



HDD Mining & Waterwell

Product listing and applications



**Wherever you're working,
our HDD Mining & Waterwell
specialists have you covered**

**Where do your projects take you?
Into mines hundreds of feet below the
earth or coring jobs at the surface?
Tunneling beneath rivers or under major
highways? Conducting curb-to-house
installations or drilling for coal-bed
methane reserves?**

Wherever you work, you can depend on M-I SWACO HDD Mining & Waterwell specialists to keep your projects on target. As the industry-leading provider of drilling-fluid systems and additives, solids-control equipment, and engineering services, we have the know-how and resources to custom-design solutions that meet the unique requirements of your project, regardless of its location or complexity. Our highly trained drilling-fluid specialists have worldwide experience in delivering 24-hr, onsite engineering services that no competitor can match.

As an operating group of M-I SWACO, HDD Mining & Waterwell provides drilling fluids, solids-control and drilling waste management equipment and services.

Total-package solutions

- Complete pre-bore planning, including mud programs, logistics and engineering
- A complete line of drilling fluids and additives from a company with many years of worldwide experience
- Solids-control equipment and shaker screens from the same fluids company
- Customized solutions engineered for individual projects

Advantages

- Fewer unscheduled problems that can result in costly delays and accidents
- Effective fluids solutions that save time and materials
- Reduced logistics problems and associated costs
- Optimum benefit and greater efficiency from both fluids systems and solids-control equipment

**Our solids-control and recycling
equipment and services keep your
project and bottom line under control**

As a part of M-I SWACO, we can provide a wide variety of linear and balanced elliptical motion shakers, mud cleaners, desanders, desilters, and centrifuges, each of which can be tailored for your requirements, from recycling to dewatering drilling fluids. M-I SWACO HDD Mining & Waterwell specialists also provide, for sale or rent, unitized recycling systems capable of cleaning drilling fluids at a rate of 150 to 1,000 GPM (568 to 3,785 L/min). In addition, we manufacture shaker screens that are compatible with every brand of solids-control equipment in the industry.

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HDD Mining & Waterwell Products

Name	Description
DRILPLEX HDD	A specialty product used to enhance the gel strengths of MAX GEL* viscosifier, DRILPLEX* HDD viscosifier is an inorganic chemical viscosifier for water-base, bentonite drilling fluids
DUO-TEC	Dispersible, non-clarified technical-grade xanthan gum that provides viscosity, including low-shear-rate viscosity and suspension for all water-base mud systems
DUO-VIS/SUPER-VIS	Xanthan gum that is a high-molecular-weight biopolymer used for increasing carrying capacity in water-base systems
FLO-PLEX	A fluid-loss-control agent that is a polysaccharide derivative used to control filtration in the DRILPLEX system at recommended concentrations
GEL SUPREME	A viscosifier that is a premium-grade Wyoming bentonite (a sodium montmorillonite clay) which has not been chemically treated
GOPHER GROUT	A granular bentonite grouting composition that contains high swelling sodium montmorillonite clay. It is designed for use in water wells requiring a 20% solids grout
KLA-GARD	A shale stabilizer that reduces the swelling of sensitive shales and drill cuttings exposed to water-base drilling fluids
KWIK-PLUG FINE & MICRO	Granular bentonites that are used to effectively plug and seal boreholes
KWIK-PLUG MEDIUM & COARSE	Screen-sized bentonite chips which are used to seal and plug earthen boreholes
Lost Circulation Materials	Cedar Fiber, Mica, Drilling Paper, Cottonseed Hulls, and FED-SEAL*
MAX BORE HDD	A proprietary, blended, high-yielding Wyoming bentonite supplied as a single-sack product used especially in boring-fluid applications
MAX GEL	A premium 220 bbl yield Wyoming bentonite blended with special extenders that yields more quickly than regular API-grade bentonite
PLATINUM D-D	An aqueous blend of surface-active agents, it is designed to reduce the surface tension of all water-base mud systems and reduce the sticking tendency of water-sensitive shale cuttings
PLATINUM FOAM PLUS	This foaming agent is water-soluble and biodegradable
PLATINUM PAC	A polyanionic cellulose that is a readily dispersible, water-soluble polymer designed to control fluid loss in water-base muds
PLATINUM PAC UL	A polyanionic cellulose that is a readily dispersible, water-soluble polymer designed to control fluid loss in water-base muds with minimal viscosity increase
POLYPAC R	A polyanionic cellulose, high-quality, water-soluble polymer designed to control fluid loss in water-base muds
POLYPAC UL	A polyanionic cellulose, high-quality, water-soluble polymer designed to control fluid loss in water-base muds with minimal viscosity increase
POLY-PLUS	This polymer is a high-molecular-weight, anionic liquid designed to provide cuttings encapsulation and shale stabilization
POLY-PLUS 2000	A high-molecular-weight anionic polymer that comes as a water-free high solids dispersion. It provides excellent cuttings encapsulation and shale stabilization
POLY-PLUS EHV	An acrylic copolymer of very high-molecular-weight, anionic PHPA dry granular powder for use in mineral exploration and construction applications
POLY-PLUS LV	A low-molecular-weight anionic PHPA designed to provide cuttings encapsulation and clay-dispersion inhibition with minimal viscosity increase
POLY-PLUS RD	This acrylic copolymer (PHPA) is a readily dispersible product designed to provide cuttings encapsulation and shale stabilization
POLYSWELL	A copolymer used in lost circulation that expands to 200 times its volume in freshwater
RINGFREE	A highly efficient, thermally stable polymer thinner that also removes clays from the drillstring and helps to break up clay balls
ROD COAT B 700	A high-performance, barium salt-base drill-rod grease reduces rod vibration
ROD EASE	A superior lubricant for HDD, coring and rotary drilling applications
SMOOTH GROUT 20	An easy-to-use bentonite-grouting composition that when mixed properly, provides a 20% solids pumpable slurry for sealing boreholes
SMOOTH GROUT 30	An easy-to-use bentonite-grouting composition that when mixed properly, provides a 30% solids pumpable slurry for sealing boreholes
SMOOTH GROUT THERMAL	An easy-to-use bentonite grouting composition that is designed to be mixed with silica sand to obtain desired thermal conductivities necessary in ground source heat loop applications
SUPER PLUG	A proprietary blend of bentonite with 100% inorganic additives used in hole abandonment applications where a low permeability, flexible seal is required
TACKLE	A liquid polymer that is a low-molecular-weight, anionic thinner designed to deflocculate a wide range of water-base drilling fluids
TUBE LUBE	A 100% biodegradable and non-toxic paste that is used to lubricate the inner core barrel and core to facilitate core entry and removal

	Primary Application				Typical Concentration [†]		
	HDD products	Mining products	Waterwell products	NSF-Certified products	lb/100 gal	lb/bbl	kg/m ³
	■	■	■	■	10:1 ratio with MAX GEL		
	■				0.5-2	0.25-1	0.7-2.75
	■				0.5-2	0.25-1	0.7-2.75
	■	■			2-4.5	0.75-2	2-6
				■	20-50	8.5-20	25-55
			■	■	See product data sheet		
	■	■			0.75 - 2 gal/100 gal		7.5-20 L/m ³
		■	■	■	See product data sheet		
		■	■	■	See product data sheet		
	■	■			See product data sheet		
	■				20-30	8-12	20-35
	■	■	■	■	15-30	6-12	15-35
	■				1-4 qts/100 gal		2.5-10 L/m ³
	■	■	■	■	1-4 qts/100 gal		2.5-10 L/m ³
	■	■	■	■	0.5-2	0.25-1	0.75-2.75
	■	■	■	■	0.5-4	0.25-1.5	0.75-4
	■	■	■		0.5-2	0.25-1	0.75-2.75
	■	■	■		0.5-4	0.25-1.5	0.75-4
	■		■	■	1-4 qts/100 gal		2.5-10 L/m ³
		■		■	0.5-1 qts/100 gal		1.5-2.5 L/m ³
		■		■	0.5-1	0.25-0.5	0.75-1.4
	■	■	■	■	0.5-2	0.25-1	0.75-2.5
	■	■			0.5-2	0.25-1	0.75-2.5
	■	■			As required		
	■	■	■	■	0.5-1 qts/100 gal		1.5-2.5 L/m ³
		■			As required		
	■	■			0.5-2 qts/100 gal		1.5-5 L/m ³
			■	■	See product data sheet		
		■	■	■	See product data sheet		
			■	■	See product data sheet		
		■			See product data sheet		
		■		■	0.5-1 qts/100 gal		1.5-2.5 L/m ³
		■			As required		

[†] Actual concentration will depend on the formations being encountered.

DRILPLEX HDD



Certified to
NSF/ANSI 60

Advantages

- High rate of penetration
- Optimum cuttings transport
- Excellent solids suspension
- Borehole stabilization
- Low drilling costs

Limitations

DRILPLEX* HDD fluids are not compatible with anionic products. Do not add any polymers or thinners to this fluid. Polymers and thinners destroy the rheological properties of the fluid. DRILPLEX HDD fluid should only be used to enhance a bentonite-base fluid. The mixing tank must be clean before being used to mix DRILPLEX HDD fluid.

Toxicity and handling

Bioassay information is available upon request. Handle as an industrial chemical, wearing protective equipment and observing the precautions as described in the Material Safety Data Sheet (MSDS).

Packaging and storage

DRILPLEX HDD viscosifier comes in 25 lb (11.3 kg) multi-walled, paper sacks with 80 sacks to a pallet.

Store in a dry location away from sources of heat or ignition, and minimize dust.



Typical physical properties

Physical appearance	Off-white powder
Odor	None
Specific gravity	2.3 to 3.1

A specialty product used to enhance the gel strengths of MAX GEL* viscosifier, DRILPLEX HDD viscosifier is an inorganic chemical viscosifier for water base, bentonite drilling fluids. DRILPLEX HDD viscosifier is only slightly soluble in water.

Applications

DRILPLEX HDD viscosifier allows the formulation of fluids with exceptional shear-thinning properties, resulting in a drilling fluid with both excellent dynamic and static carrying capacity for solids.

This is indicated by high yield point and low plastic viscosity readings. When not circulating, the mud instantly reverts to a gelled state and results in high suspending capacity indicated by high, non-progressive gel-strength readings.

For 300 gal (1,136 L) of drilling fluid mix:

- Add 1½ sacks (75 lb [34 kg]) MAX GEL viscosifier in freshwater and hydrate for 10 min. If higher rheological properties are desired, mix more gel. For every 7 lb (3.2 kg) of additional gel added, the yield point rises approximately 20 points
- After the gel is hydrated, add 6 lb (2.7 kg) of DRILPLEX HDD (3 vis cups) viscosifier and mix for an additional 5 to 10 min
- For torque reduction, add 1.5 gal (5.7 L) of ROD EASE* lubricant

DUO-TEC

Advantages

- Highly effective viscosifier
- Shear-thinning rheological profile for improved hydraulics
- Minimum frictional pressure losses for additional hydraulic horsepower at the bit and low, high-shear-rate viscosity for maximum penetration rates
- Viscous laminar flow in the annulus for improved wellbore stability with maximum hole cleaning and suspension capacity
- Easy to mix

Limitations

- Trivalent ions such as chromium and iron can cause biopolymer precipitation and loss of viscosity or cross-linking
- Not tolerant of high pH or high calcium ion conditions
- DUO-TEC* systems should be pretreated with either sodium bicarbonate or SAPP and possibly citric acid prior to drilling cement
- Subject to bacterial degradation, a biocide should be used to prevent fermentation. Slightly anionic nature of DUO-TEC xanthan gum requires special mixing procedures when mixed with cationic materials

Toxicity and handling

Bioassay information is available upon request.

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

Packaging and storage

DUO-TEC xanthan gum is packaged in 25 lb (11.3 kg) or 55.1 lb (25 kg), plastic-lined, multi-walled, paper sacks.

Store at room temperature in a dry, well-ventilated area. Keep in original container. Keep container closed. Store away from incompatibles.

