

## HORIZONTAL WELL STIMULATION IMPROVEMENT WITH FLUID PULSE TECHNOLOGY

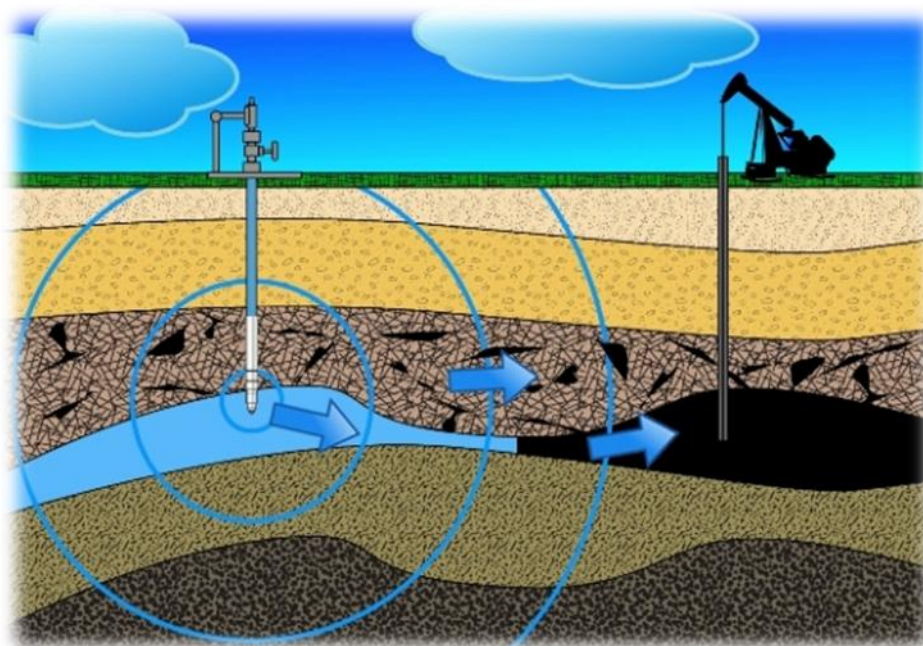
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In last decade breakdown in gas industry led to the turn the largest market in the world and created a new gas power number 1 - U.S.. However, from an environmental view, it is extremely dangerous. Tap water and sewage wells produce methane; frequent earthquakes endanger infrastructure and people worried about new gas provinces.



Canadian Wavefront Technology offers a more harmless and eco method. The developers tried understand the increase in debit of wells immediately after the earthquake. By theory, it should be the opposite. In fact, after the earthquake in the productive zone many breaks appear and do not coincide with the general direction of production activity. Therefore the decline in debits of wells.

Aftershock (repeated seismic shock of lower intensity compared to the main seismic shock) creates a wave compresses the collectors. This Hydrodynamic shock effectively increases in debit of wells. PowerWave technology, based on a similar mechanism, sends the fluid momentum in scale and sand are around mine.

