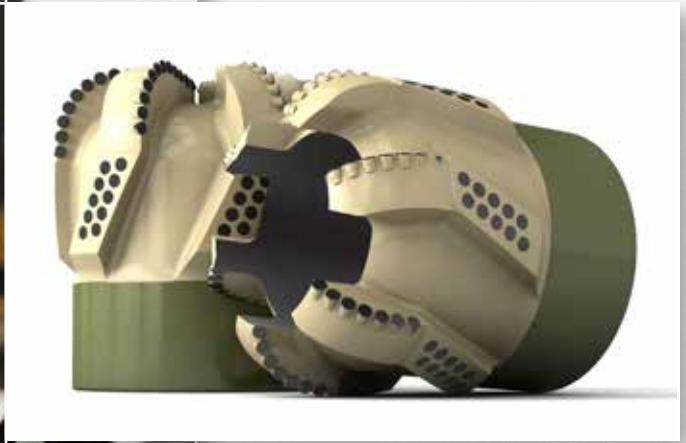


SMITH BITS

A Schlumberger Company



Direct XCD

Drillable alloy casing bit

Drillable PDC bit for casing-while-drilling applications

The Direct XCD* drillable alloy casing bit is a PDC bit specially made for drilling vertical or tangential wells to TD in one run. The bit drills on standard casing that is rotated at the surface.

The cutting structure of the Direct XCD casing bit can be fitted with 13-, 16-, or 19-mm PDC cutters, which are available in standard or premium grades. The bit's sub is composed of durable oilfield grade steel, while its body is made of a copper bronze alloy. This unique alloy allows it to be drilled out by any standard PDC bit after the Direct XCD bit has drilled to TD, and the casing has been cemented in place. After drillout, the drillout PDC bit can continue drilling the next interval, eliminating the need for a dedicated drillout run.



After the Direct XCD bit drills to TD, it serves as a casing shoe (left); after cementing, the bit's alloy composition allows it to be efficiently drilled out (right).

Greater wellbore stability and reduced fluid losses

During drilling, rotating casing and the resulting smaller annulus cause cuttings to be smeared into the borehole wall, strengthening the wellbore. This action has been termed the plastering effect. It seals pores in the formation to reduce fluid losses and improves cementing to help protect well integrity. Because cuttings are plastered into the borehole wall, fewer are returned to surface. As a result of being subjected to grinding, the cuttings that are returned to surface are smaller in size.

The plastering effect process has proven to reduce NPT resulting from borehole-related problems, such as

- sloughing shales
- tight holes
- borehole bridges
- lost circulation
- large-diameter surface hole resulting in hard-to-remove cuttings from the annulus
- damaged producing zones
- stuck pipe.



Drilling with conventional drillpipe (left) allows a larger annulus, while drilling with casing (right) minimizes annulus size; rotating casing smears cuttings into the borehole wall, sealing pores in the formation to reduce fluid losses and producing a stronger borehole for improved cementing.

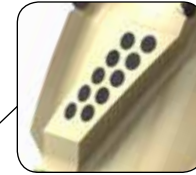
Direct XCD drillable alloy bit



Bit cutting structure
can be fitted with 13-, 16-, or 19-mm premium grade PDC cutters on each blade.



Optimized erosion-resistant nozzles
direct flow and hydraulic force to maximize ROP.



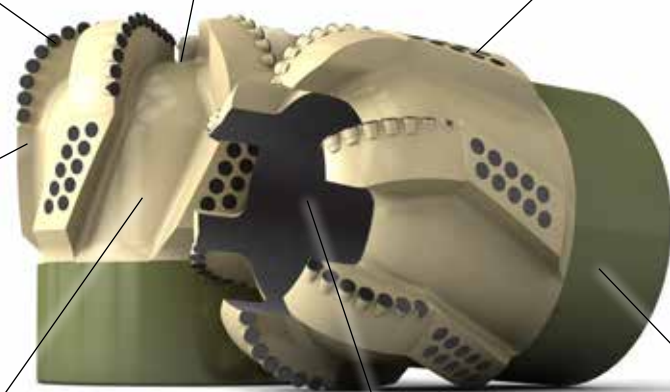
Spiral-gauge pads
maximize bit stability and reduce vibration.

