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Integration Brings Success in Difficult Louisiana Well

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Integration Brings Success In Difficult Louisiana Well

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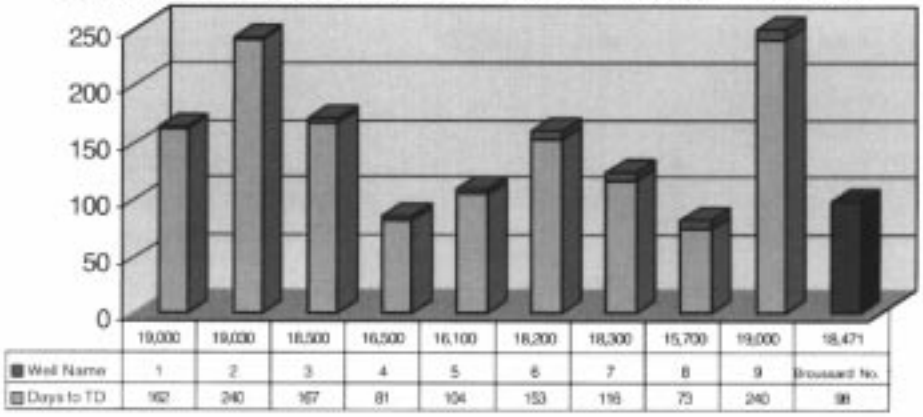
NEW ORLEANS–An integrated approach to fluids management, coupled with a unique contractual model, contributed to the highly successful drilling of an 18,417-foot exploratory well in the extremely troublesome Vermilion Parish area onshore southern Louisiana.

The L.M. Broussard No. 1 well in the North East Wright Field was drilled to total depth in only 98 days–45 days faster, on average, than the time required to drill other wells in the problematical area. Not only was it a textbook well from surface to TD, but the closed-loop fluids processing system (FPS) employed in conjunction with the integrated approach to fluid and waste management played a major part in reducing disposable wastes by 43 percent when compared to the best available offset.

The drilling efficiencies illustrated by the L.M. Broussard No. 1 represent a major milestone for operators working in the difficult Vermilion, Cameron and Jefferson parishes of Louisiana, where wells target the Marg Tex formation located below 15,000 feet. Extreme faults, fractures and salt water flows have historically created havoc with Marg Tex drilling operations. Owing to the hostile downhole conditions, which vary from well to well, kicks, stuck pipe, extreme fluid losses and other problems have considerably increased the average drilling time per project. A sampling of wells drilled in a heavily explored section adjacent to the Broussard well shows an average time to TD of 143 days, with some wells requiring up to 240 days (Figure 1).

FIGURE 1

Broussard No. 1 Compared to Offsets in the Vermilion Parish Area



Recognizing the historical performance and the associated economic ramifications intrinsic to this area, the operator elected to attempt a new approach for planning the L.M. Broussard No. 1.

Integrated Approach

The principal motivation in integrating all fluid-related issues was to free the operator's on-site representative to concentrate solely on improving drilling efficiencies. Furthermore, a contractual model that combined drilling, solids control and waste disposal into a single cost-per-foot target for each interval created an incentive-based agreement that transferred more ownership to the service provider.

The concept of integrating all fluids and waste management activities under one umbrella was based on the conviction that the associated products and services represent a natural grouping at the well site. This natural grouping includes drilling, drill-in and completion fluids; solids control and filtration equipment; and waste treatment and remediation equipment. This grouping is natural to the extent that the performance of individual components is interdependent. In other words, managing and executing these processes jointly with combined resources increases the opportunities for improved results.

The integrated fluids engineering process begins in the well planning stages and extends through completion, including the ultimate disposal of fluid waste. The process goes well beyond shared infrastructure and personnel to exploit synergies in technology and delivery inherent in this natural products and services grouping.

Unlike approaches that simply bundle services, the truly integrated service incorporates total fluid and waste management planning procedures, best practices, benchmarking, newly developed software, and other fluid-related technologies. Additionally, the completely linked product and service approach includes an integrated data management system that features a common database to analyze the interactions between all fluid system components. This component is fundamental for continuous analysis and improvement.

Comprehensive Evaluation

The integrated approach also includes a comprehensive evaluation of the mud mixing, solids control and waste management systems on drilling rigs prior to spudding a well. The process can have a dramatic impact on operational efficiency and ultimate fluid-related costs.

To avoid any unexpected problems during the drilling program, the inspection (which includes everything from examining the shakers, mud mixing system and mud pits) should ideally be conducted early in the planning stages of an integrated fluid engineering project. Audits have been conducted on new-builds, rigs undergoing refurbishment, and even to improve the solids control and waste management efficiencies of units while a well is in progress

A new integrated fluids management approach and contractual model were used to successfully drill the 18,417-foot L.M. Broussard No. 1 exploratory well in the Vermilion Parish area onshore southern Louisiana. The well was drilled to total depth 45 days faster, on average, than other wells in the area, and disposable drilling wastes were reduced by 43 percent compared to the best available offset.

