

WAVEFRONT

POWERWAVE

Removing The Toughest Obstacles –Self-Adjusting Nozzle (SAN)

Wavefront's Powerwave SAN cavitation-based fluid pulsing tool utilizes a hydro-mechanical means to hydraulically create a water hammer effect on the formation face, tubulars, etc. The high-impact action of the Powerwave SAN removes fines, scales, waxes, asphaltenes or other blockages to re-establish and enhance production or injection potential.

IMPACT PRESSURE KEY TO SUCCESS

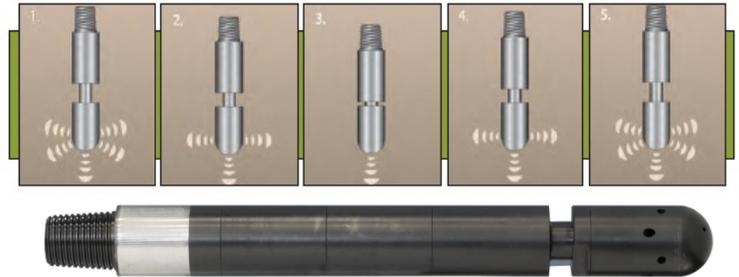
There are other companies that may "say" they have a tool like the Powerwave SAN but in fact these tools are only fluidic switching tools or fluidic oscillators. These types of tools switch flow from one port to another. Due to the method used to switch ports they are restricted to the number of and angle of the nozzles producing continuous jet streams. Marketed in the oil industry under such trade names as "Perfclean", "Pulsonix" or "Oscillators" these tools are unable to produce a similar impact pressure as the Powerwave SAN.

The impact pressure of a fluidic oscillator reduces significantly beyond two inches so the tools' effectiveness is greatly reduced as it enters larger ID's such as casing or open hole. Extensive research into cavitation flow associated with the Powerwave SAN indicates that the impact pressure of a cavitating fluid pulse is 9 to 124 times greater than that produced from a fluidic oscillator. The large impact pressures generated from the Powerwave SAN put it in a class of its own.



Gravel size asphaltenes (left) and fines (right), Haynesville Shale Formation, Louisiana.

POWERWAVE SAN OPERATION



- The SAN directs high-impact cavitating fluid pulses from 12 orientations ensuring 360° coverage in the fully open position.
- The SAN shifts to single fluid outlet if a blockage is encountered.
- Once the blockage is cleared all 12 fluid outlets are re-engaged.

TESTIMONIALS

The Wavefront SAN for well bore cleaning of fill, scale, paraffin's, etc., meets and exceeds every expectation one may have for efficiency and post-stimulation well performance. I have personally supervised the use of the SAN on over 1,000 wells in West Texas and in my opinion the SAN delivers superior results over rotating jetting tools; fluidic oscillators such as the Pulsonix TF; and, sonic hammers. The Wavefront SAN continues to be the standard for well bore cleaning in West Texas and I would recommend the SAN for all such applications.

JOE GIBSON, EPI CONSULTING, MIDLAND, TX

While onsite using the Wavefront SAN on BHP sites, I observed the tool work effectively in many different situations. I personally observed the Wavefront SAN penetrate through the toughest paraffin and scale build up on many sites. With much of these problems in West Texas I would highly recommend using the SAN over any other product.

LARRY SMITH, PROJECT MANAGER, TANKLOGIX, ODESSA, TX