

Case histories relate learning experiences

BIG-BORE HTHP WELLS

RESERVOIR PRESSURE IN the Arun Field has declined from 7,100 psi to below 600 psi. As a result, a number of wells have been lost to formation subsidence and wellbore collapse, prompting a need for additional big-bore HTHP wells to meet volume requirements. New wells have been executed under more challenging conditions due to a requirement to drill through a highly pressured section and immediately into the severely drawdown completion interval. Significant work in the following areas supported this successful campaign to further exploit the field:

Declining reservoir pressure in the Arun field resulted in some wells lost to formation subsidence and wellbore collapse, prompting the need for big-bore HTHP wells to meet volume requirements. IADC/SPE 87171.

- Rig and specialized supporting equipment design;
- Well design and conversion to 10-in. tubing completions;
- Installation of 7-in. drill-in liners across the shale collapse zone;
- High temperature underbalanced drilling of the sour gas reservoir;
- Oil-base mud use and remediation including land farm cells;
- Rotary drilling through tree components enabling completion in an undamaged state;
- A focused QA/QC process to ensure integrity of critical equipment.

Optimization of Big-Bore HTHP Wells to Exploit a Low Pressure Reservoir

in Indonesia (IADC/SPE 87171) **J M Benesch, N Nor, ExxonMobil Development Company.**

RESERVOIR NAVIGATION TOOL

The Shell Petroleum Drilling Company EA project is located Offshore Nigeria with hydrocarbons spread over as many as 90 reservoirs.

Several platforms were installed, including two small platforms with 16 slots each. To achieve a large number of wells, 11 shared conductors will facilitate 22 wells. Two 13 3/8-in. casing strings are run through a single 36-in. conductor then run in a deviated 29-32-

to date in the Gulf of Thailand, with 252 wells being drilled in 2002 alone. In partnership with PTTEP and MOECO, Unocal has reduced the average drilling and completion costs from \$5 million and 60 days in 1980 to completed wells costing less than \$950,000 and averaging approximately five days.

The authors will discuss the neutral walk tendency of the bit on motor steerable assemblies in rotate mode, and the objectives and challenges facing the operator.

Ultra Fast Drilling in the Gulf of Thailand - Putting Science into the Design Process (IADC/SPE 87173) **J Pinto, Unocal Thailand Ltd; L E Pendleton, Brunei Energy Thailand Ltd; J L Dick, A Sinor, B Stauffer, Hughes Christensen.**

EXTENDING DRILLING WINDOW

The Brent Field reservoir has depleted some 3,500 psi from the original 5,500 psi virgin pressure. Since mid-2002 the average lost circulation per well has dropped from 5,238 bbls to 748 bbls and the associated NPT has dropped from 302 hours per well to less than 1 hour per well.

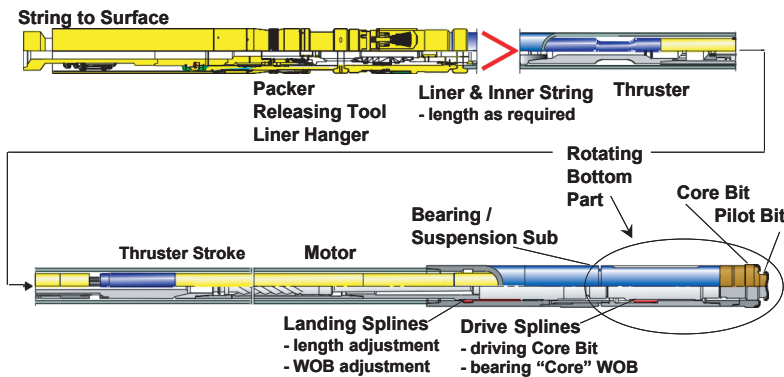
The authors will examine three main topics: application of drilling fluid technology, operational drilling practices and well design considerations.

Extending the Drilling Operating Window in Brent: Solutions to Infill Drilling in Depleting Reservoirs (IADC/SPE 87174) **M Davison, W Bennett, A MacKenzie, C J Higgons, N Shuttleworth, Shell E&P UK; R Leaper, Baker Hughes Inteq; M B Cauley, Shell International E&P; S Wilkinson, KCA Deutag Drilling Ltd.**

STEP CHANGE

Analysis of the extensive Alpine development field database of over 1,000,000 feet of hole drilled to date reveals how introduction of new technology and optimized operating parameters in the past two years has increased drilling efficiency by 17%.

