



## Coiled tubing rigs lower cost in shallow plays

*Although shallow plays appear to be an easy target, profitability remains a factor of lowering drilling costs.*

By Tayvis Dunnahoe, Senior Editor

July 1, 2010

It is no secret that coiled tubing (CT) drilling rigs offer advantages over conventional rigs when it comes to ease of mobility, safety, environmentally friendly footprint, and drilling time. That said, CT drilling does have its limits. For many of today's growing [shale](#) plays, for example, the need for drilling vertical sections with even longer horizontal laterals keeps most CT drillers out of the market.

When it comes to shallow, vertically accessible formations, however, CT rigs sometimes can cast a shadow over conventional rigs. The question for operators is, "What advantages can be realized in CT drilling over conventional rigs?"

Since 2005, Advanced Drilling Technologies (ADT) has drilled more than 1,700 wells for 29 customers in Colorado, Nebraska, Kansas, Oklahoma, and Texas. Based in Yuma, Colo., ADT began CT drilling in the Denver-Julesberg (D-J) Basin in northeast Colorado. Tom Roelfs, vice president and director of operations, said, "It's difficult to break into new areas. We placed our first rig on a six-well contract in January 2005 in the D-J Basin in Colorado. To date, we've drilled more than 1,400 wells in the northeast Colorado area."

ADT's CT rigs are limited to 5,000 ft (1,524m). The rig design provides maneuverability and speed during rigup/rigdown, a process that usually can be performed within two hours with these CT rigs. Rig design also has taken into account weights and height to allow maximum logistical ability and minimal environmental footprint. The rig comes in four completely wheeled loads with the exception of Rig 168, which carries five loads to accommodate a larger mud pump with greater capacity.

### **Efficient operations**

The company operates with a two-rig system for each well. First, a surface rig is used to spud the well and set the surface casing. Then the CT rig drills the entire well to total depth (TD). This two-rig process eliminates downtime by keeping the crew working while the surface cement sets.

The patented injector wheel provides more control of the coiled tubing as it drills, and with suitable geology, ADT's rigs can achieve rates of penetration (ROP) between 400 and 600 ft/hr

(122 and 183 m/hr). For many operations, drilling to TD, running logs, and cementing casing can be completed in around 24 hours. Because CT drilling exists as an uninterrupted process, it can lower costs for an overall development.

In addition, there is no need to make connections during the drilling process. This achieves higher ROP, continuous circulation both in and out-of-hole, provides a cleaner well bore for logging and well analysis, and eliminates surges that could damage the formation.

Other benefits of the CT fleet include improved safety and a lower impact on the environment. With a rig footprint of only 100 ft by 150 ft (30 m by 46 m), CT rigs can be much less intrusive than conventional rigs. The smaller footprint also lowers the amount of construction and remediation for each location and provides less disruption for land owners. Because CT offers joystick control once drilling has commenced, the process requires small crews who remain at a safe distance from operations during drilling.

### **Proven cost reduction**

The real test for ADT's "Big Wheel" CT rigs came in 2008. A major operator conducting a five-year drilling program in southwest Texas decided, after two years, to use ADT's CT drilling rig to compare its performance to that of conventional rigs. The project focused on drilling the San Miguel formation with a productive limit ranging from 1,135 to 1,768 ft (346 by 539 m), well within ADT's 5,000-ft (1,524-m) reach. The plan proved successful.

The field redevelopment project called for an average of 300 wells drilled yearly for five years. Other goals included reducing the cost per well, drilling time, vendor count, and HSE exposure.

Results presented at the IADC/SPE conference in New Orleans, La., in February 2010, showed a significant reduction in drilling cost was realized after drilling 233 wells using the hybrid CT unit. CT drilling reduced drilling and completion time by 60% in comparison to conventional rotary rigs.

Conventional rigs typically required at least three days for each well. To complete the required 300 wells per year would have taken at least three conventional rigs and would have required additional service providers. With ADT's CT rig, the operator was able to drill each well at an average time of 28 hours per well, with the best well coming in at 20 hours. In addition, the dedicated surface rig allowed for continuous operations throughout the entire project.

The pilot program drilled 81 wells in all (64 producers and 17 injection wells), averaging 1,744 ft (531 m) depth. The wells were drilled at an average ROP of 216 ft/hr (66 m/hr) with the standout record of 467 ft/hr (142 m/hr) – 1,400 ft (427 m) in three hours.

At the conclusion of the project, the operator improved economics by minimizing site preparation

for CT rig deployment. It also benefitted from an innovative cementing solution. Costs were further reduced by the reduction of drilling times to 60% over that of conventional rigs.

Another cost-saving feature of ADT's CT program is its turnkey approach to project management. The operator reported turnkey services led to a 14% reduction in overall cost in 2008 with a 33% savings (adjusted for inflation). In addition, drilling projects requiring an average of 17 vendors in 2006 required only six vendors in 2008 – a 65% reduction. Fewer vendors and a smaller crew also improved the program's HSE requirements. Lastly, where conventional rigs required an average of 118 connections, CT operations only required 14 – an 88% reduction in risk.

Of the turnkey approach, Roelfs said, "It took much of the work out of the operator's hands. Offering a turnkey CT drilling service allows us to efficiently serve the needs of the operator by offering a one-stop-shop." He added that providing a simpler program with more in-house management eliminated a lot of work for the operator.

### **Looking ahead**

The current case of field redevelopment deals solely with vertical wells. For speed, operational efficiency, and cost savings, CT has proven to be a viable solution. However, with an increased need for horizontal drilling in many of today's oil and gas plays, CT certainly has room for improvement.

On the next phase of CT development, Roelfs said, "We are exploring the option to drill horizontal wells utilizing coiled tubing with the capacity for larger holes." Currently, tool availability to allow for CT to drill larger holes of 6¼ in. up to 8¾ in. is not available. There remain many shallow plays worldwide that could benefit from improved technology in this area. "We're working toward that goal," Roelfs said.

*Editor's Note: Some of the data in this article was taken from IADC/SPE #128926, "Improved Drilling Performance and Economics Using Hybrid Coiled Tubing Unit on the Chittim Ranch, West Texas" presented at the IADC/SPE Drilling Conference and Exhibition in New Orleans, La., February 2 – 4, 2010.*