DUO-TEC additive is a dispersible, non-clarified technical-grade xanthan gum that provides viscosity, including low-shear-rate viscosity, and weight-material suspension for all water-base mud systems. DUO-TEC xanthan gum has the unique ability to produce a fluid that is highly shear-thinning and thixotropic.

Applications

The primary function of DUO-TEC xanthan gum is to increase viscosity for cuttings transport and suspension. DUO-TEC xanthan gum performs effectively in all waterbase fluids, from highly weighted to low-solids systems. This includes freshwater, seawater, salt and heavy-brine systems.

DUO-TEC xanthan gum works to provide an optimized rheological profile with elevated low-shear-rate viscosity and highly shear-thinning characteristics with low “n” values.

These characteristics frequently result in fluids with inverted flow properties, i.e., the yield point being greater than the plastic viscosity. Shear-thinning fluids have low effective viscosities at the high shear rates encountered inside the drillstring and at the bit. This low effective viscosity for minimal pressure losses and standpipe pressures allows optimized hydraulics and maximized rates of penetration.

Conversely, at the low shear rates experienced in the annulus, DUO-TEC xanthan gum enables the fluid to have a high effective viscosity for adequately cleaning the well and suspending cuttings.

DUO-TEC xanthan gum should be added slowly through the hopper to prevent lumping and minimize waste. It should be added at the rate of approximately one 25 lb (11.3 kg) sack every seven minutes. The time required for the product to yield its ultimate viscosity depends on salinity, temperature and shear.

The amount of DUO-TEC xanthan gum required depends upon the desired viscosity. Normal concentrations range from 0.50 to 2.5 lb/bbl (1.43 to 7.1 kg/m³) for most mud systems. Special fluids and difficult hole cleaning conditions can require higher concentrations up to 4 lb/bbl (11.4 kg/m³).

The addition of salt, an anti-oxidant and thermal stabilizers improves temperature stability in DUO-TEC fluids from 250° to 280°F (121° to 138°C). Specially formulated systems/pills have been used at temperatures up to 400°F (204°C). DUO-TEC xanthan gum is subject to bacterial degradation, and treatments with a biocide are recommended to prevent fermentation.

Typical physical properties

Physical appearance	Cream-to-tan powder
Specific gravity	1.5
Bulk density	50 lb/ft ³ (800 kg/m ³)

DUO-VIS/SUPER-VIS

Advantages

- Highly effective suspension enhancer; small treatments produce significant results
- Provides a shear-thinning rheological profile for improved hydraulics
- Minimum frictional pressure losses for additional hydraulic horsepower at the bit and low, high-shear-rate viscosity for maximum penetration rates
- Viscous laminar flow in the annulus for improved wellbore stability with maximum hole-cleaning and suspension capacity
- Easy to mix

Limitations

- Trivalent ions such as chromium and iron can cause biopolymer precipitation and loss of viscosity or cross-linking
- DUO-VIS*/SUPER-VIS* systems should be pretreated with either sodium bicarbonate or SAPP, and possibly citric acid, prior to drilling cement
- Subject to bacterial degradation; a biocide should be used to prevent fermentation if used for prolonged periods
- Lightly anionic nature of DUO-VIS/SUPER-VIS biopolymer requires special mixing procedures when mixed with cationic materials

Toxicity and handling

Bioassay information is available upon request.

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



DUO-VIS*/SUPER-VIS* xanthan gum is a high-molecular-weight biopolymer used for increasing carrying capacity in water-base systems. DUO-VIS/SUPER-VIS biopolymer has the unique ability to produce a fluid that is highly shear-thinning and thixotropic.

Typical physical properties

Physical appearance	Cream-to-tan powder
Specific gravity	1.5
Bulk density	50 lb/ft ³ (800 kg/m ³)

Packaging and storage

DUO-VIS product is packaged in 25 lb (11.3 kg) sacks.

SUPER-VIS product is packaged in 2 gal (7.6 L) buckets (12.5 lb [5.7 kg] per bucket). The product can also be packaged in 2 lb bottle (25 x 2 lb bottles per box).

Store in a well-ventilated area away from sources of heat or ignition.

For more information, please request a product bulletin from your M-I SWACO representative.

Applications

The primary function of DUO-VIS/SUPER-VIS biopolymer is to increase low-shear viscosity for cuttings transport and suspension. This product performs effectively in all water-base fluids, from highly weighted to low-solids systems, including freshwater, seawater, salt and heavy-brine systems.

DUO-VIS/SUPER-VIS xanthan gum works to provide an optimized rheological profile with elevated low-shear-rate viscosity and highly shear-thinning characteristics with low “n” values. These characteristics frequently result in fluids with inverted flow properties (i.e., the yield point is greater than the plastic viscosity). Shear-thinning fluids have low effective viscosities at the high shear rates encountered inside the drillstring and at the bit. This low effective viscosity for minimal pressure losses and standpipe pressures allows optimized hydraulics and maximized rates of penetration. Conversely, at the low shear rates experienced in the annulus, the DUO-VIS/SUPER-VIS product enables the drilling fluid to have a high effective viscosity for adequately cleaning the well and suspending cuttings.

FLO-PLEX

FLO-PLEX

Advantages

- Specially designed as the fluid-loss-control agent for the DRILPLEX system
- Performs in other water-base systems
- Resistant to attack from bacteria
- Temperature limits may be increased to 300°F (149°C) by using thermal-extension additive

Limitations

- Water hardness must be removed
- Ineffective in high levels of magnesium

Toxicity and handling

Bioassay information is available upon request.

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

Packaging and storage

FLO-PLEX* additive is packaged in 50 lb (22.7 kg) multi-walled, paper sacks.

Store in a dry location away from sources of heat or ignition, and minimize dust.



FLO-PLEX* fluid-loss-control agent is a polysaccharide derivative used to control filtration in the DRILPLEX system at recommended concentrations. FLO-PLEX additive will not destroy the low-end rheology of the DRILPLEX system as observed with conventional anionic fluid-loss-control agents such as CMC and PAC.

Typical physical properties

Physical appearance	White powder
pH (4% water)	9.5 to 10.5
Solubility in water	Soluble
Bulk density	35 to 40 lb/ft ³ (560 to 640 kg/m ³)

FLO-PLEX additive is effective in seawater fluids, but all hardness should be treated out before adding the FLO-PLEX product. FLO-PLEX agent may be used in any other type of fluid where starches and cellulosic additives are permitted. The temperature stability of FLO-PLEX agent is about 250°F (120°C), but may be extended to 300°F (149°C) by the addition of a thermal stability agent such as PTS-200* additive. FLO-PLEX additive is resistant to bacterial degradation.

Applications

Traditional fluid-loss additives tend to destroy the high-end rheology that makes the DRILPLEX system unique.

Conventional anionic fluid-loss agents will thin the DRILPLEX system. Therefore, a separate additive was developed to provide fluid-loss control without lowering the yield-point value and breaking the cross-links.

FLO-PLEX fluid-loss-control additive, a polysaccharide derivative, is very effective in the DRILPLEX system.

When preparing new fluid, FLO-PLEX agent should be added at concentrations no less than 3.5 lb/bbl (9.8 kg/m³), if fluid-loss control is required. Lower concentrations can cause loss of rheology. Treatment levels can be increased to 4.5 to 5 lb/bbl (12.8 to 14.3 kg/m³) as required to maintain low filtration rates.

Hardness in the seawater should be treated out. FLO-PLEX additive can be used in other water-base systems, and it will not be degraded by the action of bacteria.

GEL SUPREME



Certified to
NSF/ANSI 60

Advantages

- Hydrates more than other types of clays and is best for generating viscosity, developing gels for suspension and controlling filtration
- A premium-grade, API, non-treated bentonite. Therefore, it does not contain chemical treatments and is considered to be more desirable for certain applications
- The small particle size, unique flat shape and high surface area of hydrated GEL SUPREME viscosifier provides superior filtration characteristics
- Promotes the deposition of thin compressible, filter cakes in the wellbore

Limitations

Performance reduced in salty (>5,000 mg/L Cl⁻) or hard (>240 mg/L Ca⁺⁺) waters due to decreased hydration.

Toxicity and handling

Bioassay information is available upon request.

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

Packaging and storage

GEL SUPREME bentonite is packaged in 50 lb (22.7 kg), multi-walled, paper sacks and is available in bulk. Minimize dust (use dustless systems for handling, storage and cleanup).

Store in a dry location (slip hazard when wet).

Typical physical properties

Physical appearance	Light tan/gray-green powder
Specific gravity	2.3 – 2.6
Bulk density	48 – 52 lb/ft ³ (769 – 833 kg/m ³)

ISO 13500 Clause 10 Specifications:

Suspension properties (Suspension of 25 grams into 350 cm³ deionized water):

Dispersed plastic viscosity	10 cP, min.
Yield point/plastic viscosity ratio	1.5, max.
Dispersed API filtrate volume	2.5 cm ³ , max.

GEL SUPREME* viscosifier is a premium-grade Wyoming bentonite (a sodium montmorillonite clay) which has not been chemically treated. It is used as a primary filter-cake-building filtration-control and suspension agent in freshwater systems, and has application in all water-base mud systems. GEL SUPREME is a high-quality product that meets the API specification for non-treated bentonite.

Applications

GEL SUPREME bentonite is used to increase viscosity and reduce fluid loss in water-base drilling fluids.

It is a cost-effective product for achieving viscosity, controlling fluid loss and maintaining filter-cake quality in freshwater and seawater muds.

Typical concentrations for GEL SUPREME additive range from 5 to 35 lb/bbl (14.3 to 100 kg/m³).

As with all bentonite products the yield decreases as the salinity increases.

In muds containing more than 10,000 mg/L chlorides, the performance of GEL SUPREME viscosifier is significantly reduced unless it is prehydrated in freshwater, before adding it to the mud system.

Typical amounts of GEL SUPREME additions added to freshwater

Drilling application/desired results	lb/100 gal	lb/bbl	kg/m ³
Normal drilling	50 – 70	20 – 30	60 – 85
In gravel or other poorly consolidated formation	70 – 95	30 – 40	85 – 115
Lost-circulation control	105 – 130	45 – 55	125 – 155
Added to freshwater mud to improve hole-cleaning properties, increase hole stability and develop thin filter cakes	45	20	55



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GOPHER GROUT

GOPHER GROUT



Advantages

- Inorganic, non-fermenting and non-toxic
- Develops lower-solids slurries up to 20% total active solids
- Easily mixed and handled with most conventional mixing equipment
- Permanent, flexible seal prevents entry of contaminants from the surface
- Extended working time controlled by grout solids content
- Firm texture providing structural stability after grout set

Limitations

When used as recommended, there are no limitations imposed on this product.

Toxicity and handling

Bioassay information available upon request.

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

Packaging and storage

GOPHER GROUT grouting composition is packaged in 50 lb (22.7 kg), heavy-duty, multi-walled, waterproof sacks.

Store in a cool, dry place.

Typical physical properties

Physical appearance	Beige to tan granular
Screen analysis	90% max passing through 20-mesh
Moisture content	8%
Specific gravity	2.5
pH (1% solution)	7.0
Slurry density	9.4 lb/gal (1.1 kg/L) for 20% solids
Dry bulk density	80 lb/ft ³ (1,281 kg/m ³)

GOPHER GROUT* granular bentonite grouting composition contains high-swelling sodium montmorillonite clay. It is designed for use in water wells and monitoring wells, for sealing the annular space around well casing, and for plugging drilled holes and abandoned wells. GOPHER GROUT composition contains no organic additives or polymers.

A one-sack formulation of GOPHER GROUT granular bentonite grouting composition mixes with freshwater to yield 20%-pumpable grouting slurry with an extended working time. When set up, the GOPHER GROUT grouting composition develops a satisfactory seal with adequate structural strength and low hydraulic conductivity. When properly placed, GOPHER GROUT grouting composition remains flexible, rehydratable and unstratified through heating and cooling cycles.

