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NEO-tork
Torque Management, Optimized Performance

NeoTork is a downhole tool that manages torque generated by the drill bit as well as mitigating axial and torsional vibrations, protecting critical downhole equipment.

The simple, unique design automatically controls downhole torque. When torque exceeds a preset limit, the tool contracts to reduce the drill bit depth of cut. The excess torque 'stored' in the system is slowly released as the drilling structure drills off.

APPLICATION

DOWNHOLE MOTORS

There has been a rise in the use of PDMs over recent years, mostly thanks to increased horizontal drilling in shale developments. Although PDMs are effective, they are at risk of stalling if torque levels exceed their operational limits.

Once a PDM stalls, the coil needs to be lifted from bottom to allow the PDM to restart rotating. The coil is then slowly returned to the bottom to resume milling. This costs time and money.

To avoid stalling, operators limit parameters, or use mill bits generating lower torque (roller cones). Whilst this does reduce stalling, it impacts on ROP and the completion time for the well.

NeoTork manages downhole torque and prevents PDM stalling. Any excess torque, from a peak on WOB or a change in milling material is 'stored' by the tool. NeoTork contracts, automatically pulling up the mill bit and allows milling to continue without stalling the PDM. Running NeoTork when using a PDM allows optimization of milling parameters as well as the use of more aggressive milling structures instead of roller cones, removing the risk of lost cones down hole.

RESULTS

- Less downtime
- Faster ROP
- Longer bit life
- Smoother borehole
- Reduced number of stalls

WELL INTERVENTION

Today, many well interventions are completed using coiled tubing which transmits energy downhole, via a fluid flow, to a drilling system. The fluid is pumped inside the coil and powers a PDM.

Even with surface-automated WOB systems, PDMs frequently stall particularly when milling through the different materials that make up plugs and completion equipment and which cause torque to peak and fluctuate. The same happens when reaming scale of different hardness and thickness.
NeoTork protects the mud motor from variances in torque and greatly reduces the risk of stalling. The conditions are therefore better for mud motors and downhole equipment, which experience less damage. Smoother drilling and milling, within optimum parameters means faster ROP and swifter project completion.

RESULTS

- Less downtime
- Faster ROP
- Longer bit life
- Limit number of stalls
- Reduced equipment damage

CHALLENGING FORMATIONS

Constant variations in nature and composition of rocks affect the drill bit performance. During a drill bit run, a bit will often cut through a blend of different rocks, meaning that it will be exposed to variable reactive strengths. This often results in torsional vibrations as the energy required to cut through the rock fluctuates.

NeoTork, positioned in the BHA, absorbs variances in energy that would otherwise induce slip-stick and other damaging vibrations.

NeoTork dampens the torque variations generated by the drill bit, regardless of the changes in formation drillability. The drill bit remains engaged in the formation at all times, with a depth of cut automatically defined by the actual reactive torque generated.

RESULTS

- Faster ROP
- Longer bit life
- Smoother borehole
- Reduced equipment damage

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HOLE ENLARGEMENT
Hole enlargement operations can be challenging. As the drill bit and enlarger drill through different rock types, their drilling speeds can vary. As a result, the loads on both the bit and the enlarger are constantly changing in different proportions, impacting on their combined performance.

Using two NeoTork tools on the drill string will help balance the loads.

Located in the BHA, the fi rst NeoTork will reduce slip and stick, compensating for any slack in the BHA caused by an increase in the speed of the enlarger.

Positioning the second NeoTork above the enlarger will stop it from stalling or vibrating when it encounters a load peak, for example due to the bit drilling faster, a too large slack from the surface or from going through a change in the nature of the formation.

NeoTork smoothens torque and weight transfer, which reduces vibrations and protects both bit and hole enlarger, as well as all other drill string components.

RESULTS

- Faster R.O.P.
- Longer tools life
- Reduce L.I.H risk
- Reduced downtime
- Cost effective improved performance
- Encourage dual drilling and enlarging operations

CORING
Coring is a unique process, designed to capture a pristine sample of rock and bring it to surface for analysis. Coring can be expensive, due to multiple tripping, but the value of the reservoir information captured by the core is undeniable.

A lot of effort has been spent optimizing coring technologies and processes, resulting in extended run lengths and improved ROP. Even so, many coring jobs still suffer from slip and stick and drill string vibrations that result in jamming, forcing the barrel to be pulled to surface. Slip and stick vibrations do not just damage the equipment but also the core, reducing its value to the operator.

