Dennis Denney, *JPT* Senior Technology Editor

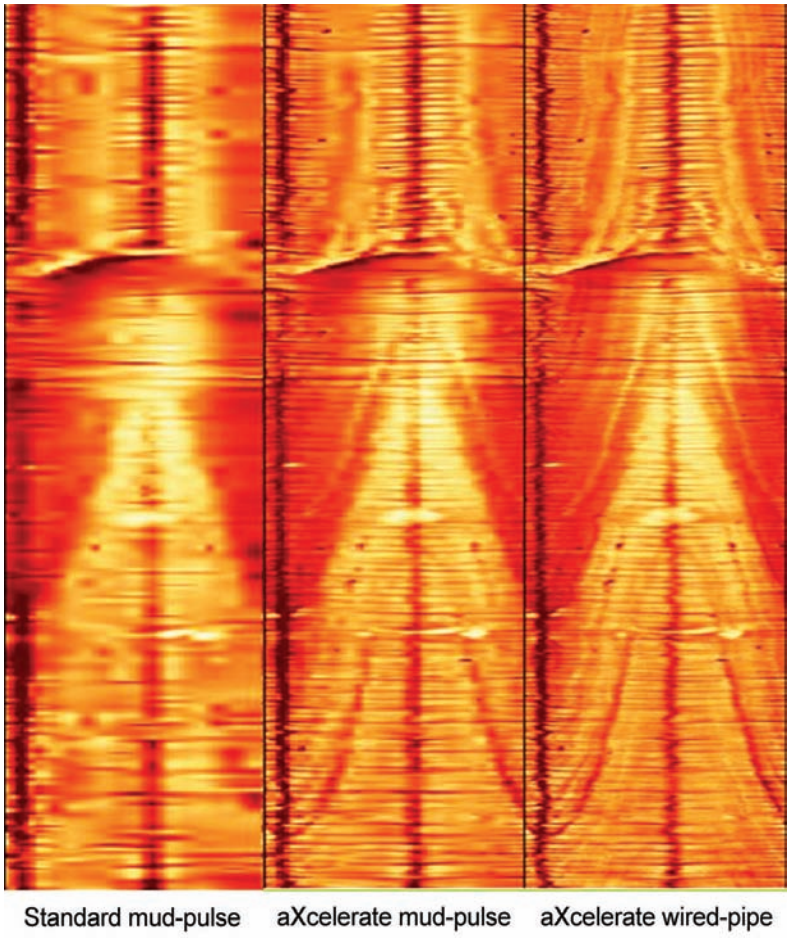


Fig. 1—The Baker Hughes StarTrak supplies images of the borehole wall that can be transmitted with standard mud-pulse-, high-speed-mud-pulse-, and wired-pipe-telemetry speeds.

High-Speed Telemetry—Baker Hughes' Inteq has introduced its aXcelerate high-speed-telemetry service for high-speed mud-pulse and wired-pipe data transmission in logging-while-drilling (LWD) and measurement-while-drilling applications. The service enables wired-pipe-telemetry connectivity in conjunction with the National Oilwell Varco IntelliServ Network. The mud-pulse system incorporates new downhole-pulser technology and surface components along with advanced decoding and noise-reduction signal-processing algorithms. The system facilitates high-speed two-way communication for changing downhole drilling and logging parameters without interrupting drilling. On a recent reservoir-navigation application in the Middle East, the system delivered telemetry rates of 20 bps while drilling at speeds up to 130 ft/hr—providing both real-time LWD density images and highly detailed 64-sector StarTrak high-definition resistivity images **(Fig. 1).** The wired-pipe-telemetry service enables time-sensitive, real-time applications. With wired-pipe telemetry, operators can have simultaneous, instantaneous access to high-resolution downhole images, detailed logs, and comprehensive drilling-dynamics measurements.

For additional information, visit www.bakerhughesdirect.com/aXcelerate.

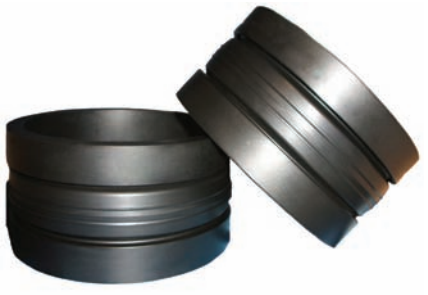


Fig. 2—Caledyne's elastomer-free high-performance MTM seal.

