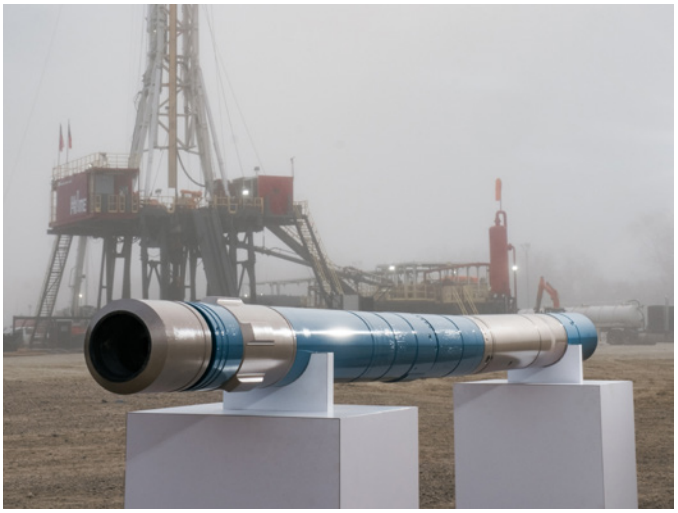
7⅛ in. Vector Series 50 SelectShift Downhole Adj Motor

Developed specifically for our Vector™ drilling motors, the SelectShift™ downhole adjustable motor saves time and money by reducing the number trips, increasing operational flexibility and optimizing critical drilling parameters. This revolutionary, NOV patented technology allows rapid adjustment of the motor bend setting downhole. The ability to shift to straight or a low bent setting downhole allows for broader and improved operating parameters such as higher drill string rotation, thereby improving bit life, hole quality, and ROP. The Vector Series 50 SelectShift downhole adjustable motor provides industry leading torque output capability with 100% flow to the drill bit. Engineered to be 35% stronger than previous generations of motor technology, this motor can be run on our strongest ERT™ power sections.



Technical Data

Size	7⅛ in.
Bit to center of stabilizer	18.5 in.
Motor stabilizer size	Max ¼ in. UG
Bit to bend	64½ in.
Bit to stator	122 in.
WOB @ 100 RPM	115,000 lbs
Bottom connection	4½ in. REG

Features

- Downhole adjustment of the motor bend setting
- Two configurations (straight to bent assembly and low bent to high bent assembly)
  - Two position options within each configuration
    - Straight to bent assembly - 0, 1.5, 1.83, 2.0, 2.12 bend options
    - Low bent to high bent assembly - 1.1, 1.2, 1.5, 1.83, 2.0, 2.12 bend options
- Hold mode in the straight or low bent setting
- Permanent signal mechanism with no bypass - ~150-250 psi
- High torque/high differential pressure design
- All-mechanical design
- Optimized for higher flow rates

Benefits

- Significant time and money savings
  - Reduces the number of trips required
  - Optimizes critical drilling parameters while increasing operational flexibility
  - Significantly lowers rotary torque and WOB requirements when rotating in straight mode compared to bent mode
- Improves ROP
  - Increased rotary RPMs/bit RPM in the straight position and requires less sliding in the lateral and curve
  - Less side loading of the bit aids ROP by drilling a more in-gage hole
  - Extends well reach with the ability to turn more rotary RPM while drilling in straight mode
- Improve hole quality and limited sliding
  - Offers more bend when faster correction is needed in the lateral
  - Provides build rates up to 16° per 100 feet
  - Straight setting limits hole tortuosity and aids hole cleaning
- Simple to use and adjust via RPM changes and flow changes
- Hold mode allows the straight or low bent setting to be maintained during connections
- Bend setting confirmation via permanent pressure signal on surface

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SelectShift Technology: Proven Performance

7⅛” Vector™ Series 50 SelectShift™ downhole adjustable motor successfully reaches TD while improving bit dull condition

Challenge:

Drill the entire 8¾” vertical / tangent section to KOP while effectively holding inclination and improving bit life. The vertical / tangent consisted of challenging sandstones, siltstones, and limestones. The previous well was pulled before KOP and the bit was damaged beyond repair.

Solution:

The Vector™ Series 50 SelectShift™ downhole adjustable motor, configured with an 8½” stabilizer and 7” 7/8, 5.7 stage ERT™ power section, was used to drill the vertical / tangent section KOP in one run. The SelectShift downhole adjustable motor was used with a 7 blade 19 mm cutter PDC drill bit and configured to alternate between 1.83° and 0.00° bend settings.

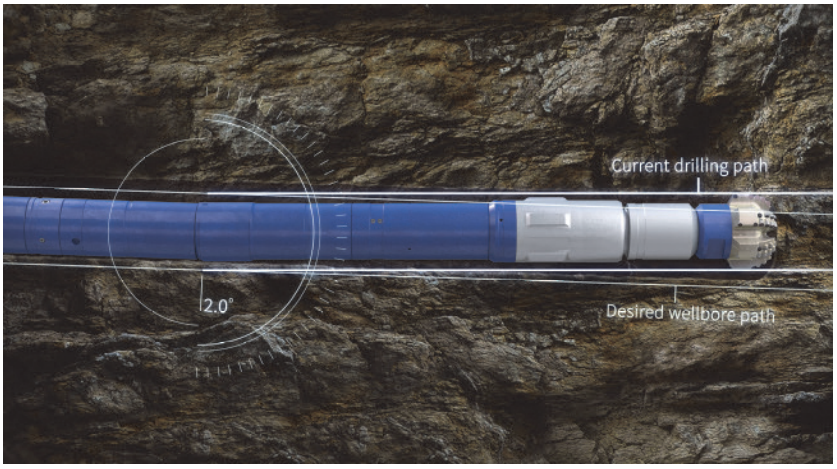
The SelectShift successfully reached KOP in one run, drilling 2,719 ft with the tool in the 0.00° setting. Hole inclination was easier to hold with the tool in the straight mode, effectively reducing the number of slides. The bit was deemed repairable and was a significant improvement in dull condition over the first run. The SelectShift was able to provide maximum drilling efficiency and an improved bit dull condition.

The offset well used a SelectShift with the same configuration and bit, and drilled 1,587 ft with the tool in the 0.00° setting. The drilled intervals on both the subject and offset wells ranged between 6,200 ft and 6,400 ft.

Results:

- SelectShift motor reached KOP without having to trip
- 71% Increase in footage drilled in 0.00° resulted in an improved bit dull condition
- 57% Decrease in the number of slides performed

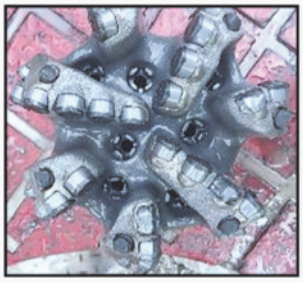
Client	Confidential
Well	Confidential
County	Confidential
Basin	Permian
State	Texas
Country	USA
Date	Q1 2019
Lithology	Sandstone, siltstone, limestone



Offset Well

1,587 ft Drilled in 0.00°
1-5-RO-T-X-I-BT-PR

Subject Well



2,719 ft Drilled in 0.00°
1-3-BT-S-X-I-CT-KOP