

# Evolution® Brine System



**NEWPARK**  
DRILLING FLUIDS

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**N**ewpark's unique Evolution® system is a high-performance water-based drilling fluid system that reduces torque and drag to levels normally associated with oil-based drilling fluids without the environmental costs and risks associated with non-aqueous fluids. When formulated with brine as the base fluid, the Evolution system further reduces costs by eliminating production water disposal and reducing chemical transportation, fresh-water and barite requirements.

The Evolution Brine system achieves high penetration rates, efficient hole cleaning and reduced torque and drag through a technically robust line of products proven to reduce the friction of the brine compared to that of non-aqueous drilling fluids. In unconventional horizontal drilling, reducing friction allows longer production laterals and decreased tool costs and wear. The Evolution Brine system is fully recyclable, which reduces product and brine consumption.

## WHY BRINE?

The dissolved salts in brines offer inherent inhibition and increased density compared to fresh-water drilling fluids.

- **Inhibition:** The salinity of brine prevents hydration of troublesome shale formations by maintaining the drilling fluid water activity less than or equal to the water activity of the shale, improving shale stability and reducing cuttings hydration. Brines protect the production zone by minimizing the impact the drilling fluid has on the formation.
- **Density:** Brines are more dense than fresh water. They reduce the requirement for barite by up to 1.6 lb/gal, which can eliminate 120 lbs of barite per barrel of active system, which also reduces suspended solids. NaCl brine systems can be unweighted when hydrostatic pressures allow mud weights of 10 lb/gal or less. Other salts allow for higher densities.

## CORE COMPONENTS

The Evolution Brine system's five key components minimize chemicals on location for improved operational efficiency and economics.

### NDFT 255 (EvoVis® S) Viscosifier

NDFT 255 (EvoVis S) viscosifier is a liquid polymer that disperses and yields rapidly in the Evolution Brine system. Effective over a wide density range, the polymer requires little concentration compared to other viscosifying agents, thereby minimizing transportation costs. The viscosity breaks easily in an acidic environment for dewatering operations.



### EvoLube® Drilling Performance Enhancer

EvoLube Drilling Performance Enhancer (DPE) is an extremely effective lubricant blend that provides coefficient of friction values typical of conventional oil-based fluids. It is especially effective in horizontal applications where it minimizes torque and drag to enhance transmission energy to the bit and increase rate of penetration (ROP). When used with NDFT 255 (EvoVis S) viscosifier, the combination is exceptionally beneficial in stabilizing reactive formations.

### EvoCon® Fluid Conditioner

EvoCon fluid conditioner is a water-based stabilizer ideal for unconventional wells. This high-performance additive optimizes the performance of both the NDFT 255 (EvoVis S) viscosifier and the EvoLube DPE lubricant blend.

### EvoTrol™ Filtration Reduction Agent

EvoTrol filtration reduction agent provides the Evolution Brine system with gel strength for improved hole cleaning and reduced fluid loss. It forms a thin, yet strong filter cake, which protects the formation from filtrate invasion and reduces the potential for differential sticking. Its effect on viscosity is minimal. The EvoTrol agent is resistant to degradation and does not require biocide.

### NewStabil™ Fluid Stabilizer

NewStabil fluid stabilizer controls alkalinity in brine systems and extends the temperature range and stability of polymeric drilling fluid systems. Operators are able to maintain stable drilling fluid at higher downhole temperatures while reducing polymer additions and costs. In addition, the alkalinity provided by NewStabil fluid stabilizer is more strongly buffered and less hazardous than that of caustic soda. This makes the NewStabil agent particularly effective in high-hardness brines, such as those encountered in the Bakken and West Texas.

## PROVEN SOLUTION

The Evolution Brine system exhibits consistent, repeatable and predictable field results in unconventional applications with 5,000 to 14,500-foot horizontal laterals, while achieving friction factors below the 0.10 target and maintaining torque below 12,000 ft-lbs. The system consistently demonstrates improved rates of penetration and reduced days on well. In turn, operators accomplish a high return on investment by allowing for a quick spud to market.