Since the success of an integrated approach to fluids and fluid management depends on proficient well site engineering capabilities, an extensive cross-training program was developed that includes the full gamut of drilling and completion fluids and waste management. The curriculum includes such topics as completion fluids, drilling technologies, drilling systems, drilling fluid economics, rig data acquisition, the relationship of mud to solids, solids control systems, and waste minimization and treatment services. As such, an engineer assigned to a particular project has the training and expertise to oversee drilling fluids, completion fluids and all solids control/waste management activities.

The reason to attempt this type of service in a problem area was to find a way to distribute some of the risk involved in drilling, thereby allowing the drilling foreman to concentrate more on drilling the well.

Contractual Model

The L.M. Broussard No. 1 was setup to be drilled as an offset to the D.W. Guidry No. One ST No. 2 well. During the early planning stages, discussions with the drilling fluids provider prompted the idea of contracting all fluids and fluids-related activities on a cost-per-foot basis. Under this scheme, the mud, solids control, and waste management–including monitoring water usage, land farming and disposal–would be performed by one lead company on the basis of cost per foot. This represented a new pricing approach for the operator.

After several weeks of follow-up discussions, the operator's management was approached with the idea. Upon approval, bids for handling mud products, solids control, personnel, on-site living arrangements, and other activities were evaluated. Since it was the first contract of its kind for the operator, the bid requests were not entirely specific. Therefore, all of the submissions were within $2,000 of one another.

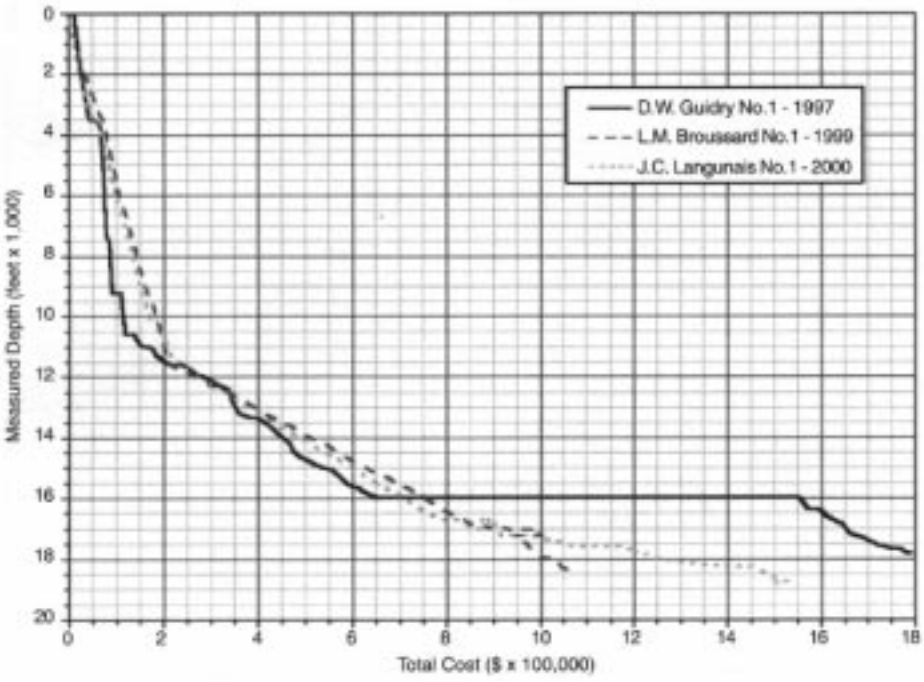
After the contract was awarded, the operator and fluids service provider held a number of comprehensive pre-spud meetings to discuss everything from fluid properties, logging and casing points, squeeze cementing, and mud losses. From these discussions, an agreement was developed that would serve as a guideline for both the operator and mud company's field and office personnel.

During drilling, situations occurred that had not been taken into consideration in the pre-well plan and contractual arrangement. Operator and mud company representatives discussed each problem individually, eventually arriving at solutions that were fair to both parties.

Also during the planning stages, the lead integrated fluids engineering company suggested a closed-loop fluids processing system for waste management. Key components of the closed-loop FPS included four high-speed shakers, a sander, desilter, a 202 microclone, and two 414 and 518 centrifuges. The waste management plan called for land farming from surface to intermediate casing depth, with the liquids and oil-based cuttings

FIGURE 2

Mud, Solids Control and Waste Management



generated from that point to TD earmarked for off-site treatment and disposal.

