number:	49-837-28373						
Operator Name:	BP America						
Well Name and Number:	Frewen 31-120						
Longitude:	-108.042901						
Latitude:	41.666038						
Long/Lat Projection:	NAD27						
Production Type:	Gas						
True Vertical Depth (TVD):	9,936						
Total Water Volume (gal):	235,923						
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	BP America	Carrier / Base Fluid	No MSDS ingredients	7732-18-5	100%	83.09509%	
Sand (Proppant)	Schlumberge	Proppant	Crystalline silica	14808-90-7	100%	16.12166%	
B145	Schlumberge	Friction Reducer	Distillates (petroleum), hydrotreated light	64742-47-8	40%	0.00066%	
W054	Schlumberge	Non-Emulsifying Agent	Alcohol ethoxylate C-10/16 with 6.5 EO	68002-97-1	5%	0.00083%	
			Methanol	67-56-1	70%	0.06065%	
			Oxyalkylated alkyl alcohol (1)	Proprietary	10%	0.00724%	
			Oxyalkylated alcohol (2)	Proprietary	10%	0.00724%	
			Quaternary ammonium compound	Proprietary	5%	0.00362%	
			Heavy aromatic naphtha	64742-94-5	5%	0.00362%	
			Oxyalkylated alcohol (1)	Proprietary	5%	0.00362%	
B354	Schlumberge	Temporary Clay Stabilizer	Cholinium Chloride	67-48-1	70%	0.12840%	
J218	Schlumberge	Breaker	Diammonium Peroxodisulphate	7727-54-0	100%	0.00211%	
EZEFL0 F110	Schlumberge	Surfactant	Methanol	67-56-1	40%	0.02165%	
			Ethoxylated alcohols	Proprietary	30%	0.01624%	
			Oxyalkylated alcohols #2	Proprietary	30%	0.01624%	
EB-CLEAN E308 / J475	Schlumberge	Breaker	Diammonium peroxodisulphate	7727-54-0	100%	0.00622%	
LD10	Schlumberge	X-Linker	Boric Acid / Sodium Hydroxide	10043-35-3 / 1310-73-2	100%	0.03547%	
M007	Schlumberge	Activator	Sodium hydroxide	1310-73-2	60%	0.04842%	
M208L	Baker Hughes	Biocide	Tetrakis (hydroxymethyl) Phosphonium Sulfate	55566-30-8	100%	0.00820%	

The FracFocus source data contains enough detail about each frac to allow for a comprehensive analysis

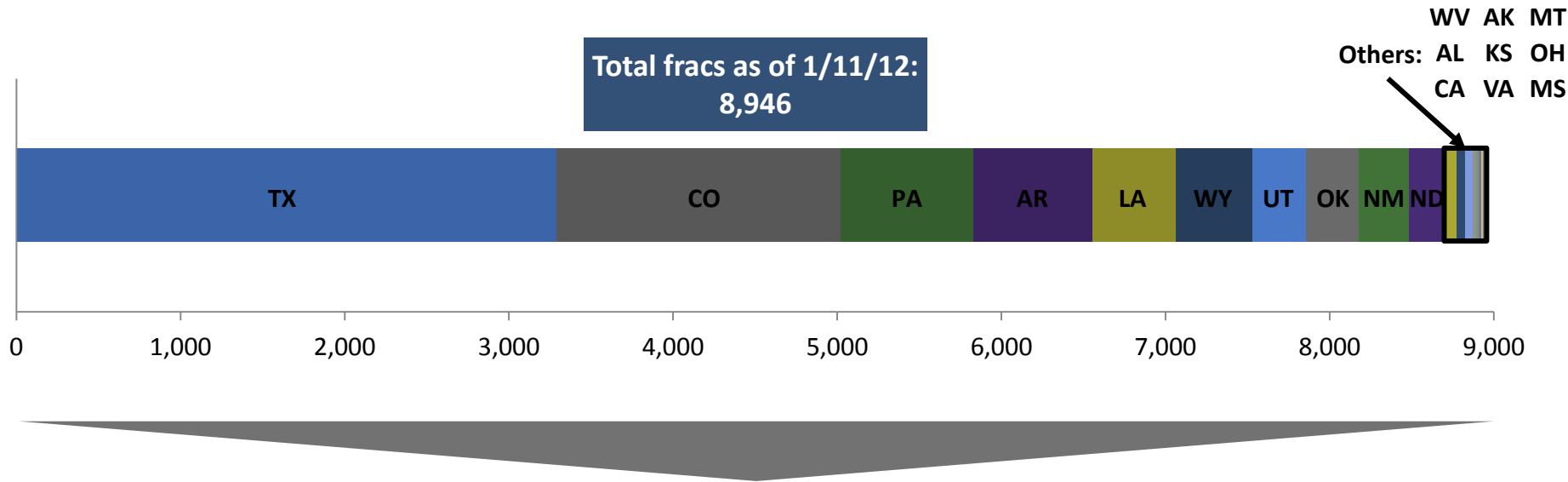
Elements of FracFocus Source Data

- The Frac Focus source data is split into two tables:
 - Basic well and frac details
 - Detailed fluid composition
- The tables contain the following data fields:

Basic Well and Frac Details	Detailed Fluid Composition
Fracture date	Trade name
State and county	Supplier
Well API number	Purpose
Well operator	Ingredients
Well name and number	Chemical abstract number
Latitude and longitude	Max ingredient concentration in additive
Production type	Max ingredient concentration in fluid
True vertical depth	
Total water volume	

But the real value comes from aggregating all FracFocus data into a true database (FracDB) that enables large-scale analysis

Current State of FracDB



Types of Analysis Made Possible by FracDB:

Analysis Type	Status
Monthly / quarterly number of fracs by operator	Mostly automated
Mapping of pressure pumper / customer relationships	Mostly automated
Market share of pressure pumper providers	Mostly automated
Review of peer frac designs	Manual – undertaken on a case-by-case basis
Aggregate market chemical usage / volume	Manual - undertaken on a regional level in a few cases
Market share of chemical suppliers	Manual - undertaken on a regional level in a few cases
...many others we have not yet envisioned	Significant scope for automation of additional analysis

For a number of reasons, there are limitations to the data and how it can be used

Limitations of Data

- The FracDB is not yet an exhaustive set of all fracs
 - At last count, 10 states have passed frac chemical disclosure regulations (Arizona, Arkansas, Colorado, Michigan, Montana, New Mexico, Pennsylvania, Texas, West Virginia, Wyoming), although 3 others have proposed legislation (California, Louisiana, North Dakota)
 - In states without regulation we are dependent upon E&Ps that voluntarily disclose chemicals
- Chemical additive reporting structure makes it difficult identify precise volumes
 - Chemical volumes are reported as concentrations of total fluid, requiring backwards calculations using water volume as a baseline and estimation of additive densities
 - Additive volumes are often an estimate
- E&Ps / suppliers withhold some chemicals data due to trade secrets
 - Some (10-15%) source files contain additives for which the ingredients and concentrations have been withheld for reasons of trade secrets
 - In many of these cases it is not possible to determine volumes of all chemical additives used
- Not always possible to identify pressure pumping provider
 - Due to the way the chemical suppliers are reported it is not always possible to identify the pressure pumper with a reasonable level of confidence
 - Three to five percent of fracs in the database have “unknown” pressure pumpers