Slickline for the Information Age

Over time, but particularly in recent decades, the business of finding and producing hydrocarbons has grown steadily more challenging. Technology and technology applications in nearly all segments of the E&P industry have kept pace with the challenge. As a consequence, the industry’s equipment, tools, software and workforce skills have long been and remain at the cutting edge of technology development.

Slickline technology, on the other hand, has defied this trend and has changed little since the inception of slickline operations, testimony to its suitability for live well intervention. Aside from the recent introduction of battery-powered devices and memory sensors, the tools deployed and the information available to the operator during job execution remain essentially what they have been for decades. As measured by current standards, downhole information from slickline technology has been limited in nature, quantity and availability.

Only recently has there been a significant advance in slickline technology, one that incorporates cutting-edge benefits such as real-time visibility and interaction and control, while maintaining the hallmark slickline advantage of simplicity.

Often, in our R&D efforts to improve or develop technology applications, we overdesign and thus build complexity into a technology solution. As a consequence, simplicity can elude us and innovations can become overly complex and less effective than the simple systems from which they originated.

A hybrid approach to innovation recognizes the value of simplicity wherein developers deliver a tool that is simple to use but relies on a high level of sophistication and complexity that remains in the background and does not require users’ understanding. Perhaps Steve Jobs’s approach to technology—creating usable tools that are not hindered by their own complexity—is the most prominent example of this concept. But appreciation for the value of simplicity in science is not a recent phenomenon; Leonardo da Vinci called simplicity “the ultimate sophistication.”

It is, in fact, the inherent simplicity of slickline that has allowed it to survive relatively unchanged for these many years. Early attempts to introduce significant change to slickline met with mixed results. Scientists delivered a slick wire that could act as a conductor, but the resulting wire was unable to handle the tensile stresses or perform slickline operations in the environment and mode typically required of it. Ultimately, it could not execute the scope of work for which it was intended.

The idea to build on simplicity rather than compromising it, while not losing sight of the role and advantages of slickline, turned out to be the right path. Using standard slickline as its core, engineers developed LIVE* digital slickline. In addition to performing traditional operations, the enhanced slickline enables real-time digital telemetry. This, coupled with other innovative components, provides a plethora of capabilities, each of which can be applied with considerable advantage to the mechanical, remedial and measurement applications of slickline.

Mechanical applications are the most commonly used of slickline services. The ability to deliver relevant, in situ downhole measurement data to the surface in real time promises to have significant impact on those mechanical operations, ensuring operators a means by which to perform interventions in a more controlled, risk-managed approach. In addition, digital slickline services provide a digital record of all operations—information that is increasingly in demand. Perhaps most importantly, these well intervention advances may play a sizeable role in the industry’s efforts to increase recovery factor.

The idea of insulating a standard slickline to allow digital telemetry is a simple one; achieving it has proved more difficult. The barrier to success was creating an insulated slickline—developing a method for bonding the wire and the insulator so that they would remain intact and operational despite the rigors of repeated bending the wire and shocks imposed in the inherently hostile environments.

After years of attempts, however, engineers have succeeded in delivering a slickline that meets these demands, while providing enhancements and advantages necessitated by today’s E&P industry (see “Slickline Signaling a Change,” page 16).

Digital slickline provides many of the advantages of electric line, retains the simplicity and the relatively smaller footprint of traditional slickline and lends itself to well intervention optimization with minimal risk. This remarkable technology is certain to gain a secure place in the industry.

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An asterisk (*) indicates a mark of Schlumberger.