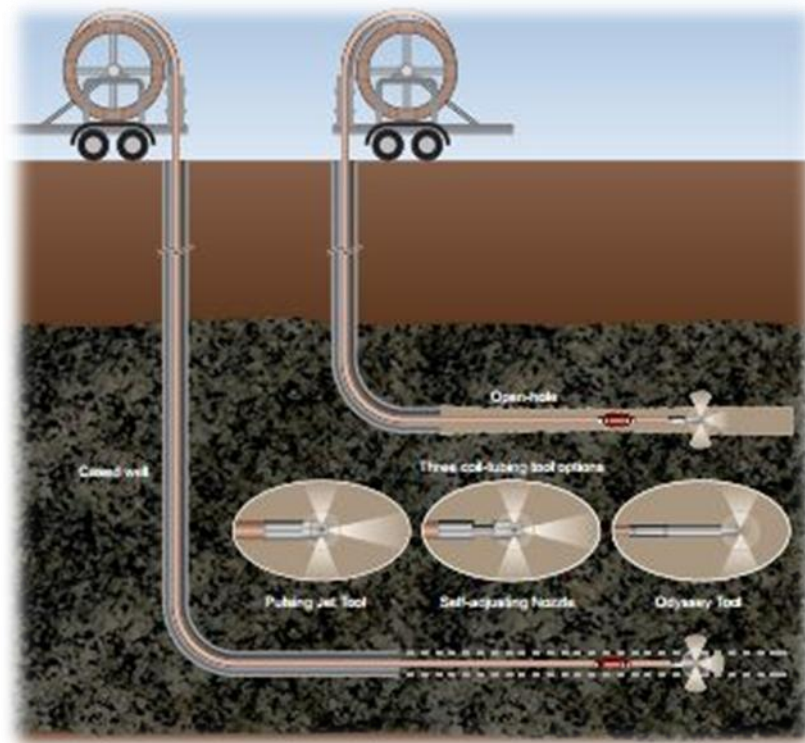
Oil is pushed out of the reservoir as well as the heart create waves to push fluid through blood vessels. Unlike breakdown, water don not penetrate throught crevasse and use all the pores.

## About Wavefront Technology

Wavefront's fluid pulse technology adds a new dimension to horizontal well stimulation. The company provides a wide range of coil tubing conveyed tools.

### Technology Overview

Fluid pulse technology creates high inertial fluid momentum, which improves the flow efficiency of the wellbore, the near wellbore region and the reservoir. The nature of fluid displacement energy ensures that any pulsed fluid will penetrate the matrix proximal to where the tool is placed.



Fluid pulse technology is ideal to improve the placement of chemical treatments, production solvents, water, gas and combinations thereof. The tools can be used in short term (stimulation) or long term enhanced recovery applications. If you can Intervene in a wellbore with coil tubing, you can utilize fluid pulse technology.

### Fluid Pulse Benefits

- High amplitude displacement waves effectively distribute treatment fluid into the reservoir evenly along the completed interval.
- The creation of new fluid pathways to improve contact with the reservoir.
- Promotion of radial flow distribution negating the effects of fluid channelling through higher permeability areas or thief zones.
- Increased fluid penetration compared to bullheading, chemical squeezes and multi-zone stimulation methods.

