



EnerSEAL

MMH TECHNOLOGY

NEXT GENERATION



DESCRIPTION (CONTINUED)

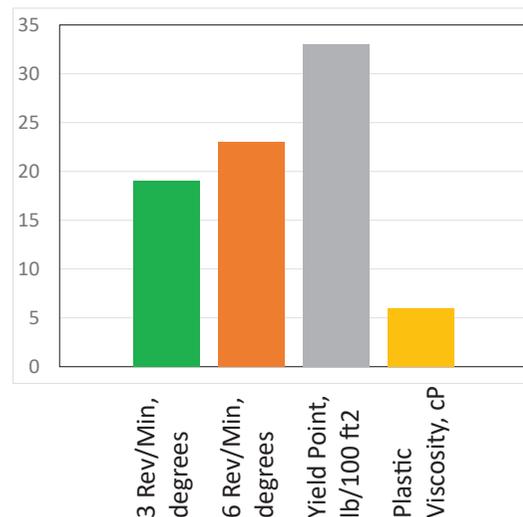
The robust nature of EnerSEAL maintains its special properties as contaminants are encountered while drilling. Some compounds, such as those of an anionic nature, disrupt the MMH network, resulting in sudden and dramatic loss of properties such as viscosity.

EnerSEAL is built to tolerate common debris, allowing the system to perform where other systems fail. Stable up to 300°F, the system is suited for many drilling applications.

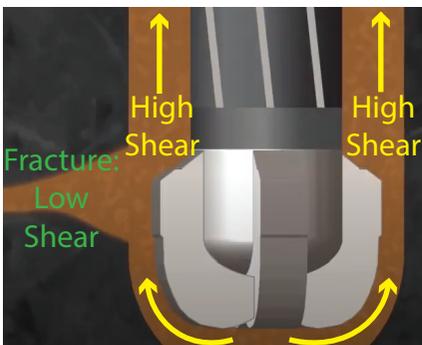
EnerSEAL achieves all of these properties without the use of harsh chemistry. The unique rheology complements solids control equipment for efficient solids separation and minimal dilution.

Note the elevated 6 and 3 rev/min readings versus yield point and plastic viscosity in a typical EnerSEAL system rheology (right).

Typical Rheology at 120 °F
(Oilfield Units)



APPLICATIONS



EnerSEAL performs in vertical and horizontal wells. It is regularly applied where loss zones are expected, such as unconsolidated or fractured formations. As EnerSEAL travels away from the wellbore into a loss zone, it enters an area of low shear where it thickens, reducing or eliminating losses.

Where hole cleaning is critical, EnerSEAL offers a unique solution. This includes milling operations as well as challenging laterals where pump rates are limited by rig equipment or equivalent circulating density. Efficient cuttings removal also lowers torque and drag. When pumps are off, EnerSEAL keeps cuttings suspended, lowering packoff risk.

EnerSEAL also aids to reduce washout. The fluid-wellbore interface is an area of reduced shear where EnerSEAL is in laminar flow. This limits the scouring effect seen in turbulent flow regimes, preventing erosion of unconsolidated or salt formations.

Pictured (left): The shear-thinning nature of EnerSEAL allows low pump pressures in the wellbore in high shear areas. In low shear areas, such as fractures, the fluid thickens, mitigating losses.

PERFORMANCE

EnerSEAL has proven effective for a number of applications. In over 200 wells in the Permian basin, clients have taken advantage of EnerSEAL properties to minimize losses in highly depleted formations, such as the Brushy Canyon. This has allowed clients in the area to eliminate a casing string, resulting in a savings of 5 rig days.

In another lost circulation scenario, the client was able to set surface pipe without losses to achieve full returns while cementing in a riverbed for the first time using EnerSEAL.



“Our casing runs have been much smoother, and torque has dropped allowing us to drill faster.”

“We’ve reduced exposure to dangerous chemicals and improved waste management with this system.”

“It [EnerSEAL] is much more stable than the MMH system from years past.”

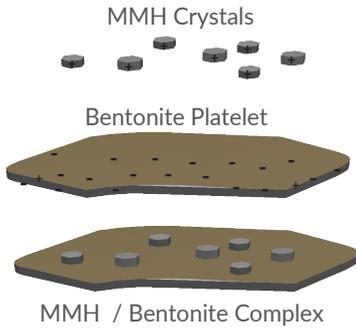


EnerSEAL[†]

MMH TECHNOLOGY

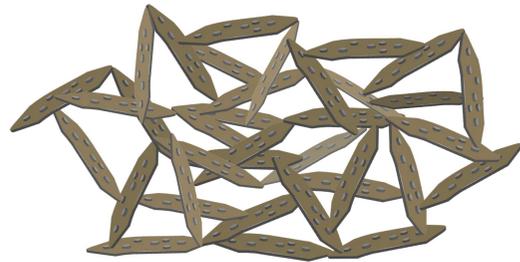
EnerSEAL is an advanced mixed metal hydroxide (MMH) water-base drilling fluid with superior stability and performance over previous systems. Using a proprietary chemistry, EnerSEAL delivers challenging wells where MMH technology performs but old systems could not deliver.

EnerSEAL provides ideal flow properties for drilling: superior cuttings suspension, low surge and pump pressures, a unique ability for the fluid to dramatically reduce formation losses, in-gauge wellbores, reduced torque and drag, and increased solids control efficiency. EnerSEAL features an optional inhibition package to reduce swelling and dispersion of clays and lower fluid loss.



MMH crystals attach to the bentonite platelets by ionic exchange in which the naturally occurring cations on bentonite are exchanged with MMH. This forms a strong association on the face of the clay platelets.

The MMH complex entangles a network of clay platelets. The electrostatic charge maintaining the network readily breaks with shear. This is what provides the unique rheological properties of EnerSEAL.



MMH Network



DESCRIPTION

E n e r S E A L

Robust mixed metal hydroxide system

Ideal shear thinning properties limit loss rates and improve hole cleaning



BENEFITS

E n e r S E A L

Superior cuttings suspension without impacting pump pressures

Minimal washout

Resistance to losses due to elevated viscosity under low shear conditions in thief zones



APPLICATIONS

E n e r S E A L

Intervals with high risk of losses, such as fractured and unconsolidated formations

Critical hole cleaning applications where pump pressures are limited

Milling operations





AES DRILLING FLUIDS

www.aesfluids.com

☎ Phone : 281 556 5628

✉ Email : info@aesfluids.com

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