Applications

- Sealing and grouting casing
- Sanitary sealing in water well construction
- Sealing monitor wells
- Plugging and abandoning exploration boreholes

Addition methods

GOPHER GROUT grouting composition should be mixed with freshwater to obtain maximum results.

The recommended mixing rate is a 50 lb (22.7 kg) sack of GOPHER GROUT grouting composition with 24 gal (91 L) of water to make a 20%-active-solids slurry. Adjust the amount of water to alter viscosity and consistency.

Waterwell mixing procedures

1. Using a mixing device, blend one 50 lb (22.7 kg) sack of GOPHER GROUT grouting composition into 24 gal (91 L) of freshwater.
2. Blend, do not over-mix. The resulting slurry should be like lumpy cake batter. Pump through tremie line without delay.

GOPHER GROUT slurry at various solids content

GOPHER GROUT lb (kg)	Water gal (L)	Solids content %	Useable slurry gal (L)	Estimate working time (min)
50 (22.7)	30 (114)	16.7	33 (125)	30 – 60
50 (22.7)	28 (106)	17.5	31 (117)	15 – 30
50 (22.7)	24 (91)	20.0	27 (102)	5 – 15

KLA-GARD

Advantages

- Highly effective shale stabilizer
- Effective at all pH levels
- Environmentally acceptable
- Stable at temperatures in excess of 400°F (204°C)
- Reduces potential for bit balling
- Reduces the amount of dilution required and the associated treatment costs
- Unaffected by contaminants such as hard water, cement or CO₂

Limitations

- Should not be added to systems containing high concentrations of active solids; flocculates muds with high Methylene Blue Test (MBT) values, causing excessive viscosity
- Limits the hydration of all clay materials, therefore bentonite additions must be prehydrated in freshwater
- Due to the interaction of KLA-GARD stabilizer with active solids and bentonite, increased attention must be given to filtration control
- Product is biodegradable and requires a biocide
- Toxicity and handling
- Bioassay information is available upon request
- Handle as an industrial chemical, wearing protective equipment and observing the precautions as described in the Material Safety Data Sheet (MSDS)

Typical physical properties

Physical appearance	Clear, blue liquid
Specific gravity	1.1
pH (1% solution)	6.5 to 8.5
Solubility in water @ 68°F (20°C)	100%
Flash point	>210°F (99°C) (PMCC)

KLA-GARD* shale stabilizer reduces the swelling of sensitive shales and drill cuttings exposed to water-base drilling fluids. It inhibits shale hydration, reducing the effect of drill solids on viscosity, and it works to minimize problems such as excessive dilution rates, increased torque and drag, high surge and swab pressures, and bottomhole assembly balling. This high-quality, concentrated product has applications in a wide variety of mud systems and has such low toxicity characteristics it can be considered for offshore applications.

Applications

KLA-GARD stabilizer should be specified for applications where additional inhibition is needed as an alternative to gyp, lime and potassium systems. It can improve the inhibition of water-base fluids to a level that competes with oil-base muds for many applications.

Due to the powerful effect KLA-GARD stabilizer has on active solids, it should only be added to: mud systems containing low concentrations of active solids, bentonite-free systems or freshly prepared low-solids systems containing a minimum amount of prehydrated bentonite. These systems should have a methylene blue capacity of less than 12.5 lb/bbl (35.6 kg/m³) with 2 to 5 lb/bbl (5.7 to 14.3 kg/m³) of prehydrated bentonite for filtration control.

KLA-GARD stabilizer is compatible with most drilling-fluid additives, and is especially suited for use in freshly prepared, low-solids polymer systems such as the POLY-PLUS* system.

It is most effective when the use of organic thinners, such as SPERSENE* lignosulfonate, is minimized.

Normal concentrations of KLA-GARD stabilizer range from 4 to 8 lb/bbl (11.4 to 22.8 kg/m³) depending on hole size, rate of penetration, interval length and reactivity of the shale. A minimum concentration of 4 lb/bbl (11.4 kg/m³) is required for the product to be effective. One lb/bbl of KLA-GARD stabilizer contributes 508 mg/L chlorides; KLA-GARD B stabilizer, a chloride-free formulation, is available. To prevent bacterial attack, a biocide should be used.

KLA-GARD stabilizer works by being adsorbed onto active solids, thereby reducing their sensitivity to water. This action causes the product to be depleted from the mud system at a rate dependent on the reactivity of the formation, cuttings size and amount of hole volume drilled. A test procedure is available to monitor the approximate concentration of excess KLA-GARD stabilizer.

Packaging and storage

KLA-GARD stabilizer is packaged in 55 gal (208 L) drums and 5 gal (18.9 L) cans.

Store in a dry, well-ventilated area. Keep container closed. Keep away from heat, sparks and flames. Store away from incompatibles. Follow safe warehousing practices regarding palletizing, banding, shrink-wrapping and/or stacking.

For more information, please request a product bulletin from your M-I SWACO representative.

KWIK-PLUG FINE & MICRO



Certified to
NSF/ANSI 60

Advantages

- High-swelling Wyoming bentonite that forms tight seals
- Granular product with reduced dust
- Forms a low, permeable and flexible seal

Limitations

When used as recommended, there are no limitations imposed on this product.

Toxicity and handling

Bioassay information is available upon request.

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

Packaging and storage

KWIK-PLUG granular bentonite product is packaged in 50 lb (22.7 kg), heavy-duty, multi-walled, waterproof sacks and various sized super sacks.

Store in a cool, dry place.

Typical physical properties

Physical appearance	Gray-white granular
Specific gravity	2.5
Solubility	Insoluble in water
KWIK-PLUG FINE	97% min. passing 4-mesh
KWIK-PLUG FINE	5% max. passing 20-mesh
KWIK-PLUG MICRO	97% min. passing 8-mesh
KWIK-PLUG MICRO	5% max. passing 20-mesh



KWIK-PLUG* FINE and KWIK-PLUG MICRO granular bentonite products are composed of dried sodium-montmorillonite clay. KWIK-PLUG products can be used as a sealant for earthen structures and dry, shallow-hole abandonment. KWIK-PLUG products can also be used to control lost circulation in mud used in rotary or coring operations.

Applications

- Seal or grout casing in well construction
- Plug abandoned earthen boreholes
- Seal ponds and other water structures

Addition methods

For an earthen structure seal, the normal treatment is 1 to 2 lb/ft² (4.88 to 9.76 kg/m²), depending on the soil type. Treatment concentration should be tested using a 5 gal (18.9 L) bucket with holes punched in the bottom. Put the soil to be treated in the bucket and add 1 to 2 lb (0.5 to 0.9 kg) of KWIK-PLUG granular bentonite. Pour water into the bucket and observe the seal. By using this method, the exact concentration of KWIK-PLUG product can be determined.

For lost-circulation control in mud rotary applications, add KWIK-PLUG granular bentonite directly to the suction pit. For coring-rig applications, mix KWIK-PLUG product in vegetable oil and pour the solution down the rods. Pump slurry to the point of the lost circulation, then pick up the rods and wait while the slurry hydrates.

For dry, shallow-hole abandonment, pour the required amount of KWIK-PLUG product directly down the borehole and hydrate with freshwater.

KWIK-PLUG MEDIUM & COARSE



Advantages

- Prevents entry of surface water into boreholes
- Forms a permanent, flexible, downhole seal
- Allows hole re-entry
- Easy to apply, no mixing expense
- More cost effective compared to pelletized bentonite

Limitations

When used as recommended, there are no limitations imposed on this product.

Toxicity and handling

Bioassay information available upon request.

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

Packaging and storage

KWIK-PLUG material is packaged in 50 lb (22.7 kg), heavy-duty, multi-walled, waterproof sacks and various sized super sacks.

Store in a cool, dry place.

Typical physical properties

Physical appearance	Beige to tan powder
Specific gravity	2.5 to 2.6
Permeability of resulting plug	1×10^{-9} cm/sec.
Moisture	15%
Bulk density KWIK-PLUG MEDIUM	68 lb/ft ³ (1,089.2 kg ³)
Bulk density KWIK-PLUG COARSE	64 lb/ft ³ (1,025.2 kg ³)



The KWIK-PLUG MEDIUM & COARSE products are screen-sized bentonite composed of a naturally occurring clay which is used to seal and plug earthen boreholes. KWIK-PLUG material will travel through water standing in the hole and reach the bottom of the hole with minimum hydration or swelling.

The annular space can be completely filled, and bridging of the particles in the upper portion of the hole minimized. The annular space being completely filled is necessary to form an effective, long-term plug. KWIK-PLUG material is available in two sizes: KWIK-PLUG COARSE (¾ in. [19.1 mm]) size and KWIK-PLUG MEDIUM (3/8 in. [9.5 mm]) size. The size of the open annular space will determine which size should be used. When the annular space is ¾ in. (19.1 mm) or more, KWIK-PLUG MEDIUM material is recommended. When the annular space is 1½ in. (38.1 mm) or more, KWIK-PLUG COARSE material is recommended.

Applications

- Environmental monitoring wells
- Sealing outside casing annulus
- Plugging decommissioned boreholes
- Sealing lost-circulation zones
- Sealing above gravel packs

Lost-Circulation Materials (LCM)

Drilling paper

Drilling paper is a blend of variable-sized particles of ground paper that is applicable for use in all water-base mud systems.

Drilling paper can be used in concentrations of up to 20 lb/bbl (57 kg/m³) in slug treatments or as an additive to the entire system. In areas of known lost-circulation zones, it is advisable to pretreat the system before drilling into the zone of loss. Drilling paper can be mixed through the mud hopper or added directly to the pits and gunned into the mud.

The most important aspect of combating lost circulation is using the correct particle size. Consequently, it is recommended that a combination of materials be added to ensure a good particle-size distribution. If left in the mud for an extended period of time, drilling paper may be susceptible to bacterial degradation. A bactericide may be necessary to prevent fermentation.

Packaging and storage

Drilling paper is packaged in 40 lb (18 kg) plastic sacks.

Mica

Mica is a selected, non-abrasive mineral available in fine and coarse grades. Mica has no adverse effect on mud properties. It is used to prevent and regain lost returns. Fine mica can pass through a 20-mesh screen.

Application

- Lost circulation: 5 to 15 lb (2.25 to 6.75 kg)

Packaging and storage

Mica is packaged in 50 lb (22.68 kg) sacks.

Cottonseed hulls

Cottonseed hulls are fibrous and biodegradable, creating an excellent bridging agent when large-particle-size material is needed. They can be used in any water-base mud system.

Cottonseed hulls are used in concentrations of up to 20 lb/bbl (57 kg/m³) as slug treatments or as an additive to the entire system. In areas of known lost-circulation zones, it is advisable to pretreat the system before drilling into the zone of loss. Cottonseed hulls can be mixed through the mud hopper or added directly to the pits and gunned into the mud. The most important aspect of combating lost circulation is using the correct particle size. Consequently, it is recommended that a combination of materials be added to ensure a good particle-size distribution. If left in the mud for an extended period of time, cottonseed hulls can be susceptible to bacterial degradation, resulting in the release of H₂S and CO₂ into the mud. Bactericide may be necessary to prevent fermentation.

Packaging and storage

Cottonseed hulls are packaged in 50 lb (22.68 kg) and 100 lb (45.37 kg) burlap or paper sacks.

Cedar fiber

Cedar fiber is a specially processed blend of fibers of controlled length, giving proper size distribution for regaining circulation.

- Non-fermenting
- Amounts used vary from 1 to 35% by volume

Packaging and storage

Cedar fiber is packaged in 40 lb (18 kg) bags.

FED-SEAL

FED-SEAL* lost-circulation material is an engineered product that contains an optimum blend of granular, fibrous and flake materials. FED-SEAL LCM is available in three grinds (coarse, medium and fine) covering a wide range of lost-circulation problems. FED-SEAL additive is normally recommended in concentrations of 20 to 30 lb/bbl (57 to 86 kg/m³) mixed in a slug of 100 to 200 bbl and spotted at the zone of loss, displacing the slurry at a reduced pumping rate with either large nozzles or an open-ended system. FED-SEAL LCM can be added to either the water-base mud being used at the time of loss or in any special purpose slurry prepared for squeeze applications.

