Drilling with casing technology 'almost a no-brainer' in the problem-solving toolbox

Weatherford: By eliminating pilot hole, up to 30% rig time can be saved immediately

DRILLING WITH CASING (DwC™) has so far remained a niche application, estimated to make up less than 5% of all drilling operations. But in today's market, with rig rates topping $300,000 a day, it would be foolish not to consider every possible method of improving drilling efficiency.

"It's almost a no-brainer for flat-time savings," said **Steve Rosenberg**, **Weatherford** senior drilling engineer. "You could save 20% to 30% rig time right off the bat by eliminating the conventional pilot hole trip by drilling with casing."

Additionally, drilling the casing in place reduces or eliminates trips and minimizes downhole trouble time (e.g. fighting lost circulation and/or wellbore instability). It provides improved hole cleaning through mono-diameter annular geometry resulting in higher annular velocities. Risks of well control incidents also are reduced by eliminating drillpipe tripping (the swab/surge effect) and by the fact that casing is always at or near bottom.

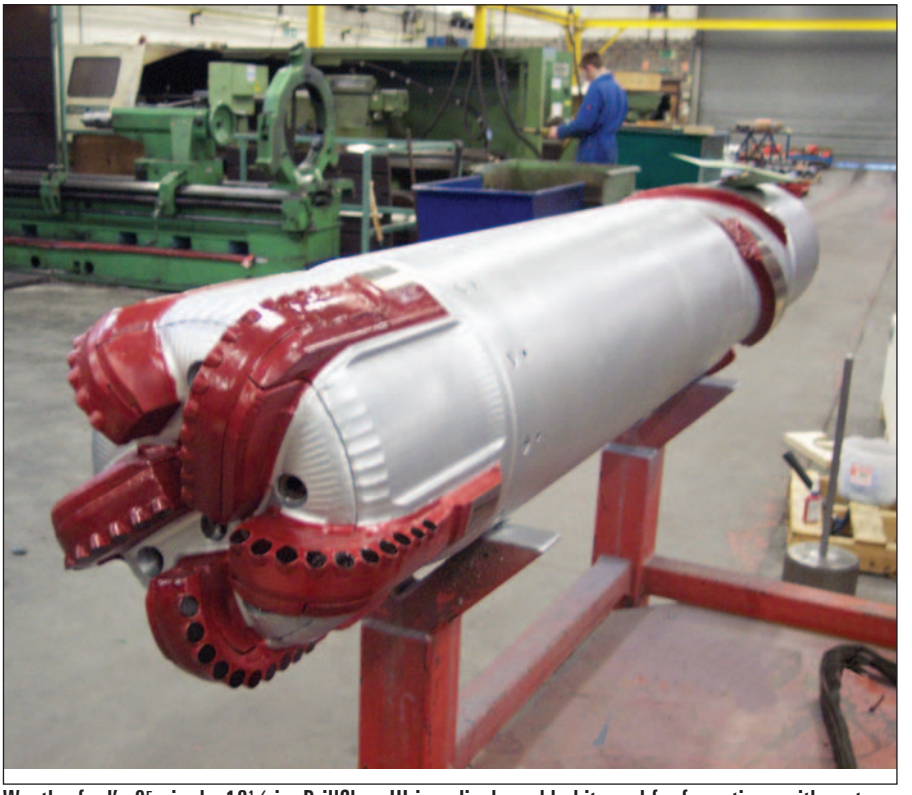
Weatherford has been marketing the technology since about 2001, Mr Rosenberg said, and has run more than 500 jobs for companies such as **Chevron** and **ConocoPhillips**. Its cement-in-place systems require virtually no rig modifications and allow operators to begin cementing as soon as TD is reached.

The basic system includes a drillable drill bit/casing shoe (Weatherford's DrillShoe I, II and III), a float collar, centralizer/stabilizer system, a drive system to transmit torque from the top drive to the casing string, and the rig's top drive.

INNOVATIVE APPLICATIONS

One of the most successful drilling with casing applications at Weatherford was an operation in the Madura Strait in Indonesia's Java Sea.