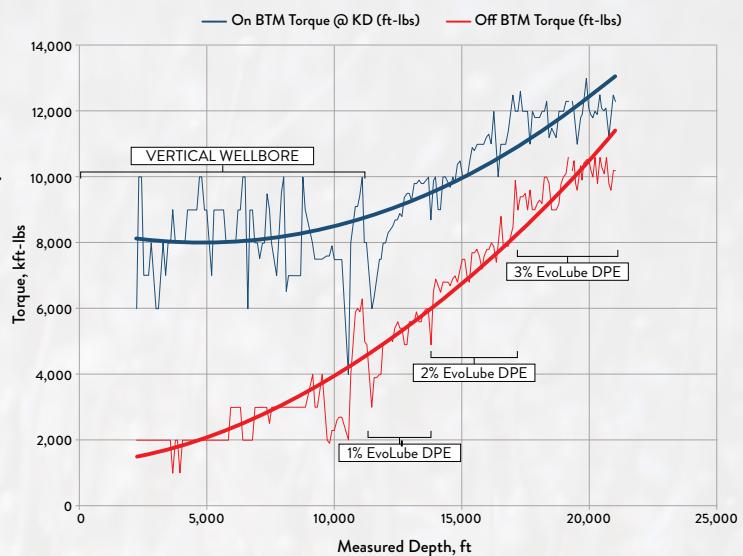
## CASE STUDY – BAKKEN

Operators in North Dakota drill 10,000' to 14,500' (3,000-4,400 m) laterals through the relatively inert, low-pressured Bakken/Three Forks shales using the Evolution Brine system, free of viscosifiers and barite. The salinity of the brine adds the required density for applications up to 10 lb/gal (1.2 Kg/L). It also provides enough inhibition to eliminate any potential wellbore stability problems. Success of these exceptionally long laterals requires high penetration rates, efficient hole cleaning and reduced torque and drag. The Evolution Brine system reduces torque and drag to levels normally associated with non-aqueous fluids. The lack of viscosity and gels in the Evolution Brine system diminishes energy losses caused by resistance. The resultant turbulent flow minimizes the formation of cuttings beds. In addition, the bit rotates faster. More efficient hole cleaning, faster bit rotation and low coefficients of friction combine to result in higher penetration rates.

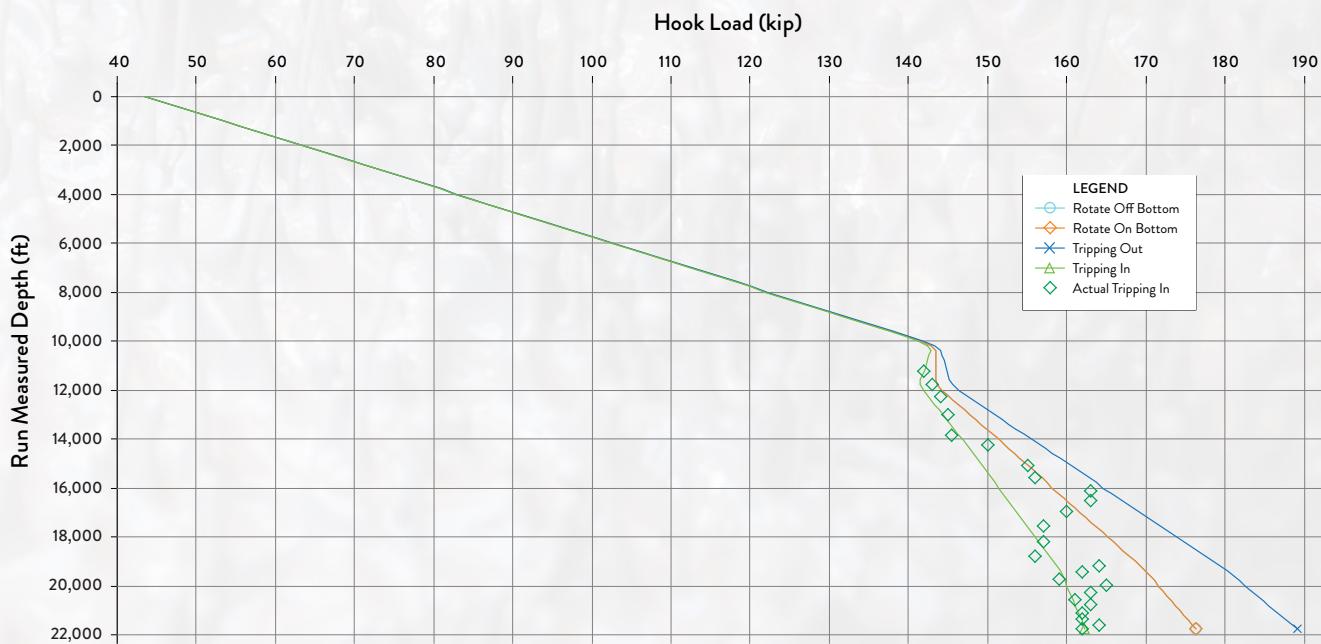
On a recent Evolution Brine well, EvoLube DPE concentrations increased with the depth of the well up to nearly 22,000' (6,700 m) of measured depth. According to industry-accepted software analysis, Newpark achieved an open hole friction factor of 0.10 while remaining under the operator target of 16,000 ft-lbs (2,200 Kg-m) of torque.