The FED-SEAL product has been used for preventive measures or as a “filler” because the fine grade can pass through 20-mesh shaker screens in concentrations of 2 to 10 lb/bbl (6 to 28 kg/m³).

Limitations

Do not mix in oil muds.

Toxicity and handling

Bioassay information is available upon request.

Packaging and storage

FED-SEAL LCM is packaged in 40 lb (18 kg) multi-walled, paper sacks.

MAX BORE HDD

Advantages

- One-sack system provides ease of mixing and reduces the number of products required to prepare boring fluid
- Hydrates more than other types of clays and is best for generating viscosity for hole cleaning, developing gels for suspension and controlling filtration
- Unique size, shape and high surface area provide superior filtration characteristics
- Provides lubricity and wellbore stability for ease of drilling and stability of water-sensitive clays and shales
- Non-toxic and environmentally safe

Limitations

Performance is reduced in salty (>10,000 mg/L Cl⁻) or hard (>240 mg/L Ca⁺⁺) waters due to decreased hydration.

Toxicity and handling

Bioassay information is available upon request.

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

Packaging and storage

The MAX BORE HDD system is packaged in 50 lb (22.7 kg) multi-walled sacks, 56 per pallet. Store in a well-ventilated area away from sources of heat or ignition.



Typical physical properties

Physical appearance	Light tan/gray-green powder
Specific gravity	2.3 to 2.6
Bulk density	48 to 52 lb/ft ³ (769 to 833 kg/m ³)

The MAX BORE[®] HDD system is a proprietary, blended, high-yielding Wyoming bentonite supplied as a single-sack product used especially in boring-fluid applications.

The MAX BORE HDD system provides suspension, wellbore stability and filtration control. The system also helps reduce torque and drag for water-base applications and is designed to minimize environmental impact.

Applications

The MAX BORE HDD system provides suspension, improves wellbore stability, controls filtration, and helps reduce torque and drag in boring-fluid applications. It is a cost-effective product for achieving viscosity for hole cleaning, gel strength for cuttings suspension and transport, wellbore stability, fluid-loss control, and filter-cake quality in freshwater and seawater applications. Typical concentrations of the MAX BORE HDD system range from 15 to 45 lb/100 gal (18 to 54 kg/m³).

Typical amounts of MAX BORE HDD additions added to freshwater

Drilling application/desired results	lb/100 gal	lb/bbl	kg/m ³
Normal drilling	20 – 25	8.5 – 10	25 – 29
Clay environments	10 – 15	4 – 6	12 – 18
Gravel/rock/cobble	25 – 30	10 – 13	29 – 37

MAX GEL

Advantages

- Yields more quickly than API-standard bentonite
- Non-toxic and proven suitable for use in drilling potable water wells
- Higher penetration rates than regular bentonite systems due to lower solids content
- Reduced transportation and storage costs as a result of less product required for treatment
- Finer grind to enable rapid mixing

Limitations

Loses effectiveness in water containing >7,500 mg/L sodium chloride/240 mg/L calcium.

If dispersants or thinners are to be used, they should be added sparingly, using 50% or less of the normal treatment.

Toxicity and handling

Bioassay information is available upon request.

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

Packaging and storage

MAX GEL bentonite is packaged in 50 lb (22.7 kg), multi-walled, paper sacks and is available in bulk.

Store in a dry location (slip hazard when wet) and minimize dust (use dustless systems for handling, storage and cleanup). Material can be palletized at either 56 sacks/pallet or 70 sacks/pallet.

Store in a well-ventilated area away from sources of heat or ignition.



Typical physical properties

Physical appearance	Light tan/gray-green powder
Specific gravity	2.3 to 2.5
Approximate yield	220 bbl/ton

MAX GEL* viscosifier is a premium 220 bbl yield Wyoming bentonite blended with special extenders, capable of yielding more than twice as much viscosity as regular Wyoming bentonite. MAX GEL viscosifier is an easily mixed, superior Wyoming sodium bentonite for freshwater drilling and boring applications.

Applications

MAX GEL viscosifier is used in the following applications to rapidly build mud viscosity and provide superior hole cleaning, as well as to help control lost circulation, formation sloughing and promote hole stability in unconsolidated formations:

- Potable-water wells
- Mineral exploration (coring and rotary drilling)
- Horizontal directional drilling
- Blast holes
- Shaft drilling
- Monitor/observation wells
- Gel-foam, air-drilling applications

Typical amounts of MAX GEL additions added to freshwater

Drilling application/desired results	lb/100 gal	lb/bbl	kg/m ³
Normal drilling	15 – 25	6 – 11	15 – 30
In gravel or other poorly consolidated formation	25 – 40	12 – 18	35 – 50
Lost-circulation control	35 – 45	15 – 20	40 – 45
Added to freshwater mud to improve hole-cleaning properties, increase hole stability and develop filter cakes	5 – 10	2 – 5	6 – 14

M-I GEL



Certified to
NSF/ANSI 60

M-I GEL

Advantages

- Hydrates more than other types of clays and is best for generating viscosity, developing gels for suspension and controlling filtration
- Small particle size, unique flat shape and high surface area of hydrated M-I GEL viscosifier provides superior filtration characteristics
- Promotes the deposition of thin, compressible filter cakes in the wellbore

Limitations

- Performance reduced in salty (>5,000 mg/L Cl⁻) or hard (>240 mg/L Ca⁺⁺) waters due to decreased hydration

Toxicity and handling

Bioassay information is available upon request.

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

Packaging and storage

M-I GEL viscosifier is packaged in 100 lb (45.4 kg), multi-walled, paper sacks, 88 lb (40 kg) sacks, big bags and is available in bulk.

Store in a dry, well-ventilated area. Keep container closed. Store away from incompatibles. Follow safe warehousing practices regarding palletizing, banding, shrink-wrapping and/or stacking.

Typical physical properties

Physical appearance	Light tan/gray-green powder
Specific gravity	2.3 to 2.6
Bulk density	48 to 52 lb/ft ³ (769 to 833 kg/m ³)
ISO 135000 Clause 9 Specifications: Suspension properties (Suspension of 22.5 g into 350 cm ³ water):	
Viscometer dial reading at 600 fpm	30, min.
Yield point/plastic viscosity ratio	3, max.
Filtrate volume	15 cm ³ , max.
Residue >75 μ (wet screen)	4% wt, max.

M-I GEL* viscosifier is a premium-grade bentonite (a sodium montmorillonite clay) that will yield 91 to 100 bbl of 15-cP mud per ton (1.7 m³/100 kg). It is used as a primary filter-cake-building, filtration-control and suspension agent in freshwater systems, and has application in all water-base mud systems. M-I GEL viscosifier is a high-quality product which meets the ISO 13500 Clause 9 (formerly known as API Spec 13A, Section 9) specifications for bentonite.

Applications

M-I GEL viscosifier is a cost-effective means of achieving viscosity, fluid-loss control and filter-cake quality in freshwater and seawater muds. Typical concentrations for M-I GEL viscosifier range from 5 to 35 lb/bbl (14.3 to 100 kg/m³).

As with all bentonite products, the yield decreases as water salinity increases. In muds containing more than 10,000 mg/L chlorides, the performance of M-I GEL viscosifier is significantly reduced unless prehydrated in freshwater before adding to the mud system.

PLATINUM D-D

Advantages

- Minimizes bit and BHA balling
- Reduces the surface tension of the liquid phase, helping to drop sand and remove drill solids
- Improves water-wetting action on all solids and reduces the sticking tendency of reactive shale cuttings
- Effective in all water-base muds

Limitations

The freezing point of PLATINUM D-D additive is 32°F (0°C). D-D CWT additive, a special cold-weather formulation with a freezing point of -29°F (-20°C), is also available.

Toxicity and handling

Bioassay information is available upon request.

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

Fluids containing high concentrations of PLATINUM D-D additive may not be suitable for discharge into all marine environments.

Packaging and storage

PLATINUM D-D liquid is packaged in 5 gal (18.9 L) cans and 55 gal (208.2 L) drums.

Store in a well-ventilated area away from sources of heat or ignition.



Typical physical properties

Physical appearance	Light red liquid
Specific gravity	1.038
pH (1% solution)	7.5 to 8.5
Solubility in water	100%
Flash point	>200°F (>93°C)

PLATINUM D-D* additive is an aqueous blend of surface-active agents. It is designed to reduce the surface tension of all water-base mud systems and reduce the sticking tendency of water-sensitive shale cuttings.

Applications

PLATINUM D-D additive has application in all drilling areas and can be used in virtually any water-base drilling fluid. It is used primarily in upper-hole drilling to minimize bit and Bottomhole Assembly (BHA) balling, reduce surface tension, and aid in dropping sand and removing drill solids.

PLATINUM D-D additive frequently reduces torque and drag, even when no oil is present in the system. Normal treatments range from 0.1 to 0.2 lb/bbl (0.29 to 0.57 kg/m³) and provide satisfactory performance under most conditions. In severe gumbo shale areas, 4 to 6 lb/bbl (11.4 to 17.1 kg/m³) concentrations of PLATINUM D-D additive are recommended to minimize bit and BHA balling; higher concentrations can cause foaming and require a defoamer.

This product is effective in all water-base systems including freshwater, brackish water, seawater and saturated saltwater fluids.

PLATINUM FOAM PLUS



Certified to
NSF/ANSI 60

Advantages

- NSF/ANSI Standard 60 certified
- Produces stable, consistent foam in all types of water
- Small and tight bubble formation provides excellent carrying capacity
- Environmentally acceptable and biodegradable
- Lubricating properties make it suitable for use with downhole hammers
- Highly stable foam with excellent retention times
- Improves hole cleaning and penetration rates

Limitations

When used as recommended, there are no limitations imposed on this product.

Toxicity and handling

Bioassay information is available upon request.

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

Packaging and storage

PLATINUM FOAM PLUS agent is packaged in 5 gal (18.9 L) buckets and 55 gal (208.2 L) drums.

Store in a well-ventilated area away from sources of heat or ignition.

Typical physical properties

Physical appearance	Clear-to-pale-yellow solution
Freeze point	15°F (–9.4°C)
Flash point	142°F (61.1°C)
Specific gravity	1.04
Solubility	100%
pH	7.5 to 8.5 (10% solution)

PLATINUM FOAM* PLUS foaming agent is water-soluble and biodegradable. It is specially designed to have a high flash point to minimize transit restrictions. In addition, PLATINUM FOAM PLUS foaming agent is formulated to have a low freezing point for cold weather applications. PLATINUM FOAM PLUS foaming agent has the ability to foam in fresh, brackish or salty waters.

Applications

PLATINUM FOAM PLUS foaming agent is used in air-drilling applications. Based on the amount of product added and the injection rate, it can be used for dust suppression, mist, foam, and stiff-foam drilling. Typical applications rates are 0.5 to 2% by volume of injection water.

Methods of addition

- To use as a dust suppressor or to prevent bit balling in damp formation: Mix ½ to ¾ pints (0.2 to 0.4 L) per 50 gal (189 L) of water
- For mist drilling with moderate amounts of water intrusion: Mix 1.5 to 3 pints (0.8 to 1.5 L) per 50 gal (189 L) of water
- For foam drilling with excessive amounts of water intrusion: Mix 6 pints (2.9 L) of product per 50 gal (189 L) of water
- Stiff foams: To obtain desired viscosity, mix MAX GEL* viscosifier or POLY-PLUS* 2000 polymer in 50 gal (189 L) of water to 32 sec/qt and stir in ¾ gal (3 L) of PLATINUM FOAM PLUS foaming agent. Pump the slurry into the air stream at 7 to 10 gal (26.6 to 38 L) per min. POLY-PLUS polymer may be substituted for POLY-PLUS* 2000 polymer



Certified to
NSF/ANSI 60

PLATINUM PAC

Advantages

- Controls fluid loss and produces a thin, slick, tough filter cake
- Inhibits the hydration of drill solids and encapsulates the drill solids for easier removal
- Exhibits superior mixing in low-shear environments
- Is more readily dispersible than conventional dry PAC polymers
- Effective in low concentrations for controlling fluid loss
- Encapsulates shale particles to inhibit swelling and dispersion
- Resists bacterial attack, requiring no biocides or preservatives
- Functions over a wide range of salinity, hardness and pH levels
- Compatible with all common mud-treating additives

Limitations

- Circulating temperature stability to approximately 300°F (149°C)
- Effective in systems with total hardness <1,000 mg/L (as calcium), but can be precipitated in the combined presence of high hardness and high pH

Toxicity and handling

Bioassay information is available upon request.