In November 2002, the company completed the industry's first drilling with casing operation from a floating drilling unit. The operation was able to combine drilling with casing and surface BOP technology off a semisubmersible rig.



Weatherford's 9⅝-in. by 12¼-in. DrillShoe III is a displaceable bit used for formations with up to 18,000 psi compressive strength. It has a premium cutting structure that is displaced to the annulus after drilling to TD by a simple pressure cycle.

With a 17½-in. DrillShoe II – which replaces the conventional drill bit and is used in formations with as much as 7,000 psi compressive strength – Weatherford drilled 13⅜-in. casing, thereby eliminating the 30-in. and 20-in. casing strings. This enabled the use of a surface BOP system, reducing the time required for running and deploying a typical subsea BOP system.

"This was a major accomplishment," Mr Rosenberg said.

Compared with conventional processes, the job saved more than 2½ operational days, and rig time was reduced by 80% compared with the offset well, from about 80 hours to about 20. The savings to the operator totaled $437,000.

In February and March 2003, the company took DwC to a platform on the Zhao Dong field in China's Bohai Bay. In a batch drilling operation, 24 strings of 13⅜-in. casing was drilled in, all reaching planned setting depths with the DrillShoe II.

"We started off with about 30 hours per well, and the last one was under 7 hours," Mr Rosenberg said. "We averaged 80 m/hr with connections, saving 23 days of rig time and $1.9 million for the operator."

In all, 6,149 m was drilled using drilling with casing technology in 12.7 days.

DRILLING WITH LINER

Depending on operator requirements, whether mechanical- or pressure-related, Drilling with Liner may be better-suited than drilling with casing. Instead of tying a full string of casing to the surface, drilling with liner hangs or sets the liner top in a parent casing string. Therefore, the casing isn't tied back to surface. Applications include depleted formations, unstable formations, loss zones, pressure zones, sal t dome drill-

ing, moving/swelling formations and excessive hole cavings.

More than 90% of Weatherford's drilling with liner operations employ the Nodeco™ system, which has a running tool that is good to 25,000 to 35,000 ft-lbs of torque. Its other system, the BLLT (Best Line Torque Tool) system, is used in problem areas where the first trip doesn't demand a hanger or packer and the running tool cannot be released with a sole pressure event.

In March this year, Weatherford applied drilling with liner to drill a 9⅝-in. liner with a 12¼-in. DrillShoe™ III offshore Veracruz, Mexico. From a semisubmersible rig, the system was used to drill from 9,452 ft to 9,718 ft – 266 ft – in a 75° section of open hole to reach the pay zone in the fractured Abra formation while maintaining the angle and full mud returns over the drilled distance.

Offset wells had experienced lost circulation, pack-off problems and hole stability issues from exposure of the Brecha formation while drilling, resulting in nonproductive time.

The drill bit/casing shoe was a displaceable bit with a PDC cutting structure

Weatherford's 16-in. internal casing drive tool.

and used for formations with as much as 18,000 psi compressive strength. It drilled through this hard formation, even though the task usually requires 5-bladed PDC bits.

Not only did the application save the operator 39½ rig days, representing a cost reduction of $4.5 million, it also proved that high angle can be maintained by combining passive rotary directional control and the drilling with liner system, Mr Rosenberg said.

COST SAVINGS

Although economics can prohibit general use of the technology, interest is increasing, and Mr Rosenberg said he actually estimates current usage to be split 50-50 between land and offshore projects.

"We have an ongoing project in Colorado where DwC isn't providing a cost saving against dayrate but is an enabler, guarantying that casing will reach planned casing depth," he said. "So you have to look at more than the line-item cost. You have to consider the overall benefits."

THE FUTURE

Mr Rosenberg hopes operators will lead exploration of the technology's other potentials, such as combining it and landing the casing string in a subsea wellhead.

"This hasn't been done because it requires physically drilling in casing and simultaneously landing the seal assembly from the subsea wellhead in that wellhead. It would require a joint effort between rig contractors, operators and wellhead vendors to come up with a solution," he said. "It has tremendous potential for significant cost savings and well control problems mitigation in deepwater environments.

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