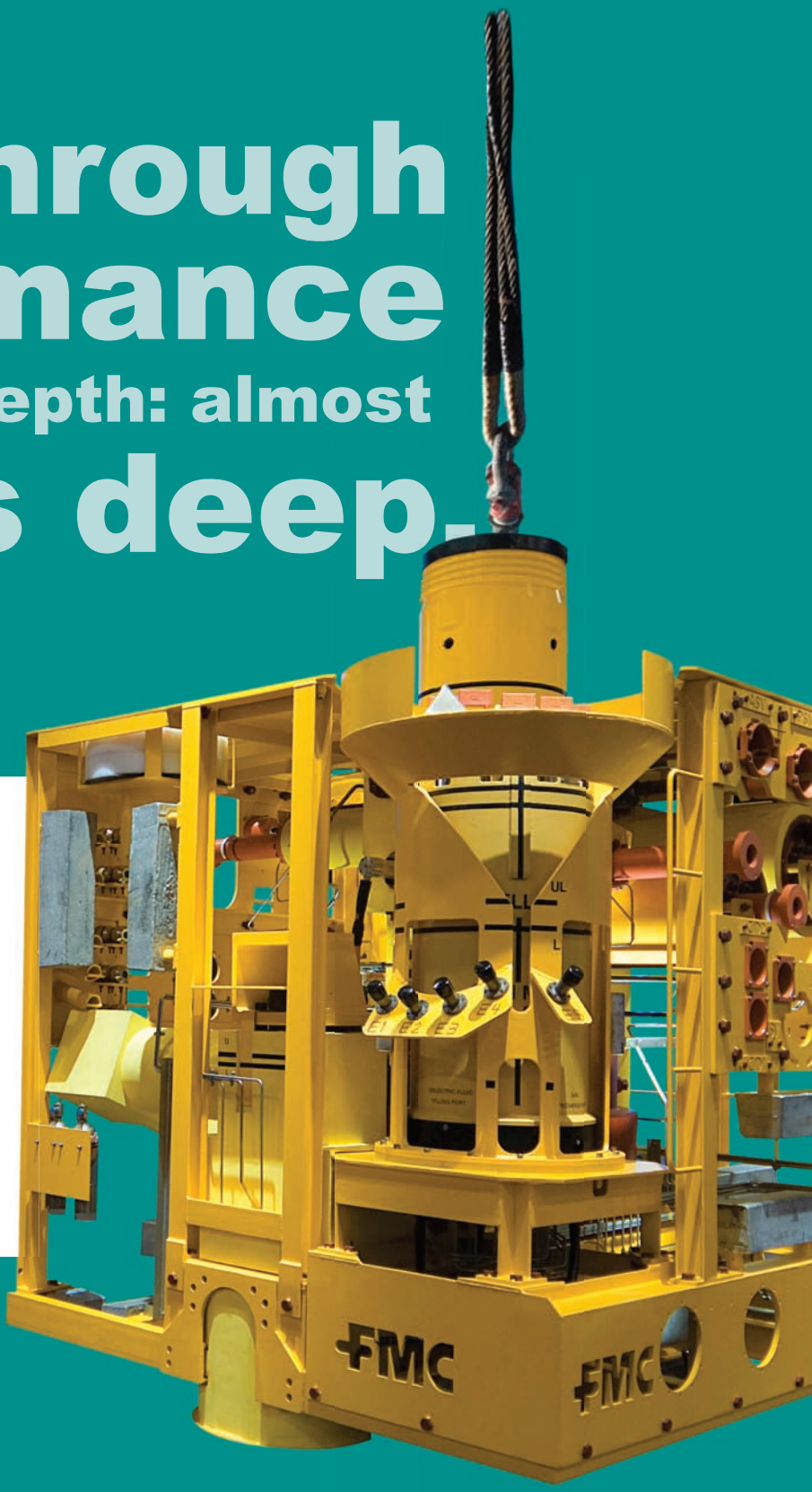
Metal-to-Metal Seal—Caledyne's retrievable metal-to-metal (MTM) downhole seal system consists of flexible material contained inside a metal shell **(Fig. 2).** The structure creates a complete metal barrier in the well, and when fully energized, it protects against harsh downhole conditions. The system acts similarly to a standard rubber or elastomeric seal, while remaining resistant to high H_2S and CO_2 concentrations. Performance-rated to more than 10,000 psi at 572°F, the seal can be installed on permanent and retrievable packers, bridge plugs, hanger packers, sliding sleeves, and subsea-sealing applications such as plugs and flange seals. Currently, seals are available in 5-, $5^1/_2$-, $6^5/_8$-, 7-, and $9^5/_8$-in. sizes. In a recent installation on the Bunga Kekwa project in Malaysia, its use in conjunction with a retrievable bridge plug enabled an upper-completion repair by providing a high-performance barrier to isolate a section of the well safely.

For additional information, visit www.caledyne.co.uk.

