HydraGlyde
High-performance water-based drilling fluid system
Performance meets practicality
Given the economic and environmental constraints of many drilling projects including shale plays, oil-based drilling fluids are not always the optimal choice.

- The exceptional drillability of nonaqueous fluids in high-angle, long-reach horizontal land wells is offset by tremendously high logistical and waste management costs that can account for half the total drilling fluids bill.

- While highly inhibitive water-based drilling fluids mitigate many environmental issues, their price is often prohibitive for use in these cost-competitive plays.

- Most premier water-based fluids formulations lack the engineering flexibility to address the unique drilling conditions of widely diverse shale formations, which demand more than a one-size-fits-all fluid system.

Recognizing that no two shale plays are alike as well as the need to rein in costs, M-I SWACO developed the HydraGlyde® high-performance water-based drilling fluid system specifically to address these diverse conditions.

The system provides a fast, trouble-free, flexible drilling fluid solution that fits well within rigid AFE and HSE constraints. Its novel cost-effective chemistry reduces torque and drag, in addition to shale swelling and dispersion. The HydraGlyde system delivers oil mud-comparable ROP, exceptional hole cleaning, and wellbore stability in high-angle-build and long-lateral sections—all while reducing restrictive costs and decreasing environmental impact.
Conventional high-performance water-based drilling fluids provide excellent inhibition, which is the most advantageous performance characteristic of the invert-emulsion muds they were meant to replace. However, more mature, microfractured, highly laminated, or dispersive shales may be easily destabilized by the drilling fluid or filtrate. And, with differences among every shale play and overburden across the globe, drilling fluids must be tailored to meet specific geological characteristics, drilling conditions, and operator objectives.

M-I SWACO developed the HydraGlyde system to meet inhibition requirements while reducing torque and drag and improving ROP in the vertical, build, and horizontal sections. This cost-effective chemical package provides a high degree of lubricity and also overcomes the typical drilling-related problems encountered in more mature shales—gumbo accretion in the surface hole, wellbore instability, mud losses in the intermediate section, solids buildup, and hole cleaning in the horizontal section.

In addition to its exceptional drilling performance, the HydraGlyde system also generates a thin, tight, and slick filtercake that helps simplify running casing and installing the completion system.

To deliver this combination of performance and flexibility, the HydraGlyde system is engineered with three components:

- HydraHib* shale inhibitor, an amine-based additive that provides a high degree of wellbore stability and flexibility with the ability to adjust its concentration.
- HydraCap* encapsulating additive, which replaces the conventional partially hydrolyzed polyacrylamide (PHPA) additive to minimize clay dispersion and enhance wellbore integrity. Compared with PHPA, the HydraCap additive disperses more in water and generates less viscosity.
- HydraSpeed* ROP-enhancing primary lubricant, which demonstrates a coefficient of friction factor of 30.8 compared to 39.8 for a higher-cost lubricant. The unique nonhydrocarbon chemistry of HydraSpeed lubricant provides the combination of lubricity, wellbore stabilization, and filtercake enhancement.

To enhance hole cleaning and help eliminate sweeps, the HydraGlyde system also incorporates the supplemental DUO-VIS* biopolymer additive to increase low-shear viscosity for cuttings transport and suspension, while the POLYPAC UL* ultralow-viscosity polyanionic cellulose controls fluid loss with a negligible increase in viscosity.
The HydraGlyde system family has been expanded with the addition of HydraGlyde Optima flexible high-performance water-based drilling fluid system to address more dispersive shales and enhance the environmental profile for areas such as the North Sea. The HydraGlyde Optima system uses HydraHib shale inhibitor as the primary inhibitor and uses AcreteBlok* antiaccretion additive to prevent bit balling while drilling more reactive shales. The HydraGlyde Optima system enhances the inhibitive character to fill the performance gap between the HydraGlyde system and ULTRADRIL* high-performance water-based drilling fluid system.
HydraGlyde

Features
- High lubricity water-based mud system
- Cost-efficient chemistries
- Stable rheological profile
- Shale inhibition
- Low coefficient of friction factors for laterals
- Stable, low-shear viscosity
- Thin, high-quality filtercake
- Low fluid loss
- Design flexibility
- Minimal products required
- Compatible with a variety of make-up water and brines

Benefits
- Stabilizes shale sections while drilling
- Delivers high drilling rates in build and lateral sections
- Lowers torque and drag while drilling and running pipe
- Promotes trouble-free running of casing and completion equipment
- Provides excellent hole cleaning without sweeps
- Reduces dilution rates
- Reduces risks of differential sticking
- Minimizes nonproductive time (NPT)
- Saves drilling costs
- Elevates environmental profile
Challenge
Like many mature shale reservoirs in North America, the Permian Basin’s Wolfcamp Formation has been extensively drilled with vertical wellbores. The transition to horizontal wellbores and tightening economics magnified the need to reduce the high costs and environmental impact of oil-based muds. However, horizontal Wolfcamp wells posed tremendous challenges for water-based drilling fluids, including shale instability and increased torque and drag. Although these issues are relatively minor problems in vertical wellbores, they became major obstacles to the successful drilling, evaluation, and casing of a lateral well.

Results
To reduce costs and meet drilling and environmental objectives, the operator agreed to replace conventional diesel-based fluid with the HydraGlyde system. M-I SWACO arranged to compare drilling rates between the water-based and oil-based fluids in a test to determine HydraGlyde system effect on drilling days, environmental impact, and wellsite waste management.

