Mi SWACO
A Schlumberger Company

HDD Mining & Waterwell

Product listing and applications

Version 3

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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, on site 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 150–1,000 GPM (568–3,785 L/min). In addition, we manufacture shaker screens that are compatible with every brand of solids-control equipment in the industry.

HDD Mining & Waterwell Products:

Product Summaries

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-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
PLATINUM ROD EASE	A superior lubricant for HDD, coring and rotary drilling applications.
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 COAT L 1000	A high-performance lithium 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/m³
	■	■	■	■	10:1 ratio with Max Gel		
	■				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/m³
		■	■	■	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/m³
	■	■	■	■	1–4 qts/100 gal		2.5–10 L/m³
	■	■	■	■	0.5–2	0.25–1	0.75–2.75
	■	■	■	■	0.5–4	0.25–1.5	0.75–4
	■	■			0.5–2 qts/100 gal		1.5–5 L/m³
	■	■	■		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/m³
		■		■	0.5–1 qts/100 gal		1.5–2.5 L/m³
		■		■	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/m³
		■			As required		
		■			As required		
	■	■			0.5–2 qts/100 gal		1.5–5 L/m³
			■	■	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/m³
		■			As required		

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

HDD Mining & Waterwell Products:

DRILPLEX HDD

Certified to NSF/ANSI 60

Typical physical properties

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

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 7 lb (3.2 kg) of DRILPLEX HDD (3 vis cups) viscosifier and mix for an additional 5–10 min
- For torque reduction, add 1.5 gal (5.7 L) of ROD EASE† lubricant

Benefits

- 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.

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.

HDD Mining & Waterwell Products:

DUO-VIS/SUPER-VIS

Typical physical properties

Physical appearance	Cream-to-tan powder
Specific gravity	1.5
Bulk density	50 lb/ft³ (800 kg/m³)

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.

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.

Benefits

- 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

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

Packaging and storage

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

SUPER-VIS product is packaged in 1-gal (3.8L) buckets (5 lb [2.3 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.

HDD Mining & Waterwell Products:

FLO-PLEX

Typical physical properties

Physical appearance	White powder
pH (4% water)	9.5–10.5
Solubility in water	Soluble
Bulk density	35–40 lb/ft³ (560–640 kg/m³)

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.

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.

Benefits

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

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 from 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.

Limitations

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

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.

Certified to NSF/ANSI 60

HDD Mining & Waterwell Products:

GEL SUPREME

Benefits

- 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.
- Small particle size, unique flat shape and high surface area provides superior filtration characteristics
- Promotes the deposition of thin compressible, filter cakes in the wellbore

Typical physical properties

Physical appearance	Light tan/gray-green powder
Specific gravity	2.3–2.6
Bulk density	48–52 lb/ft³ (769 – 833 kg/m³)

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 cm³, 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.

Limitations

Performance reduced in salty (>5,000 mg/L C1–) or hard (>240 mg/L Ca++) waters due to decreased hydration.

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 amounts of Gel Supreme additions added to freshwater

Drilling application/desired results	lb/100 gal	lb/bbl	kg/m³
Normal drilling	50–70	20–30	60–85
In gravel or other poorly consolidated formation	70–95	30–40	85–115
Lost-circulation control	105–30	45–55	125–155
Added to freshwater mud to improve hole-cleaning properties, increase hole stability and develop thin filter cakes	45	20	55

HDD Mining & Waterwell Products:

GOPHER GROUT

NSF Certified to NSF/ANSI 60

Benefits

- Inorganic, non-fermenting and non-toxic
- Develops lower-solids slurries up to 20% total active solids
- 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

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

Limitations

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

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.

Gopher Grout slurry at various solids content

Gopher Grout lb (kg)	Water gal (L)	Solids content %	Usable 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

Typical physical properties

Physical appearance	Clear, blue liquid
Specific gravity	1.1
pH (1% solution)	6.5–8.5
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/m^3) with 2–5 lb/bbl (5.7–14.3 kg/m^3) of prehydrated bentonite for filtration control.

Benefits

- Effective at all pH levels
- 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 CO_2

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/m^3) depending on hole size, rate of penetration, interval length and reactivity of the shale. A minimum concentration of 4 lb/bbl (11.4 kg/m^3) 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.

(Continued on next page)

HDD Mining & Waterwell Products:

KLA-GARD (Continued)

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)

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.

Certified to NSF/ANSI 60

HDD Mining & Waterwell Products:

KWIK-PLUG FINE & MICRO

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/ft^2 (4.88 to 9.76 kg/m^2), 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 1–2 lb (0.5–0.9 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.

Benefits

- 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.

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.

HDD Mining & Waterwell Products:

KWIK-PLUG MEDIUM & COARSE

Certified to NSF/ANSI 60

Typical physical properties

Physical appearance	Beige to tan powder
Specific gravity	2.5–2.6
Permeability of resulting plug	1 x 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 (⅜ 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.

Benefits

- Prevents entry of surface water into boreholes
- Forms a permanent, flexible, downhole seal
- Allows hole re-entry
- More cost effective compared to pelletized bentonite

Applications

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

Limitations

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

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.

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/m^3) 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: 5–15 lb (2.25–6.75 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/m^3) 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 H_2S and CO_2 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 20–30 lb/bbl (57–86 kg/m^3) mixed in a slug of 100–200 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 2–10 lb/bbl (6–28 kg/m^3).

Limitations

Do not mix in oil muds.

Packaging and storage

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

HDD Mining & Waterwell Products:

MAX BORE HDD

Benefits

- 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

Typical physical properties

Physical appearance	Light tan/gray-green powder
Specific gravity	2.3–2.6
Bulk density	48–52 lb/ft³ (769–833 kg/m³)

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).

Limitations

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

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 amounts of MAX BORE HDD additions added to freshwater

Drilling application/desired results	lb/100 gal	lb/bbl	kg/m³
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

Certified to NSF/ANSI 60

HDD Mining & Waterwell Products:

MAX GEL

Typical physical properties

Physical appearance	Light tan/gray-green powder
Specific gravity	2.3–2.5
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

Benefits

- Yields more quickly than API-standard bentonite
- Non-toxic and proven suitable for use in drilling potable water wells
- Higher penetration rates 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.

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 amounts of Max Gel additions added to freshwater

Drilling application/desired results	lb/100 gal	lb/bbl	kg/m³
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

HDD Mining & Waterwell Products:

M-I GEL

Certified to NSF/ANSI 60

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 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 >75µ (wet screen)	4% wt, max.

M-I GEL† viscosifier is a premium-grade bentonite (a sodium montmorillonite clay) that will yield 91–100 bbl of 15-cP mud per ton (1.7 m^3/100 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.

Benefits

- Best for generating viscosity, developing gels for suspension and controlling filtration
- 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

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.

HDD Mining & Waterwell Products:

PLATINUM D-D

Benefits

- 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

Typical physical properties

Physical appearance	Light red liquid
Specific gravity	1.038
pH (1% solution)	7.5–8.5
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/m^3) and provide satisfactory performance under most conditions. In severe gumbo shale areas, 4–6 lb/bbl (11.4–17.1 kg/m^3) 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.

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.

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.

HDD Mining & Waterwell Products:

PLATINUM FOAM PLUS

Certified to NSF/ANSI 60

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	7.5–8.5 (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.

Addition methods

- To use as a dust suppressor or to prevent bit balling in damp formation: Mix ⅓–¾ pints (0.2–0.4 L) per 50 gal (189 L) of water
- For mist drilling with moderate amounts of water intrusion: Mix 1.5–3 pints (0.8–1.5 L) per 50 gal (189 L) of water

Benefits

- 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

- 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 7–10 gal (26.6–38 L) per min. POLY-PLUS polymer may be substituted for POLY-PLUS 2000 polymer

Limitations

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

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.

Certified to NSF/ANSI 60

HDD Mining & Waterwell Products:

PLATINUM PAC

Typical physical properties

Physical appearance	White or off-white powder
Ionic character	Anionic
Bulk density	0.64–9.0 g/cm³
pH (1% solution)	6.5–9.0

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.

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

Benefits

- 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

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.

HDD Mining & Waterwell Products:

PLATINUM PAC UL

Certified to NSF/ANSI 60

Typical physical properties

Physical appearance	White, free-flowing powder
Specific gravity	1.5–1.6
pH (1% solubility)	6.5 –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 m^3).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/m^3).

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.

Benefits

- 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

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.

PLATINUM ROD EASE

Typical physical properties

Physical appearance	Dark brown liquid
Specific gravity	0.88–0.9
pH	7.0–8.0 (1% solution)
Pour point	-9°C (15° F)
Flash point	>121° C (>250°F)

PLATINUM 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 PLATINUM 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. PLATINUM ROD EASE lubricant is also effective in lubricating the drill rods in wireline coring operations.

Applications

PLATINUM ROD EASE lubricant mixes instantly and is not affected by water quality. For this product to deliver effective 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. Initial 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 0.473 to 0.946 l (1 to 2 pints) per 378.5 l (100 gal) of drilling fluid. The dosage amount should be increased if the penetration rate decreases, torque increases, or the run length decreases indicating poor cutting.

Benefits

- Reduces torque and drag
- 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
- Reduces jacking forces

Limitations

None

Packaging and storage

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

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

HDD Mining & Waterwell Products:

POLYPAC R

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.

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 m^3). POLYPAC R polymer also develops viscosity to a degree that is dependent on the solids concentration, salinity and makeup water chemistry.

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.

Benefits

- 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

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.

POLYPAC UL

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/m^3). 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/m^3).

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.

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

Benefits

- 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

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.

HDD Mining & Waterwell Products:

POLY-PLUS

Certified to NSF/ANSI 60

Benefits

- 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
- 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

Typical physical properties

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

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 0.75–3 lb/bbl (2.1–8.5 kg/m³). It is also effective in salt muds, such as KCl- or NaCl-enhanced fluids, although slightly higher concentrations of POLY-PLUS polymer may be required.

Clear-water fluids

POLY-PLUS polymer can be used in clear-water, solids-free drilling fluids. The POLY-PLUS system increases viscosity and enhances solids removal by flocculating the undesired solids. It also provides cuttings encapsulation and improved wellbore stability.

This system is frequently used in slim-hole, continuous-coring applications. Adding 0.5–1.75 lb/bbl (1.4–5 kg/m³) enhances solids removal by flocculating solids.

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.

Typical amounts of Poly-Plus added to freshwater

Concentration[1] lb/bbl (kg/m³)	gal/bbl (L/m³)	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

[1] Based on 30% active material

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.

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.

HDD Mining & Waterwell Products:

POLY-PLUS 2000

Certified to NSF/ANSI 60

Benefits

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

Typical physical properties

Physical appearance	White liquid dispersion
Odor	Slightly hydrocarbon
Viscosity (typical)	200–500 cP
Specific gravity	1.06–1.08
pH (1% solution)	6.5–7.5
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 (1–3 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 (0.01–0.05 lb/bbl [0.028–0.14 kg/m^3]) 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. 1–2 vis cups (1–2 L) per 100 gal (378.5 L) of fluid.

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.

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.

HDD Mining & Waterwell Products:

POLY-PLUS EHV

Certified to NSF/ANSI 60

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)	6.0–8.0

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.

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 0.5–1 lb/bbl (1.4–2.9 kg/m^3) 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 0.05% solution of POLY-PLUS EHV acrylic copolymer into the flowline or just prior to any mechanical separation greatly enhances the removal of drill solids.

Benefits

- 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
- 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
- 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

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:
1.5–2 lb (0.7–0.9 kg) per 100 gal (378.5 L) water (0.6–0.8 lb/bbl [1.7–2.3 kg/m^3])

Unconsolidated formation:
2.5–3.5 lb (1.1–1.6 kg) per 100 gal (378.5 L) water (1–1.5 lb/bbl [2.9–4.3 kg/m^3])

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.

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.

HDD Mining & Waterwell Products:

POLY-PLUS LV

Certified to NSF/ANSI 60

Typical physical properties

Physical appearance	White, granular powder
Specific gravity	0.7
pH (0.5 % solution)	6.0–8.0
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 1–3 lb/bbl (3–9 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.