### Torque Management While Drilling



### Hook Load Graph: Actual vs. Generated Line for 0.10 Friction Factor on Industry Accepted Software



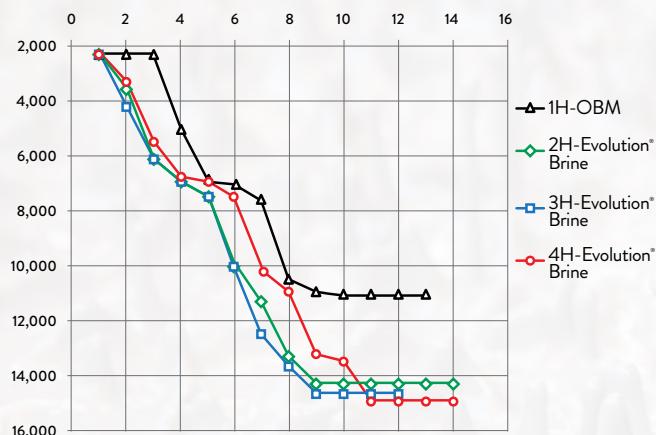
## CASE STUDY – EAGLE FORD

South Texas operators save hundreds of thousands of dollars by not setting intermediate casing. This practice leaves the troublesome, highly reactive Midway shale exposed to the drilling fluid as the horizontal laterals are drilled through the underlying Eagle Ford and Olmos shales. Non-aqueous fluids are most often chosen, as the emulsified brines within those fluids provide the required inhibition to maintain formation integrity. The Evolution Brine system also provides the salinity required to inhibit the Midway shale, making it an economically viable and operationally effective alternative.

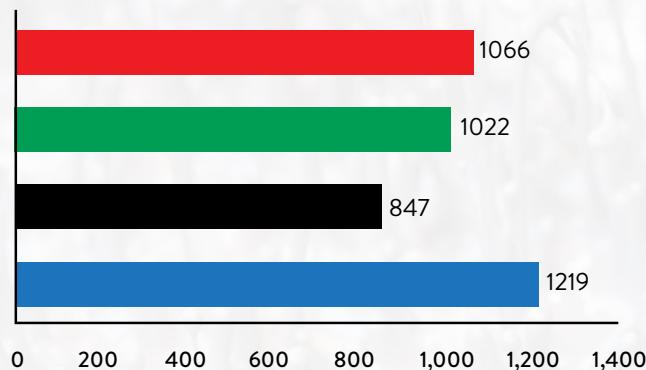
On this four-well pad, three wells were drilled with Newpark's Evolution Brine system and one with a non-aqueous fluid. The operator pre-set 9  $\frac{5}{8}$ -inch surface casing at approximately 2,300' (700 m) for

each well. The base fluid was 10.0 lb/gal (1.2 Kg/L) brine that was then viscosified and weighted up with barite to desired mud weights. The Evolution Brine wells drilled an average of 30% faster than the non-aqueous well drilled on the same pad. The Evolution Brine laterals averaged 55% longer than the non-aqueous lateral.