Seismic Imaging—WesternGeco's recent advances in processing capabilities enable sophisticated seismic-data-migration methods. Improvements in imaging take advantage of increased computer capacity, enabling imaging techniques that are closer to the ideal-wave equation. New acquisition geometries extend the frequency bandwidth and the offset and azimuth range of recorded data **(Fig. 3).** Acquisition geometries such as wide-azimuth, multiazimuth, rich-azimuth, and Coil-Shooting single-

FMC Technologies

Breakthrough performance at a record depth: almost 2 miles deep.



FMC's new Enhanced Vertical Deepwater Tree (EVDT) just set a new depth record at Shell's Perdido project in the Gulf of Mexico: 9,356 feet (2,852 m). That's impressive, but so is EVDT's performance: It combines the advantages of slimbore design with large bore production capacity. It's versatile – you can land the tubing hanger in the subsea wellhead or in the tubing head. And you can install it with a conventional rig equipped with a surface BOP, for big savings. Which makes EVDT a great choice at any depth.

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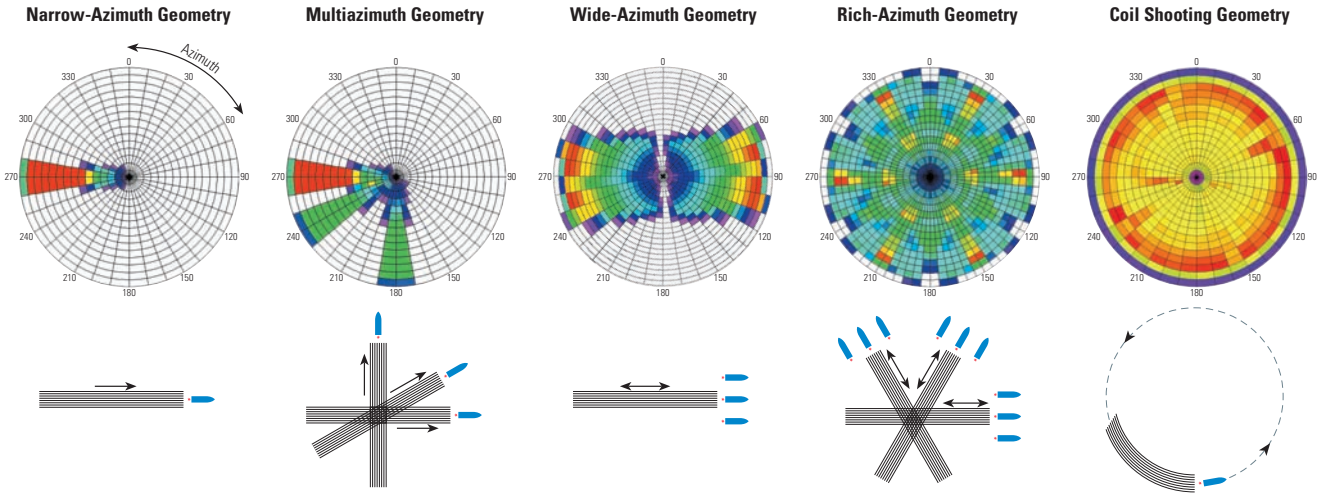

Fig. 3—WesternGeco acquisition geometries.

vessel full-azimuth acquisition deliver increased illumination of the subsurface from a wider range of angles and azimuths. These techniques enhance the accuracy of the inversion of seismic data for Earth properties. In addition, increasing the frequency bandwidth by lowering the minimum frequency of seismic sources has improved steep-dip imaging and overall resolution. Migration techniques that honor the physics of wave propagation improve image quality. Two main trends are reverse-time migration and anisotropy, both of which require adequate computer resources for an integrated approach of imaging and Earth-property determination. In a traditional compressional-wave (or P wave) workflow, acoustic-imaging algorithms yield accurate Earth-reflectivity and elastic-reflectivity inversion to provide a model of the Earth properties. Today, full-wave inversion combines these steps into a single estimation of absolute properties directly from the wave field.

For additional information, email seismic@slb.com.

Biocide/Polymer Package—The use of Kemira friction reducers, including Cyanaflo and Callaway polymers, helps optimize fracturing treatments. Even with the use of polymeric friction reducers, time for activation and ultimate friction reduction have been a concern, especially in brine systems. The use of the company's AMA 324 microbiocide in conjunction with polymeric friction reducers enhances both activation time and ultimate friction-reduction levels, regardless of the ionic character of the polymer. Testing was performed on a variety of fluid combinations in the laboratory and in the field. For example, when dosed with 250 ppm of AMA 324 with 0.5 gal of A-4330 in 1,000 gal of 2% KCl fluid, the time required to reach maximum reduction is one-sixth the original time and the ultimate friction-reduction percentage is almost tripled. With the use of a cationic reducer under the same conditions, the required time is cut in half and friction reduction is almost doubled. The synergistic effect of these two chemistries results in lower activation time on the surface going downhole, reduces surface-holding capacity needed to reach required reduction levels, and reduces the equipment needed. This combination also allows for higher friction-reduction levels that allow lower pump pressures.