Benefits

- 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
- Provides improved shale stabilization
- Significantly lower screen-blinding potential compared to higher-molecular-weight encapsulators
- Does not negatively affect positive rheological profiles

Recommended treatment

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

Limitations

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

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 amounts of Poly-Plus LV added to freshwater

	lb/100 gal	lb/bbl	kg/m³
Bentonite-free drilling fluid	0.5–1.5	0.2–0.6	0.6–1.8
Added to MAX GEL viscosifier or MAX BORE HDD bentonite for inhibition	0.25–0.75	0.–0.3	0.3–1.0
Foam drilling (stiff foams)	0.5–1.0	0.2–0.4	0.6–1.2

HDD Mining & Waterwell Products:

POLY-PLUS RD

Benefits

- Readily dispersible and does not form "fish eyes"
- Excellent cuttings encapsulator limits cuttings dispersion
- Provides improved shale stabilization
- Highly concentrated product (>90% activity) reduces transportation costs and storage space requirements
- Aids in preventing balling on the bit

Typical physical properties

Physical appearance	White, granular powder
Odor	Slightly hydrocarbon
Specific gravity	1.25–1.40
pH (1% solution)	7.7
Bulk density	40–46 lb/ft³ (641–737 kg/m³)
Nature of charge	Anionic
Activity	>90%

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.

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– lb/bbl (0.71–2.85 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

(Continued on next page)

Typical properties of POLY-PLUS RD in freshwater

Concentration lb/bbl (kg/m³)	PV cP	YP lb/100 ft²	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

HDD Mining & Waterwell Products:

POLY-PLUS RD (Continued)

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.

Addition methods

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

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 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

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.

HDD Mining & Waterwell Products:

POLYSWELL

Typical physical properties

Physical appearance	White powder
Specific gravity	0.8–1.0
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.

Addition methods

POLYSWELL additive can be mixed in water or drilling mud with or without LCM. Add 1–3 lb (0.5–1.5 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.

Benefits

- 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.

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.

HDD Mining & Waterwell Products:

RINGFREE

Certified to NSF/ANSI 60

Typical physical properties

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

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.

Addition methods

- Bit balling/mud rings: Use ½ vis cup (0.5 L) per 300 gal (1,135 L) of fluid up to 0.5–1.5 gal (1.9–5.7 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

Benefits

- 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.

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.

HDD Mining & Waterwell Products:

ROD COAT B 700

Typical physical properties

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

Benefits

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

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 ½ 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.

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.

Packaging and storage

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

HDD Mining & Waterwell Products:

ROD COAT L 1000

Typical physical properties

Physical appearance	Fibrous semi-solid
Solubility	Nil
Specific gravity at 61°F (16°C)	0.926

ROD COAT† L 1000 high-performance, lithium-base drill-rod grease reduces rod vibration.

Applications

ROD COAT L 1000 grease is used primarily to reduce rod vibration, especially in holes with lower water tables.

Addition methods

To improve lubricity and reduce rod vibration, apply ROD COAT L 1000 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 ½ in. (12.7 mm) of ROD COAT L 1000 grease to the exterior of the rods. This puts a layer of grease on the walls of the hole, which improves stability.

Benefits

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

Limitations

ROD COAT L 1000 grease has a hydrocarbon base and does not degrade. Use of ROD COAT L 1000 grease should be limited to areas that are not environmentally sensitive.

Packaging and storage

ROD COAT L 1000 grease is supplied in 5 gal (18.9 L) buckets.

HDD Mining & Waterwell Products:

ROD EASE

Typical physical properties

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

Benefits

- 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

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

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.

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 1–2% of fluid volume or 1–2 pints (0.473–0.946 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.

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.

HDD Mining & Waterwell Products:

SMOOTH GROUT 20

Certified to NSF/ANSI 60

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.

Benefits

- 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

Applications

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

Addition methods

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.

SMOOTH GROUT 20 slurry at various solids content

Smooth Grout 20 lb (kg)	Water gal (L)	Solids content %	Usable 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

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.

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.

HDD Mining & Waterwell Products:

SMOOTH GROUT 30

NSF Certified to NSF/ANSI 60

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.

Benefits

- 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

Applications

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

Addition methods

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.

SMOOTH GROUT 30 slurry at various solids content

SMOOTH GROUT 30 lb (kg)	Water gal (L)	Solids content %	Usable 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

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.

Limitations

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

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.

HDD Mining & Waterwell Products:

SMOOTH GROUT THERMAL

Certified to NSF/ANSI 60

Typical physical properties

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

SMOOTH GROUT THERMAL† high-solids bentonite 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.

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.

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 (1–2 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 5–15 gal/min (18.9–56.8 L/min).

Limitations

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

Packaging and storage

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

Benefits

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.

Typical properties

Thermal Conductivity Btu/hr ft °F	Silica[1] 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

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

HDD Mining & Waterwell Products:

SUPER PLUG

Typical physical properties

Physical appearance	Light tan to gray powder
Specific gravity	2.45–2.55
pH	8.0–10.0 (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.

Benefits

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

Addition methods

Mix one 50 lb (22.7 kg) bag of SUPER PLUG additive with 33–43 gal (125–163 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.

Limitations

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

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.

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%

HDD Mining & Waterwell Products:

TACKLE

Certified to NSF/ANSI 60

Typical physical properties

Physical appearance	Amber to brown liquid
Specific gravity	1.2–1.3
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).

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

Benefits

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

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.

HDD Mining & Waterwell Products:

TUBE LUBE

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.

Benefits

- 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

Addition methods

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 0.5–1.5% by volume. At this concentration 1.5–4.5 gal (5.7–17.1 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.

Packaging and storage

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

MD-2 Dual-Deck Shale Shaker

The uniquely engineered MD-2 dual flat-deck shaker with DURAFLO† composite screen technology has taken the solids control process to an entirely new level of efficiency.

In providing primary solids removal from both oil and water-base drilling fluids, the MD-2 dual-deck shaker delivers high-capacity separation efficiency and operational flexibility in a value-added footprint. Capable of easily switching between balanced elliptical and progressive elliptical motions, the MD-2 shaker adapts instantly to the continual changes in drilling conditions.

To further enhance its performance the dual-deck MD-2 shale shaker is engineered to unlock the full solids control potential of the strong and efficient M-I SWACO DURAFLO family of composite-frame screens. Compared to conventional shaker screens, the productive life of our DURAFLO pre-tensioned composite screens is considerably longer and the overall screening area appreciably larger.

The extended useful life of composite screens in tandem with the higher capacity of a single dual-bed, flat-deck shaker assures a cost-effective and high-performing solids control package.

Features

- Dual-deck design with full primary and half-width scalping decks
- Progressive and balanced modes of elliptical motion
- Durable pretension composite screens
- Small footprint design
- Flexible fluid distribution
- Modular platform
- Select components are fabricated with durable stainless steel materials
- Adjustable deck angles
- +7 G's operating mode
- Can accommodate most gas detection devices
- Two screen vibratory motors
- Pneumatic screen clamping/ sealing system
- Vapor recovery hoods
- CE compliant

Benefits

- Delivers high processing capacities
- Adjusts instantly to changing drilling conditions
- Provides longer screen life
- Generates drier cuttings
- Enhances overall solids control efficiencies
- Conveys solids quickly out of fluid pool
- Deceases NPT
- Fits restricted space requirements
- Promotes easy deck adjustments
- Requires only marginally more power than single-deck unit
- Removes harmful vapors
- Reduces maintenance
- Lowers solid waste volumes
- Reduces drilling, waste disposal costs
- Helps ensure environmental compliance
- Raises HSE profile

Key features

Open access to easily inspect scalping and primary deck screens

Two oilfield proven 3.7 HP motion generators

U-shape screen clamping actuators designed with continuous toggle to allow installation from discharge end of shaker

Deck angle can be adjusted while processing fluid. Adjustment Range:

- Scalping deck: -1˚ to +3˚
- Primary deck: +3˚ to +7˚

Composite lightweight MD series screens with self latching mechanism and integrated seal with the following gross screen area:

- Scalping deck: 16.9 ft squared (1.6 m^2)
- Primary deck: 33.9 ft squared (3.1 m^2)

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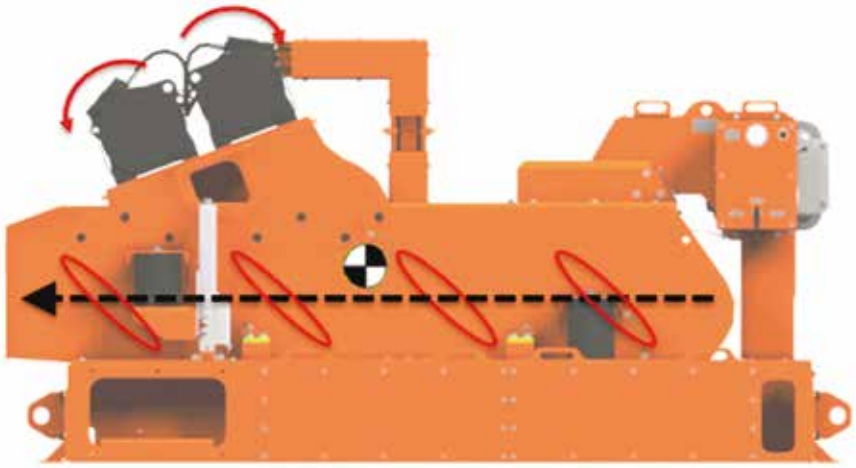
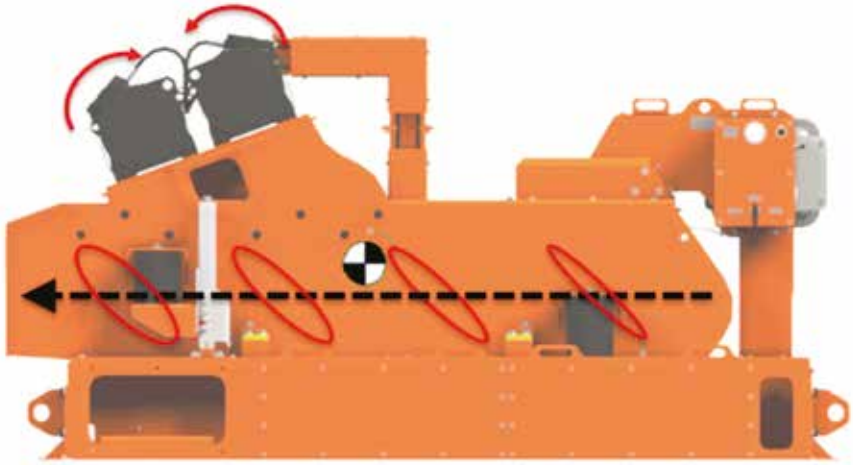
MD-2 Dual-Deck Shale Shaker (Continued)

Comparison of motion



Balanced Elliptical Motion

- Balanced elliptical motion +7.0 Gs
- Speeds conveyance
- Increases shaker-fluid capacity
- Enables shaker to process heavier solids loads
- Enhances cuttings-processing volume



Progressive Elliptical Motion

- Progressive elliptical motion 6.5 Gs
- Speeds conveyance
- Increases shaker-fluid capacity
- Enables shaker to process heavier solids loads
- Enhances cuttings-processing volume

Basic technical specifications

Dimensions

- Length: 125.0 in. (3,175 mm)
- Width: 74.7 in. (1,898 mm)
- Height at 0°: 63.5 in. (1,613 mm)
- Weir height: 39.8 inch (1011 mm)
- Weight: 6,200 lbs (2,812 kg)

