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MIXED FLEET
A NEW APPROACH TO MAKING MONEY
IN THE OIL & GAS MARKET

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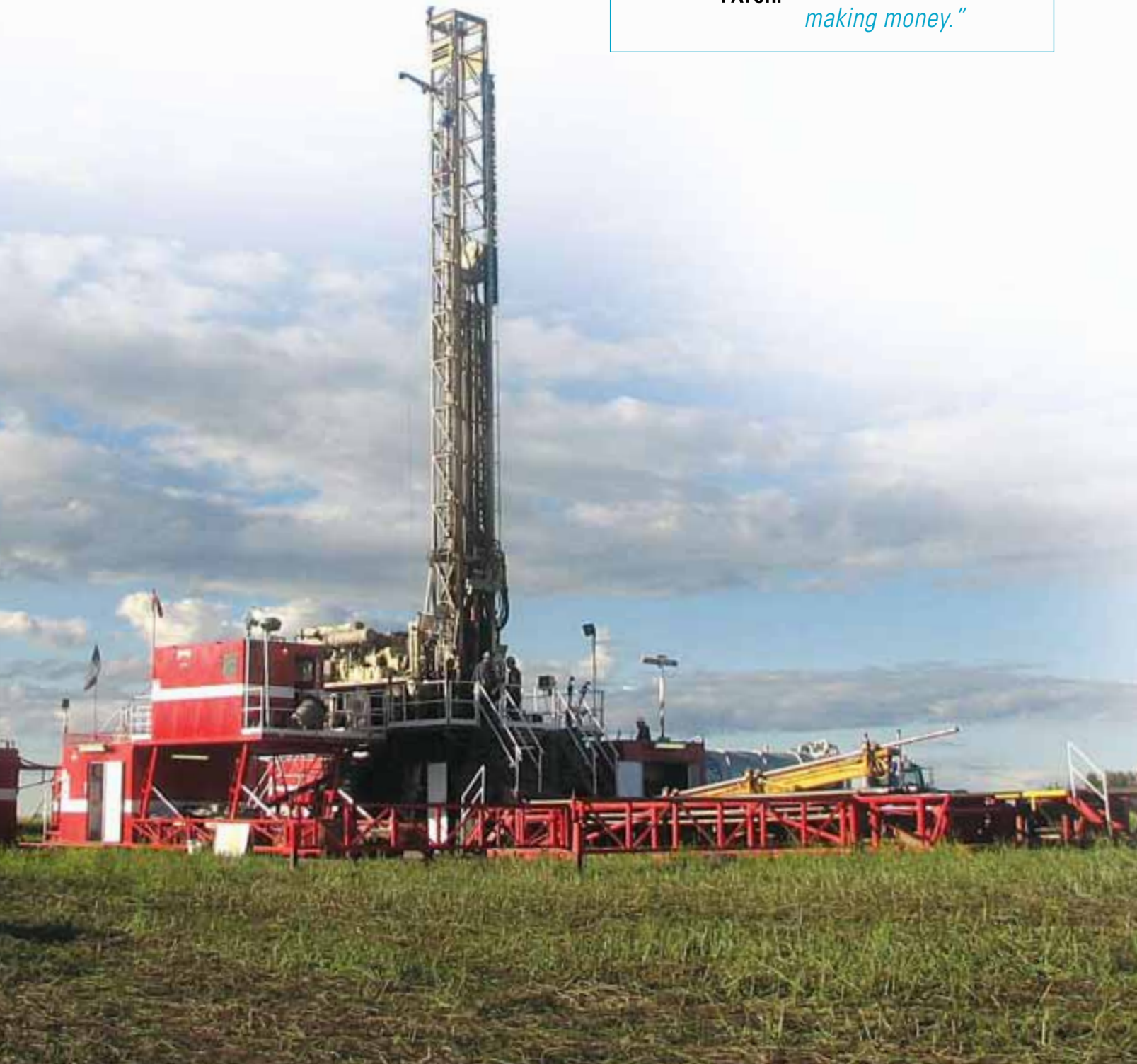
Here's an idea for you to consider... a simple way to increase efficiency and reduce operating costs. The concept is called the "mixed fleet."

With the mixed fleet approach, land-based drilling contractors capitalize on the strengths of two types of drilling rigs: lightweight mobile rigs and deep-hole conventional rigs. With this approach, the lightweight

hydraulic top-drive rigs drill surface holes and pre-set casing. Then the larger rig follows and drills the deeper segment of the well. The benefit is that both rigs perform at maximum efficiency. Each rig completes its part of the drilling plan in the least time and at the lowest possible cost.

**THERE'S AN OLD
ADAGE IN THE OIL
PATCH:**

*"If a rig isn't turning
to the right, it isn't
making money."*



TAKE A CLOSER LOOK

Consider what a drilling rig does. From the time it's mobilized to go on a new location until it's moved to the next location, there's considerable time, effort and money spent on non-drilling functions. The mixed fleet approach focuses on reducing the time and money spent on non-drilling functions.

Drilling/ Non-drilling Operations ▶

Traditionally, drilling a deep well is considered a continuous process where a single, large rig drills from the surface to TD.