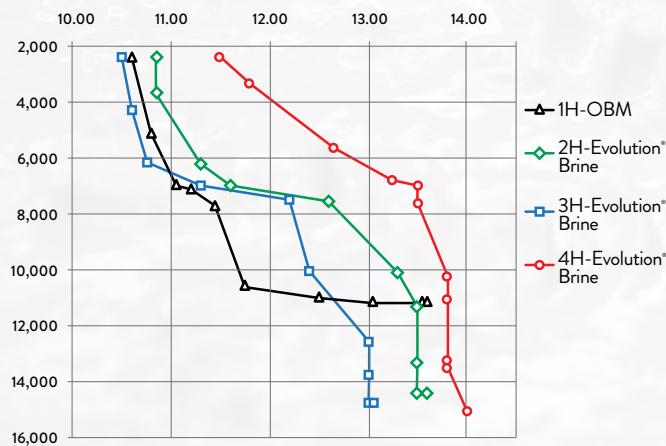
**Days on Well vs. Measured Depth**



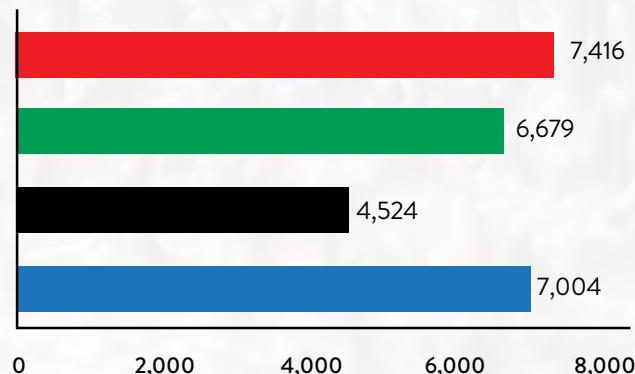
**Average Footage per Day**



**Mud Weight vs. Measured Depth**



**Lateral Length**



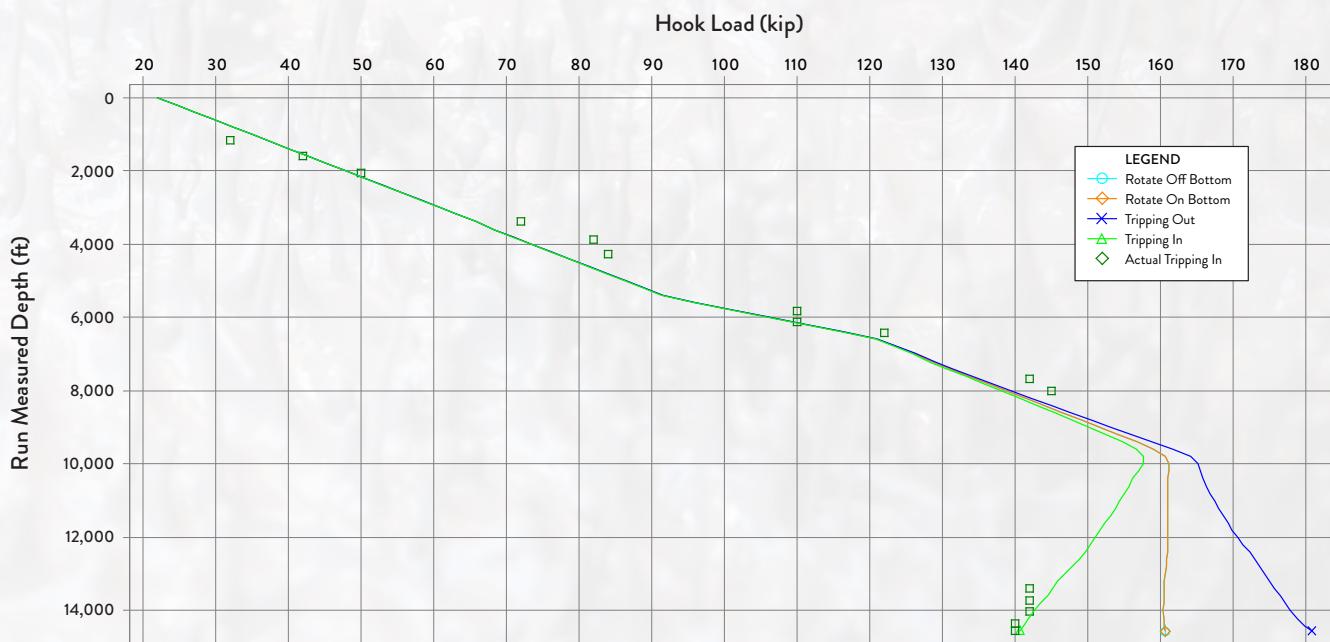
## CASE STUDY – WOLFCAMP

Operators targeting the Spraberry/Wolfcamp formation in West Texas use Newpark's Evolution Brine system on many wells. One operator drilled a well in Midland County, Texas to a total depth of 14,570' (4,440 m), and used the Evolution Brine system to drill the 4,747' (1,447 m) lateral. The hook loads remained fairly constant as pick-up and slack-off weights averaged 20,000 lbs (9,000 Kg) over the string weight. The lubricity coefficient ranged from 0.03 to 0.05 and API fluid losses remained under 4.3 mL/30min throughout the drilling of the production lateral. During tripping operations, hook loads remained normal, indicating low frictional losses from tight hole. In fact, according to industry-standard software, an open hole friction factor of 0.15 was achieved with this well.

An operator used the Evolution Brine system to drill 8,000' (2,438 m) laterals through the Wolfcamp shale in Crockett County, Texas. One well reached its total measured depth of 14,889' (4,538 m) in only 17 days. The lateral section was drilled in seven days, averaging 1,330' (405 m) per day. This exceptionally fast drill time encompassed all downtime associated with the rig, including trips. On-bottom torque remained consistently low throughout the curve and into the extended reach section of the well. An Evolution System Field Certified Technician monitored the lubricity coefficient throughout the drilling process using an EP/lubricity meter. Lubricity coefficient values ranged from 0.08 to 0.11.



**Hook Load Graph: Actual vs. Generated Line for 0.10 Friction Factor on Industry Accepted Software**





**EVOLU**TION<sup>®</sup> Water-based  
Fluid System



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