Screen Deck and Screens

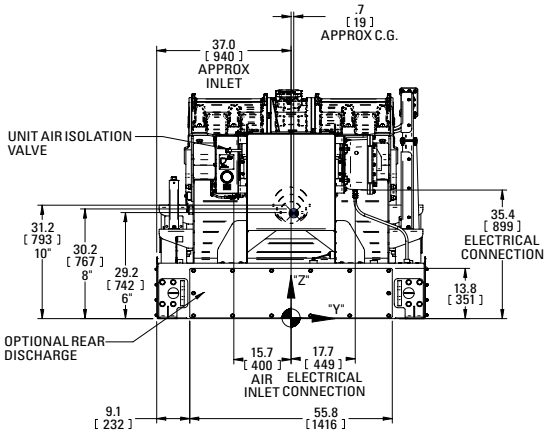
- Gross screen area:
  - Scalping deck: 16.9 ft² (1.6 m²)
  - Primary decks: 33.9 ft² (3.1 m²)
- Net (API) surface area:
  - Scalping deck: 10.6 ft² (1.0 m²)
  - Primary decks: 21.1 ft² (2.0 m²)
- Deck-adjustment system:
  - Scalping deck: +3° to -1°
  - Primary decks: +3° to +7°

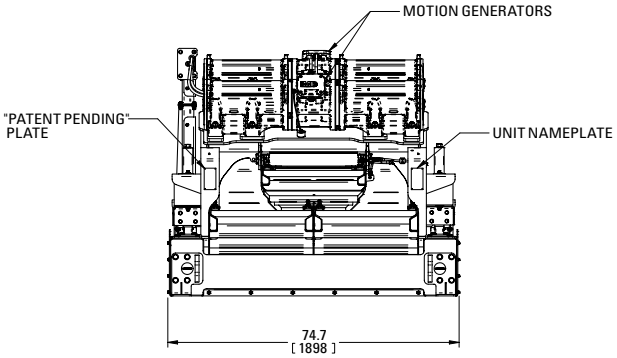
Vibratory Motion Type

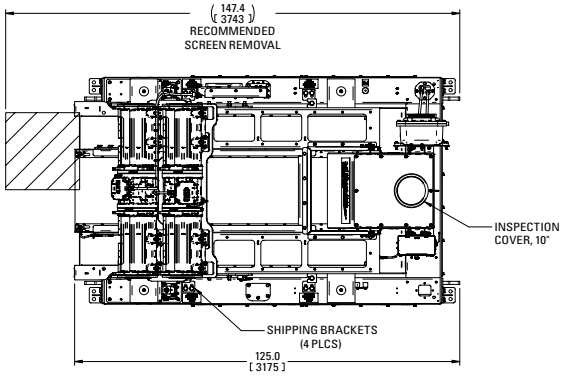
- Normal mode: 6.5 G
- Capacity mode: +7.0 G

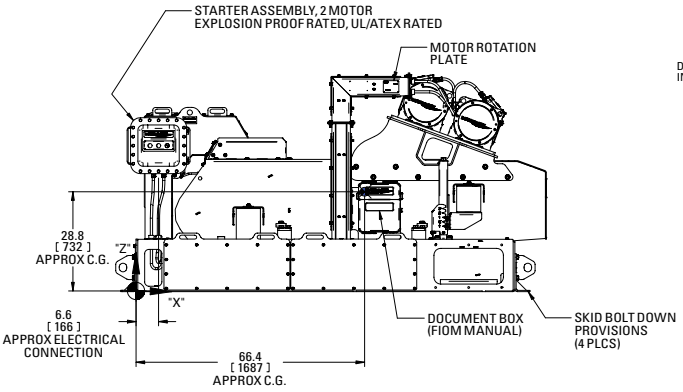
Motor Specifications

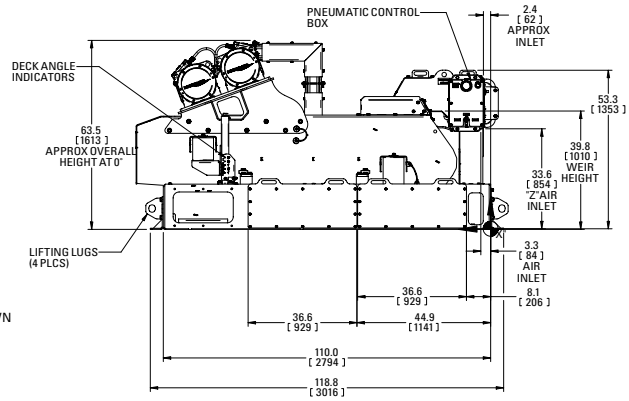
- Voltage: 220-690 VAC
- Speed: 1800RPM/60Hz; 1500RPM/50Hz
- Certifications: UL/cUL, CE, ATEX rated











MD-3 Triple-Deck Shale Shaker

Changing drilling conditions require immediate, flexible solids-control solutions. Environmental requirements demand up-to-the-minute conformance with ever stricter criteria. Rig space, especially offshore but also onshore, is at an all-time premium as more and more technology crowds the working environment.

The MD-3 shale shaker lets you meet all of these challenges — small footprint, the most effective solids-control options and the ability to adapt quickly to changing drilling conditions — with a compact, high-performance solution.

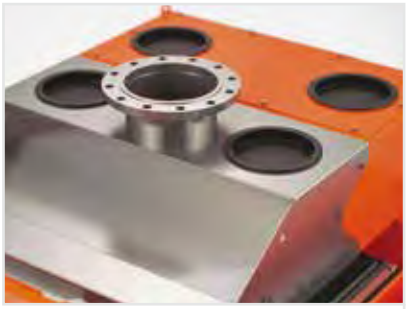
Features

- Dual motion: 7.2 G capacity mode or 6.3 G normal mode
- Three-deck configuration
- Pneumo-hydraulic controls on front of shaker provide deck adjustment
- Configured to all common power supply requirements
- Standard integral fume extraction hood
- Standard spray bar for scalping deck
- Pre-tension, lightweight composite screens (<15 lbs [6.8 kg])
- Modular bolting provisions
- Front-loaded screens
- Pneumatic screen clamping system with controls mounted on front of shaker
- Screen bed with sloped bottom
- Designed to HSE-driven standards

Benefits

- Increases fluid capacity and solids control
- Maximizes fluid recovery
- Maximizes screen life
- Decreases space requirements
- Reduces mud losses from screens
- Promotes flexible shaker configurations
- Recovers loss circulation, wellbore strengthening materials
- Replaces multiple shakers
- Allows for easy screen changes
- Provides safer, faster screen changes
- Decreases maintenance requirements
- Increases process capacity
- Delivers drier cuttings
- Reduces costs

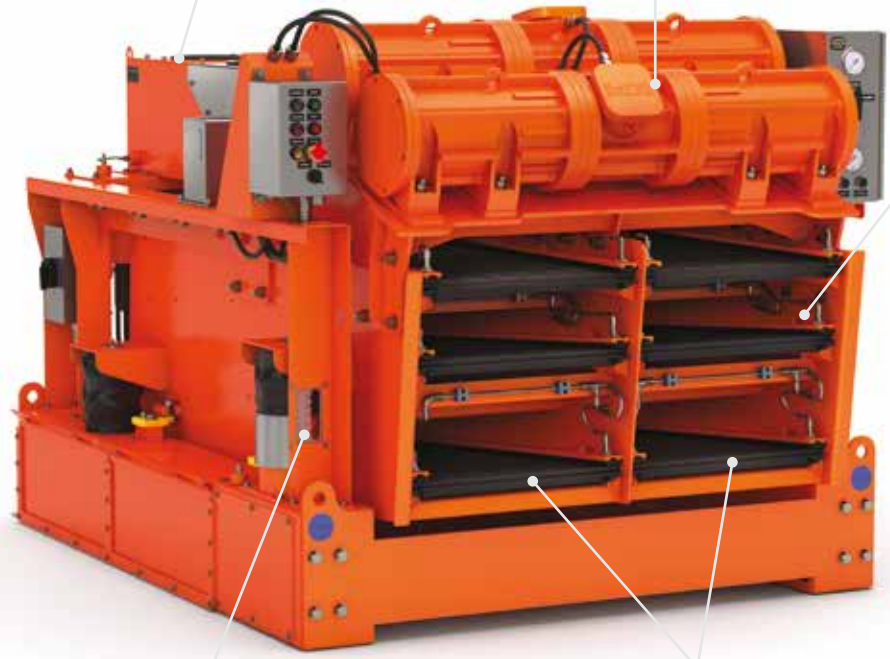
Key features



Fluid is split into four streams on top flowback pan and is directed to primary decks through four rear ducts

Two state-of-the-art, oilfield proven 3.7-HP motion generators with 1,800 rpm maximum speed

Screen-clamping actuators designed with continuous toggle to allow installation from discharge end of shaker



Deck angle can be adjusted while processing fluid. Adjustment range:

- Scalping deck: +3˚ to -1˚
- Primary decks: +8˚ to +4˚

Standard configuration has one scalping deck and two primary decks. Pre-tensioned, composite scalping screens have the following gross screen areas:

- Scalping deck: 25.4 ft² (2.4 m²)
- Primary decks: 50.8 ft² (4.7 m²)

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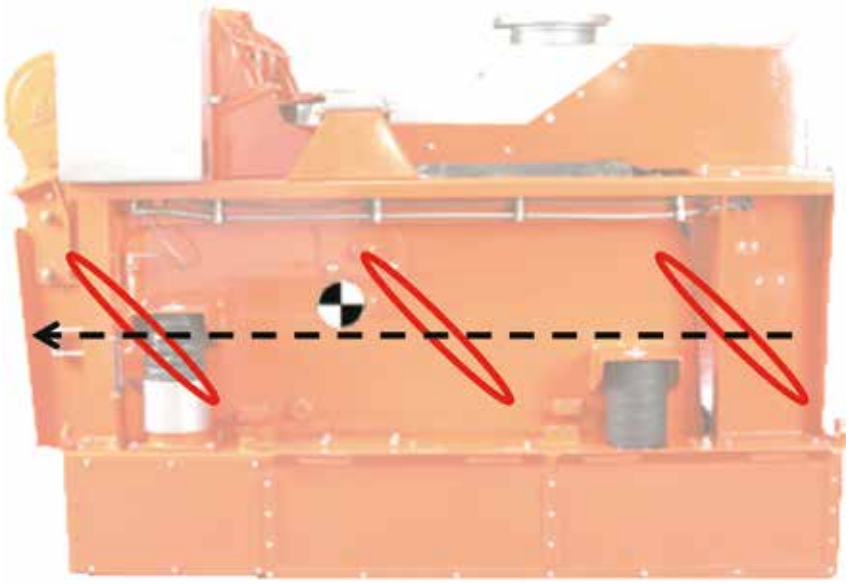
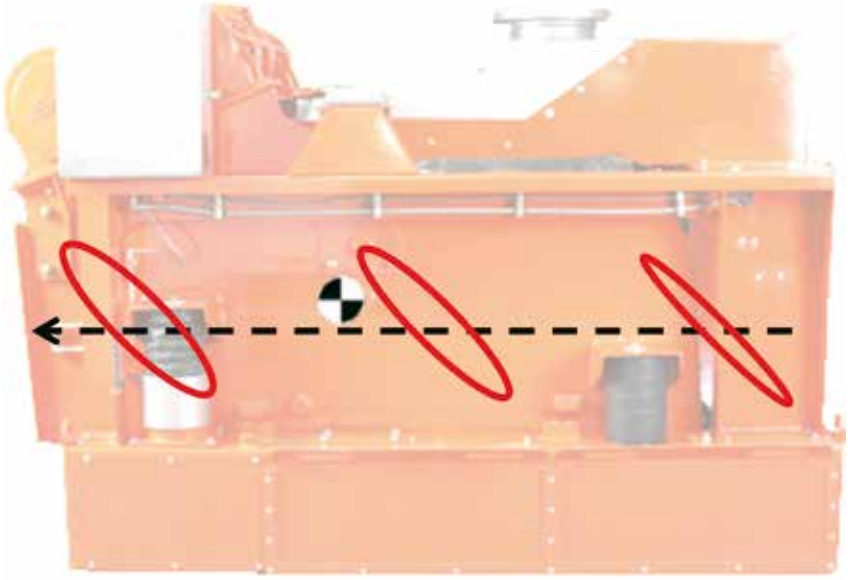
MD-3 Triple-Deck Shale Shaker (Continued)

Comparison of motion



Balanced Elliptical Motion

- Balanced elliptical motion 7.2 Gs
- Speeds conveyance
- Increases shaker-fluid capacity
- Enables shaker to process heavier solids loads
- Enhances cuttings-processing volume



