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Logging

MWD/LWD

Surface Systems

Well Intervention & Maintenance

**SPECIAL SECTION:
Shale Technology Showcase**

Unconventional Report:
HAYNESVILLE

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IndustryVoice[®]

The Giant Awakens

DUG
EAGLE FORD



CROSSING *the* *Finish* LINE

Advances in completion tools help shift wells to money-maker status.

Shale Technology SHOWCASE

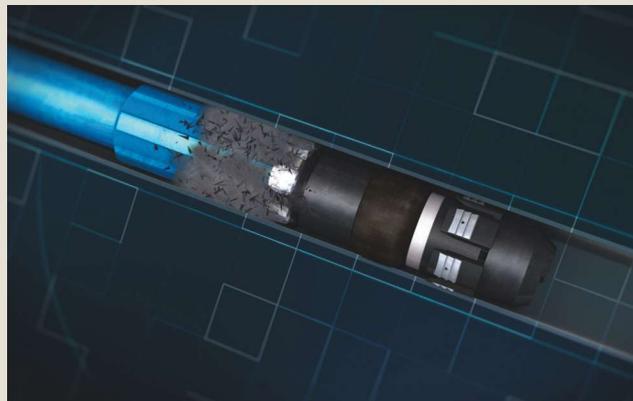
In this special section *E&P* highlights some of the latest products and technologies for shale and looks at how they will benefit companies in their ongoing search for new reserves, improved production and more effective operating techniques. ■

COMPOSITE FRACTURE PLUG IMPROVES PNP SPEED, RELIABILITY

Plug-and-perf (PNP) completions favored among unconventional operators are process-intensive. Composite plug drillouts can take days, and the plugs can become stuck in the wellbore or set prematurely, resulting in unplanned interventions.

Baker Hughes' TORPEDO composite fracture plugs deliver a new level of efficiency and reliability in PNP operations using a streamlined design that is also more robust than competitive offerings. The plug, which features a single set of slips vs. the conventional two sets, contains 40% less material and is shorter in length compared to standard plug designs. The plug cuts millout times by an average of 50% without sacrificing strength or reliability. The plug also incorporates an ultradurable slip ring and contains no ceramic or carbide buttons to reduce the risk of sticking and plug presets.

An Oklahoma operator recently ran 33 TORPEDO composite plugs in a 4,572-m (15,000-ft) well with a 3,048-m (10,000-ft) lateral section at an average rate of 122 m/min (400 ft/min)—almost double the average run-in speed for standard plugs in previous jobs. No sticking or presets resulted in zero plug-related nonpro-



Baker Hughes' TORPEDO cuts millout times by an average of 50%. (Source: Baker Hughes)

ductive time during well completion. Drill-out time was cut by 80%, from 15 to 3 minutes per plug, and all plugs were drilled out in a single trip using a Baker Hughes VANGUARD drillbit. The smaller overall volume of cuttings enabled easier, more effective wellbore cleanup. bakerhughes.com ■

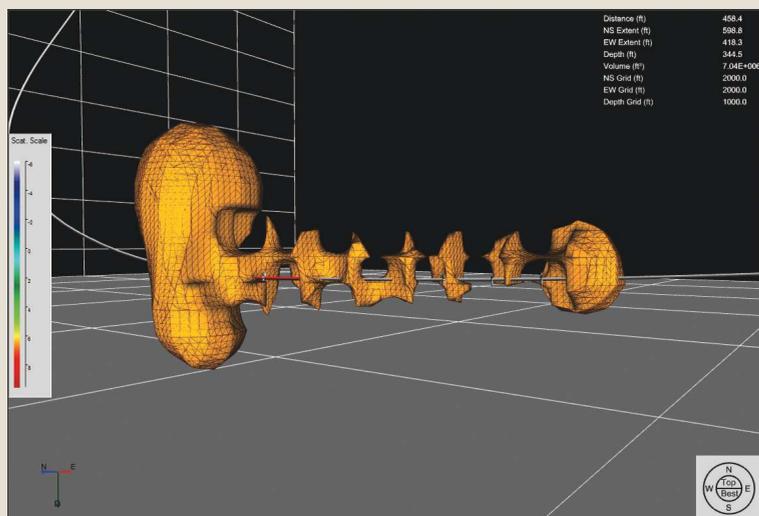
SYSTEM IMPROVES ABILITY TO DETECT LOCATION OF PROPPANTS IN RESERVOIR

About 100 billion pounds mass of proppant is used annually in global unconventional reservoirs, with the location of the proppant critical to understanding reservoir drainage, well spacing and stage spacing. However, proppant detection has traditionally been limited to near-well-

bore measurements. CARBO has developed a method to detect proppant in the far field, known as QUANTUM quantified propped reservoir volume imaging.

The QUANTUM method, now in the field trial phase, uses electromagnetic principles. A transmitter source and an array of electric and magnetic field sensors are located at the surface, and a current signal with a unique wave form and frequency is transmitted to the bottom of the wellbore via a standard electric line unit. An electrically conductive proppant is pumped into the stages of interest. The electric and magnetic fields are measured before and after the detectable proppant stages, and a novel analysis method is then employed to process and invert these differentiated data to create an image of the propped reservoir volume.

QUANTUM is designed to identify the exact location of proppant in fractures. The program also assists in understanding well drainage and spacing, stage and perforation cluster spacing, vertical fracture coverage, and the impact of fracture design changes. carboceramics.com ■



QUANTUM quantified propped reservoir volume imaging offers far-field fracture imaging that shows actual proppant location. (Source: CARBO)