Meeting Challenges with New Technology

Recent geopolitical events remind us that international and local volatilities affect most of the world’s large hydrocarbon deposits and hinder long-term stabilization of supplies and prices. Even though energy demand is likely to grow, we must remain focused on cost-effective oil and gas exploitation. The petroleum industry needs to discover and develop new reservoirs, and at the same time, increase recovery from existing fields.

Technology and skilled people are the foundations for meeting this dual challenge and building a more successful energy business. In addition to steady improvements in environmental protection and wellsite health and safety, operators have realized major gains in operational efficiency and well productivity. These strides have come primarily through new technologies that dramatically change the way oil fields are discovered, developed and produced.

The latest advances in deepwater drilling rigs improve well-construction operations, reducing both time requirements and costs. Compared with conventional methods, monobore wells and new expandable tubulars allow drilling of smaller holes. Offshore, this translates into smaller risers and blowout preventers. Innovative well completions facilitate the application of these “lean-profile” drilling techniques.

Screenless completions, for example, offer cost-effective alternatives for rigless well interventions. To date, this sand-control technology has yielded encouraging results (see “Screenless Methods to Control Sand,” page 38). Screenless techniques provide fullbore access across productive intervals and maximize reserve recovery by allowing completion of bypassed zones or rehabilitation of wells with plugged gravel packs and screen failures.

Improvements in directional drilling, logging-while-drilling and measurements-while-drilling, and new bit designs have led to record-breaking drilling achievements, including extended-reach wells that exceed 10 km [6 miles]. Because directional control is easier, wellbore trajectory can be adjusted rapidly if difficult drilling conditions are encountered, and we can accurately place wells within a few feet of an intended target. These are key factors in the shift to high-angle, horizontal and multilateral wells. One well with a complex trajectory or multilateral configuration that intersects several reservoir targets can achieve the same objectives as several vertical wells.

Advanced rotary steerable systems, topdrive rigs and superior drilling fluids facilitate rotation of the entire drillstring to minimize the risk of stuck pipe and promote hole cleaning in upper hole sections. Smoother boreholes significantly increase penetration rates and drilling efficiency, and facilitate subsequent well-construction operations.

Innovative cement systems improve primary cementing and zonal isolation by decoupling fluid characteristics from slurry density. Recent cementing technology provides a range of slurry densities from extremely low to extremely high without sacrificing compressive strength, hydraulic isolation or prevention of gas migration. Nondamaging polymer-free fracturing fluids based on viscoelastic surfactant technology improve both gravel packing and hydraulic fracturing. The net result is better field operations and enhanced productivity from depleted and ultra-deepwater reservoirs alike.

As we undertake projects in deepwater and frontier areas, real-time monitoring of reservoir behavior using permanent sensors will help maximize asset value and financial performance. Sophisticated downhole gauges in intelligent completions supply continuous data and link with remote flow-control devices. This real-time information allows us to predict reservoir behavior, manage production and make adjustments that increase recovery.

Our success in timely and effective implementation of new technologies and maximizing their pass-along benefits depends on how we manage corporate and industry-wide knowledge. Lessons learned, best practices and expertise must be validated, retained and shared in an integrated environment. The speed of company intranets and the Internet give us unprecedented access to the best and most up-to-date information when decisions must be made, but these data must be validated and promptly available.

Knowledge databases are most effective when technical communities share information, learn from each other and reuse what is already known. Companies should reward knowledge sharing among employees to build on and apply existing resources and expertise. In this way, we can bridge the gap between advising and decision-making communities, thereby empowering everyone to use the knowledge available within the petroleum industry and our own organizations. Partnering with a service provider through an alliance also allows oil companies to extend their technical resources by integrating the technology and dedicated work force of the alliance partner.

Angelo Calderoni
Vice President of Technical Services–Well Operation
Eni S.p.A., E&P Division
Milan, Italy

Angelo Calderoni has been vice president of Technical Services–Well Operation at division headquarters in Milan, Italy since February 2003. He joined Agip in 1979 as a junior drilling supervisor and worked in several operational and managerial drilling and completion positions in various countries. In 2001, he became general manager and deputy managing director in Venezuela, where he pioneered the Dación development, which is operated by an alliance between Eni Venezuela and Schlumberger. Angelo holds several patents in drilling technologies and is active in the SPE, serving as membership chairman of the SPE Italian Section from 1996 to 2000. He obtained a degree in electrical engineering at the University of Bologna, Italy.
**Advisory Panel**

Antongiulio Alborghetti  
Agip S.p.A  
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**Address editorial correspondence to:**

Oilfield Review  
225 Schlumberger Drive  
Sugar Land, Texas 77478 USA  
(t) 281-285-7847  
(fax) 281-757-9519  
E-mail: andersen@sugar-land.oilfield.slb.com

**Address distribution inquiries to:**

Matt Garber  
(44) 1223 325 377  
Fax: (44) 1223 361 473  
E-mail: mgarber@cambridge.scr.slb.com

Oilfield Review subscriptions are available from:

Oilfield Review Services  
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On the cover:

The sedimentary character of the Pennsylvania Morrowan fluvial-deltaic deposits at Searcy Quarry, White County, Arkansas, USA, is clearly visible in the rock-wall face. Obtained from a test well about 140 feet [43 m] behind the quarry face, an FMI Fullbore Formation MicroImager* well log provides an excellent formation to wellbore image-log correlation. The reference scale is 5 ft [1.5 m] per color increment. Thanks to Rick Kears, Schlumberger Principal Geologist, New Orleans, Louisiana.

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