Progressive Elliptical Motion

- Reduces G-forces (6.3 Gs maximum)
- Optimizes solids removal
- Maximizes drilling-fluid recovery
- Drier cuttings
- Extends screen life

Basic technical specifications

Dimensions (Parallel Mode)

- Length: 103.2 in. (2,621 mm)
- Width: 77.4 in. (1,967 mm)
- Height at 0°: 67.7 in. (1,720 mm)
- Weir height: 45.5 in (1,156 mm)
- Weight: 6,450 lb (2,926 kg)

Dimensions (Series Mode with Recovery Trough)

- Length: 113.5 in. (2,882 mm)
- Width: 77.4 in. (1,967 mm)
- Height at 0°: 67.7 in. (1,720 mm)
- Weir height: 45.5 in (1,156 mm)
- Weight: 6,780 lb (3,075 kg)

Screen Deck and Screens

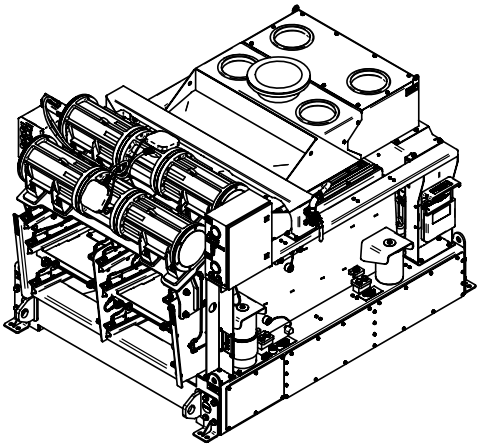
- Gross screen area:
  - Scalping deck: 25.4 ft² (2.4 m²)
  - Primary decks: 50.8 ft² (4.7 m²)
- Net (API) surface area:
  - Scalping deck: 15.8 ft² (1.5 m²)
  - Primary decks: 31.7 ft² (2.9 m²)
- Deck-adjustment system:
  - Scalping deck: +3° to -1°
  - Primary decks: +4° to +8°

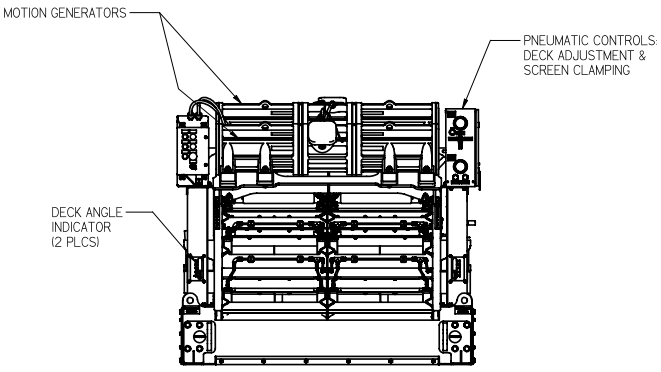
Vibratory Motion Type

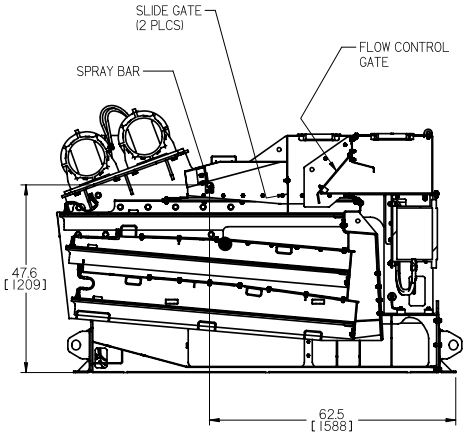
- Normal mode: 6.3G
- Capacity mode: 7.2G

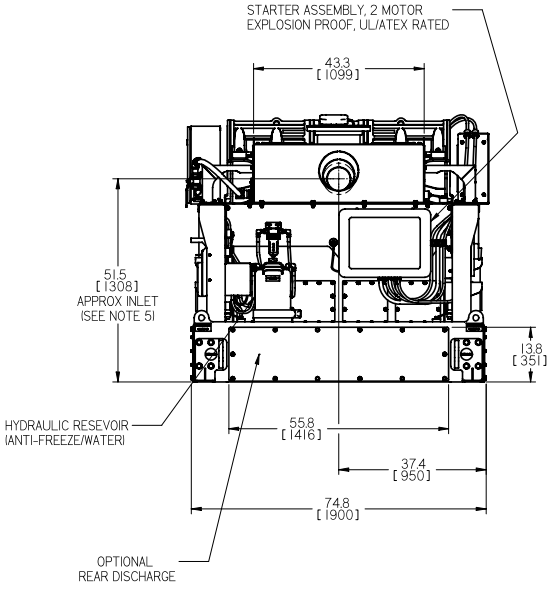
Motor Specifications

- Voltage: 220–690 VAC
- Speed: 1800RPM/60Hz; 1500RPM/50Hz
- Certifications: UL/cUL, CE, ATEX rated









Available configurations

- Series mode for applications where Wellbore Strengthening Materials are used
- Parallel mode fore increased fluid capacity
- Mud cleaner using two or three 12" D-SANDER† cones and six, eight, or ten 4" D-Silter twin cones

MONGOOSE PRO Shale Shaker

With the new generation MONGOOSE PRO dual-motion shale shaker, M-I SWACO has combined balanced and progressive elliptical motion technology for a shaker that adapts as drilling conditions change.

As drilling conditions change, the evolutionary MONGOOSE PRO dual-motion shaker can be adjusted while operating. Simply flipping a switch on the control box reconfigures the shaker from Capacity to Normal Mode.

Features

- Dual motion: 7.5 G capacity/ 6.5 G normal
- Single switch controls motion changes during operation
- Utilizes pre-tension composite screens
- Patented ultra-tight seal between screen and screen bed
- Largest net (API) screen area among shakers of similar footprint
- Increased screen visibility
- Can be aligned with up to four shakers
- Comparatively small footprint
- Patented high-capacity distribution box
- Heavy duty, reliable, mechanical deck adjustment system
- Corrosion resistant deck jacks
- Low weir height

Benefits

- Increases fluid capacity and solids conveyance rate when operating in capacity mode
- Maximizes fluid recovery and screen life when operating in normal mode
- Allows for continuous shaker operations when switching between motions
- Facilitates fast screen change out
- Eliminates costly solids bypass
- Promotes safer screen changes and inspections
- Minimizes maintenance costs
- Reduces dilution, chemical requirements
- Recovers valuable drilling fluid for reuse
- Reduces waste stream
- Lowers costs
- Improves environmental performance

Patent No. 7,150,358 (Screen Seal MONGOOSE and MEERKAT)
Patent Nos. 6,485,640. 6,746,602. 6,838,008. (Distribution Box MONGOOSE and MEERKAT)

Key features

Increased access for inspection, installation, and removal of screens

Two oilfield proven 2.5 HP motion generators

Patented ultra-tight seal between screen and screen bed

Deck angle can be adjusted while processing fluid. Adjustment Range is -3° to +3°

Largest non-blanked screen area among shakers of similar footprint: 21.2 ft² (1.97 m²)

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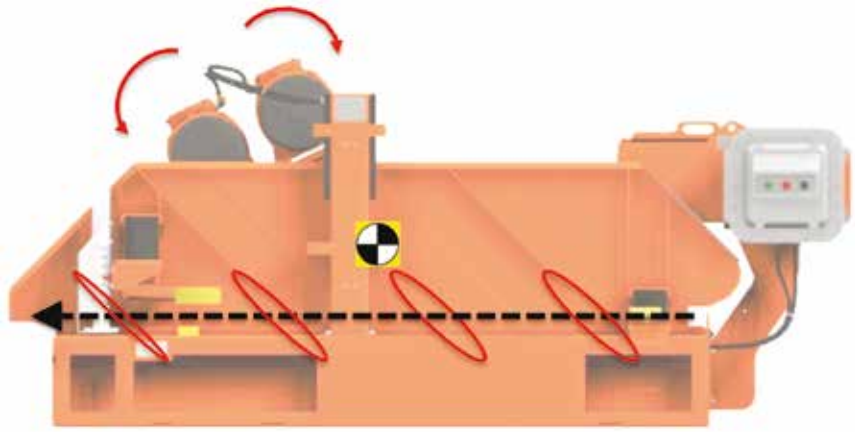
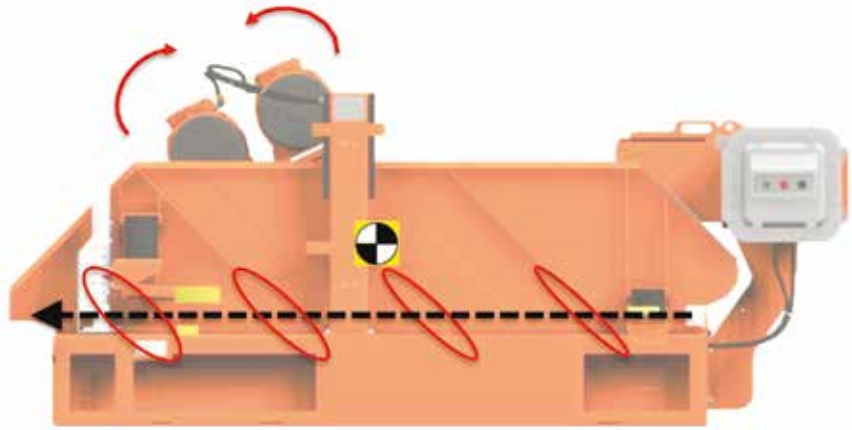
MONGOOSE PRO Shale Shaker (Continued)

Comparison of motion



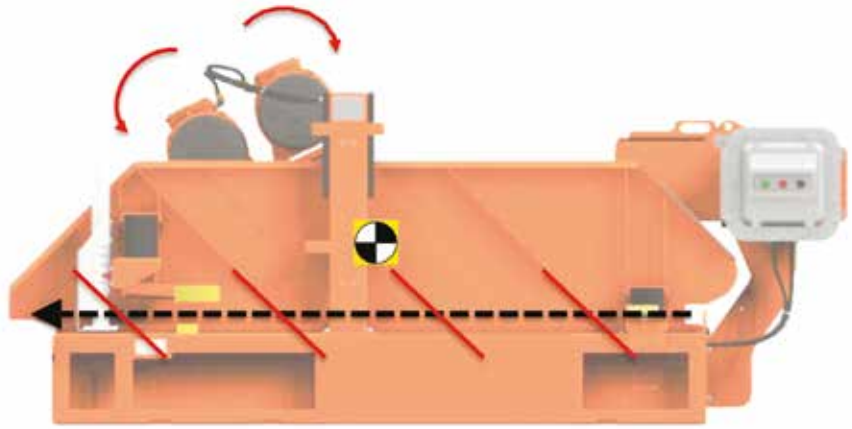
Capacity Mode

- Increases G-forces 7.5 Gs
- Speeds conveyance
- Increases shaker-fluid capacity
- Enables shaker to process heavier solids loads
- Enhances cuttings-processing volume



Normal Mode

- Reduces G-forces (6.5 Gs)
- Optimizes solids removal
- Maximizes drilling-fluid recovery
- Drier cuttings
- Extends screen life



Linear Motion

(Configuration available on special request)

- Linear motion only (8 Gs)
- Applications where a linear single motion high G shaker is required

Basic technical specifications

Dimensions

- Length: 119.8 in (3,044 mm)
- Width: 68.9 in. (1,749 mm)
- Height at 0°: 52.4 in. (1,330 mm)
- Weir height: 29 in. (737 mm)
- Weight: 3,300 lb (1,500 kg)

