

## **Current Advanced Practices in Hydrofracture (Hydrofrac) – Hydraulic Fracturing of ‘Tight Gas Shale’ Formations: The “Listening” Well for Micro-Seismic data collection**

Recent acquired knowledge in the Oil & Gas Exploration Industry has permitted the successful Exploration and Production of Natural Gas from ‘Tight Gas Shales’ such as the Barnett, Haynesville and Marcellus. It is the combination of Horizontal Drilling techniques in combination with the use of Hydraulic Fracturing (HydroFracing) that has lead to these successes.

Now, after more than 10 years of experimentation and experience, the increasing use of these techniques has come under closer examination; and the Gas Exploration companies are more vigilant than ever seeking increased economic gains as well. The environmental impact of Hydrofracing, which consumes millions of gallons of water in the process, and which must then be handled correctly to avoid toxic contamination of ground water in addition to streams and rivers, has now become a major policy issue – especially in New York and Pennsylvania with the current Marcellus Shale and Trenton Black River gas plays.

In economic terms – every horizontal well costs about 3 times that of a vertical well. In addition a horizontal well can consume 3 to 10 times the water of a vertical well in the process of hydrofracture. So, the Gas Company is quite prepared to spend the money needed to gain the 3-5 times gas production from the horizontal well – but, the added expense of properly handling the water used for hydrofracing remains a risky and largely unknown upfront cost as the States revise and update their Regulations on water use, quality and disposal which will directly impact the costs of oil & gas exploration.

These exploration companies are not just sitting back and waiting for the actual cost bases to be worked out – they are operating to develop practical techniques to maximize the return on their investment in horizontal well technologies while working to minimizing the costs – especially the water-related costs – of hydrofracture.

Because of the often Secret techniques and formulations used in oil & gas exploration; the literature is almost void of details on these emerging techniques.

One such technique which has emerged in describing wells that are being drilled in fields that are destined to be very productive is the ‘Listening” Well.

An oversimplified definition of a “Listening” Well – a well drilled into the producing rock formation(s) that will be used primarily for monitoring the micro-seismic events in the adjacent areas produced by the action of hydrofracture.

“Listening” wells have become the ‘local’ ears that the oil & gas exploration geologists use to measure a whole host of factors that influence the progress of exploration efforts and costs. Since these ‘Tight Shales’ are quite deep – 1.5 to 2 miles down – the closer the ‘sensors’ can be placed to the ‘action’ the higher the quality of the information and measurements.

A metaphor might make the issue a bit clearer: Imagine you have a walnut that you would like to crack open and eat. But, the only tool you have that is capable is your car – okay, like you can't find a rock (but this is a metaphor). So, you position the walnut under the tire, and you want to just barely move the car so that the tire breaks the hard shell, but doesn't smash the nut meat into powder. You roll down all the windows and you listen for the 'crack' of the shell. But the car motor is noisy, and your ear is 5-6 feet from the 'action'. If you had a microphone that you could place a few inches from the walnut (and out of reach of the car tire) – you could use that to listen for the shell 'crack' with much greater ease, and control the car's movement with greater precision.

So, for the Gas Company, these "Listening" Wells have some cost, but the ability to monitor the hydrofracing of many wells, both Vertical and Horizontal, in the immediate area will permit them to save much greater costs in terms of both water use and extent of the fracture zone for optimal gas production. For instance, by adjusting the hydrofrac water pressure and listening to the fractures propagate, they can maximize the effectiveness of the hydrofrac technique while minimizing the use of water in the process.

Here are a couple links to some of the sources for my conjecture, above.

<http://www.wikipatents.com/6904366.html>

Is a published Patent where the inventor cites a few academic articles in providing the context for the invention, a few of which mention "listening" wells.

[http://www.total.com/static/en/medias/topic2627/results\\_stakeholder\\_consultation.pdf](http://www.total.com/static/en/medias/topic2627/results_stakeholder_consultation.pdf)

Is an article on sequestering CO<sub>2</sub> – a 'Greenhouse' Gas – where the monitoring system for containing the CO<sub>2</sub> in underground chambers incorporates 'Listening' Wells to monitor for micro seismic activity.

## RRE 8/27/2008 – 9/4/2008 ##