Critical to the absolute team effort envisioned in the drilling plan was excellent communication between all pertinent parties on the rig. As part of the well plan, operator and service company representatives scheduled meetings every morning to outline the day's objectives and any problems or concerns that could hinder meeting those goals.

Benchmarks Achieved

Every benchmark outlined in the drilling program was achieved in drilling the L.M. Broussard No. 1 well. One such benchmark was reducing the high downhole fluid losses encountered on previous wells drilled in the area. On this well, losses were reduced by 32 percent when compared to the best available offset. One reason for the reduced fluid losses was the use of data generated through a unique software package that monitors the behavior of fluids downhole.

The unitized software package was designed specifically for calculating pump pressures, equivalent circulating (ECD) and equivalent static (ESD) densities, as wells as surge and swab pressures for oil- and synthetic-based systems. The program essentially subdivides the well into short depth segments to account for the impact of temperature and pressure on the density and rheological properties of invert emulsion fluids. The variable downhole rheology is combined with localized downhole conditions to generate accurate hydraulics calculations. This characteristic permits a unique downhole perspective of rheology and hydraulics at a single point in time, providing accurate data for effective decision making to maintain well control, reduce the incidence of lost circulation, and improve overall drilling performance with fewer operational problems.

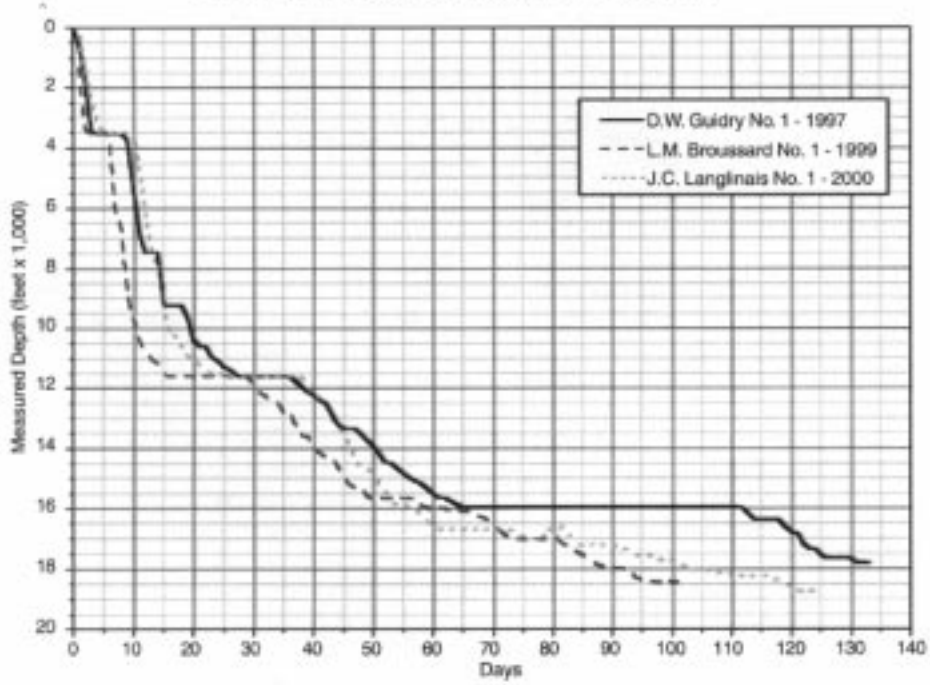
Meanwhile, the FPS system produced a highly-effective waste management system that led to a 43 percent reduction in wastes to be disposed of either through land farming or off-site disposal (Figure 2). The all-encompassing system even included the cost-effective collection and disposal of non-contaminated rainwater through a dammed-up levy at the rig site.

After work was completed, the lessons learned from the Broussard No. 1 well were incorporated into bid requests for the J.C. Langlinais No. 1. However, this time the bids were more specific, which made evaluating the bids easier. The Langlinais well was spudded on Jan. 23, 2000, but owing to severe lost circulation problems and squeezing the open hole, the Langlinais was taken off contract at a depth of 17,012 feet.

The final review shows that mud properties seen in the field for both wells were better than the properties agreed upon in the guidelines. Several days were saved when the Broussard and Langlinais are compared to the Guidry (Figure 3), and much of this time savings can be attributed to the mud company's proposal, but also to extensive reviews of bits and bottom-hole assemblies in the planning stages. Furthermore, the integrated fluids

FIGURE 3

Drilling Times for North East Wright Field



approach resulted in more personnel, other than the normal operator representatives, monitoring the daily progress of the well.

The integrated fluids engineering approach and the new contractual arrangement created a win-win situation for both the operator and service provider, and it will be applied on future wells. ❐

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