Screen Deck and Screens

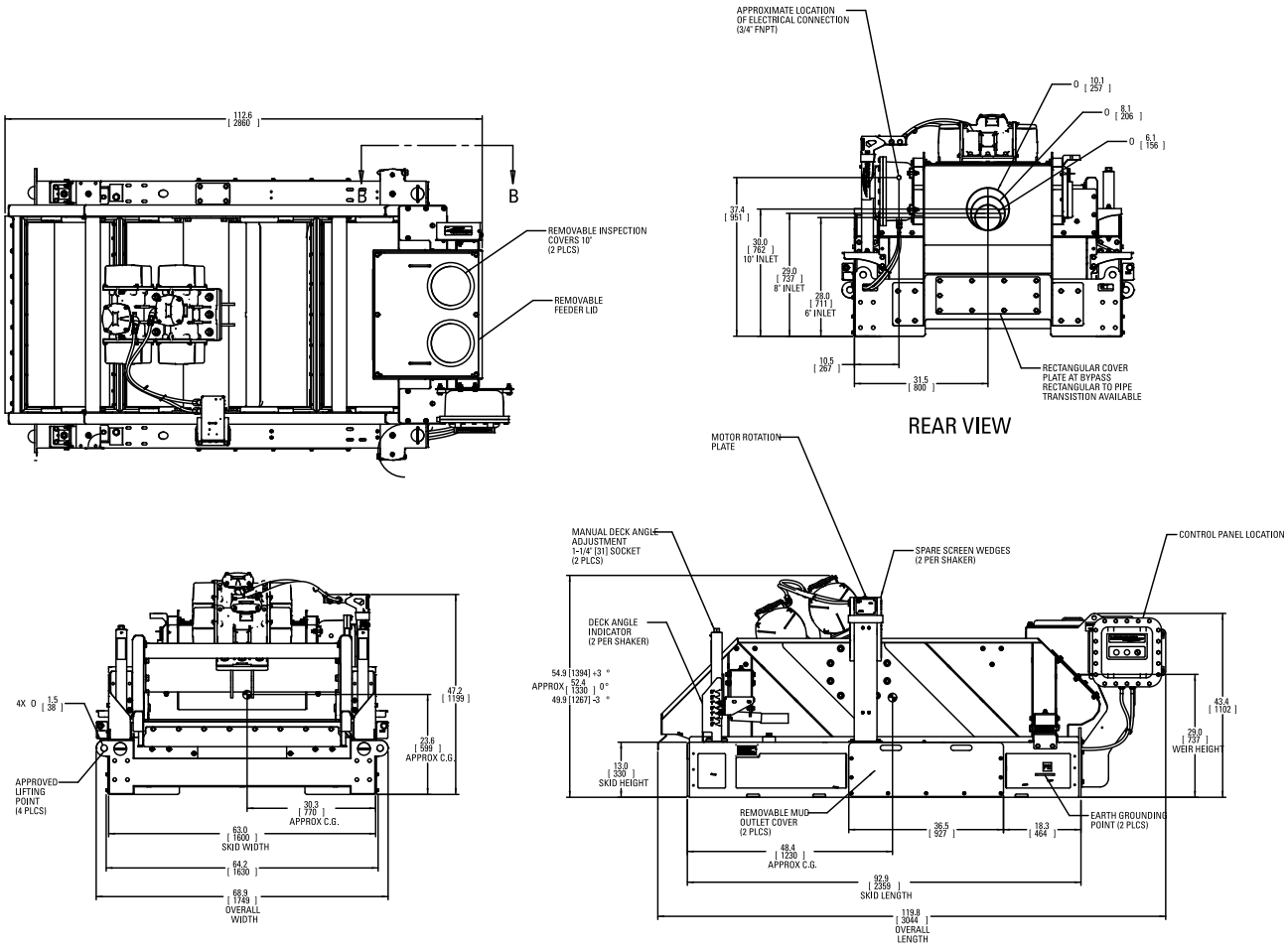
- Screen area:
  - Gross: 29.4 ft² (2.73 m²)
  - Net (API): 21.2 ft² (2.0 m²)
- Deck-angle adjustment: +2° to +8°

Vibratory Motion Type

- Normal mode: 6.5G
- Capacity mode: 7.5G

Motor Specifications

- Voltage: 220-690 VAC
- Speed: 1800RPM/60Hz; 1500RPM/50Hz
- Certifications: UL/cUL, CE, ATEX rated



Available configurations

- Low Profile skid for decreased weir height
- Dual, Triple, or Quad shakers mounted on a single skid with a common feed and single lift point
- Mud cleaner using two or three 12" D-SANDER† cones and six, eight, or ten 4" D-SILTER† twin cones

MEERKAT PT Shale Shaker

M-I SWACO has combined linear and balanced elliptical motion technology to create the revolutionary MEERKAT PT† dual-motion shaker. The design incorporates a 0.6 hp vibrator motor that allows it to perform on an unparalleled level.

But as drilling conditions change, the MEERKAT PT dual-motion shaker can be adjusted by simply flipping a switch on the control box to reconfigure the shaker from linear to balanced elliptical motion. There is no need to suspend or shut down operations. With the MEERKAT PT shaker operating in the gentler balanced elliptical mode, solids encounter reduced G-forces and longer screen residence time. This results in drier solids, improved drilling-fluid recovery, longer screen life and reduced operating costs.

Features and Benefits

- Units can be customized to meet both tight-space requirements and high-performance criteria
- All configurations are compact and modular
- Linear motion for fast conveyance and heavy loading; balanced elliptical motion for maximum retention time and drier cuttings
- Elliptical motion at the flip of a switch without stopping the shaker
- Balanced basket functions flawlessly in either linear or balanced elliptical mode, with dry, light loads or wet, heavy loads
- Most reliable mechanical jacking system in the industry — simple and easy to use; requires no pinning
- Unique distribution box option can replace flowline possum belly, providing increased handling capacity and dampening the velocity of fluid from the flowline
- Pre-tensioned composite screens for fast screen changes and overall ease of use
- Ultra-tight seal between screen and screen bed eliminates solids buildup and costly bypass of solids
- Largest net-usable screen area among shakers of similar footprint: 15.9 ft^2 (1.5 m^2)

Key features

Two 2.5 hp motion generators

Patented high capacity distribution box with low weir height

Dual motion: BalancedElliptical/Linear change at the "flip of a switch"

Largest non-blanked screen area among shakers of similar footprint: 21.2 ft² (1.97 m²)

Utilizes 3 MONGOOSE Composite screens

Patented ultra-tight seal between screen and screen bed

Heavy duty, reliable, mechanical deck adjustment system. Jacks with corrosion resistant coating.

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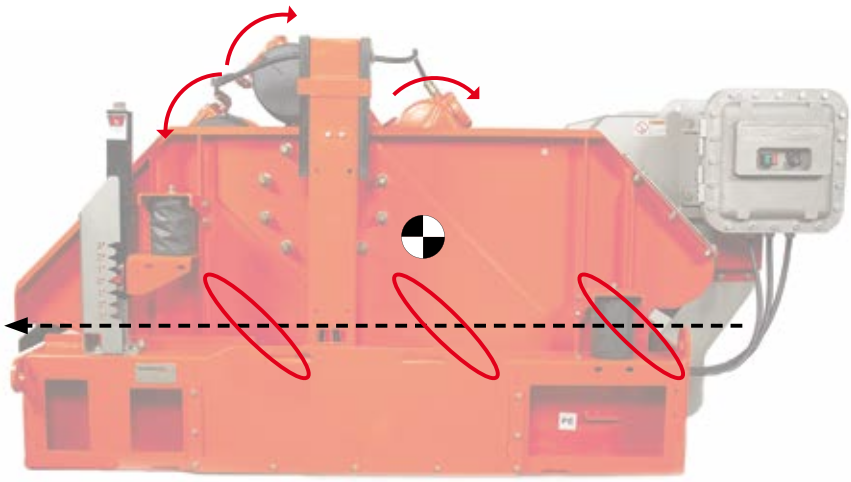
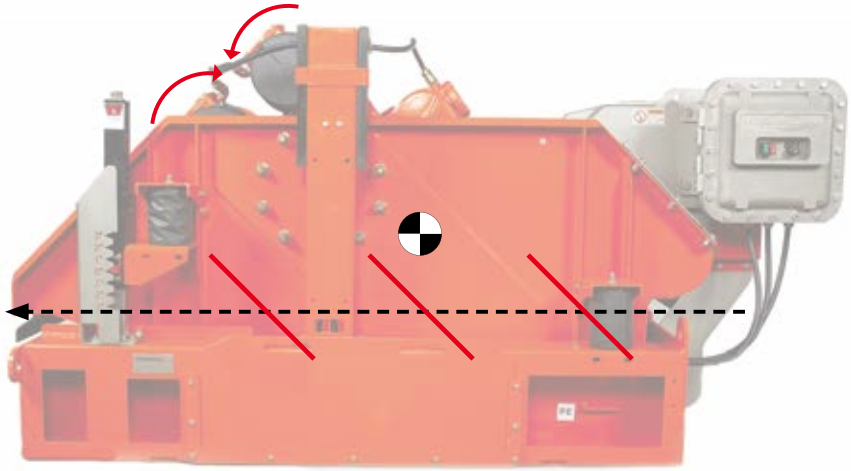
MEERKAT PT Shale Shaker (Continued)

Comparison of motion



Balanced Elliptical Motion

- Uniform elliptical motion at all points on basket
- Reduces G-forces (5.7 G's maximum)
- Optimizes solids removal
- Maximizes drilling-fluid recovery
- Drier cuttings
- Extends screen life



Linear Motion

- G-force linear motion up to 6.9 G's
- Speeds conveyance
- Increases shaker-fluid capacity
- Enables shaker to process heavier solids loads
- Enhances cuttings-processing volume

Basic technical specifications

Specifications

- Length: 94 in. (2,388 mm)
- Width: 74.8 in. (1,900 mm)
- Weir height: 22.3 in. (565 mm)
- Height: 44 in. (1,118 mm)
- Weight: 2,885 lb (1,311 kg)

Mounting Footprint

- Length: 75.2 in. (1,911 mm)
- Width: 59 in. (1,499 mm)

Screen Deck and Screens

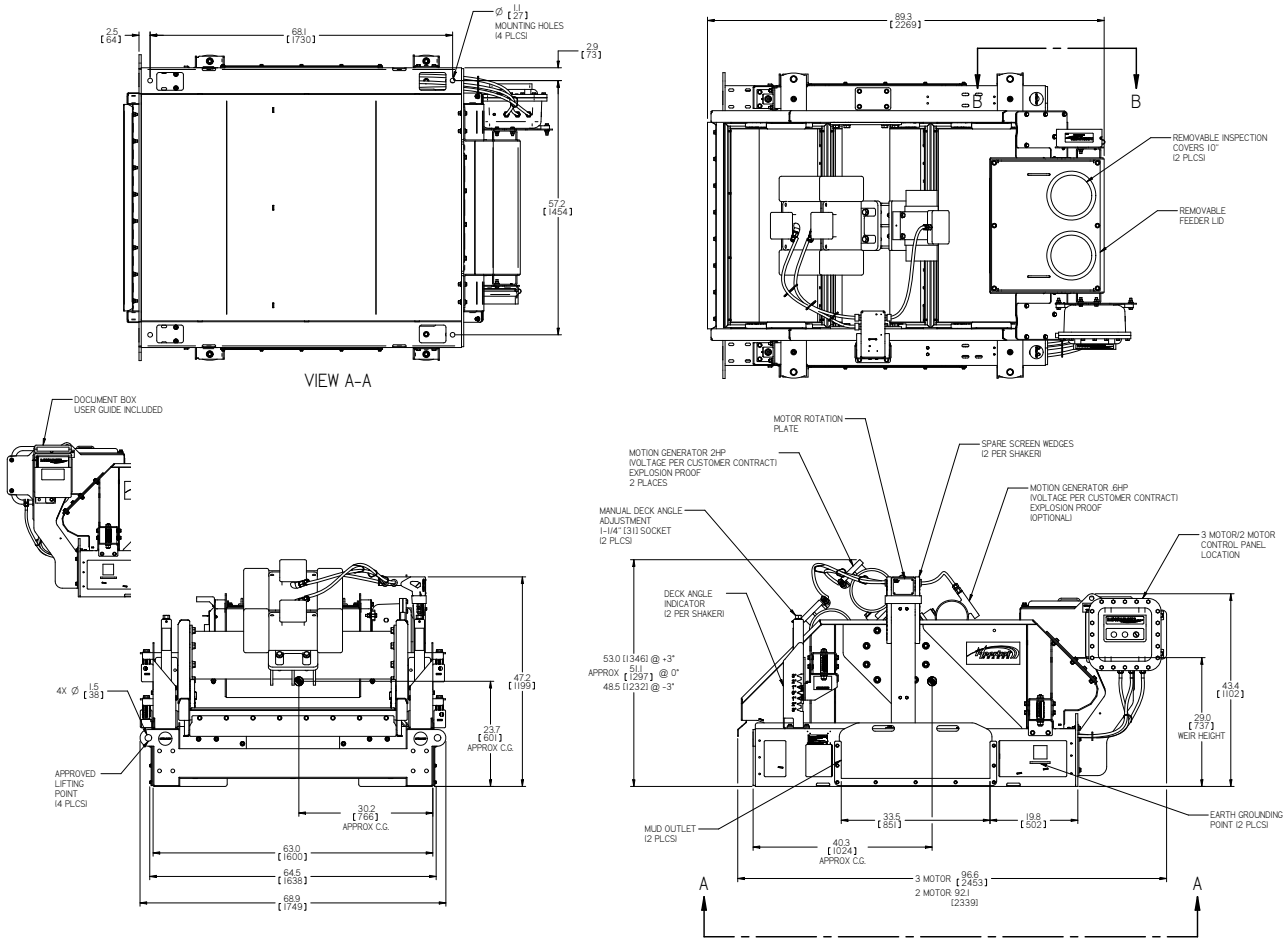
- Screen area:
  Gross: 22 ft² (2 m²)
  Net (API): 15.9 ft² (1.5 m²)
- Deck-angle adjustment:
  -3° to +3°
- Screen type: Pre-tensioned
  4 x 2 ft (1.2 x 0.61 m)