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

Packaging and storage

PLATINUM PAC polyanionic cellulose is packaged in 2 lb (0.91 kg) bottles, 25/case, 25 lb (11.3 kg) net product in 5 gal (18.9 L) buckets, and 50 lb (22.7 kg) bags.

PLATINUM PAC additive should be stored inside under cool, dry conditions.



Typical physical properties

Physical appearance	White or off-white powder
Ionic character	Anionic
Bulk density	0.64 to 9.0 g/cm ³
pH (1% solution)	6.5 to 9.0

PLATINUM PAC* polyanionic cellulose is a readily dispersible, water-soluble polymer designed to control fluid loss in water-base muds.

Applications

PLATINUM PAC polyanionic cellulose is effective in low concentrations, with the normal fluid-loss treatment ranging from 0.25 to 1 lb/bbl (0.71 to 2.85 kg/m³). This product is applicable in all water-base muds, ranging from low-solids, non-dispersed polymer systems to high-density, dispersed systems. It is used as a filtrate reducer and borehole stabilizer in water-base drilling applications.

PLATINUM PAC UL



Certified to
NSF/ANSI 60

Advantages

- Readily dispersible
- Effective in low concentrations for controlling fluid loss and building viscosity
- Produces minimal viscosity increase
- Encapsulates shale particles to inhibit swelling and dispersion
- Resists bacterial attack, requiring no biocides or preservatives
- Functions over a wide range of salinity, hardness and pH levels
- Has application in all water-base, low-solids, non-dispersed mud systems. Compatible with all common mud-treating additives
- Excellent environmental acceptability

Limitations

- Circulating temperature stability to approximately 300°F (149°C)
- Effective in systems with total hardness <1,000 mg/L (as calcium), but can be precipitated in the combined presence of high hardness and high pH

Toxicity and handling

Bioassay information is available upon request.

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

Packaging and storage

PLATINUM PAC UL anionic polymer is packaged with 25 lb (11.3 kg) net product in 5 gal (19 L) buckets and 50 lb (22.7 kg) bags.

Store in a cool, dry place.



Typical physical properties

Physical appearance	White, free-flowing powder
Specific gravity	1.5 to 1.6
pH (1% solubility)	6.5 to 8.0

PLATINUM PAC* UL Polyanionic Cellulose (PAC) is a high-quality, water-soluble polymer designed to control fluid loss. Because it is an “Ultra-Low” (UL) additive, it causes a minimal increase in viscosity in water-base muds. PLATINUM PAC UL additive is readily dispersible in a wide range of water-base mud systems.

Applications

PLATINUM PAC UL additive controls fluid loss in freshwater, seawater, KCl, and salt muds. It forms a thin, resilient, low-permeability filter cake that minimizes the potential for differential sticking and the invasion of filtrate and mud solids into permeable formations. PLATINUM PAC UL additive resists bacterial attack, eliminating the need for biocides or preservatives. It is effective in low concentrations, with the normal fluid-loss treatment ranging from 0.25 to 1 lb/bbl (0.71 to 2.85 kg m³). In saltwater and PAC-polymer systems, higher concentrations are required

for encapsulation, with normal concentrations ranging from 1 to 3 lb/bbl (2.85 to 8.6 kg/m³).

Because PLATINUM PAC UL additive is low viscosity, it generates less viscosity as compared to the POLYPAC* and PLATINUM PAC products. The viscosity generated depends on the solids concentration, salinity and makeup-water chemistry.

PLATINUM PAC UL anionic polymer attaches to and encapsulates exposed shales and drill cuttings. This protective polymer “envelope” inhibits the dispersion of shale cuttings and restricts fluid interactions with exposed shales.

In saturated salt systems, PLATINUM PAC UL additive tends to work significantly better than regular-viscosity PAC materials. For difficult filtration-control fluids, a combination of the UL product and regular-viscosity PAC products is generally most effective.

POLYPAC R

Advantages

- Effective in low concentrations for controlling fluid loss and building viscosity
- Encapsulates shale particles to inhibit swelling and dispersion
- Resists bacterial attack, requiring no biocides or preservatives
- Functions over a wide range of salinity, hardness and pH levels
- Applicable in all water-base muds, ranging from low-solids, non-dispersed polymer systems to high-density, dispersed systems
- Compatible with all common mud-treating additives
- Excellent environmental acceptability

Limitations

- Circulating temperature stability of approximately 300°F (149°C)
- Effective in systems with total hardness <1,000 mg/L (as calcium), but can be precipitated in the combined presence of high hardness and high pH

Toxicity and handling

Bioassay information is available upon request.

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

Packaging and storage

POLYPAC R anionic polymer is packaged in 50 lb (22.7 kg) and 55 lb (25 kg), heavy-duty, multi-walled, waterproof sacks.

Store in a dry, well-ventilated area away from incompatibles or sources of heat or ignition.



Typical physical properties

Physical appearance	White, free-flowing powder
Specific gravity	1.5 to 1.6
pH (1% solution)	6.5 to 8.0

POLYPAC® R polyanionic cellulose is a high-quality, water-soluble polymer designed to control fluid loss and increase viscosity in water-base muds.

POLYPAC R anionic polymer attaches to and encapsulates exposed shales and drill cuttings. This protective polymer “envelope” inhibits the dispersion of shale cuttings and restricts fluid interactions with exposed shales.

Applications

POLYPAC R additive controls fluid loss in freshwater, seawater, KCl and salt muds. The polymer forms a thin, resilient, low-permeability filter cake that minimizes the potential for differential sticking and the invasion of filtrate and mud solids into permeable formations.

POLYPAC R fluid-loss-control additive resists bacterial attack, eliminating the need for biocides or preservatives. It is effective in low concentrations, with the normal fluid-loss treatment ranging from 0.25 to 1 lb/bbl (0.71 to 2.85 kg m³). POLYPAC R polymer also develops viscosity to a degree that is dependent on the solids concentration, salinity and makeup water chemistry.

POLYPAC UL

Advantages

- Effective in low concentrations for controlling fluid loss and building viscosity
- Produces minimal viscosity increase
- Encapsulates shale particles to inhibit swelling and dispersion
- Resists bacterial attack, requiring no biocides or preservatives
- Functions over a wide range of salinity, hardness, and pH levels
- Has application in all water based muds (compatible with all common mud treating additives)
- Excellent environmental acceptability

Limitations

- Circulating temperature stability to approximately 300°F (149°C)
- Effective in systems with total hardness <1,000 mg/L (as calcium), but can be precipitated in the combined presence of high hardness and high pH

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

POLYPAC UL polymer is packaged in 50 lb (22.7 kg) and 55 lb (25 kg), heavy-duty, multi-wall, waterproof sacks.

Store in a cool, dry place.

Typical physical properties

Physical appearance	White, free-flowing powder
Specific gravity	1.5 to 1.6
pH (1% solution)	6.5 to 8.0

POLYPAC* UL polyanionic cellulose (PAC) is a high quality, water-soluble polymer designed to control fluid loss. Because it is an ultra-low (UL) additive, it causes minimal increase in viscosity in water based muds.

Applications

POLYPAC UL polymer controls fluid loss in freshwater, seawater, KCl, and salt muds. It forms a thin, resilient, low permeability filter cake that minimizes the potential for differential sticking and the invasion of filtrate and mud solids into permeable formations. POLYPAC UL additive resists bacterial attack, eliminating the need for biocides or preservatives. It is effective in low concentrations, with the normal fluid-loss treatment ranging from 0.25 to 1 lb/bbl (0.71 to 2.85 kg/m³). In saltwater and PAC polymer systems, higher concentrations are required for encapsulation, with normal concentrations ranging from 1 to 3 lb/bbl (2.85 to 8.6 kg/m³).

POLYPAC UL additive generates less viscosity than regular POLYPAC polymer. The viscosity generated depends on solids concentration, salinity, and makeup water chemistry.

The anionic POLYPAC UL polymer attaches to and encapsulates exposed shales and drill cuttings. This protective polymer “envelope” helps inhibit the dispersion of shale cuttings and restricts fluid interactions with exposed shales.

In saturated salt systems, POLYPAC UL additive tends to work significantly better than regular viscosity PAC materials. For difficult filtration control fluids, a combination of UL and regular viscosity PAC products is generally more effective.



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POLY-PLUS

POLY-PLUS

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

Toxicity and handling

Bioassay information is available upon request.

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

For more information, please request a product bulletin from your M-I SWACO representative.

Typical physical properties

Physical appearance	Cream colored, opaque liquid
Odor	Slightly hydrocarbon
Specific gravity	1.07 to 1.10
pH (1% solution)	8.0 to 9.0
Flash point	$>200^{\circ}\text{F}$ (93.3°C) (PMCC)
Pour point	-20°F (-28.9°C)
Viscosity (typical)	~ 500 cP

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.

Applications

POLY-PLUS polymer mud systems

The POLY-PLUS system provides excellent cuttings encapsulation and improved wellbore stability. Typical concentrations of POLY-PLUS are 0.75 to 3 lb/bbl (2.1 to 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 to 1.75 lb/bbl (1.4 to 5 kg/m³) enhances solids removal by flocculating solids.

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.

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

POLY-PLUS 2000



Certified to
NSF/ANSI 60

Advantages

- 50% active material
- Low dosage rate for comparable viscosities
- Encapsulates drill solids
- Stabilizes clay formations

Limitations

POLY-PLUS 2000 copolymer is less effective in fluids with total hardness values in excess of 200 ppm. To optimize POLY-PLUS 2000 copolymer characteristics, total hardness should be maintained at 100 ppm or less. POLY-PLUS 2000 additive is not as effective in temperatures above 275°F (135°C). The effective temperature range can be increased to 325°F (162°C) by adding an oxygen scavenger to the mud. The effectiveness of POLY-PLUS 2000 additive also decreases in fluids that have a pH of 10.2 or greater.

Toxicity and handling

Bioassay information available upon request.

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

Packaging and storage

POLY-PLUS 2000 copolymer is supplied in 5 gal (18.9 L) buckets.

Cleanup

POLY-PLUS 2000 copolymer 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 2000 additive. Do not use perfumed liquid bleach or solid calcium hypochlorite.

Typical physical properties

Physical appearance	White liquid dispersion
Odor	Slightly hydrocarbon
Viscosity (typical)	200 to 500 cP
Specific gravity	1.06 to 1.08
pH (1% solution)	6.5 to 7.5
Flash point	248°F (120°C)

POLY-PLUS* 2000 polymer is a multi-function synthetic copolymer developed for use in freshwater-, potassium- and saltwater-base drilling fluids. POLY-PLUS 2000 water-free dispersion has excellent freeze/thaw stability and is not subject to phase separation or premature activation inside the pail or drum. POLY-PLUS 2000 copolymer provides the same benefits as regular POLY-PLUS polymer, but at lower concentration.

Applications

Viscosity

POLY-PLUS 2000 copolymer is a cost-effective viscosifier in low-salinity fluids. Its shear-thinning properties maximize penetration rates at the bit under high shear rates and exhibit excellent hole-cleaning characteristics under low shear rates. It also allows for easy solids deposition in settling pits.

Add 1 to 3 vis cups (1 to 3 L) per 300 gal (1,135 L) of fluid for desired viscosity.