Optional tungsten carbide coating
applied to bit body and blades resist erosion in aggressive applications.

Large-face waterways
and junk-slot areas maximize cuttings removal.

Bit body design
allows drill out by any PDC bit.

Bi-metal composition
drillable body includes a bit sub made of oilfield-grade steel.

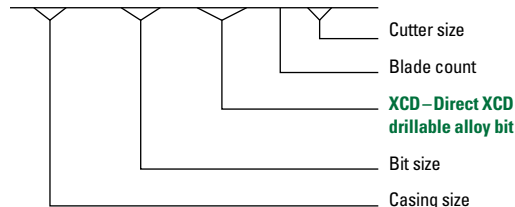


Available bit sizes and nomenclature

Available bit sizes						
Application	Bit	Casing Size, in × Bit Size, in				
Soft formations <8,000 psi unconfined compressive strength (UCS)	XCD319	13 $\frac{3}{8}$ × 17 $\frac{1}{2}$				
	XCD413	10 $\frac{3}{4}$ × 13 $\frac{1}{2}$				
	XCD416	9 $\frac{5}{8}$ × 12 $\frac{1}{4}$				
	XCD419	9 $\frac{5}{8}$ × 12 $\frac{1}{4}$	13 $\frac{3}{8}$ × 17 $\frac{1}{2}$	18 $\frac{5}{8}$ × 23	20 × 23	20 × 24
Medium formations 8,000–14,000 psi UCS	XCD316	12 $\frac{3}{4}$ × 15 $\frac{1}{2}$				
	XCD416	9 $\frac{5}{8}$ × 12 $\frac{1}{4}$				
	XCD419	9 $\frac{5}{8}$ × 12 $\frac{1}{4}$	13 $\frac{3}{8}$ × 17 $\frac{1}{2}$			
	XCD516	7 × 8 $\frac{1}{2}$	10 $\frac{3}{4}$ × 13 $\frac{1}{2}$			
	XCD519	16 × 18 $\frac{1}{4}$				
	XCD616	13 $\frac{3}{8}$ × 16	13 $\frac{3}{8}$ × 17 $\frac{1}{2}$			
Hard formations >14,000 psi UCS	XCD516	9 $\frac{5}{8}$ × 11 $\frac{3}{8}$	9 $\frac{5}{8}$ × 12 $\frac{1}{4}$			
	XCD613	9 $\frac{5}{8}$ × 12 $\frac{1}{4}$				

Nomenclature

9 $\frac{5}{8}$ × 12 $\frac{1}{4}$ **XCD 5 16**



Face Features

P	Premium cutters
S	Standard cutters
O	Optimized drillout path

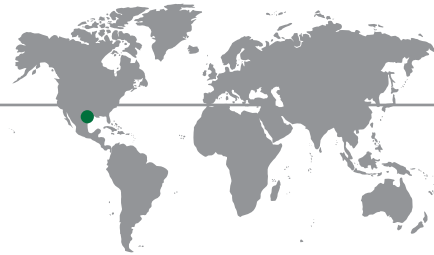
Hydraulic Features

H	Higher number of nozzles than standard
L	Lower number of nozzles than standard
E	Erosion-resistant nozzles

Connection Features

B	Blank thread form
WP	Weld preparation
BTC	API buttress-threaded connection
C	Premium threaded per request

Case Study



Direct XCD Drillable Casing Bit Drills 5 Wells to Access Permian Basin Reservoir Below CO₂ Injection Zone

Inefficient wellbore construction threatens to exceed operator's AFE

As part of an effort to access a reservoir in the Permian basin, an operator was using a three-string well design in which the casing point was above the field's high pressure CO₂ zone. This approach was effective and it countered problems the operator had experienced using a two-string design: CO₂ kicks, stuck pipe, wellbore collapse, poor cementing, and NPT. However, the high cost of a three-string well design made it an unsustainable option for the operator.