Basket Isolation

- Powder-coated steel springs

Motor Specifications

- Two (2) primary vibrator motors
- One (1) secondary vibrator motor on dual-motion model
- 440-480V/60 Hz/1,800 rpm or 380-415V/50 HZ/1,500 rpm
- Explosion proof
- Class I, Groups C and D UL/cUL, CE, ATEX, NORSOK



Available configurations

- Low Profile skid for decreased weir height
- Dual or Triple, shakers mounted on a single skid with a common feed and single lift point
- Mud cleaner using two or three 12" D-SANDER† cones and six, eight, or ten 4" D-SILTER† twin cones

High-Volume Mud Cleaners

The M-I SWACO line of mud cleaners consists of a two-stage separation process using a combination of hydrocyclones mounted over a shale shaker to operate as a single unit. Designed to handle the entire circulating volume, mud cleaners are effective on both weighted and unweighted drilling-fluid systems in removing and drying solids while retaining the expensive liquid.

The hydrocyclones make the primary separation with underflow directed onto the shaker's vibrating screen. Used correctly, the M-I SWACO mud cleaners lower both drilling-fluid and disposal costs.

Features and Benefits

Versatile

- M-I SWACO mud cleaners can be configured with an M-I SWACO D-SILTER†, a D-SANDER† or both over a high-performance shaker to process weighted or unweighted drilling-fluid systems.

Environmentally efficient

- Removing and drying drilled solids helps meet environmental regulations by minimizing waste generated and reducing disposal costs.

Minimizes maintenance

- Continuous removal of sand and abrasive cuttings from drilling fluids cuts downtime and reduces repair and replacement of worn parts on downstream equipment.

Wide range of mud cleaners for your drilling-fluid system

- M-I SWACO mud cleaners are available in a variety of configurations.
- The Model 6T4 (12 clone), Model 8T4 (16 clone) and Model 10T4 (20 clone) D-SILTERs, when matched with an M-I SWACO shale shaker, provide processing rates from 900 to 1,500 GPM (3,406.9 to 5,678.1 L/min). The Model 2-12 D-SANDER, when matched with an M-I SWACO shaker, provides processing capabilities to 1,000 GPM (3,785.4 L/min).
- The three-in-one Model 2-12 D-SANDER and Model 6T4 (12 clone) D-SILTER mounted over an M-I SWACO high-performance shaker provides the most versatile separation combination package with rates of 1,000 and 900 GPM (3,785.4 and 3,406.9 L/min) respectively.

Works with oil- or water-base muds

- M-I SWACO mud cleaners are designed to work with either oil- or water-base weighted muds, as well as with either dispersed or non-dispersed muds.

How it works

Mud cleaners combine a hydrocyclone system with a shale shaker to help remove the fine drilled solids from the drilling fluid.

Together, they have the capability to process the entire drilling-fluid circulation volume, and remove drilled solids from weighted mud systems; retaining expensive barite and liquids, and economically reducing hole problems associated with excessive drilled solids. Drilling fluid passes through a series of hydrocyclones - either D-SILTER or D-SANDER units - that separate the fine, light particles from the heavy, coarse particles. Barite and other heavy drilled solids are then carried in the underflow to a 100- to 200-mesh vibrating screen. There, they are separated, with the barite passing through the screen and returning to the active system.

The M-I SWACO D-SILTER unit features the exclusive polyurethane TWIN SWACONE† D-SILTER cones with a unique 20° taper angle (compared to the 15° taper angle on most other units). The twin-cone design provides a 50% greater capacity than other 4 in. (102 mm) cones.

The M-I SWACO D-SANDER Models 2-12 and 3-12 are designed to remove sands and abrasive cuttings - 95% of all particles to 74 microns and more than 50% of particles to 40 microns.

The D-SANDER features your choice of two or three 12 in.- (304.8 mm) diameter replaceable, wear-resistant, polyurethane hydrocyclones and quick-release stainless-steel clamps for simplified changeout.

These high-volume mud-cleaner product combinations provide drillers a wide range of efficient, space-saving processing options including connection to centrifuges for barite recovery.

Mud cleaners can be installed on the single, dual and triple configurations:

- The D-SANDER unit is available in two- or three-cone
- The D-SILTER unit is available in six, eight or ten twin-cone
- Low profile (approx. 64 in. [1,626 mm] to top of trough)
- Integral bypass between shaker and D-SILTER/D-SANDER units
- Compact footprint
- Allows inspection/maintenance without ladders or scaffolds
- Operates as D-SILTER and D-SANDER units and flowline shaker independently

These hydrocyclone options are available for all M-I SWACO shakers

D-SANDER Mud Cleaners

Model	Number of Clones	Length in. (mm)	Width in. (mm)	Height in. (mm)	Weight lb (kg)	Capacity gpm (L/min)
1-12 D-SANDER (vertical)	1	33 (838.2)	19.5 (495.3)	74.4 (1,889.8)	401 (181.9)	500 (1,892.7)
2-12 D-SANDER (vertical)	2	36 (914.4)	51.5 (1,308.1)	71.2 (1,808.5)	1,125 (510.3)	1,000 (3,785.4)
2-12 D-SANDER (slant)	2	78 (1,981.2)	47.5 (1,206.5)	35.2 (894)	1,030 (467.2)	1,000 (3,785.4)
3-12 D-SANDER (vertical)	3	40.7 (1,033.8)	75.5 (1,917.7)	78.3 (1,988.8)	1,878 (851.9)	1,500 (5,678.1)
3-12 D-SANDER (slant)	3	83 (2,108.2)	71 (1,803.4)	41.5 (1,054.1)	2,450 (1,111.3)	1,500 (5,678.1)

D-SILTER Mud Cleaners

Model	Number of Clones	Length in. (mm)	Width in. (mm)	Height in. (mm)	Weight lb (kg)	Capacity gpm (L/min)
4T4	8	52 (1,320.8)	30 (762)	56.1 (1,424.9)	680 (308.4)	600 (2,271.2)
6T4	12	66 (1,676.4)	30 (762)	56.1 (1,424.9)	800 (362.9)	900 (3,406.9)
8T4	16	80.3 (2,039.6)	30 (762)	56.1 (1,424.9)	925 (419.6)	1,200 (4,542.5)
10T4	20	94.5 (2,400.3)	32 (812.8)	60.3 (1,531.6)	1,150 (521.6)	1,500 (5,678.1)

Combo D-SANDER/D-SILTER Mud Cleaners

Model of D-SANDER	Model of D-SILTER	Number of Clones	Length in. (mm)	Width in. (mm)	Height in. (mm)	Weight lb (kg)	Capacity gpm (L/min)
2-12 D-SANDER	**4T4**	12	129.5 (3,289.3)	72.8 (1,849.1)	97 (2,463.8)	7,072 (3,207.8)	1,000/900 (3,785.4/3,406.9)
2-12 D-SANDER	**6T4**	16	129.8 (3,296.9)	80.5 (2,044.7)	97 (2,463.8)	7,162 (3,248.6)	1,000/1,200 (3,785.4/4,542.5)

Solids Control Systems & Products: **Screens:**

DURAFLO Composite OEM & Replacement Screens

The composite evolution began with our first generation, patented, HiFlo screen. It was the first to use a grid made from a composite of high-strength plastic and glass, reinforced with high tensile strength rods. Today's evolutionary composite DURAFLO screens deliver even longer screen life and greater ease in making repairs, giving way to an overall more robust product.

Longer Screen Life

The composite frame design encompasses the "window pane" effect of incorporating an increased number of smaller panels, thereby evenly distributing mechanical stresses and containing mesh damage to small localized areas.

Reduced Screen Weight

The DURAFLO composite screen weighs about the same as our first generation composite, HiFlo. However, it weighs up to 40% less than traditional metal framed screens. Lower screen weight gives way to enhanced shaker G-Force.

Easy Screen Repair

The patented Snap-Lok plug repair system reduces repair time to less than 2 minutes. By simply inserting a factory made plug, this system eliminates the need for cutting and gluing damaged cells. This equates to reduced rig time for solids control equipment service and maintenance.

Features and Benefits

- Patented, composite frame design
- Available for M-I SWACO, Brandt, Derrick, and Axiom brand shakers
- Featuring the "window pane" effect, has increased number of smaller flow panels for enhanced durability.
- Consistent screen open area
- Less weight than metal-frame screens
- Featuring the SNAP-LOK repair system
- Composite screen offers chemical resistance and environmental degradation
- Consistently manufactured, rugged construction
- Increased operational life
- Lower overall screen costs due to fewer required replacements
- Quick and easy to repair
- Less downtime
- Resistant to rust and delamination caused by chemical and environmental exposure
- Improved QHSE considerations

*NOV Brandt and VSM 300 are marks of Varco I/P, Inc.

DURAFLO Composite OEM Screens for M-I SWACO shakers



Simply stated, we've combined the industry's best available solids control equipment technology with it's most optimized accessory, the composite screen. The high capacity composite screens from M-I SWACO are the most rugged, long lasting, and efficient screens available.

Composite screens are unique in the industry and provide chemical resistance and delamination to corrosive drilling fluids. Our patented technology offers significant fluid handling capacity, blinding resistance, drier solids discharge, and an overall larger net usable screen area. The precision molding process produces increased number of smaller, more precise panels.

Our integrated sealing mechanism creates an ultra-tight seal between the screen and bedding plane, thereby eliminating solids buildup and costly solids bypass. A cleaner mud = efficient drilling = reduced skin damage = enhanced production.

For MONGOOSE series shakers

The DURAFLO for MONGOOSE-Series Shakers (including MEERKAT) features unique wedge mechanism for screen locking. The composite construction combined with the efficient and easy locking mechanism eliminates solids bypass which give way to costly required fluid dilutions. In addition, it allows easy screen removal, repair, or replacement.

For BEM series shakers

The DURAFLO OEM screen for M-I SWACO BEM-600† and BEM-650† shale shakers takes the best screen and matches it to the best balanced elliptical motion shakers on the market. Featuring a patented, composite frame design that holds up under virtually all drilling conditions, the screen delivers unsurpassed usable screen area. DURAFLO screens are available with HC, Ultra-Fine (XL) and XRMESH†, giving operators maximum screening flexibility.

Features & Benefits

- Composite material, resistant to chemical degradation
- Integrated Sealing Mechanism, eliminates bypass
- Easy installation/removal using patented interlocking system
- Light-weight
- Enhanced fluid handling capacity
- Co-molded Gasket Design
- Improved QHSE profile
- Easily Repairable
- Blinding Resistance

For MD series shakers

The MD Shakers and Screens were designed in tandem, to take full advantage of the technology available through the use of composite materials, while maximizing shaker performance.