Shale stabilization/inhibition

POLY-PLUS 2000 copolymer can be used alone or in conjunction with KCl to stabilize active shales. It protects by encapsulating reactive shales, forming a protective coating on the wellbore and around cuttings. Coating reduces the shale's tendency to absorb water, swell and slough.

At least 1 vis cup (1 L) per 300 gal (1,135 L) of fluid.

Foam stabilization

The long-chain polymer of POLY-PLUS 2000 additive creates a tighter, stronger foam, which improves the fluid's cuttings-carrying capacity.

Flowline flocculant

Small concentrations of POLY-PLUS 2000 copolymer (0.01 to 0.05 lb/bbl [0.028 to 0.14 kg/m³]) economically flocculate drill solids. Additions should be made at the flowline to optimize settling time of drill solids in the pits.

Friction reduction/lubrication

The POLY-PLUS 2000 copolymer's shear-thinning properties reduce power losses at points of high shear, especially at the drill bit and at the other restrictions such as the pump discharge, drill collars, etc. The polymer structure also helps reduce turbulence, which reduces erosion and the likelihood of washouts in weak formations.

Fluid-loss control

At least 2 vis cups (2 L) per 300 gal (1,135 L) of fluid to be effective.

Some solids may be required.

Lubricity. At least 1 vis cup (1 L) per 300 gal (1,135 L) of fluid.

Foam stabilization. 1 to 2 vis cups (1 to 2 L) per 100 gal (378.5 L) of fluid.



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POLY-PLUS EHV

POLY-PLUS EHV

Advantages

- Provides a clay-free boring fluid that disperses easily with minimal shear
- Soil stabilizer can be used to replace bentonite at a ratio of 1:100 (e.g., one 50 lb [22.7 kg] bag can replace 2.5 tons [2.3 metric tons] of bentonite in a typical geo-construction application)
- Produces very-high-viscosity slurries at low dosage rates
- Slurries typically have low gel strength
- Slurry binds loose sand, clay, shale and gravel, facilitating their removal and preventing dispersal into the slurry
- Reduces fluid loss by penetrating the surrounding soil with a high-viscosity gel fluid, sealing the walls of the excavation site without the use of a conventional filter cake
- Stabilizes reactive formations and is an efficient viscosifier for a clear, solids-free drilling fluid
- Provides high cohesiveness to bind sandy soil and gravel
- Enhances core recovery in continuous wireline coring operations
- Facilitates the removal of drilled soils from augers
- Non-fermenting, no petroleum distillates and easily broken down with household bleach

Toxicity and handling

When used in accordance with the manufacturer's published instructions, this product is considered non-hazardous. Drill cuttings exposed to POLY-PLUS EHV acrylic copolymer should be washed with calcium hypochlorite to break down the POLY-PLUS EHV acrylic copolymer before the cuttings can be confined or stored in a sealed container or drum.

Packaging and storage

POLY-PLUS EHV acrylic copolymer is supplied in 5 gal (18.9 L) buckets. POLY-PLUS EHV acrylic copolymer should be stored inside under cool, dry conditions. When stored under these conditions, it has a shelf life of at least one year.

Typical physical properties

Physical appearance	White, granular powder
Ionic character	Anionic
Density	0.8 g/cc
Bulk density	50 lb/ft ³ (800 kg/m ³)
pH (1% solution)	6.0 to 8.0

POLY-PLUS* EHV acrylic copolymer is an extremely-high-molecular-weight, high-charge, polyacrylamide supplied as a dry granular powder. POLY-PLUS EHV acrylic copolymer produces very high viscosity solutions at low dosage rates, particularly in freshwater. It has excellent handling characteristics, mixes easily and dissolves quickly when added to water-base fluid systems.

Applications

POLY-PLUS EHV acrylic copolymer is ideally suited for applications such as water-well drilling, mineral exploration, and construction applications.

Due to its very high molecular weight, POLY-PLUS EHV additive is also an excellent flocculant for dewatering drilling fluids, waste pits and sumps.

POLY-PLUS EHV acrylic copolymer has several functions, including:

Viscosifier

As a viscosifier, the addition of 0.5 to 1 lb/bbl (1.4 to 2.9 kg/m³) of POLY-PLUS EHV acrylic copolymer is a cost-effective way to generate viscosity in fresh- or low-salinity drilling fluids. Its shear-thinning capacity ensures maximum power at the bit under high shear while retaining excellent carrying capacity under low-shear conditions.

Flocculant

As a flowline flocculant, POLY-PLUS EHV acrylic copolymer can also be used for clear-water or low-solids drilling. Adding a 5% solution of POLY-PLUS EHV acrylic copolymer into the flowline or just prior to any mechanical separation greatly enhances the removal of drill solids.

Friction reducer

Adding POLY-PLUS EHV acrylic copolymer into a drilling fluid helps to reduce turbulent flow, friction, and power losses at points of high shear. Lowering turbulent flow also helps reduce erosion and washouts of fragile geologic structures.

Add slowly and uniformly through a high-shear jet type mixer

Continue to circulate and agitate the slurry until all materials are dispersed and dissolved.

Recommended application amounts:

Normal consolidated formation:
1.5 to 2 lb (0.7 to 0.9 kg) per 100 gal (378.5 L) water (0.6 to 0.8 lb/bbl [1.7 to 2.3 kg/m³])

Unconsolidated formation:
2.5 to 3.5 lb (1.1 to 1.6 kg) per 100 gal (378.5 L) water (1 to 1.5 lb/bbl [2.9 to 4.3 kg/m³])

Cleanup

POLY-PLUS EHV acrylic copolymer can be chemically broken down with liquid bleach in regular household concentration (5% sodium hypochlorite). Use 1 gal (3.8 L) of liquid bleach per 100 gal (378.5 L) of fluid formulated with POLY-PLUS EHV acrylic copolymer. Do not use perfumed liquid bleach or solid calcium hypochlorite.

POLY-PLUS LV



Certified to
NSF/ANSI 60

Advantages

- Provides excellent cuttings encapsulation and limits cuttings dispersion
- Enhances removal of drill solids by reducing dispersion tendencies
- Minimal contribution to the viscosity of the system
- For use in seawater, KCl or freshwater systems
- Provides improved shale stabilization
- Significantly lower screen-blinding potential compared to higher-molecular-weight encapsulators
- Does not negatively affect positive rheological profiles

Limitations

Makeup water should be treated with soda ash or bicarbonate to reduce hardness and increase the performance of the product.

Toxicity and handling

Bioassay information is available upon request.

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

Packaging and storage

POLY-PLUS LV acrylic copolymer is packaged in 27.5 lb (12.5 kg), 5 gal (18.9 L) buckets.

Store in a dry location away from sources of heat or ignition, and minimize dust.

Typical physical properties

Physical appearance	White, granular powder
Specific gravity	0.7
pH (0.5 % solution)	6.0 to 8.0
Solubility in water	Soluble

POLY-PLUS* LV acrylic copolymer is a low-molecular-weight, medium-charge acrylic copolymer designed to provide cuttings encapsulation and clay-dispersion inhibition. It is designed for use in fluids based on fresh and saline water environments. POLY-PLUS LV acrylic copolymer provides minimal viscosity increase and can enhance filtration properties. When added to MAX GEL* viscosifier or MAX BORE* HDD bentonite, POLY-PLUS LV acrylic copolymer produces an inhibitive drilling-fluid system without affecting fluid properties.

Applications

POLY-PLUS LV acrylic copolymer provides excellent cuttings encapsulation by adsorbing onto the clay surfaces and forming a protective film that prevents cuttings from sticking to each other or the shaker screen. The product is also effective in seawater and KCl-based fluids. Normal dosage rates are between 1 and 3 lb/bbl (3 and 9 kg/m³).

Due to the low molecular weight of this polymer, the mixing process requires less shear than polymers with higher molecular weights. The resulting fluid can pass through fine shaker screens without blinding.

Recommendations: Total hardness should be treated out first with bicarbonate/soda ash. Maintain pH below 10 for optimum performance.

Recommended treatment

Approximate amounts of POLY-PLUS LV acrylic copolymer added to water-base fluid.

	lb/100 gal	lb/bbl	kg/m ³
Bentonite-free drilling fluid	0.5 to 1.5	0.2 to 0.6	0.6 to 1.8
Added to MAX GEL viscosifier or MAX BORE HDD bentonite for inhibition	0.25 to 0.75	0.1 to 0.3	0.3 to 1.0
Foam drilling (stiff foams)	0.5 to 1.0	0.2 to 0.4	0.6 to 1.2

POLY-PLUS RD

Advantages

- Readily dispersible and does not form “fish eyes”
- Excellent cuttings encapsulator limits cuttings dispersion
- Provides improved shale stabilization
- Powdered material has significantly lower toxicity than invert-emulsion, liquid polymers
- Highly concentrated product (>90% activity) reduces transportation costs and storage space requirements
- Aids in preventing balling on the bit, stabilizers and bottomhole assembly by coating and lubricating solids
- Enhances removal of drill solids
- Can be used to viscosify clear-water and low-solids drilling fluids

Limitations

- Severe flocculation can occur during the initial treatment of POLY-PLUS RD acrylic copolymer in a non-dispersed mud system. Flocculation causes high viscosity until all of the solids are coated. POLY-PLUS RD acrylic copolymer mud systems use low concentrations (<15 lb/bbl [$<43 \text{ kg/m}^3$]) of MAX GEL viscosifier to reduce this interaction. Continued additions of POLY-PLUS RD polymer result in a stable system with the desired rheology
- Calcium-sensitive — begins to precipitate when the calcium concentration exceeds 300 mg/L
- pH-sensitive with an optimum pH range of 8.5 to 10.5. At levels above this range, hydrolysis can convert acrylamide into acrylate and release ammonia (NH_3)
- Temperature-stable to approximately 350°F (177°C), although the copolymer can begin to release ammonia (NH_3) and hydrolyze into polyacrylate when exposed to prolonged temperatures above 275°F (135°C)
- Subject to shear degradation of its viscosity and can lose its ability to viscosify. Cuttings encapsulation and shale stabilization are not affected

Toxicity and handling

Bioassay information available upon request.

No special requirements are necessary for handling and storage. Avoid inhalation of dust. A dust respirator and goggles are recommended if mixing in an enclosed area.

Packaging and storage

POLY-PLUS RD acrylic copolymer is packaged in 50 lb (22.7 kg), multi-walled, paper sacks or 5 gal (18.9 L) buckets.

Store in a dry location away from sources of heat or ignition, and minimize dust.

Contamination

POLY-PLUS RD acrylic copolymer 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 like lignite or citric acid to treat cement contamination.



POLY-PLUS* RD acrylic copolymer (PHPA) is a readily dispersible product designed to provide cuttings encapsulation and shale stabilization. It is formulated for easy mixing with improved dispersion to eliminate “fish eyes.” This is beneficial when rapidly mixing either large quantities or high concentrations of polymer where good mixing equipment is unavailable. POLY-PLUS RD acrylic copolymer acts as a viscosifier, friction reducer and flocculant. It also provides some fluid-loss control.

POLY-PLUS RD acrylic copolymer is a specially treated, high-molecular-weight product. It can be used in systems ranging from low solids to weighted muds, using makeup waters from freshwater to saltwater.

Addition method

POLY-PLUS RD acrylic copolymer 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. Sweeps can be prepared by mixing POLY-PLUS RD acrylic copolymer.

Typical physical properties

Physical appearance	White, granular powder
Odor	Slightly hydrocarbon
Specific gravity	1.25 to 1.40
pH (1% solution)	7.7
Bulk density	40 to 46 lb/ft ³ (641 to 737 kg/m ³)
Nature of charge	Anionic
Activity	>90%

Typical properties of POLY-PLUS RD in freshwater

Concentration lb/bbl (kg/m ³)	PV cP	YP lb/100 ft ²	Marsh Funnel sec/qt
0.125 (0.4)	2	1	28
0.25 (0.7)	3	2	31
0.50 (1.4)	4	4	34
0.75 (2.1)	6	8	46
1.00 (2.9)	9	11	60
1.50 (4.3)	15	17	110

Applications

POLY-PLUS RD acrylic copolymer mud systems.