## Deeper Fluid Penetration

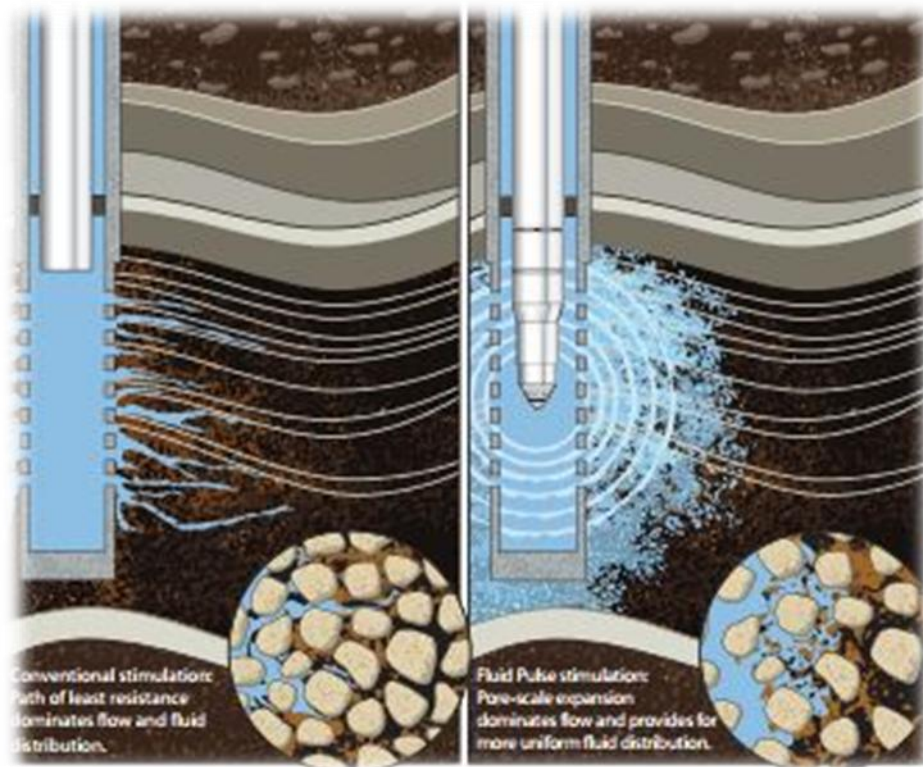


Figure shows the benefits of fluid pulsing stimulation over conventional treatments

### Fluid Pulse Stimulation Tools

Wavefront's fluid pulse stimulation tools can be deployed on coil tubing in open or cased hole completions. The Pulsating Jet Tool can accommodate any fluid, gas or mixture. A vortex is formed inside the tool, which produces oscillating pulse energy. This energy produces sonic stress waves that have a far greater effectiveness than common jet nozzles. The pulsating jet tool is very effective in cleaning the wellbore and can provide a shallow stimulation treatment into the near reservoir region.

In coil tubing applications the pulsating jet tool assists the extended reach capabilities of coil tubing by enhancing the "worming effect" needed to creep the coil horizontally. The tool can be manufactured in a number of port orientations to direct flow in both forward and reverse orientations to ensure removed debris does not pile up and "stick" the coil tubing.

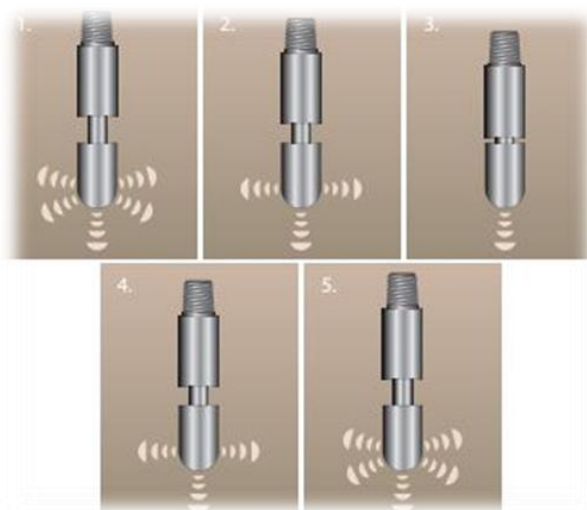
### Applications and Benefits

- Open, cased or liner completions
- Conventional oil or heavy oil (cold or thermal applications)
- Used to improve the efficiency of solvent based recovery methods
- Single Trip Needed to both wash, acidize and jet dry the hole
- Shockwave energy has been tested to travel 18" in a core test environment
- Excellent for removal of resin coated sand and sand plugs without the need for a mud motor



Pulsating Jet Tool

The Self Adjusting Nozzle Tool (SAN) is able to direct its jet stream energy from multiple ports to a single port and back to multiple ports as determined by what is encountered down hole. If the nozzle tags (say hard scale or a scale plug/bridge) the tool will shut off its back and side ports to direct greater energy towards the tag. As the nozzle washes through the tag the nozzle reverts back to its multiple port configuration. The nozzle is extremely efficient in horizontal wells because the back facing ports are able to wash fill as the work string (coiled tubing or tubing) is retracted. The nozzle is available in 31.75 mm (1.25”) and 41.1 mm (1.62”) sizes.



Wavefront's Self Adjusting Nozzle Positions

Wavefronts Coil Tubing Tools are 1.2 meters (3.9 ft) in length and can be run on coil tubing as small as 25.4 mm (1”) and as large as any coil tubing available. The tools are typically run “slick” with the coil tubing string and are manufactured from 4140 heat-treated steel hardened to 2832 Rockwell ‘C’ (the same used for drill collars). A variety of custom designed nozzles is available.



Wavefront Coil Tubing Tools with Nozzles Assembled

Подготовлено по материалам <http://www.onthewavefront.com> и <http://www.multitrans.ru>