The DURAFLO for MD Series Shakers feature a novel self-latching design that maintains screen-to-screen seal. This allows screens to be removed as a unit instead of individually, with no tools required.

Solids Control Systems & Products: **Centrifuges:**

518 HV Centrifuge

The 518 High Volume (HV) centrifuge is a unit which replaces the operation of two standard 518 centrifuges combined through an increased fluid handling capacity & improved solids separation.

The 518 HV centrifuge is designed to handle higher fluid processing rates by providing more power and improving the fluid flow in and out of the machine.

Increasing the available power for the main (50 Hp) and back drive (15 Hp) allows more fluid to be fed into the bowl while providing the necessary torque to remove the increased solids load resulting from the higher feed rate.

The unit also has an improved fluid accelerator to reduce turbulence and bring the fluid velocity (both magnitude and direction) up to the bowl rotating speed and direction as quick as possible, thus reducing the energy consumed for fluid acceleration and reserving more energy for solids conveyance.

The unit contains a Quasi-Axial flow scroll which increases the flow area inside the bowl thus reducing the fluid velocity and hence, the onset of turbulence.

Features

Performance

- Quasi-Axial scroll
- Tungsten carbide tiles (scroll)
- High bowl speed
- Variable bowl & scroll speed (1)
- Fixed bowl & differential speed (2)
- Variable feed pump speed
- Split pillow blocks
- Stainless steel rotating assembly
- Perfectly balanced rotating assembly
- PLC control (1)

Safety

- Vibration sensor
- Torque limiter
- Micro switches on vessel and guards
- Bearing temperature sensors (1)
- Pressure sensors (3)
- Hydraulic oil temperature sensor (3)
- Speed sensors (3)

Benefits

Performance

- Quasi-Axial scroll provides an increased flow area which minimizes the turbulence
- Increased flights wear resistance thereby reducing maintenance requirements
- High bowl speed assures a high G-Force, solids removal efficiency percentage and finest cut points.
- Complete control of G-Force and differential settings for improved separation efficiency
- Six bowl speed/differential combinations on fixed drive units for enhanced simplicity and efficiency
- Split pillow blocks for increased protection against contamination, extended material life and easier maintenance
- Highly corrosion resistant
- Minimal vibration and noise emissions
- Programmable Logic Controller (PLC) provides continues monitoring & automatic shut-down of all critical parameters while providing automatic control to avoid centrifuge plugging (1)

(1) Not applicable to Fixed Drive, (2) Only applicable to Fixed Drive, (3) Only on Fully Hydraulic Drive types

Basic technical specifications All dimensions are expressed in inches (millimeters).

Performance

- Hydraulic Capacity: 248 GPM (939 LPM)
- Operating Speed: 3,200 rpm
- G-Force: 1,975 G
- Sigma Value: 24,326 ft^2 (2,260 m^2)
- Solids Discharge: 27 GPM (6.1 m^3/h)

Rotating Assembly

- Bowl Diameter: 13.9 in. (353.1 mm)
- Bowl Length: 57.5 in. (1,461.1 mm)
- Pond Depth: 2.3, 2.42, 2.54 in. (58.5, 61.5, 64.5 mm)
- Scroll Type: Single Lead Quasi Axial Flow
- Scroll Pitch: 4.31 in. (109.5 mm)
- Main Bearings: Grease Lubricated
- Internal Bearings: Grease Lubricated
- Feed Tube: Open Ended

Rotating Assembly Material

- Bowl: Stainless Steel Duplex A890
- Scroll: Stainless Steel Duplex A890 AISI 304
- Scroll Flights: Tiles; Tungsten Carbide
- Discharge Bushings: Tungsten Carbide

Gearbox

- Type: Planetary
- Gear Ratio: 57:1
- Torque, maximum: 2,531 ft-lb (3,432 Nm)
- Differential Range:
  - Fixed Drive: 10 to 79 rpm
  - VFD: 1 to 55 rpm
  - FHD: 1 to 80 rpm
- Weight: 159 lbs (72 Kg)

Nozzle Schedule

- Liquid Discharge: 8 in. Victaulic
- Solids Discharge: 21.0 x 13.8 in. (530 x 350 mm)
- Feed Tube: 2 in. NPT [Male Connection]

Fixed Drive Type

- Power: 400/460 V - 50/60 Hz, 3 Phase
- Main Drive Motor: 50 Hp (37 kW)
- Back Drive Motor: 15 Hp (11 kW)

VFD Type

- Power: 400/460 V - 50/60 Hz, 3 Phase
- Main Drive Motor: 50 Hp (37 kW)
- Back Drive Motor: 15 Hp (11 kW)

FHD Type

- Power: 400/460 V - 50/60 Hz, 3 Phase
- Main Drive Motor: 60 Hp (45 kW)
- Hydraulic Pump: Variable Displacement Pump

Certification

- 518 HV (Fixed Drive): ATEX CE Ex II 2G c IIB T3 or UL, Class I, Div I
- 518 HV VFD: ATEX CE Ex II 2G c IIB T3 or UL, Class I, Div I
- 518 HV FHD: ATEX CE Ex II 2G c b IIB T3
- 518 HV SL VFD: ATEX CE Ex II 2G c IIB T3 or UL, Class I, Div I
- 518 HV SL FHD: ATEX CE Ex II 2G c b IIB T3

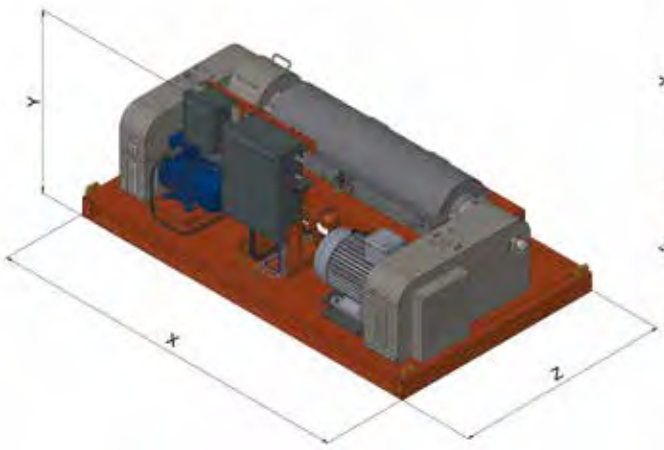
(Continued on next page)

518 HV Centrifuge (Continued)

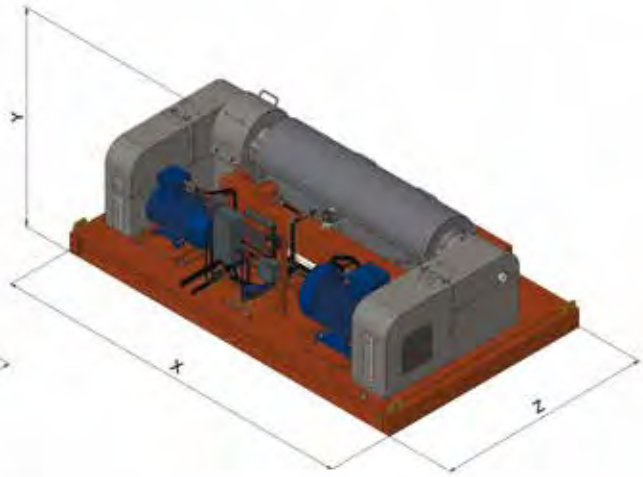
Basic technical specifications All dimensions are expressed in inches (millimeters).

Dimensions & Weights

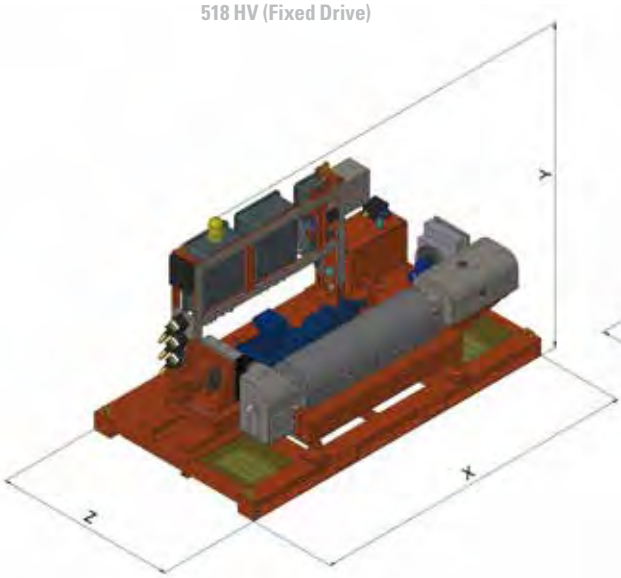
	X	Y	Z	Weight
518 HV (Fixed Drive)	119.0 in. (3,023 mm)	53.3 in. (1,353 mm)	70.0 in. (1,778 mm)	6,173 lbs (2,800 Kg)
518 HV VFD	119.0 in. (3,023 mm)	34.9 in. (887 mm)	70.0 in. (1,778 mm)	5,291 lbs (2,400 Kg)
518 HV FHD	142.0 in. (3,608 mm)	70.1 in. (1,780 mm)	78.7 in. (2,000 mm)	10,141 lbs (4,600 Kg)
518 HV SL VFD	132.6 in. (3,368 mm)	65.9 in. (1,674 mm)	39.4 in. (1,000 mm)	5,855 lbs (2,656 Kg)



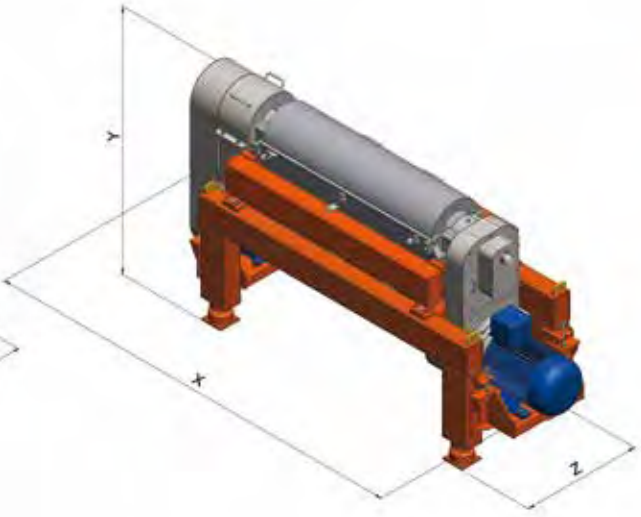
518 HV (Fixed Drive)



518 HV VFD



518 HV FHD

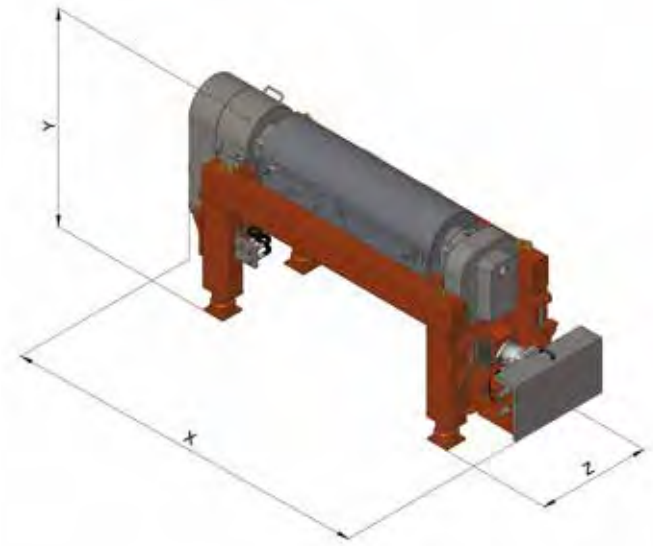


518 HV SL VFD

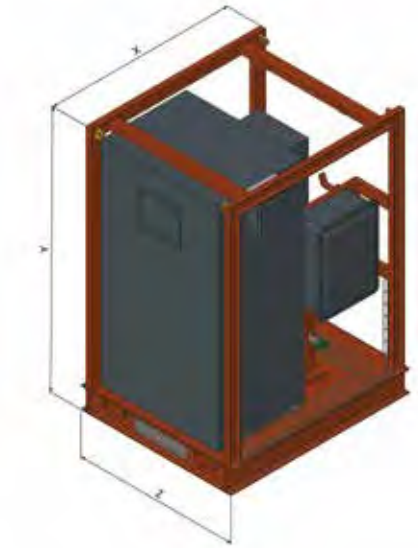
Basic technical specifications All dimensions are expressed in inches (millimeters).