The HydraGlyde system exceeded operator’s objectives. The average ROP in the lateral section was higher than that of offset wells drilled with the diesel-based fluid. The system also exhibited minimal increase in surface torque. Tripping was accomplished with no issues with casing run to bottom and cemented. The operator eliminated ancillary waste transportation and disposal costs and realized a cost savings per barrel compared with the diesel-based fluid used in the offset wells.

The average ROP in the Wolfcamp Shale laterals in a well using the HydraGlyde system was from 18% to 163% higher than offsets drilled with diesel-based fluid with the same BHA.

HydraGlyde system saves costs per barrel
Innovative solution increases ROP, improves waste management in the Permian Basin

Case Study

The average ROP in the Wolfcamp Shale laterals in a well using the HydraGlyde system was from 18% to 163% higher than offsets drilled with diesel-based fluid with the same BHA.
HydraGlyde Optima system improves shale drilling
Water-based fluid ensures stable open hole

Challenge
An operator sought to improve drilling for an exploration well through a zone with highly dispersive shale. Because a standard water-based mud (WBM) was used on the offset well, two day’s NPT had been spent cleaning out the 8½-in section prior to the logging program. Cuttings samples from the offset well clearly showed a lack of inhibition that worsened with depth. Prewell analysis confirmed that the drilled shales were highly dispersive.

Results
When the operator requested the use of a high-performance WBM, M-I SWACO recommended HydraGlyde Optima flexible high-performance water-based drilling fluid system based on accretion laboratory test results that showed a reduction from 33% to 18%, near a 50% reduction of this risk.

No major challenges or fluid-related problems were encountered drilling the problematic 8½-in section. The fluid viscosity and the other fluid parameters remained very stable throughout the section. Overall, cuttings integrity was good and the high-performance system provided sufficient inhibition, proving its value in drilling through the challenging shale identified prior to drilling.

As the section drilled also explored the sand reservoir below the troublesome dispersive shale, the fluid inhibition characteristics ensured a stable open hole during the static period when logging.
Water-based fluid system delivers oil-based performance, offshore Denmark

Background

An operator in Denmark required an alternative fluid system to oil-based mud to drill a 17½-in section to TD without NPT due to fluid-related issues. Because the operator did not want to reduce the fluid’s technical grade to the common KCl glycol drilling fluid, M-I SWACO recommended the HydraGlyde Optima flexible high-performance water-based drilling fluid system for a field trial with minimum risk. The large saving in waste cost by not having to ship oil-based cuttings to shore was taken into consideration when selecting the HydraGlyde Optima water-based system over a potentially more robust oil-based one.

The 17½-in section was drilled in one bit run over five days, from the 20-in casing shoe at 4,109 ft [1,252 m] to section TD at 8,662 ft [2,640 m]. Zero NPT was experienced. A small volume of the system was contaminated with high-pH fluid, but isolated. Casing was run and cemented without any losses or fluid problems. This second consecutive well proved the chosen concept of drilling with an optimized high-performance water-base mud instead of the usual oil-based mud.

HydraGlyde Optima creates excellent cuttings quality while drilling chalk and clay formations.
An operator was drilling an exploratory well in Argentina’s Bajada del Toro Field. To improve reservoir understanding, the operator planned to collect high-resolution measurements and formation samples in the 17½-in and 12¼-in sections. Multiple logging runs required well stability for extended periods of time—the operator needed to ensure proper mud weight and inhibition so the well would not close in or become unstable plus meet strict environmental regulations because the well was located near an aquifer zone.

**High technical and environmental performance**

Schlumberger selected the HydraGlyde high-performance water-based drilling fluid system with potassium sulfate, HydraSpeed ROP-enhancing primary lubricant, and HydraCap encapsulating additive for its excellent lubricity and inhibitory characteristics.

**Operator saved 1.2 days and completed six logging runs**

The HydraGlyde fluid system delivered ROP, hole cleaning, and stability similar to oil-based mud with the economic and environmental benefits of a water-based drilling fluid. Despite the drilling challenges, the operator drilled and logged both sections 1.2 days ahead of schedule. A planned calibration trip was eliminated and more than 85% of the drilling fluid from the 17½-in section was reused in the 12¼-in section. These efficiencies helped reduce costs in each section by 2% and 14%, respectively.

Dry cuttings from the primary shakers demonstrate the inhibitive properties of the HydraGlyde fluid system.
The 7,000-ft (2,134-m) section was successfully drilled with two bit runs during 13 days to section TD. The fluid’s inhibition properties held stable throughout the operation and ensured the planned ROP and success of the section. No bit balling or other downhole problems were encountered during drilling or tripping. The fluid system provided hole stability during the 6-day casing run, making the following cement job a success. The length of the casing run was due to casing tong restrictions and led to a longer openhole exposure than planned. The HydraGlyde Optima system secured the hole integrity, enabling the casing to be run and cemented properly.

**Background**

An operator was looking at the possibility of drilling a vertical 17½-in section to TD without using oil-based mud (OBM), which would save the operator approximately USD 1 million in waste costs. The proposed solution was a high-performance water-based (WBM) system, and the main KPI was to drill the section and cement the casing without any NPT due to fluid-related issues. The section included a thick shale formation, increasing the risk of not drilling with an OBM. Because the operator accepted the use of a high-performance WBM, M-I SWACO recommended the HydraGlyde Optima flexible high-performance water-based drilling fluid system. The main criteria for choosing the system over a standard WBM was based on accretion test results on the well-specific shale showing a reduction from 33% to 18%.
Put the HydraGlyde system to work for you.

Find out more about our HydraGlyde high-performance water-based drilling fluid system and how it is performing for customers.

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