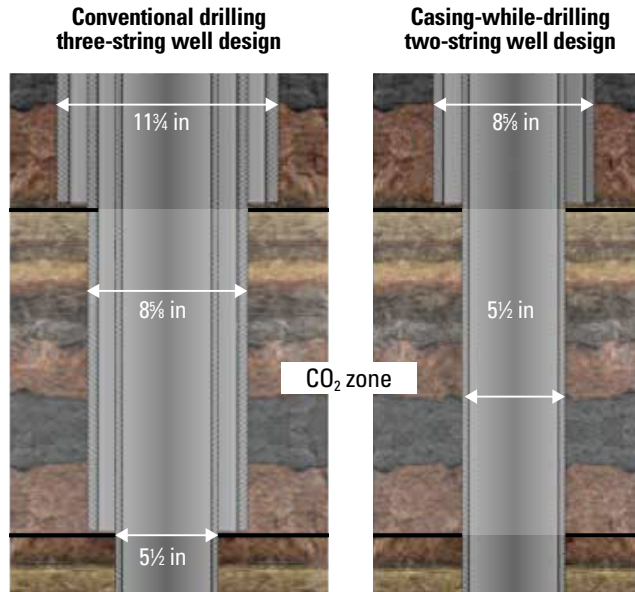
Casing-while-drilling two-string well design implemented

To maintain the economic viability of the project, Schlumberger recommended constructing a two-string well using the Smith Bits 7 $\frac{1}{8}$ -in Direct XCD drillable alloy casing bit. Multilobe torque (MLT) rings were added to the operator's 5 $\frac{1}{2}$ -in buttress-threaded coupled casing to provide positive makeup and increase torque. In addition, hydro-formed centralizers were used to help stabilize the drilling casing string and center it for cementing.

High-quality wellbore construction at a sustainable cost

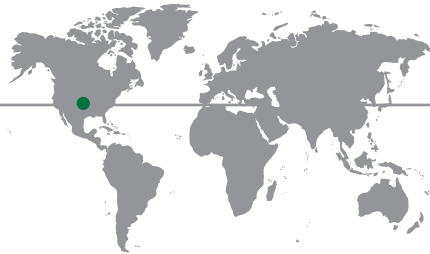
Using the Direct XCD casing bit to construct a two-string well design in five wells enabled the operator to come out of the conventionally set 8 $\frac{5}{8}$ -in casing and drill below the high-pressure CO₂ zone to TD with 5 $\frac{1}{2}$ -in production casing. The 5 $\frac{1}{2}$ -in production casing was cemented, and the Direct XCD casing bit was drilled out with a standard PDC bit. No kicks, stuck pipe, borehole collapse, or extended NPT were experienced during the operation.

As a result of the operation, the expense of an additional string was eliminated in five wells, and cement bond logs confirmed the cementing job was a record best for the operator.



The two-string well design spared the expense of an additional string while producing high-quality wellbores.

Case Study



Direct XCD Drillable Casing Bit Saves Two Colorado Wells and USD 8.6 Million

Unstable shale application threatens operation

An operator working in Fremont County, Colorado, was drilling a 9 $\frac{1}{2}$ -in well section through a part of the Denver-Julesburg basin's Niobrara formation, which is characterized by unstable Pierre shale. Although the planned well depth was 5,000 ft, at 3,800 ft the BHA became stuck and was lost. After drilling a sidetrack to 3,410 ft, the drilling team attempted to run 9 $\frac{1}{2}$ -in casing, but was unable to get the casing string past 2,444 ft. The operator pulled out of the hole and made a cleanout run with drillpipe to 3,095 ft. Upon reentering the well, following cementing, the operator could only reach a depth of 2,800 ft.

