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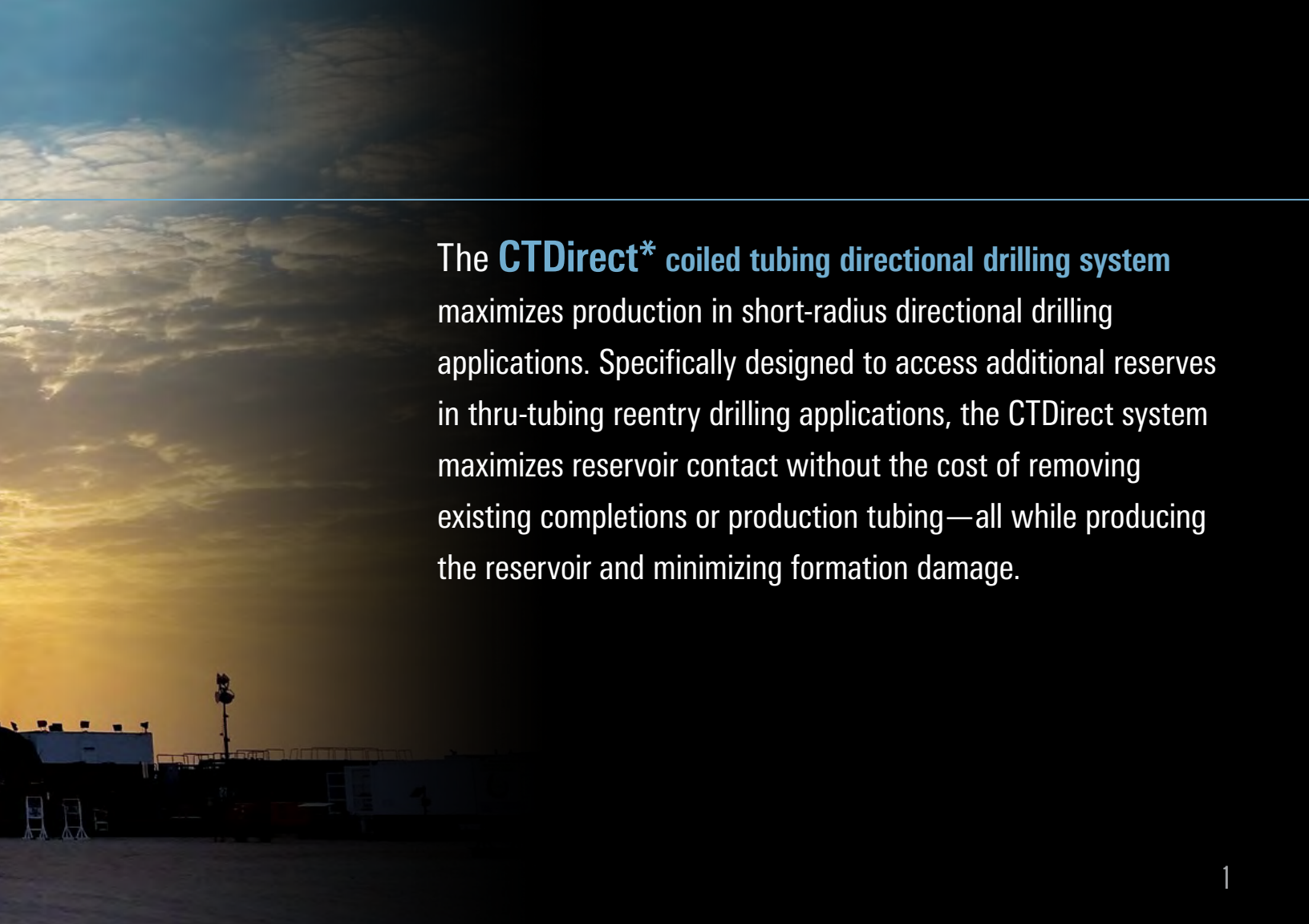
CTDirect

Coiled tubing directional drilling system


CTDirect



The **CTDirect* coiled tubing directional drilling system** maximizes production in short-radius directional drilling applications. Specifically designed to access additional reserves in thru-tubing reentry drilling applications, the CTDirect system maximizes reservoir contact without the cost of removing existing completions or production tubing—all while producing the reservoir and minimizing formation damage.

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Applications

- Vertical, horizontal, and directional wells
- Reentry drilling
- Underbalanced and overbalanced drilling
- Thru-tubing drilling

Benefits

- Maximizes reservoir contact
- Improves production potential in reentry wells
- Increases ROP in underbalanced applications
- Eliminates cost of removing completions
- Avoids risk of taking well offline during reentry drilling
- Enables better geosteering with full 3D directional capability

Enhance production from existing wells

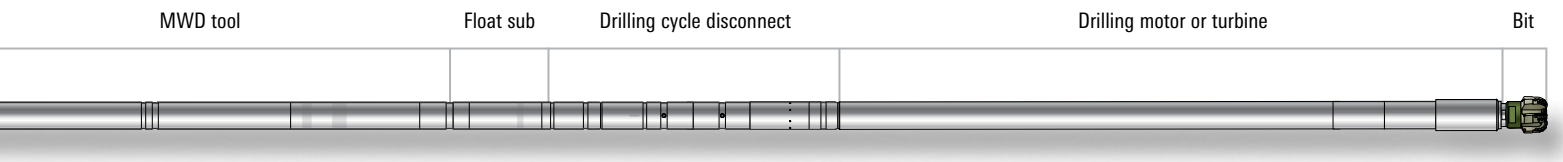
The CTDirect system is designed to access bypassed reserves and extend production in underbalanced, short-radius, and thru-tubing reentry drilling applications. The system features a 410° continuously variable toolface orienter with real-time bidirectional data communication capabilities.

