

Technologies Tackle Challenging Wells

By Victor A. Schmidt
Special Correspondent

Constructing a high-quality wellbore from the pilot hole to target depth is dependent on a long list of technologies and processes, but none are more fundamental to success than the tubular components used to drill, case and ultimately produce the hydrocarbons. The performance metrics of pipe and connections continue to be redefined as operators drill ever-more complex borehole architectures in the quest to develop tight oil, shale gas and deepwater reserves as efficiently, safely and cost-effectively as possible.

In these demanding environments, tubulars and connections are subjected to increased torque, compression, fatigue, collapse, friction, drag, wear and other stresses, along with higher pressures/temperatures and more corrosive environments. And not only are today’s well designs more challenging, but they also consume more tubular goods. With increasing lateral lengths, some onshore horizontal wells are rivaling their deepwater counterparts with respect to the total quantity of steel run down the hole. On average, a single horizontal or deepwater well requires enough pipe and connections to drill and case at least seven typical lower-48 vertical wells.

It is a different world out there with new sets of engineering and operating challenges, and oil country tubular goods manufacturers are responding with a new generation of solutions. The gold standard in OCTG and drilling tubulars has become high-torque, high-strength pipe and connections engineered to withstand the rigors of today’s drilling and development programs, whether getting a 10,000-foot lateral

to total depth in the Wolfcamp play or getting casing to bottom 25,000 feet below the mudline in a subsalt Miocene well.

Metal-To-Metal Alloy

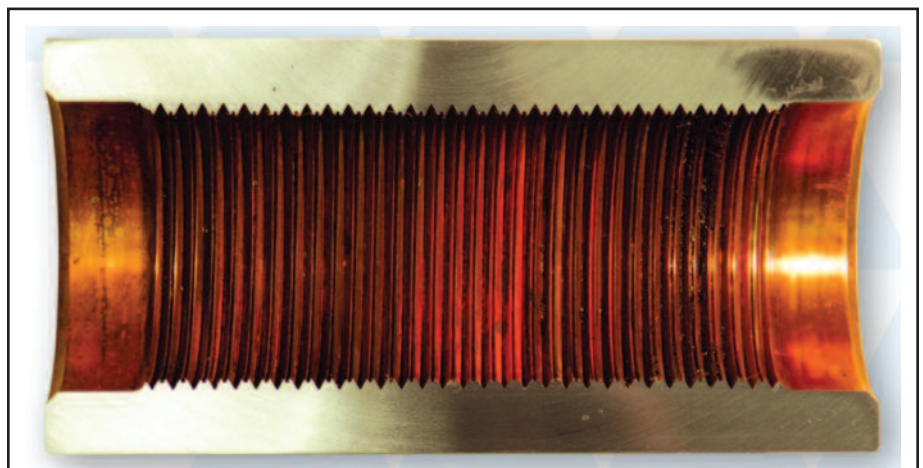
Bill Nielsen, vice president and general manager, alloy products, at Materion, reports a steady growth in the number of oil and gas companies using sucker rod couplings made from the company’s ToughMet® 3 high-performance alloy to overcome wear issues during production operations.

“The environment in which sucker rods operate is very dynamic, in constant motion, and with high fatigue because of the constant alternation between tension and compression while the pump is in operation,” Nielsen says. “In addition, the couplings rub against the interior of production tubing, and the operator has

to choose between sacrificing couplings or tubing. Usually, it is the couplings that are sacrificed, leading to worn couplings, frequent pulling operations and occasional fishing jobs.”

ToughMet applies modern bearing technology to sucker rod couplings. Nielsen says some of the early ToughMet couplings still are operating and in good shape after up to four years of operation. The enhanced durability is related to the nature of the copper-nickel-tin alloy, which acts as a metal-to-metal, anti-galling bearing surface between the coupling and the production tubing. The result is longevity, durability and minimal wear on both the coupling and production tubing.

The couplings are usually placed in the rod string in sections of the well where severe wear is expected, such as



Operators are using sucker rod couplings made from Materion’s ToughMet® 3 high-performance alloy to overcome wear issues in rod-pumped wells. The enhanced durability is related to the nature of the copper-nickel-tin alloy, which acts as a metal-to-metal, anti-galling bearing surface between the coupling and the production tubing. The results are longevity, durability and minimal wear on both the coupling and production tubing.



the curved section where a well turns horizontal. Nielsen relates that Hess Corporation tested ToughMet couplings in horizontal Bakken/Three Forks wells over an 18 month period. The couplings were placed in the worst wear sections of the rod strings in 10 wells.

“The rate of damage to the sucker rod couplings and production tubing, and the frequency of well failure, were significantly reduced,” he states. “No appreciable wear of the couplings or tubing was found in triple the run times of standard couplings.”

Given the positive results of applications in only the worst wear sections, two operators now are experimenting with full ToughMet-coupled strings to test production improvements that may result. Since the friction from the coupling material is so low, the load on the polished rod and gearbox is reduced and increased stroke length can be captured, according to Nielsen.

“Modeling of the pumping system shows that if drag/friction can be reduced in the system, it is possible to extend the pump stroke, increase pump fillage, and thereby increase production by up to 20 percent,” he says. “The benefit of avoiding this mode of well failure is enormous, from \$70,000-\$100,000 per well per year, with the promise of saving operators millions in workover costs over a producing field’s lifetime.”

‘In-Casing’ Diversion System

Once the casing is in place and it is time to complete the well, Thru Tubing Solutions has introduced an innovative “in-casing” diversion technology—SlicFrac™—that is used to increase stimulation within fracturing stages, according to Jenna Robertson, SlicFrac manager for Thru Tubing Solutions.

In addition to stimulating new completions (stage-by-stage or diversion), applications include recompletions or refracs, chemical treatment, and wells with casing problems such as partial collapses or casing patches, she adds.

Perf Pods™ are dropped from the surface or launched during the completion to seal inside perforations that are taking the majority of the proppant, effectively diverting the hydraulic pressure into perforations that have not been treated efficiently, Robertson explains.

“The pods consistently seal irregular-shaped holes and are available in several versions to meet all operational requirements, including dissolvable, acid-resistant and high-temperature qualities,” she says.

“By design, Perf Pods selectively plug the perforations that are taking the most fluid to divert the treatment to virgin formation, efficiently stimulating the entirety of each stage.”

“SlicFrac can eliminate or reduce the number of frac plugs, reducing cost to the operator and eliminating some of the

risk,” Robertson states, noting that since its release in early this year, the technology already had been used successfully by 50 companies to complete more than 250 jobs as of early August.

“Some customers are claiming a huge increase of production from using SlicFrac,” she reports. □

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