Neyrfor Turbodrills
Maximizing Wellbore Value
Neyrfor turbodrills deliver significantly greater mechanical drilling power downhole than any other drive system because of the efficiency with which hydraulic energy from mud circulation is converted into mechanical energy transmitted to the bit. The high power output is maintained throughout the run, making these turbodrills ideal for drilling the hardest, most abrasive formations such as basement rocks. In addition, the PDC bearing system is engineered to absorb excessive loads for extended periods of time. Low frictional loss within the bearing assembly further increases the mechanical power delivered.

Concentric rotation of the turbodrill allows the passage of drilling fluid through the tool to rotate the drive shaft at a significantly higher RPM than the surface rotary speed, while enabling the tool to remain dynamically stable about its geometrical axis. The high speed of rotation at the drill bit induces a limited depth of cut at the bit face, increasing fixed-cutter bit life and allowing more aggressive fixed-cutter bits to be used. Absence of lateral vibration means that the greater portion of the energy generated by the turbodrill is applied directly to drilling. A more stable BHA also delivers improved borehole quality. The superior vibration characteristics of the turbodrill are evident during surface tests. The turbodrill appears virtually motionless as it hangs in the derrick, owing to the balanced power section design.

Premium borehole quality

Due to the high bit rotary speed, turbodrills drill a consistently smooth wellbore when compared with a positive displacement motor (PDM). The Neyrfor Traditional standard turbodrill and the Neyrfor Delta high-performance directional turbodrill are both based on a concentric design, minimizing borehole rugosity. While directional drilling, the turbodrill’s consistent and predictable toolface control coupled with the use of stabilization ensures that hole spiraling and micro doglegs are minimized.

Representation of borehole drilled with a PDM compared with that drilled with a turbodrill.
Neyrfor turbodrills operate with either diamond-impregnated, PDC, or hybrid combination drill bits, and deliver a considerably higher ROP than conventional drive systems. This is a consequence of the efficiency with which mechanical power is delivered to the drill bit, enabling it to penetrate rock faster. Moreover, the balanced drive of the turbodrill minimizes the risk of shock- and vibration-induced damage to the BHA, increasing the time spent on bottom drilling ahead.

Similar ROP is achieved in both rotation and orient/slide modes. Flow rate and turbine RPM remain unchanged and consequently, so does the power delivered to the drill bit when sliding. The turbodrill stability enables more precise toolface control, improving directional performance. Furthermore, the wellbore quality produced by the turbodrill means less string friction and added control of weight applied at the drill bit – resulting in less stalling events and more efficient slides.
Applications
- Performance Vertical and Directional drilling
- PDC and Diamond Impregnated bit drillable formations
- Whipstock, cement plugs, and open hole sidetracks
- High-pressure, high-temperature (HPHT) wells
- Hostile mud conditions
- Thru-tubing remedial and underbalanced operations in gasified fluids, acidized systems, and high temperatures

Benefits
- Less rig time with enhanced ROP, even through very hard formations and during sliding
- More efficient directional drilling because of greater responsiveness and toolface control
- Fewer trips because of high reliability and extended drive train life
- Reduced BHA failures and bit wear because of superior vibration characteristics
- Enhanced wellbore quality and minimal tortuosity over conventional drive systems

Features
- Balanced, concentric design with minimal internal friction
- Efficient energy conversion for maximum mechanical drilling power
- High power output maintained throughout the run
- Run times up to 750 hours.
- Optional all-metal power section with no elastomers
- Effective in highly gas-cut, underbalanced mud systems
- Modular construction for rig changeability of bearing section, motor, and stabilizers
- Rig-adjustable bent housings on steerable tools
No environmental constraints
The optional feature of an all-metallic construction within the drive train and bearing section allows Neyrfor turbodrills to withstand the extreme demands of high temperature and pressure downhole, while maintaining optimum power output over the entire gradient encountered. This feature is particularly advantageous when drilling deep, basement rock. The metallic construction also allows the use of exotic and chemically enhanced drilling fluid systems such as acid washes, two-phase gaseous fluids, and oil-based systems, without any deterioration in output mechanical power, reliability, or performance typically seen with an elastomer based power section.

Protection for bit and drillstring
Although the bit and drillstring are mechanically coupled, the low friction bearings create near-perfect hydraulic decoupling. This unique feature allows the turbine to slow and even stall should the bit-formation interaction create fleeting torque surges – stalling is not detrimental to the integrity of the turbine. Thus, excessive and often damaging torque fluctuations that could damage internal components, trap excessive torque in the drillstring, and result in premature pressure surges are avoided.

Custom configurations for every application
Straight hole high-performance turbodrilling
In straight-hole applications, the speed and power of the robust Neyrfor turbodrill provide a high-performance drilling solution in hard formations or hostile downhole conditions, and deliver consistent verticality.

Directional and horizontal turbodrilling
The ability to offer consistent, predictable build rates, combined with superior toolface control, ensures that the turbodrill can achieve directional objectives in the most challenging conditions. Directional turbodrills have a track record of superior performance in extreme applications such as sidetracking below 22,000 ft in HPHT environments. With its all-metallic configuration, the exceptional durability of the turbodrill allows it to drill both legs of dual-lateral wells in a single run.

Thru-tubing turbodrilling
With the most power of any slimhole drive system, the Neyrfor TTT thru-tubing turbodrill offers the ability to achieve maximum performance in any thru-tubing operation. The design delivers consistent results in underbalanced pressure environments, two-phase gasified fluid systems, acidized systems, and high-temperature production environments. The ability of the Neyrfor TTT to operate in fluids with large percentages of gas allows continuous well production during remedial and underbalanced drilling operations.

About Neyrfor
Neyrfor turbodrill systems have been the premier turbodrilling system for over half a century, and are available from Schlumberger. With a history of exceptional drilling performance and reliability, Neyrfor turbodrills enhance efficiency in a broad range of drilling applications.