By placing NeoTork immediately above the barrel, the risk of slip and stick and vibration from vertical string movement is reduced. Jamming is less likely to occur; longer, better quality core can be recovered in a single run.

RESULTS

- Faster R.O.P.
- Longer tools life
- Reduced downtime
- Smoother borehole pattern
- Improved well trajectory accuracy
- Cost effective improved performance

DIRECTIONAL DRILLING
Any system used to drill a directional well (PDM and bent sub, or rotary steerable) relies on the orientation of a tool face to 'read' the actual string position and correctly orient the drilling system.

Movements in the tool face, due to slip and stick or vibrations, can make it diffcult to correctly read the well orientation and manage drilling trajectory. This results in more corrections, unsmooth drilling and can ultimately cause premature directional system failure.

NeoTork is the solution; it removes drill bit slip and stick that is the cause of those vibrations, making well orientation easier to read. This results in smoother, more effcient drilling results, reducing system failures and limiting the risk of premature pull out.

RESULTS

- Faster ROP
- Reduced jamming
- Improved core qualit
- Extend core barrel length
- Reduced equipment damage
- Cost effective improved performance

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TOOL DESCRIPTION
NeoTork is made up of two sections, assembled as a sole body.

There is a boxed connection in the top section of the tool. A shaft in the lower section of the tool supports the pin connection. The tool is supplied to site ready to use.

TOP ASSEMBLY
Includes a barrel, with a stack of disc springs inside.

These springs are compressed during assembly. The springs push on an axis, forcing NeoTork to extend up to its full length. The number of springs depends on the preset threshold for WOB and torque.

The disc springs are packed in a calibrated quantity and also absorb the tool's axial movement.

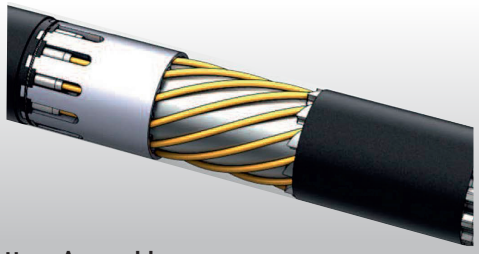
BOTTOM ASSEMBLY
The bottom assembly manages the extension or contraction of the tool. The rotating body, which includes the bottom shaft, is attached by steel cables to the upper section. In the extended position, the cables are set at a predefined angle.

When torque levels on the bottom shaft exceed the resistance exerted by the disc springs, the shaft will rotate clockwise. This forces the cables to 'swivel' around the sleeve at an increasing angle, lifting the bottom shaft until torque returns to the set level.

As the bit drills off and torque decreases, the opposite action occurs, letting the tool naturally return to its full length.

Shoulders limit the maximum upward and downward amplitude of the shaft stroke. It is these shoulders, not the cables, that stop the extension or contraction of the tool.

Top Assembly:
The disc springs are packed in a calibrated quantity and force the tool open. At both ends of the stack a low friction bearing ensures smooth rotation.



Bottom Assembly:
In the extended position, the cables are set at a pre-defined angle and are all bolted on with the exact same tension at both ends of the bottom section.

OUTER DIAMETER	2-1/8	2-7/8	3-1/2	4-3/4	6-3/4	8-1/2	9-1/2
Overall Length (ft)	4.8	5.5	7.1	14.2	16	17.6	17.6
Minimum ID (in)	0.70	0.79	0.98	1.38	2.05	2.75	2.84
Stroke	1.46	2	2.50	3.25	4.33	4.33	4.33
Ultimate Tensile Load (lbs)	59.000	111.500	215.000	396.000	920.000	1.270.000	2.000.000
Pulling Capacity (lbs)	45.000	90.000	172.000	316.000	730.000	850.000	1.700.000
Ultimate Torque (ft-lbs)	882	2.100	3.100	16.000	45.000	65.000	80.000
Maximum Torque (ft-lbs)	700	1.475	2.200	12.500	33.700	50.000	64.000
Operating Temperature (°F)	425	425	425	425	425	425	425
Connection	1-1/2 AMMT	2-3/8 PAC	2-7/8 REG	NC38	NC50	6-5/8 REG	7-5/8 REG