Noting economic and environmental issues driving the need for increased efficiencies, the authors will address the



in. hole up to 2,300 ft with an inclination of 25°.

The authors will describe the way Shell successfully established well integrity and relative orientation of the two 13 3/8-in. casings using azimuthal gamma sensors from a reservoir navigation tool and several radioactive PIP's mounted in one of the casing strings.

Reservoir Navigation Tool Successfully Used in a Unique Way to Determine Relative Orientation of dual 13 3/8-in. Casing Strings in a Shared Conductor Well (IADC/SPE 87172) **N Foekema, J Davies, Baker Hughes Inteq; B P Jones, B Otter, Brunei Shell Petroleum Development Co.**

ULTRA FAST DRILLING

Unocal has drilled more than 1,700 wells

factors that most directly contributed to achieving that goal, including comprehensive well planning; optimization of rig capabilities, mud program and operating parameters; and utilization of adjustable gauge stabilizers and point-the-bit rotary steerable technology matched with advanced technology PDC bits.

A Step Change in Drilling Efficiency: Application of New Technology in the Alpine Development Field (IADC/SPE 87176) **G Alvord, B D Noel, V T Johnson, ConocoPhillips; R Handley, D Egedahl, E M Cribbs, Sperry-Sun Drilling Services; L M Smith, Alaskan Energy Resources Inc.**

DRILLING PERFORMANCE

The authors will demonstrate how analysis of historical drilling data can help in identifying performance gaps which, if addressed in a timely manner, could improve project economics. They will also describe how analysis was performed on past drilling operations in

order to reduce future campaign costs by determining the minimum time a well can be drilled if operations are unhindered by non-productive time and "invisible" lost time. The authors also present suggested recommendations for future drilling campaigns in order to improve drilling efficiency.

Improving Drilling Performance Through Systematic Analysis of Historical Data; Case Study of a Canadian Field (IADC/SPE 87177 – Alternate) **A R Adeleye, B K Virginillo, K H Parienteau, Anadarko Canada Resources; H Licis, Noble Drilling Services; A W Iyoho, Anadarko Petroleum Corporation.**

OFFSHORE RIG SHARING

A harsh-environment, heavy-duty jack-up rig drilled seven exploration wells in the North Sea during a two-year drilling program. By using sublet well commitments and assignments, the rig was secured in a very tight rig market and shared between two Amoco (now a part

of BP) business units for four wells and another major operator for three wells.

The author discusses how the sharing of a rig, people, knowledge, and learnings can positively impact exploration drilling operations, even across different teams, business units, and operators. The benefits of rig sharing are described, as well as specific examples of learnings being shared between wells, teams, and operators to quantify the value of a long-term drilling rig contract for one-off exploration wells. Learnings and recommendations from rig sharing arrangements and contracts are also discussed.

Offshore Rig Sharing Improves Exploration Drilling Performance - A Case History (IADC/SPE 87178 – Alternate) **D R Bert, BP America Production Company.**

SHALLOW GAS DRILLING

Shallow-gas bearing formations in the Gulf of Thailand present numerous drilling and cementing challenges. In the first three wells drilled on platform WP11 in Bongkot field, initial cementing of surface casing did not achieve effective isolation of the shallow-gas zone.

The new approach involved consolidating and damaging the formation with drilling fluid and using low-temperature lightweight gas-tight cement slurry. This water-reduced formulation requires optimization of the particle size distribution, gas migration control and short transition time.

The authors will present case histories describing the solutions-oriented approach to this problem, which resulted in changes to both the drilling program and the cementing operations.

The author will also discuss the extensive laboratory testing performed to formulate the lightweight gas-tight cement slurry at low bottom hole temperature, best drilling practices learned and changes to selection of drilling fluid.

Overcoming Shallow-Gas Drilling Difficulties in the Gulf of Thailand (IADC/SPE 87179 – Alternate) **M I Dooply, W Friedl, Y A Elmarsafawi, Schlumberger; P Tiraputra, S Pongrapin, P Thiravutpinoyo, PTT E&P Public Company Ltd; B Fraboulet, Total.** ■