

POLY-PLUS

POLY-PLUS* polymer is a high-molecular-weight, anionic liquid designed to provide cuttings encapsulation and shale stabilization.

POLY-PLUS additive also acts as a viscosifier, friction reducer and flocculant. POLY-PLUS polymer can be used in mud systems using makeup waters from freshwater to saltwater.

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°F (93.3°C) (PMCC)
Pour point	-20°F (-28.9°C)
Viscosity (Typical)	~ 500 cP

Concentration ¹ lb/bbl (kg/m ³)	gal/bbl (L/m ³)	gal/100 gal
0.50 (1.4)	0.056 (1.3)	0.133
0.75 (2.1)	0.084 (2.0)	0.200
1.00 (3.0)	0.110 (2.6)	0.262
1.50 (4.3)	0.170 (4.0)	0.405

¹Based on 30% active material

Applications

Poly-Plus polymer mud systems: The POLY-PLUS system provides excellent cuttings encapsulation and improved wellbore stability. Typical concentrations of POLY-PLUS additive are 0.75–3 lb/bbl (2.1–8.5 kg/m³). It is also effective in salt muds, such as KCl- or NaCl-enhanced fluids, although slightly higher concentrations of POLY-PLUS polymer may be required.

Clear-water fluids: POLY-PLUS polymer can be used in clear-water, solids-free drilling fluids. The POLY-PLUS system 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 0.5–1.75 lb/bbl (1.4–5 kg/m³) enhances solids removal by flocculating solids.

Approximate Amounts of POLY-PLUS Polymer Added to Drilling Fluid Systems			
Drilling Application	qt/100 gal	pints/bbl	L/m ³
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, Non-Dispersed (LSND)			
Increases viscosity			
Improves hole cleaning	0.50	0.50	1.25
Reduces filter-cake thickness			
3% KCl drilling system	2.00	1.75	5.00
Injection liquid in air/foam applications	0.50–1.00	0.50–1.00	1.25–2.50

Low-Solids, Non-Dispersed (LSND) muds: POLY-PLUS polymer is well suited to LSND systems. In reduced-bentonite muds, POLY-PLUS additive 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: POLY-PLUS polymer can be used in weighted muds for cuttings encapsulation, improved wellbore stability, secondary viscosity, and improved filter-cake integrity. The effectiveness of the polymer diminishes as the concentration of organic, anionic dispersants increases.

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

Addition Method

POLY-PLUS polymer 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 POLY-PLUS polymer injected into the flowline provides selective flocculation of drill solids. Caustic and lime should not be mixed at the same time as POLY-PLUS additive. Sweeps can be accomplished by mixing POLY-PLUS polymer directly in the active system at the suction pit or by pouring small quantities (1–2 cups) directly into the drillstring during connections.

Advantages

- Provides excellent cuttings encapsulation and limits cuttings dispersion
- Provides improved shale stabilization
- Enhances drill-solids removal in clear water systems and the carrying capacity of foams
- Liquid product for easy mixing and rapid yield
- Is versatile and multipurpose
- Low pour point of -20°F (-28.9°C) for easy use in cold climates
- Can be used to viscosify clear-water, low-solids drilling fluids
- Improves the lubricity of most mud systems, particularly non-dispersed systems, 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

Limitations

The following limitations apply to all acrylamide/acrylate copolymers:

- During initial treatment with POLY-PLUS polymer in a non-dispersed mud system, severe flocculation may occur, causing high viscosity until all of the solids are coated. POLY-PLUS polymer mud systems used low concentrations of MAX GEL* product to reduce this interaction. Continued additions of POLY-PLUS polymer result in a stable system with desired rheology. Always add bentonite first to the mud followed by POLY-PLUS polymer to ensure proper yield of the bentonite and reduce the amount of polymer addition.
- POLY-PLUS polymer is calcium-sensitive and begins to precipitate when the calcium concentration exceeds 300 mg/L.
- POLY-PLUS polymer is pH sensitive, with an optimum range of 8.5 to 10.5. At pH levels above this range, hydrolysis may convert polyacrylamide into polyacrylate and release ammonia (NH₃).
- POLY-PLUS polymer is temperature-stable to approximately 350°F (176.7°C) although the copolymer may begin to hydrolyze into polyacrylate when exposed to prolonged temperatures above 275°F (135°C) and release ammonia (NH₃).
- POLY-PLUS polymer is subject to shear degradation of its viscosity but cuttings encapsulation and shale stabilization will not be affected.

Contamination

POLY-PLUS polymer 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 POLY-PLUS polymer as readily as liquid products that contain zinc.

Cleanup

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

Toxicity and Handling

Bioassay information is available upon request.

Handle as an industrial chemical, wearing protective equipment and observing the precautions described in the Material Safety Data Sheets (MSDS).

Packaging and Storage

POLY-PLUS polymer is packaged in 5-gal (18.9-L) buckets. Store in a dry location away from sources of heat or ignition, and minimize dust.



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