‘Mixed fleet’ approach to land drilling allows rigs, big or small, to perform in optimum range

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THERE’S AN OLD adage in the oil patch: “If a rig’s drill isn’t turning to the right, it isn’t making money.”

If you consider what a rig does from the time it’s mobilized to reach a location until it is moved to the next location, there is much time and money spent on non-drilling functions. Still, these complex and time-consuming non-drilling activities are necessary for achieving productive drilling.

Until recently, drilling a well was considered a continuous process where a single rig was employed to drill from the surface to TD. In reality, wells are drilled and completed in segments, and each of these well segments requires different rig capacities to achieve optimum performance and cost control. A contractor’s profitability depends on maintaining maximum performance and efficiency from the equipment in each segment of the well-drilling process.

One way land-based drilling contractors can reduce operating costs is to adopt a “mixed fleet” approach – use lightweight hydraulic top-drive rigs to perform pre-set casing work and drill shallow E&P wells. Then, when the larger rig moves on location, it can nipple up and immediately begin drilling the deeper segments of the well.

With this approach, both rigs perform at maximum efficiency, while each completes their parts of the drilling plan.

The Atlas Copco RD20, seen above on a gas well location in Alberta, Canada, has been used to drill pre-sets for larger rigs. Using a “mixed fleet” approach has the potential to help contractors save time and money.

OPTIMUM RANGE

Every drilling rig has a range of optimum performance. Outside that range, performance drops off and cost-per-foot increases. For example, a 1,000-hp to 1,500-hp triple is designed to drill holes in the 10,000-ft to 20,000-ft depth range. When it drills shallower holes, it is less efficient because it has more capacity and manpower (and the associated cost) than is required for the job.

With lighter weight, mobile drills in the 700-hp to 900-hp class, contractors can drill shallow wells from spud to TD and support larger rigs by drilling pre-sets for deeper holes. These smaller rigs and their related equipment mobilize quickly. Fewer trailer loads to bring on location can translate into a lower cost. Typically, within one to three hours upon reaching the site, lightweight, mobile drills can be effectively drilling.

In many instances, contractors are able to drill and set surface with these “pre-set” rigs in less time and with less personnel than it takes to mobilize and rig up a larger conventional rig. With pre-sets complete, a large rig can move

on location and start drilling within its range of optimum performance and efficiency.

IN THE FIELD

Some contractors have been able to save time and money by drilling surface and intermediate holes with air drilling. In the Uintah Basin, **Pro Petro Services** has been using an **Atlas Copco** RD20 rig to drill pre-sets for larger rigs. "We typically drill 200 ft to 1,500 ft cased at 13 3/8 in., and 1,500 ft to 3,500 ft cased at 8 5/8 or 9 5/8 in.," said operations manager **W.D. Martin**. These wells are typically drilled with air using the rig's on-board compressor with an auxiliary compressor and a booster.

"Prior to using the Atlas Copco RD20, our conventional rigs were drilling down to the birds-nest zone and losing 80% of their water or mud circulation pressure," Mr Martin said. Using high-pressure air, the RD20 drills through the birds-nest zone without losing circulation. When the surface and intermediate holes are cased and cemented, the conventional rigs come in to drill the wells to 6,500- to 8,000-ft TD. Mr Martin reports that his company has saved five to six days per well and drilled 10 to 15 more wells per year using the mixed fleet approach.

INCREASING EFFICIENCY

Lightweight, top-drive rigs can offer improved performance and cost efficiency in several areas:

• Mobilization cost: Carrier-mounted, self-contained rigs are highly mobile and can generally transport to and from location with simple highway permits. They can attain highway speeds and are excellent in off-road conditions, even in mountainous and remote terrain. For pre-set work, they usually require six to 10 loads to complete the location. They create a relatively small footprint and

Lightweight rigs can be highly mobile and transported from location to location with simple highway permits.

can work in tight locations.

A conventional rig may consist of up to 30 loads to build a location. Many of these loads require special weight and dimensional permits and are restricted to specific routes and times of day.

• Rig-up time: Lightweight rigs move on location and rig up, with four to six people, in one to four hours. Simple air drilling locations are usually turning to the right in one to two hours with a single crew. More complex mud drilling locations can be completed and drilling in three to four hours. In comparison, a conventional rig can take 24 hours to 72 hours, with a larger crew, to rig up with the related equipment.

• Setting surface casing: Pre-set rigs can set Range III casing at about the same rate as a conventional rig. Most lightweight rigs set surface casing with the drilling crew. These rigs are readily adaptable to hydraulic catwalks or lay-down arms that allow "hands-free" casing handling. They handle casing with the top drive and feed system. Casing is lifted and set using special elevators attached to the top drive. Rotation torque is set to match casing torque specifications. The top drive spins the casing together and stops when reaching the pre-set torque. Using the top drive and feed system allows the casing to be pushed, pulled, rotated and even circulated.

Traditional rigs handle casing with the drawworks and traveling block. Casing is hanging from the block so it must be guided and controlled by the deckhands. Casing is spun together with additional tooling and cannot be pushed, rotated or circulated. In many cases, large rigs contract a casing service to come on location to set strings of casing.

• Tripping pipe: Today's lightweight rigs handle 30-ft or 40-ft drill pipe and can be adapted to a wide range of pipe handling equipment. Most are lay-down rigs that do not stand pipe in the derrick. They are readily adapted to "hands-free" pipe-handling systems. A conventional rig can handle triple stands of pipe during a trip. This is faster than the lay-down systems on lighter pre-set rigs. This system, however, requires a worker up in the derrick and manual labor with heavy loads.

• Rig down: Lightweight rigs can rig down and move off location in one to four hours, including the related equipment. A conventional rig will usually take 24-72 hours to rig down.

The objective of the "mixed fleet" approach is not to replace larger conventional rigs with smaller rigs. Rather, it is to utilize both rigs within their optimum performance ranges to increase drilling and non-drilling performance, while reducing overall cost per well.

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