POLY-PLUS RD additive provides excellent cuttings encapsulation and improved wellbore stability. Typical concentrations of POLY-PLUS RD acrylic copolymer are 0.25 to 1 lb/bbl (0.71 to 2.85 kg/m³). It is also effective in salt muds, such as KCl- or NaCl-enhanced fluids, although slightly higher concentrations of POLY-PLUS RD acrylic copolymer can be required.

Clear-water fluids

POLY-PLUS RD acrylic copolymer can be used in clear-water, solids-free drilling fluids. This product enhances solids removal by flocculating the undesired solids and increasing viscosity. The polymer also provides cuttings encapsulation and improved wellbore stability. POLY-PLUS RD acrylic copolymer is frequently used in slim-hole, continuous-coring applications.

Low-Solids, Non-Dispersed (LSND) muds.

POLY-PLUS RD acrylic copolymer is well suited to LSND systems. In reduced-bentonite muds, POLY-PLUS RD additive extends bentonite to increase viscosity, flocculates drill solids for more efficient removal, encapsulates cuttings and improves wellbore stability.

POLY-PLUS RD sweeps

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

POLYSWELL

Advantages

- POLYSWELL copolymer can be prehydrated before adding
- Because of its swelling capacity and variability in size, POLYSWELL additive can accumulate in a variety of fracture sizes

Limitations

Improper placement of the POLYSWELL additive can result in stuck drill rods.

Toxicity and handling

Bioassay information is available upon request.

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

Packaging and storage

POLYSWELL copolymer is packaged in 5 gal (18.9 L) buckets.

Store in a dry location away from sources of heat or ignition.

Method of addition

POLYSWELL additive can be mixed in water or drilling mud with or without LCM. Add 1 to 3 lb (0.5 to 1.5 kg) per 4 gal (20 L) of water or mud in a pail. (Lesser and greater amounts have been used). Pump the mixture as soon as possible once the dry polymer beads are mixed. When using POLYSWELL additive in core drilling, be sure the core tube has been pulled before pumping the solution downhole. Repeat as necessary to stop fluid loss.



Typical physical properties

Physical appearance	White powder
Specific gravity	0.8 to 1.0
Solubility	Swells on contact with water

POLYSWELL* copolymer is used in lost circulation and expands to 200 times its volume in freshwater. This material is environmentally safe.

Applications

POLYSWELL copolymer is used to fill or seal fractures. As the material fully hydrates, the fracture/void is sealed. This product can also be spotted in caving zones to reduce caving problems.

Directly after placing the POLYSWELL pill, pull up above the problem zone to prevent sticking. Full hydration occurs in 20 to 30 min. Circulate with mud and Lost-Circulation Material (LCM) to fill the bridge.

RINGFREE



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NSF/ANSI 60

Advantages

- RINGFREE additive is an excellent clay dispersant that quickly penetrates sticky clays that can cause tools to stick
- Works quickly to alleviate hole problems and reduce costly pulling times or lost pipe

Limitations

Effectiveness is reduced in fluids with more than 1,000 ppm dissolved calcium and 10,000 ppm chlorides. Since RINGFREE additive reduces mud rheology, caution should be exercised when adding it to the active mud system.

Toxicity and handling

Bioassay information is available upon request.

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

Packaging and storage

RINGFREE additive is packaged in 5 gal (18.9 L) buckets.

Store in a well-ventilated area away from sources of heat or ignition.

Methods of addition

- Bit balling/mud rings: Use ½ vis cup (0.5 L) per 300 gal (1,135 L) of fluid up to 0.5 to 1.5 gal (1.9 to 5.7 L) per 300 gal (1,135 L) of fluid. An alternate method is to slug rods with 1 vis cup (1 L) on connections
- Thinning: Slowly add RINGFREE additive to the mud as needed to reduce viscosity



Typical physical properties

Physical appearance	Pale yellow liquid
Specific gravity	1.3
pH as supplied	7 to 7.5

RINGFREE* additive is a highly efficient, thermally stable thinner and surface-active agent that removes bentonite clays from the drillstring. It is environmentally acceptable and contains no heavy metals. Because it dissolves rapidly, RINGFREE additive immediately affects the rheology of most drilling fluids.

Applications

RINGFREE additive is used primarily to prevent bit balling and mud rings. It can also be used to reduce the viscosity and gel strengths of most freshwater drilling fluids.

ROD COAT B 700

Advantages

- Superior resistance to water washing
- Corrosion, wear and oxidation resistance
- Reduced cost
- Reduced tripping frequency for greasing

Limitations

ROD COAT B 700 grease has a hydrocarbon base and does not degrade. Use of ROD COAT B 700 grease should be limited to areas that are not environmentally sensitive.

Toxicity and handling

Bioassay information is available upon request.

Handle as an industrial chemical, wearing protective equipment and observing the precautions as described in the Material Safety Data Sheet (MSDS). Wipe rods and contain the grease in the original container. Dispose of according to applicable local regulations.

Packaging and storage

ROD COAT B 700 grease is supplied in 5 gal (18.9 L) buckets.

Addition methods

To improve lubricity and reduce rod vibration, apply ROD COAT B 700 grease to the exterior of the rods while tripping into the hole. The rods should be dry for best adhesion. In unstable hole situations, apply 1/2 in. (12.7 mm) of ROD COAT B 700 grease to the exterior of the rods. This puts a layer of grease on the walls of the hole, which improves stability.



Typical physical properties

Physical appearance	Fibrous semi-solid
Solubility	Nil
Viscosity at 104°F (40°C)	200 to 500 cP
Specific gravity at 61°F (16°C)	0.9
pH (1% solution)	6.5 to 7.5
Pour point	–20°F (–29°C)

ROD COAT* B 700 high-performance, barium-base drill-rod grease reduces rod vibration.

Applications

ROD COAT B 700 grease is used primarily to reduce rod vibration, especially in holes with lower water tables.

ROD EASE

Advantages

- Reduces torque
- Prevents rust and scale
- Environmentally safe
- Increases penetration rates
- Extends bit and mud motor life
- Increases mud motor efficiency
- Reduces wear on rods and equipment
- Maximizes rig potential and steering control
- Enhances the effectiveness of powdered drilling-fluid additives

ROD EASE lubricant is based on an environmentally safe technology that has proven effective in lubricating downhole consumables. This product has produced both bit-life and penetration increases of more than 25% during drilling operations. Because ROD EASE lubricant reduces torque and drag, the operator can use the drill rig to its full potential, meaning thrusts and pulls are at a minimum, and steering control is precise.

Tests performed in the M-I SWACO laboratory in Houston confirm the effects of ROD EASE lubricant.

Toxicity and handling

Bioassay information is available upon request.

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

Packaging and storage

ROD EASE lubricant is packaged in 5 gal (18.9 L) buckets and 55 gal (208.2 L) drums.

Store in a well-ventilated area away from sources of heat or ignition.



Typical physical properties

Physical appearance	Dark brown liquid
Specific gravity	0.887
pH	7.0 to 7.5
Boiling point	572°F (>300°C)
Freezing point	−77°F (−25°C)
Flash point	554°F (290°C)

This product is a superior lubricant for HDD, coring, and rotary drilling.

Applications

ROD EASE* lubricant mixes instantly and is not affected by water quality. For this product to deliver rod protection and reduce torque after drilling has started, consideration must be given to the number of rods and the amount of fluid in the hole. Treatment can require dosing the system with several pails of lubricant. Established maintenance levels are required after initial dosage and treatment. Normal treatment levels are 1 to 2% of fluid volume or 1 to 2 pints (0.473 to 0.946 L) per 100 gal (378.5 L) of drilling fluid. The dosage amount should be increased if the penetration rate decreases, torque increases, or the run length decreases indicating poor cutting.



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SMOOTH GROUT 20

Advantages

- Inorganic, non-fermenting and non-toxic
- Develops lower-solids slurries up to 20% total active solids
- Easy one-sack mixing
- Mixed and handled with most conventional rig equipment
- Permanent, flexible seal prevents entry of contaminants from the surface
- Extended working time controlled by grout-solids content
- Firm texture providing structural stability after grout is set

Toxicity and handling

Bioassay information is available upon request.

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

Packaging and storage

SMOOTH GROUT 20 slurry is packaged in 50 lb (22.7 kg), heavy-duty, multi-walled, waterproof sacks.

Store in a cool, dry place. Store in a dry location away from sources of heat or ignition, and minimize dust.



Typical physical properties

Physical appearance	Beige to tan powder
Moisture content	8%
Specific gravity	2.5
pH (8% slurry)	7.0
Slurry density	9.4 lb/gal (1.1 kg/L) for 20% solids
Dry bulk density	60 lb/ft ³ (961.1 kg/m ³)
Screen analysis	75% min. passing through 200-mesh

SMOOTH GROUT* 20 slurry is an easy-to-use bentonite-grouting composition containing high-swelling sodium montmorillonite clay. It is designed for use in water wells and monitoring wells, for sealing the annular space around a well casing, and for plugging drilled holes and abandoned wells. SMOOTH GROUT 20 slurry contains no organic additives or polymers.

The SMOOTH GROUT 20 system, a one-sack formulation, mixes with freshwater to yield a 20% pumpable grouting slurry with an extended working time. When set up, the SMOOTH GROUT 20 slurry develops a satisfactory seal with adequate structural strength and low-hydraulic conductivity. When properly placed, SMOOTH GROUT 20 slurry remains flexible, rehydratable and unstratified through heating and cooling cycles.

Applications

- Sealing and grouting casings
- Sanitary sealing in water-well construction
- Sealing in monitoring wells
- Plugging abandoned exploration boreholes

Addition method

SMOOTH GROUT 20 slurry should be mixed with freshwater to obtain optimum results. The recommended mixing rate is a 50 lb (22.7 kg) sack of SMOOTH GROUT 20 slurry with 24 gal (90.8 L) of water to make a 20%-active-solids slurry. The viscosity and consistency of mixed-grout slurry can be modified by adjusting the amount of water used to obtain varying solids content.

1. Using a mixing device, blend one 50 lb (22.7 kg) sack of SMOOTH GROUT 20 slurry into 24 gal (90.8 L) of freshwater.
2. Blend, do not over-mix. The resulting slurry should look like cake batter, containing partially yielded bentonite. This pumpable slurry contains 20% solids. Pump into hole without delay.

SMOOTH GROUT 20 slurry at various solids content

SMOOTH GROUT 20 lb (kg)	Water gal (L)	Solids content %	Useable slurry gal (L)	Estimate working time (min)
50 (22.7)	30 (113.6)	16.7	33 (124.9)	30 – 60
50 (22.7)	27 (102.2)	18.2	30 (113.6)	15 – 30
50 (22.7)	24 (90.8)	20	27 (102.2)	5 – 15

SMOOTH GROUT 30



Certified to
NSF/ANSI 60

Advantages

- Inorganic, non-fermenting and non-toxic
- Develops lower-solids slurries up to 30% activity
- Easily mixed with most conventional rig equipment
- Permanent, flexible seal prevents entry of contaminants from the surface
- Extended working time controlled by the grout solids content
- Firm texture providing structural stability after grout set

Limitations

When used as recommended, there are no limitations imposed on this product.

Toxicity and handling

Bioassay information is available upon request.

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

Packaging and storage

SMOOTH GROUT 30 additive is packaged in 50 lb (22.7 kg), multi-walled, paper sacks and is available in bulk. Store in a dry location (slip hazard when wet) and minimize dust (use dustless systems for handling, storage, and cleanup).

Material can be palletized at either 56/pallet or 70/pallet.

Store in a well-ventilated area away from sources of heat or ignition.

For more information, please request a product bulletin from your M-I SWACO representative.

