

# POLY-PLUS

## High-molecular-weight liquid clay inhibitor

### APPLICATIONS

- Cuttings encapsulation
- Shale stabilization

### ADVANTAGES

- Provides excellent cuttings encapsulation and limits cuttings dispersion
- Delivers improved shale stabilization
- Enhances drill-solids removal in clear-water systems and the carrying capacity of foams
- Mixes easily with rapid yield
- Exhibits a low pour point of  $-20$  degF [ $-28.9$  degC] for use in cold climates
- Can be used to viscosify clear-water, low-solids drilling fluids
- Improves the lubricity of most mud systems, particularly nondispersed systems, and dispersed mud, when used in combination with a lubricant
- Helps prevent bit balling and balling on stabilizers and bottomhole assemblies by coating and lubricating solids

POLY-PLUS\* high-molecular-weight liquid clay inhibitor is an anionic liquid designed to provide cuttings encapsulation and shale stabilization. It also acts as a viscosifier, friction reducer, and flocculant. POLY-PLUS inhibitor can be used in mud systems using make-up waters from freshwater to saltwater.



### POLY-PLUS inhibitor mud systems

The inhibitor provides excellent cuttings encapsulation and improved wellbore stability. Typical concentrations of POLY-PLUS inhibitor are 0.75 to 3 lb/bbl (2.1 to 8.5 kg/m<sup>3</sup>). It is also effective in salt muds, such as KCl- or NaCl-enhanced fluids, although slightly higher concentrations may be required.

### Clear-water fluids

POLY-PLUS inhibitor can be used in clear-water, solids-free drilling fluids. The POLY-PLUS inhibitor increases viscosity and enhances solids removal by flocculating the undesired solids. It also provides cuttings encapsulation and improved wellbore stability. This system is frequently used in slim-hole, continuous-coring applications. Adding 0.5 to 1.75 lb/bbl [1.4 to 5 kg/m<sup>3</sup>] enhances solids removal by flocculating solids.

### Low-solids, nondispersed (LSND) muds

POLY-PLUS inhibitor is well suited to LSND systems. In reduced-bentonite muds, the inhibitor serves as a bentonite extender to increase viscosity and as a flocculant to more efficiently remove drill solids. It also encapsulates cuttings and improves wellbore stability.

### Weighted muds

This inhibitor can be used in weighted muds for cuttings encapsulation, improved wellbore stability, secondary viscosity, and improved filtercake integrity. The effectiveness of the polymer diminishes as the concentration of organic, anionic dispersants increases.

### POLY-PLUS sweeps

Viscous POLY-PLUS inhibitor sweeps are effective for periodic hole cleaning. Circulating a sweep through the well or borehole helps clear accumulated cuttings and maintain a clean hole.

### Addition method

This inhibitor can be mixed directly into the active mud system. It can also be premixed at higher concentrations in a separate pit or chemical barrel, then blended into the active system. This polymer can be poured directly into the pits at any point where good agitation exists, such as at the mixer, or can be added through the mixing hopper or chemical barrel. A small, steady stream of inhibitor injected into the flowline provides selective flocculation of drill solids. Caustic and lime should not be mixed at the same time as the inhibitor. Sweeps can be accomplished by mixing POLY-PLUS inhibitor directly into the active system at the suction pit or by pouring small quantities (1 to 2 cups) directly into the drillstring during connections.

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## LIMITATIONS

The following limitations apply to all acrylamide and acrylate copolymers:

- During initial treatment with this additive in a nondispersed mud system, severe flocculation may occur, causing high viscosity until all of the solids are coated. POLY-PLUS inhibitor mud systems use low concentrations of MAX GEL\* viscosifier to reduce this interaction. Continued additions of POLY-PLUS inhibitor result in a stable system with desired rheology. Always add bentonite first to the mud followed by the inhibitor to ensure proper yield of the bentonite and reduce the amount of polymer addition.
- The inhibitor is calcium-sensitive and begins to precipitate when the calcium concentration exceeds 300 mg/L.
- POLY-PLUS inhibitor is pH-sensitive, with an optimal range of 8.5 to 10.5. At pH levels above this range, hydrolysis may convert polyacrylamide into polyacrylate and release ammonia (NH<sub>3</sub>).
- The inhibitor is temperature-stable to approximately 350 degF [176.7 degC] although the copolymer may begin to hydrolyze into polyacrylate when exposed to prolonged temperatures above 275 degF [135 degC] and release ammonia (NH<sub>3</sub>).
- POLY-PLUS inhibitor is subject to shear degradation of its viscosity, but cuttings encapsulation and shale stabilization will not be affected.

## Contamination

This inhibitor reacts with multivalent cations such as calcium. In concentrations greater than 300 mg/L, calcium causes the polymer to precipitate. Use soda ash to remove calcium concentrations above 300 mg/L.

Treat cement contamination to keep the calcium and pH as low as possible. Use sodium bicarbonate along with a pH-reducing product, such as lignite, to treat cement contamination.

Zinc oxide is recommended if hydrogen sulfide gas is encountered. Zinc oxide is preferred to liquid products containing zinc. Due to lower solubility, zinc oxide does not react with this inhibitor as readily as liquid products that contain zinc.

## Cleanup

POLY-PLUS inhibitor can be chemically broken down with liquid bleach in regular household concentration (5% sodium hypochlorite). Use 5 galUS [18.9 L] of liquid bleach per 100 galUS [378.5 L] of fluid formulated with inhibitor. Do not use perfumed liquid bleach or solid calcium hypochlorite.

## Toxicity and handling

Bioassay information is available on request. Handle as an industrial chemical, wearing protective equipment and observing the precautions described in the MSDS.

## Packaging and storage

POLY-PLUS inhibitor is packaged in 5-galUS [18.9-L] buckets. Store in a dry location away from sources of heat or ignition, and minimize dust.

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## Typical Physical Properties

Physical appearance	Cream-colored, opaque liquid
Odor	Slightly hydrocarbon
Specific gravity	1.07–1.10
pH (1% solution)	8.0–9.0
Flash point	>200 degF [93.3 degC] (PMCC)
Pour point	–20 degF [–28.9 degC]
Viscosity (typical)	~ 500 cP

Concentration <sup>†</sup> lb/bbl (kg/m <sup>3</sup> )	gal/bbl [L/m <sup>3</sup> ]	gal/100 galUS
0.50 [1.4]	0.056 [1.3]	0.133
0.75 [2.1]	0.084 [2.0]	0.200
1.00 [2.85]	0.110 [2.6]	0.262
1.50 [3.3]	0.170 [4.0]	0.405

<sup>†</sup>Based on 30% active material

## Approximate Amounts of POLY-PLUS Inhibitor Added to Drilling Fluid Systems

Drilling Application	qt/100 galUS	pints/bbl	L/m <sup>3</sup>
Freshwater	1.00	1.00	2.50
Stabilizes water-sensitive formation			
Reduces torque and pump pressure and increases hole stability	1.50	1.25	3.75
Low-solids, nondispersed (LSND)			
Increases viscosity			
Improves hole cleaning			
Reduces filtercake thickness	0.50	0.50	1.25
3% KCl drilling system	2.00	1.75	5.00
Injection liquid in air or foam applications	0.50–1.00	0.50–1.00	1.25–2.50

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