For additional information, email philip.hart@kemira.com.

Smart Pump—Colfax has announced an intelligent-concept pump with the ability to monitor its own performance, adjust to changing conditions, and order its own replacement parts—all without human supervision. The Imo TX2020 pump **(Fig. 4)** is designed for remote pipeline locations and other facilities that need to operate at high capacity. The rotary positive-displacement three-screw pump continuously monitors flow rate, pressure, liquid viscosity, and energy consumption. If it is determined that an adjustment is necessary to maintain flow, it can change speed or it can heat the liquid to lower its viscosity. The pump can operate by itself at a remote pumping location or be connected to a network of pumps managed at a central facility. Pump software includes a preventive-maintenance calendar and (based on foreseen needs or detected problems) the ability to determine which parts need replacement and to issue a purchase order for them.

For additional information, visit www.colfaxcorp.com.

Fig. 4—Colfax's Imo TX2020 smart pump.

Fig. 5—Halliburton's CAT (left) and SAT (right) were developed, in part, through cooperation with Sondex.

Production-Array Log—Multiple sensors in Halliburton's new Capacitance Array Tool (CAT) and Spinner Array Tool (SAT) **(Fig. 5)** log the entire cross section of horizontal and deviated wells over the entire zone, even if the orientation of the tool varies. In multizone wells the tools can determine flow rates and volumes of each fluid at each stage. This technique is used to determine the source of water production and enables remedial actions that increase oil and gas production and extend the life of the well. Proprietary software integrates data from traditional sensors with data from the newer arrays, and then it enters the results into Kappa's Emeraude package, resulting in a comprehensive analysis in log format. The 12 CAT sensors detect fluid density. The SAT provides six radial spinner measurements that create a velocity profile of the entire wellbore. Multiple sensors, along with tool rotation and relative-bearing measurements, increase wellbore coverage. Horizontal and vertical displays show phase segregation, and holdup and velocity measurements are made at any inclination. Downhole flow rates are determined independently of slip velocity. True-vertical-depth displays allow 3D visualization of wellbore undulations and their effect on holdups and velocity.

For additional information, visit www.halliburton.com/wireline.

Fig. 6—Spirax Sarco's DIVA steam flowmeter.

Flow Measurement of Steam—Spirax Sarco offers its DIVA compact steam flowmeter **(Fig. 6)** for general metering applications and for fiscal metering, product costing, and steam-efficiency monitoring. The direct in-line variable-flow meter produces repeatable measurements of steam flow over a wide range of flow conditions. The meter automatically compensates for changes in steam density, providing output signals proportional to mass or energy flow, and it displays steam pressure, temperature, flow rate, and total flow in both customary and SI units in real time. The unit requires straight-line runs of only six pipe diameters upstream and only three downstream for installation. The process-pressure limit is 464 psig, and the process-temperature limit is 462°F. The flowmeter operates on the spring-loaded variable-area principle, whereby the area of an annular orifice is continuously varied by a precision-shaped moving cone. This cone is free to move axially against the resistance of a spring. The flowmeter calculates flow by measuring the force caused by the deflection of the cone by use of a series of very-high-quality strain gauges. The higher the flow of steam, the greater the force. The meter has an internal temperature sensor that provides full density compensation for saturated-steam applications.

For additional information, visit www.spiraxsarco.com/us.

Geostatistical Depth Conversion—Earthworks Environment & Resources launched the latest version of its prospect-evaluation software, HIIP. The interactive software allows explorationists to make depth/structure and volumetric-uncertainty calculations. The software enables rapid testing of top-of-structure uncertainty and volumetics. It also includes volumetric- and spillpoint-sensitivity testing, including hydrocarbon-contact uncertainty and volumetric sensitivity to fault-seal presence or absence. The software is compatible with grid formats of major simulation software. The software combines a traditional Monte Carlo prospect-evaluation tool with geostatistical depth conversion and a grid-analysis and volumetric tool. The geostatistics module is designed to perform uncertainty calculations on grid-based data. Volumetric post-processing performs volumetric calculations on grids and supports conventional volume calculations by use of a known contour or hydrocarbon contact. After generating multiple geostatistical depth realizations, these can be analyzed to compute volumetric distributions under user-defined scenarios [e.g., lowest closing contour (spillpoint)] or to compute isoprobability-closure maps. The user defines prospect targets on the grids, and the software computes gross rock volumes on the basis of the selected scenario. The software can be used on a set of grids comprising multiple geostatistical simulations or can be applied to a single surface such as a deterministic depth map. **JPT**

For additional information, email info@sorviodvnvm.co.uk.