

# THE AMERICAN OIL & GAS REPORTER®

APRIL 2010

The "Better Business" Publication Serving the Exploration / Drilling / Production Industry

## New Bit Designs Maximize Performance

By Danny Boyd  
Special Correspondent

Advances in drill bit technology are enabling manufacturers to meet the demands of oil and gas companies for innovations that allow more efficient and cost-effective drilling operations, from long-lateral horizontal wells in shale plays to vertical wells in traditional oil basins where commodity prices are buttressing activity.

New bits and enhancements to existing systems continue as the industry steadily ramps up drilling activity. During the first quarter of 2010, the U.S. rig count jumped by almost 20 percent, to its highest level in more than a year. Not only is the industry stepping up activity, but the type of well also is changing. The number of rigs drilling for oil has ratcheted to levels not seen in nearly two decades, and the 711 rigs drilling horizontal wells in the third week of March was the highest number ever recorded in the weekly Baker Hughes count. In fact, operators now are drilling two horizontal or directional well bores for every one vertical well.

But these changes mean drilling and exploration managers face new challenges, whether steering a well to intersect natural fractures at just the right azimuth or managing the drill string through depleted zones to target bypassed pay in a mature oil field. And no matter the well type or drilling plan, the objective is to drill a full-gauge hole to the target interval in the least amount of rig time. Optimizing performance and eliminating nonproductive time begins with the bit, one of the most critical components in the drilling system. On cue, manufacturers are rolling out new bit designs that maximize performance to save operators hard-earned capital in their drilling programs.

### Expanded PDC Series

Varel International is placing a premium on not only developing new technology, but also on optimizing its proven bit designs to continually improve performance in the field, according to Cary Maurstad, product manager. And he says the company has done exactly that by expanding on



Varel International's Diamond Edge™ PDC bits are equipped with a multisets cutting structure that provides both durability and stability for transitional drilling and hard rock applications. In the Haynesville Shale, Diamond Edge bits equipped with the PowerCutter™ cutting structure achieved a 36 percent improvement in cost per foot compared with the closest offset, and a potential savings of \$300,000 compared with all area offsets.

its Diamond Edge™ PDC series, which was launched in 2009.

"Diamond Edge bits are specifically equipped with a unique cutting structure design methodology for transitional drilling and hard rock applications," Maurstad details. "We are moving ahead and building on better materials, better processes, quality engineering and meticulous attention in quality control."

According to Maurstad, the PDC bits feature a multisets cutting structure that provides both durability and stability, as well as a design that allows the advantages of both single-set and plural-set bits to be exploited in Varel's proprietary approach to the cutting structure.

"The bits have shown a 20 percent improvement in ROP when compared with plural-set PDC bits with minimum wear," he states. "We feel operators recognize that proper bit selection is critical for ROP. It is our goal with this series to provide a bit that is capable of meeting the challenges of their most abrasive, fractured and interbedded formations."

In regard to efficiency, Maurstad points out that the deeper the drilling goes, the more expensive it becomes. "These bits are engineered to deliver increased ROP with improved stability and durability, even at greater depths," he remarks. "Our goal is to get in, do the job, and let the operator move on to the next section."

In the Haynesville Shale, Maurstad says a large operator turned to Varel to help reduce drilling costs in the 9½-inch intermediate hole section. Three similar operations in Desoto Parish, La., had required up to eight drill bits to drill the section, and others averaged at least five bits, he notes.

Varel recommended a six-bladed Diamond Edge bit for the upper section of



the hole and a seven-bladed bit for the deeper geology, according to Maurstad. The bits were equipped with the Power-Cutter™ cutting structure, and the seven-bladed bits also were set with updrill cutters and replaceable tungsten carbide shock studs.

“This particular operation took only three bits to complete: a single DE616P and two DE713PUX bits drilled the section to a total depth of 11,040 feet in 233.5 hours at an average ROP of 39.4 feet/hour,” he reports. “This performance netted a 36 percent improvement in cost per foot compared with the closest offset and a potential savings of \$300,000 compared with all area offsets.”

### Slim Hole Roller Cone Bits

Varel also has expanded its roller cone product line with the introduction of the Compass™ series for slim hole applications, Maurstad announces, with tungsten carbide insert bits available in sizes ranging from 3¼ to 7¾ inches.

“The new series focuses on applications such as reduced-sized casing programs, horizontal drilling, re-entries, multilaterals and coiled tubing drilling, which all require steerability, reliability and maximized rates of penetration,” he says. “These bits were system-engineered to perform at low weight on bit, run longer hours and withstand the high rpm speeds typical of motor applications.”

The end result is lower cost per foot, fewer trips and increased accuracy in small pay zones, Maurstad claims. “Much

of what we learned from our High Energy™ platform has been incorporated into the new slim hole roller cone bits. The cutting structure is designed for speed and steering responsiveness,” he says. “Coupled with



**Compass™ roller cone bits from Varel International are designed for slim hole applications. The tungsten carbide insert bits are available in sizes ranging from 3¼ to 7¾ inches for reduced-sized casing programs, horizontal drilling, re-entries, multilaterals, coiled tubing drilling, and other applications that require steerability, reliability and maxim penetration rates.**

the improvements implemented in this series, the slim hole performance variable has been shifted by supplying a durable bit with advanced shirrtail protection in directional applications with a highly robust bearing surface.”

The bits contain a patent-pending heat shield for thermal protection and a conical seal gland to provide benefits during high-angle drilling, Maurstad goes on. High-temperature, high-lubricity bearing grease assists in reducing internal heat to extend bearing life.

Field tests have demonstrated improved ROP in multiple applications, according to Maurstad. “The responsiveness and durability of the bits have minimized costs associated with additional bit runs and tripping in areas where they have been tested,” he says.

Referencing multiple slim hole runs for an operator in Western Canada, Maurstad says Compass bits were applied to increase footage drilled while maintaining an acceptable ROP while drilling through increasingly hard formations, including abrasive, sharp sands in the Cadomin/Nikanassin zone.

“The Compass CM44DMRS design delivered consistent performance in multiple runs, and was shown to be a performance leader when compared to the closest offsets in the area,” he comments. “Collectively, Compass bits drilled 46 percent more footage on average than offset bits with above-average penetration rates, and the dull conditions of the bits were vastly improved.” □



**VAREL**  
INTERNATIONAL

1625 W. Crosby, Suite 124  
Carrollton, Texas 75006  
www.varelintl.com