Typical physical properties

Physical appearance	Beige to tan powder
Moisture content	8%
Specific gravity	2.5
pH (8% slurry)	7.0
Slurry density	10 lb/gal (1.2 kg/L) for 30% solids
Dry bulk density	64 lb/ft ³ (1,025.2 kg/m ³)
Screen analysis	75% min. passing through 200-mesh

SMOOTH GROUT* 30 additive is an easy-to-use bentonite-grouting composition containing high-swelling, sodium montmorillonite clay. It is designed for use in water wells and monitoring wells, for sealing the annular space around the well casing, and for plugging drilled holes and abandoned wells.

SMOOTH GROUT 30 material contains no organic additives or polymers.

A one-sack formulation of SMOOTH GROUT 30 additive mixes with freshwater to yield a 30% pumpable grouting slurry with an extended working time. When it sets up, the SMOOTH GROUT 30 slurry develops a satisfactory seal with adequate structural strength and low hydraulic conductivity. When properly placed, the SMOOTH GROUT 30 composition remains flexible, rehydratable, and unstratified though heating and cooling cycles.

Applications

- Sealing and grouting casing
- Sanitary sealing in water-well construction
- Sealing in monitoring wells
- Plugging and abandoning exploration boreholes

Addition method

SMOOTH GROUT 30 additive should be mixed with freshwater to obtain maximum results. A 50 lb (22.7 kg) sack of SMOOTH GROUT 30 additive with 14 gal (53 L) of water makes a 30%-active-solids slurry. The viscosity and consistency of a mixed grout slurry can be modified by adjusting the amount of water used to obtain varying solids content.

1. Using a mixing device, blend one 50 lb (22.7 kg) sack of SMOOTH GROUT 30 additive into 14 gal (53 L) of freshwater.
2. Blend, do not over-mix. The resulting slurry should look like cake batter. Pump through tremie line without delay.

SMOOTH GROUT 30 slurry at various solids content

SMOOTH GROUT 30 lb (kg)	Water gal (L)	Solids content %	Useable slurry gal (L)	Estimate working time (min)
50 (22.7)	14 (53)	30	17 (64.4)	30 – 60
50 (22.7)	15 (56.8)	28.6	18 (68.1)	15 – 30
50 (22.7)	16 (61)	27.3	19 (72)	5 – 15



Certified to
NSF/ANSI 60

SMOOTH GROUT THERMAL

Advantages

SMOOTH GROUT THERMAL improves the efficiency and system performance of ground-source, heat-loop systems by matching the thermal conductivity of the surrounding soil and creating a permanent, flexible seal to prevent aquifer contamination. Depending on site soil conditions, SMOOTH GROUT THERMAL can be mixed and adjusted to meet individual thermal-conductivity requirements, improving the transfer of heat between the fluid circulated in the loop and the surrounding soil for optimum system performance.

Limitations

Makeup water salinity and hardness will determine mixing ability of the product.

Toxicity and handling

Bioassay information is available upon request.

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

Packaging and storage

SMOOTH GROUT THERMAL is packaged in 50 lb (22.7 kg) bags.

Methods of addition

Place freshwater in a paddle-mixing tank of a commercial grout mixer. Start the grout mixer paddle, and add one 50 lb (22.7 kg) bag of SMOOTH GROUT THERMAL high-solids bentonite to the water. Mix for about 1 min. Add silica sand at a steady rate (1 to 2 min), and continue mixing for about 2 min to obtain a consistent mixture. Pump with a positive-displacement pump through a tremie pipe at a rate of 5 to 15 gal/min (18.9 to 56.8 L/min).



Typical physical properties

Specific gravity	2.62
Thermal conductivity	0.45-1.0 Btu/hr-ft -°F
Permeability	$< 7 \times 10^{-8}$ cm/sec
Percent Solids Range (based on TC)	30.0 – 66.0%

Applications

SMOOTH GROUT THERMAL* is a specially blended high-solids bentonite that can be mixed with sand in a two-part, thermally conductive grouting material. SMOOTH GROUT THERMAL can be mixed to meet a range of thermal conductivity from 0.40 to 1.0 Btu/hr ft °F. SMOOTH GROUT THERMAL has been carefully developed as a thermally conductive grout to heighten the performance of ground-source, heat-loop applications.

Thermal Conductivity Btu/hr ft °F	Silica* Compound Lb/50# bag	Water Gal/50# bag	Yield Gal/# bag	Weight Lb/gal	Total Solids %
0.45	0	14.0	17.0	9.83	30.0
0.57	50	14.5	19.6	11.27	45.3
0.69	100	15.5	23.0	12.14	53.7
0.79	150	16.5	26.2	12.89	59.2
0.88	200	17.5	29.3	13.51	63.1
1.00	250	18.5	32.6	13.94	66.0

*In order to achieve the highest possible thermal conductivities, only dry high silica content sand should be used.

SUPERFOAM

Advantages

SUPERFOAM liquid is more concentrated and is an economically viable alternative to regular foaming agents.

Methods of addition

- To use as a dust suppressor or to prevent bit balling in damp formations: Mix ¼ to ½ pints (0.11 to 0.23 L) per 50 gal (189 L) of water
- For mist drilling with moderate amounts of water intrusion: Mix 1 to 2 pints (0.5 to 0.95 L) per 50 gal (189 L) of water
- For foam drilling with excessive amounts of water intrusion: Mix 4 pints (1.89 L) of SUPERFOAM liquid per 50 gal (189 L) of water
- For slug drilling: Mix ¼ pint (0.11 L) in 2 gal (7.6 L) of water
- Stiff foams: To obtain desired viscosity, mix MAX GEL or POLY-PLUS* 2000 product in 50 gal (189 L) of water and stir in ½ gal (1.9 L) of SUPERFOAM liquid. Pump the slurry into the air stream at 7 to 10 gal (26.6 to 38 L) per min

Limitations

When used as recommended, there are no limitations imposed on this product.

Toxicity and handling

Bioassay information is available upon request.

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

Packaging and storage

SUPERFOAM liquid is packaged in 5 gal (18.9 L) buckets and 55 gal (208.2 L) drums.

Store in a well-ventilated area away from sources of heat or ignition.

Typical physical properties

Physical appearance	Clear liquid
Specific gravity	1.07
Solubility	100%

SUPERFOAM* agent is water-soluble and biodegradable. This material, designed exclusively for mineral and water-well drilling, has the ability to foam in fresh, brackish or salty waters.

Applications

Used in air-drilling applications, the SUPERFOAM product acts as a foaming agent. Based on the amount of product added and the injection rate, it can be used for dust suppression, mist, foam and stiff-foam drilling.

Advantages

- SUPER PLUG additive is an all-natural bentonite product
- Hydrates easily and sets efficiently

Limitations

Limitations are the same as for most bentonite products. High chlorides and calcium decrease the yield of this product.

Toxicity and handling

Bioassay information is available upon request.

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

Packaging and storage

SUPER PLUG additive is packaged in 50 lb (22.7 kg) multi-walled, moisture-resistant bags. It is also available in super sacks.

Store in a well-ventilated area away from sources of heat or ignition.

Method of addition

Mix one 50 lb (22.7 kg) bag of SUPER PLUG additive with 33 to 43 gal (125 to 163 L) freshwater. This mixture is pumpable with most pumping equipment available. Though progressive cavity or positive displacement pumps offer the best results, diaphragm or gear pumps can also be used.

Typical physical properties

Physical appearance	Light tan to gray powder
Specific gravity	2.45 to 2.55
pH	8.0 to 10.0 (5% aqueous suspension)
Solubility	Insoluble in water, forms colloidal suspension

SUPER PLUG* additive is a proprietary blend of bentonite, hydroxides and silicates. It is a 100% inorganic additive designed to minimize environmental impacts in hole-abandonment applications. SUPER PLUG additive is designed to offer superior sealing characteristics where low-permeability, flexible seals are required.

Applications

SUPER PLUG additive can be used to plug and abandon any type of drilled hole.

SUPER PLUG slurry at various solids content

SUPER PLUG lb (kg)	Water gal (L)	Density lb/gal (kg/L)	Fluid Loss cm ³ (in ³)	Solids Content
50 (22.7)	33 (125)	9.2 (1.10)	8.9 (.54)	15.4%
50 (22.7)	43 (163)	9 (1.08)	13 (0.8)	12.1%

TACKLE



Certified to
NSF/ANSI 60

Advantages

An effective deflocculant in freshwater, KCl and seawater fluids:

- Thermally stable to >400°F (>204°C)
- Not subject to bacterial degradation
- Effective in weighted or unweighted fluids and compatible with both non-dispersed and dispersed systems
- Works well as a deflocculant in POLY-PLUS polymer mud systems
- Compatible with most common mud additives
- A concentrated liquid thinner, easily added to the mud system through the mud hopper or directly into the surface system

Limitations

Highly anionic additive precipitated by high concentrations of divalent cations such as calcium and magnesium. Total hardness must be maintained below 200 mg/L with soda ash.

- Should not be used in calcium systems such as lime, gyp or untreated seawater muds that have high soluble calcium
- Effectiveness is limited in high-solids mud
- Initial treatments with TACKLE additive can actually increase viscosity when the concentration is very low, ~0.1 lb/bbl (~0.3 kg/m³). Dilution to reduce the solids, in conjunction with continued treatments with TACKLE additive, reduces viscosity
- Pilot tests are recommended prior to treating with this product

Toxicity and handling

Bioassay information is available upon request.

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

Packaging and storage

TACKLE liquid polymer is packaged in 5 gal (18.9 L) cans.

Store in a well-ventilated area away from sources of heat or ignition.

Typical physical properties

Physical appearance	Amber to brown liquid
Specific gravity	1.2 to 1.3
Flash point	>212°F (>99°C) (PMCC)

TACKLE* liquid polymer is a low-molecular-weight, anionic thinner designed to deflocculate a wide range of water-base drilling fluids. This concentrated aqueous product has proven itself in applications from the surface to total depth. While it is frequently used as a shallow-hole thinner to knock the “fluff” out of spud mud, it also maintains effective performance in more complex systems. This synthetic additive has a high temperature limit and is not subject to bacterial degradation.

Applications

TACKLE liquid polymer is an effective additive for reducing and stabilizing viscosity in a wide range of systems. It is most effective in freshwater fluids that are low in soluble calcium. TACKLE polymer is used most often in high-temperature applications and in low-solids, non-dispersed, polymer muds such as the POLY-PLUS system. Normal treatments range from 0.1 to 2 lb/bbl (0.3 to 5.7 kg/m³).

TUBE LUBE

Advantages

- TUBE LUBE paste lubricates the inner tube, which allows highly fragmented or unconsolidated cores to enter easily and not be lost to the hole after coring
- Reduces core-removal time

Toxicity and handling

Bioassay information is available upon request.

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

Packaging and storage

TUBE LUBE paste is packed in 3 gal (11.4 L) buckets.

Method of addition

To lubricate the inner core tube, put a ball of TUBE LUBE paste inside the inner core barrel prior to running into the core barrel. The lubricating ability of TUBE LUBE additive can be increased by coating the ball with a polymer, such as POLYPAC* additive, prior to inserting the ball into the inner tube. TUBE LUBE paste can be added to the drilling fluid to increase the lubricity. For most applications, the concentration of this product is 0.5 to 1.5% by volume. At this concentration 1.5 to 4.5 gal (5.7 to 17.1 L) of TUBE LUBE paste per 300 gal (1,135 L) of fluid is required to build the proper ratio. Some cases can require more paste. The quantity depends on the mud type and drilling characteristics.



Typical physical properties

Physical appearance	Brown opaque paste
Odor	Faint soap
pH	9.5
Solubility	100%

TUBE LUBE* paste is brown and opaque. Since TUBE LUBE paste is made completely of natural fatty acids, it is 100% biodegradable and non-toxic.

Applications

TUBE LUBE paste is used to lubricate the inner core barrel and core to facilitate core entry and removal. TUBE LUBE additive provides increased lubricity to water-base drilling fluids. It can be used as a maintenance addition or can be added when torque and drag become a problem. TUBE LUBE paste is especially applicable in high-angle, exploratory drilling to reduce bit wear and increase effective bit weight.

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