Conversely, consider that oil and gas wells are really drilled and completed in segments. If you think about it, there are really two or more distinct segments in drilling a well:

1. **Drilling surface hole and setting casing.**
2. **Drilling intermediate hole and setting casing.**
3. **Drilling the production hole and setting casing.**

Clearly, 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.

Every drilling rig has a range of optimum performance. Within that range, it operates at optimum efficiency. Outside that range, performance drops off and cost-per-foot increases. For example, a large rig designed to drill holes in the 10,000 - 20,000-foot depth range is less time and cost efficient when it drills shallower holes. It has more capacity and manpower (and the associated cost) than is required for the job.

Lightweight rigs, in the 3,000 - 8,000 ft. class, greatly reduce the time and cost of non-drilling operations like moving and rig up. These rigs are designed to drill and case shallower holes in less time and at a lower cost than large rigs.

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DETAILED BREAKDOWN OF DRILLING AND NON-DRILLING OPERATIONS TYPICALLY FOUND ON A NEW DRILL SITE:

Mobilization	Transporting the rig and related equipment to the location
Rig up	Setting up the rig and related equipment to drill
Drilling surface	<i>Drilling the surface hole</i>
Tripping pipe	Pulling pipe out of the hole to set casing
Setting casing	Installing surface casing in the drilled hole
Cementing	Cementing casing and dry time
Tripping pipe	Tripping pipe into the hole to begin drilling
Drilling intermediate	<i>Drilling the intermediate hole</i>
Tripping pipe	Tripping pipe out of the hole to set casing
Setting casing	Setting intermediate casing in the drilled hole
Cementing	Cementing casing and dry time
Nipple up	Rigging and pressure testing the BOP
Tripping pipe	Tripping pipe into the hole to begin drilling
Drilling production	<i>Drilling the production hole to TD</i>
Tripping pipe	Pulling pipe out of the hole to set casing
Setting casing	Installing casing in the drilled hole
Rig down	Tearing down the rig and related equipment to move
Mobilization	Transporting the rig off location and to the next well



PERFORMANCE ADVANTAGES, LOWER COSTS

There are a number of areas where lightweight, top-drive rigs offer contractors improved performance and cost efficiency. Here are a few:

Mobilization Cost – Highly mobile, these rigs move from location to location using simple highway permits. They can reach highway speeds and are excellent in off-road conditions, even in mountainous and remote terrain. All it requires is six to 10 loads to complete the location. And when they are at the site, they create a relatively small footprint and can work in tight locations.

In contrast, a conventional large rig requires 20 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. More vehicles, personnel and equipment are required to build the location.

Rig-Up Time – Lightweight rigs move on location and rig up, with four to six people, in one to four hours, including all of the related equipment. Simple air drilling locations can be drilling in one to two hours with a single crew. More complex mud drilling locations, using a substructure, can be completed and drilling in three to four hours.

In comparison, a conventional rig can take 24 to 72 hours with a larger crew, to rig up.

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 oil field rigs handle casing with the

Conventional triple in Texas ▶

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 (casing spinner) 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-foot (9-meter) or 40-foot (12-meter) 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 that improve safety and reduce manual labor content.

To contrast, a conventional rig handles triple stands of pipe during a trip. This is faster than the lay-down systems found on lighter pre-set rigs. However, this system requires a rig hand up in the derrick and a great deal of manual labor with heavy loads swinging through the rig floor.

Rig Down – Lightweight rigs rig down and move off location in one to four hours, including the related equipment. A conventional rig takes 24 to 72 hours to rig down, with a larger crew.



Atlas Copco RD20 in Utah ▼



Lightweight rigs move on location and rig up, with four to six people, in one to four hours, including all of the related equipment. In comparison, a conventional rig can take 12 to 24 hours, with a double crew, to rig up with the related equipment.

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"Sometimes a contractor has a tight deadline to get a rig on a lease and begin drilling. Lightweight, mobile rigs are perfect to satisfy this requirement."



BEST OF **BOTH** WORLDS

The objective of the “mixed fleet” approach is not to replace larger, more costly conventional rigs with smaller, less costly pre-set 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. In other words, get the best of both worlds.

In the oil patch, time is money. The quicker a contractor can spud in and reach TD, the more profitable the operation becomes. Clearly, a “mixed fleet” approach is a viable option for reducing the cost per well and maximizing the performance of the total rig fleet.

MIXED FLEET HELPS DRILLER SAVE TIME, DRILL MORE WELLS



W.D. Martin, operations manager with Pro Petro Services, reports that they save five to six days per well and drill 10 to 15 more wells per year using the mixed-fleet approach.

In Utah’s Uintah Basin, Pro Petro Services, Inc. has been using a lighter weight, mobile Atlas Copco RD20 to drill pre-sets for its larger rigs. W.D. Martin, operations manager says, “We typically drill 200 to 1,500 feet cased at 13-3/8 inches, and 1,500 to 3,500 feet cased at 8-5/8 or 9-5/8 inches.” Martin typically drills these holes with air using the RD20’s on-board compressor and an auxiliary compressor with a booster.

Martin continues, “Prior to using the Atlas Copco RD20, our conventional rigs were drilling down to

the birds-nest zone and losing 80 percent of their water or mud circulation pressure.” Using high-pressure air, the rig 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-foot TD.

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