Minimize reservoir damage while drilling

When operating in underbalanced or managed pressure drilling operations, the CTDirect system minimizes the risk of reservoir damage while keeping the well live. Compared with overbalanced conventional drilling, underbalanced drilling with the CTDirect system typically results in earlier payout and lower well stimulation costs.

Improve accuracy of well placement

The system measures downhole drilling mechanics data, shock and vibration, inclination, azimuth, and toolface orientation. These data are seamlessly transmitted to surface, where they are continuously monitored at the wellsite for precise directional steering and immediate motor stall detection.



The CTDirect system BHA enables better steering based on direction and inclination, gamma ray, annular-pressure-while-drilling, and internal-pressure-while-drilling measurements.

Reentry Drilling

Increase production and extend well life

In reentry drilling applications, the CTDirect system has proved to assist in boosting production 300–700% while avoiding lost production and the risk of killing your well. Coiled tubing drilling increases drainage by sidetracking or deepening a well, and the CTDirect system maximizes reservoir contact in short-radius applications with a build rate of up to 50°/100 ft [40°/30 m] and the ability to drill horizontals wells.

Thru-Tubing Drilling

Improve efficiency and protect production

The system brings greater safety and more efficiency to reentry drilling. Thru-tubing reentry with the CTDirect system enables you to avoid the time- and cost-intensive operation of pulling production tubing, which requires additional surface equipment. In offshore and other hard-to-access locations, the system's smaller footprint and rapid rig-up are particularly valuable.

Unlike conventional reentry drilling, in which production may not return at the same rate, the CTDirect system mitigates risks inherent to shutting off production. In fact, the system enables you to continue producing from the existing well while increasing drainage.

Reentry wells drilled with the CTDirect system experienced between **300%** and **700% more production.**

Underbalanced Drilling

Produce while you drill

The CTDirect system confers the inherent benefits of underbalanced drilling—a continuous flow of formation fluids and zero invasion. Using a closed-loop system that maintains bottomhole pressure below that of the formation being drilled, the system generates a pressure differential that induces hydrocarbons into the hole. With hydrocarbons flowing throughout the drilling process, ROI is realized more quickly.

Underbalanced drilling uses lightweight drilling fluid, which eliminates invasion and protects the production potential of the reservoir. Without the damaging side effects of using the heavyweight drilling mud required in conventional overbalanced drilling, the CTDirect system increases production and decreases the costs of drilling fluid and well stimulation.

CTDirect System Increases Average ROP by 200% in Deep, Tight-Gas Reservoirs

MIDDLE EAST

Application	Underbalanced thru-tubing reentry drilling (TTRD)
Geology	Carbonate
Hole size	3⅝ in
Total footage	8,620 ft [2,627 m]
Single-run footage	3,600 ft [1,097 m]
Dogleg severity	25°–35°/100 ft

After introducing the CTDirect system, 8,620 ft were successfully drilled in a deep well with high temperatures. In the best run, the BHA drilled 1,400 ft [427 m] in 24 h, exceeding the field's average TTRD ROP record by 200%.

Operator Accesses Previously Unreachable Targets and Improves Average Field ROP by 20%

MIDDLE EAST

Application	Underbalanced thru-tubing reentry drilling
Geology	Sandstone
Hole size	3⅝ in
Length drilled	3,990 ft [1,216 m]
Dogleg severity	25°–40°/100 ft
Unconfined compressive strength	35,000 psi [241.3 MPa]

The CTDirect coiled tubing directional drilling system successfully drilled more than 3,990 ft in a deep tight-gas sandstone reservoir with high temperatures. The operator reached all previously unachievable geological targets for significantly increased gas recovery. Using the CTDirect system, the operator exceeded the average field ROP by 20%.

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CTDirect System Specifications	
Nominal OD	3.12 in [79.25 mm]
Hole size	3.625–4.75 in [92.08–120.65 mm]
Max. allowable operational overpull	30,000 lbf [133,447 N]
Max. WOB	11,500 lbf [51,155 N]
Max. dogleg severity	50°/100 ft [40°/30 m]
Max. orienter torque	
Forward	500 ft.lbf [678 N.m]
Reverse	1,900 ft.lbf [2,576 N.m]
Nominal length, including motor†	60 ft [18.3 m]
Max. internal pressure	15,000 psi [103.4 MPa]
Max. annular pressure	10,000 psi [68.9 MPa]
Operating temperature range	14 to 302 degF [–10 to 150 degC]
Max. flow rate	130 galUS/min [492 L/min]
Produced fluids	Gas and water
Hydrogen sulfide	Up to 20%
Operational	
Cable requirement	Heptacable inside coil
Pressure barriers	Multiple

Measurements	
Inclination	Industry standard
Azimuth	Industry standard
Toolface	Gravity and magnetic
Natural gamma ray range	0 to 250 gAPI
Shock and vibration sensor peak range	500 g_n
Annular and internal pressure sensor range	0 to 10,000 psi [0 to 68.9 MPa]
Resistivity	Optional arcVISION* array resistivity compensated service in recorded mode
Surface formation evaluation	Optional quantitative hydrocarbon analysis with FLAIR* real-time fluid logging and analysis service
Fluid Compatibility	
Nitrogen	Up to 99% nitrogen, 1% water
Lubricant	Radiagreen® lubricant, up to 3%
Methanol or ethylene glycol	40% methanol or 100% ethylene glycol
Caustics	Sodium hydroxide
Corrosion inhibitor	ASTM International SA193 (amine based)
Potassium chloride	Up to 2%

† Dependent upon motor

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