Casing-while-drilling saves investment

After 68 rig days, the operator considered abandoning the well but decided to try reaching the planned TD using TDDirect technology. Reaming the casing back to bottom enabled the operator to drill the remainder of the interval to TD using a 8 $\frac{1}{2}$ -in Direct XCD drillable alloy casing bit on 7-in casing. Upon landing and cementing the casing, the bit was drilled out. The casing-while-drilling operation took approximately 10 rig days, after which the operator continued running the production string.

Direct XCD bit protects investment in first well and reduces costs on second

Once the well was completed, the operator skidded the rig 20 ft to drill a second well. Using the same drilling design from the first well, the operator ran a Direct XCD casing bit on 9 $\frac{1}{2}$ -in casing to drill from 1,600 ft to interval TD at 4,900 ft in seven days. When compared with the USD 5.5 million investment in the first well, the investment in the second well was reduced by USD 3.1 million.

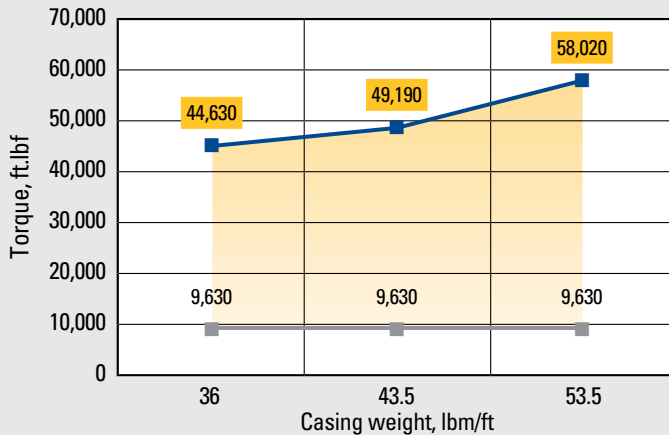


The Direct XCD casing bit substantially reduced the operator's well construction time in the Denver-Julesburg field's unstable Pierre shale by drilling while casing two wells, saving USD 8.6 million.

Multilobe torque rings

Increase torque capacity while protecting tubular connection threads

Multilobe torque (MLT) rings, which provide a positive makeup shoulder to increase torque capacity when installed in standard API buttress-threaded connections when using TDDirect* casing-drilling and liner-drilling technology applications. The increased torque capacity prevents pins and couplings used in API casing and tubing connections from being overstressed in drilling and workover applications, thereby reducing tubular connection maintenance and replacement costs.



Normal or shoulder torque capacity of a 9 $\frac{1}{2}$ -in buttress connection in N-80 grade steel is increased when MLT rings are installed in standard API buttress-threaded connections.



The MLT ring provides a reliable makeup shoulder to increase torque capacity while protecting connection threads.

Hydro-formed casing centralizers

Positive borehole centralization for casing and liner drilling

The hydro-formed casing centralizer provides positive center positioning for cementing in vertical and deviated wells. The centralizers are placed on the outer diameter of the casing string to create standoff between casing and the borehole during TDDirect technology applications.

Made with a special Hydro-forming process, the centralizer has an exclusive design and attachment method. The result is a casing drilling tubular that provides the strength and rigidity to withstand dynamic downhole loads while maintaining standoff under large side forces without being crushed. The centralizer's design also promotes the plastering effect, which strengthens wellbores for an effective cement bond that helps protect well integrity.



The casing centralizer's helical blade design enhances circulation, borehole cleaning, and cementing.

Direct XCD



Find out more about the Direct XCD casing bit at slb.com/DirectXCD.

Animation

See how the Direct XCD casing bit delivers increased efficiency in vertical well applications.

Case Studies

- Using a Direct XCD casing bit in Colorado's Niobrara formation, an operator saved a USD 5.5 million investment in one well and reduced the cost of another by USD 3.1 million.
- A Direct XCD bit was used to access a reservoir below a CO₂ zone in the Permian basin while enabling the operator to replace a three-string well design with a less costly two-string design.

IDEAS

Integrated drillbit
design platform
slb.com/IDEAS

Nomenclature

9⁵/₈ × 12¹/₄ XCD 5 16

Direct XCD casing bit

slb.com/DirectXCD

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