Dimensions & Weights

	X	Y	Z	Weight
518 HV SL FHD (Centrifuge Module)	130.5 in. (3,314 mm)	59.0 in. (1,499 mm)	37.0 in. (940 mm)	4,850 lbs (2,200 Kg)
518 HV SL FHD (Hydraulic Module)	96.5 in. (2,450 mm)	79.7 in. (2,025 mm)	50.8 in. (1,290 mm)	5,512 lbs (2,500 Kg)
VFD Control Panel (ATEX)	55.1 in. (1,400 mm)	90.7 in. (2,305 mm)	65.7 in. (1,670 mm)	2,646 lbs (1,200 Kg)



518 HV SL FHD
[Centrifuge Module]



VFD Control Panel

CD 250 Centrifuge

The CD 250 centrifuge is the smallest centrifuge in the fleet characterized by an easy control system, a rugged design and a low installation/removal time. The unit recovers valuable fluids while reducing the total volume of waste.

In spite of the compact design, it delivers a high clarification capacity thanks to the high G-Force created.

To minimize the footprint and weight the unit is equipped with a single 20 Hp motor. An innovative system of belts and pulleys drives the sun-wheel shaft and provides the necessary torque therefore eliminating the need for a second motor. As the unit only requires a single motor the power consumption is kept to a minimum.

Features

Performance

- Smallest footprint
- Lowest weight
- Fixed bowl & differential speed
- High bowl speed
- Easy control system
- Split pillow blocks
- Hard facing on flights
- Adjustable pond dams & variable pump speed
- Stainless steel rotating assembly
- Perfectly balanced rotating assembly

Safety

- Vibration sensor
- Torque limiter
- Micro switches on vessel & guards

Benefits

Performance

- Portable and rugged design
- Minimal installation and removal time
- Bowl speed (4,000 rpm) and differential (26 rpm) are set to maximize LGS removal in HDD/ Mining projects
- High bowl speed assures a high G-Force, solids removal efficiency percentage and finest cut points
- Minimized equipment operator skill requirements
- Split pillow blocks for increased protection against contamination, extended material life and easier maintenance
- High flights wear resistance thereby reducing maintenance requirements
- Adjustable pond damns & variable pump speed allow for adjustment of the retention time and subsequent efficiency
- Highly corrosion resistant
- Minimal vibration and noise emissions

Basic technical specifications

All dimensions are expressed in inches (millimeters).

Performance

- Hydraulic Capacity: 83 GPM (314 LPM)
- Operating Speed: 4,000 rpm
- G-Force: 2,191 G
- Sigma Value: 13,326 ft^2 (1,238 m^2)
- Solids Discharge: 11 GPM (2.5 m^3/h)

Rotating Assembly

- Bowl Diameter: 10.0 in. (253 mm)
- Bowl Length: 37.1 in. (941.5 mm)
- Pond Depth: 0.95, 1.14, 1.44 in. (24, 29, 36.5 mm)
- Scroll Type: Single Lead Radial Flow
- Scroll Pitch: 3.94 in. (100 mm)
- Main Bearings: Grease Lubricated
- Internal Bearings: Grease Lubricated
- Feed Tube: Slotted

Rotating Assembly Material

- Bowl: Stainless Steel Duplex A890
- Scroll: Stainless Steel AISI 304
- Scroll Flights: Castolin Eutalloy SF hard facing
- Discharge Bushings: Tungsten Carbide

Gearbox

- Type: Planetary [Model; ZG 2400/10]
- Gear Ratio: 60:1
- Torque, maximum: 1,475 ft-lb (2,000 Nm)
- Differential Range: 26 rpm
- Weight: 128 lbs (58 Kg)

Nozzle Schedule

- Liquid Discharge: 3 in. [ANSI B 16.5]
- Solids Discharge: 16.3 x 10.6 in. (413 x 268 mm)
- Feed Tube: 1 in. [WN RF ANSI 150 lb]

Fixed Drive Type

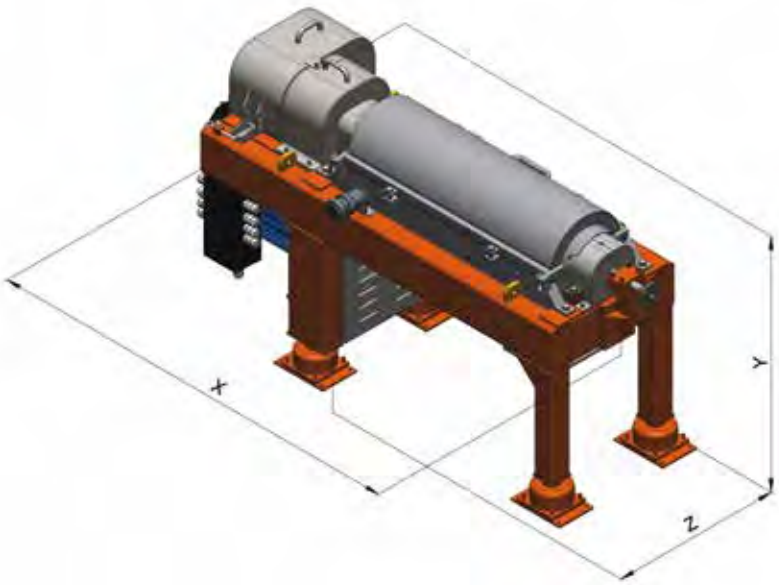
- Power: 400/460 V - 50/60 Hz, 3 Phase
- Main Drive Motor: 20 Hp (15 kW)

Certification

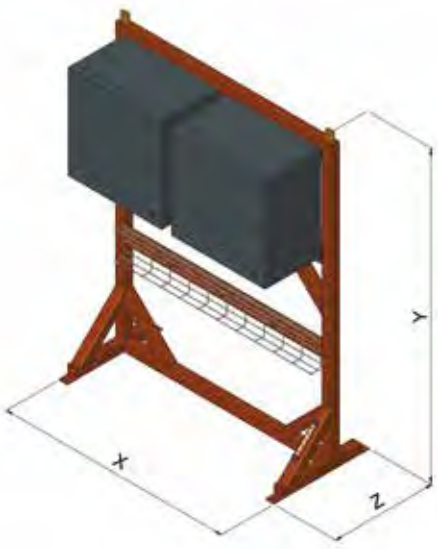
- CD 250 Fixed Drive:
  - CE Marked Only (Standard)
  - CE ATEX, Zone 1 (Optional)

Dimensions & Weights

	X	Y	Z	Weight
CD 250 Fixed Drive:	81.8 in. (2,077 mm)	46.7 in. (1,187 mm)	31.5 in. (799 mm)	2,646 lbs (1,200 Kg)
CD 250 Fixed Drive Control Panel:	45.3 in. (1,150 mm)	61.0 in. (1,550 mm)	20.1 in. (510 mm)	551 lbs (250 Kg)



CD 250 Fixed Drive



CD 250 Fixed Drive Control Panel

414 Centrifuge

The 414 centrifuge is engineered to deliver high performance at low operating costs for both oilfield and industrial applications. This highly efficient decanting centrifuge recovers 95 percent of barite and returns it to the active system, while rejecting finer, low-gravity solids. The advanced design of the stainless steel bowl and scroll maintains an even layer of conveyed solids for more uniform separation and maximum solids-control efficiency.

The 414 centrifuge has a 14-in. diameter and 34-in length (353-mm x 860-mm) stainless steel bowl and scroll assembly. The variable speed main drive is v-belt driven through a torque converter by a 25 Hp, explosion-proof, electric motor. The main drive bowl speeds are easily changed with the variable-step sheave arrangement. The differential or back drive is v-belt driven by a 10 Hp, explosion-proof, and electric motor. The differential speed of the scroll can be adjusted from 10 to a maximum of 79 rpm.

Features

Performance

- Small ratio of bowl length to diameter (Lambda ratio)
- Fixed bowl & differential speed
- Easy control system
- Split pillow blocks
- Hard facing on flights
- Adjustable pond dams & variable pump speed
- Stainless steel rotating assembly
- Perfectly balanced rotating assembly

Safety

- Vibration sensor
- Torque limiter
- Micro switches on vessel & guards

Benefits

Performance

- Recovers up to 95% of barite while rejecting finer low gravity solids
- Compact unit with light overall weight
- Six bowl speed/differential combinations on fixed drive units for enhanced simplicity & efficiency
- Minimized equipment operator skill requirements
- Split pillow blocks for increased protection against contamination, extended material life and easier maintenance
- Increased flights wear resistance thereby reducing maintenance requirements
- Adjustable pond damns & variable pump speed allow for adjustment of the retention time and subsequent efficiency
- Highly corrosion resistant
- Minimal vibration and noise emissions

Basic technical specifications All dimensions are expressed in inches (millimeters).

Performance

- Hydraulic Capacity: 129 GPM (488 LPM)
- Operating Speed: 3,200 rpm
- G-Force: 1,975 G
- Sigma Value: 11,916 ft^2 (1,107 m^2)
- Solids Discharge: 27 GPM (6.1 m^3/h)

Rotating Assembly

- Bowl Diameter: 13.9 in. (353.1 mm)
- Bowl Length: 33.9 in. (860.1 mm)
- Pond Depth: 2.3, 2.42, 2.54 in. (58.5, 61.5, 64.5 mm)
- Scroll Type: Single Lead Radial Flow
- Scroll Pitch: 4.31 in. (109.5 mm)
- Main Bearings: Grease Lubricated
- Internal Bearings: Grease Lubricated
- Feed Tube: Slotted - Position Variable

Rotating Assembly Material

- Bowl: Stainless Steel Duplex A890
- Scroll: Stainless Steel Duplex A890 AISI 304
- Scroll Flights: Stellite hard facing
- Discharge Bushings: Tungsten Carbide

Gearbox

- Type: Planetary
- Gear Ratio: 57:1
- Torque, maximum: 2,531 ft-lb (3,432 Nm)
- Differential Range: 10 to 79 rpm
- Weight: 159 lbs (72 Kg)

Nozzle Schedule

- Liquid Discharge: 6 in. Victaulic
- Solids Discharge: 21.0 x 13.8 in. (530 x 350 mm)
- Feed Tube: 2 in. NPT [Male Connection]

Fixed Drive Type

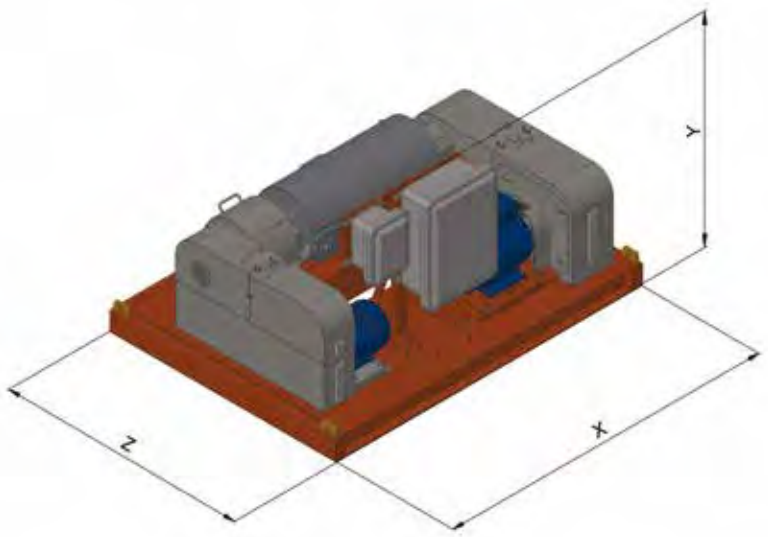
- Power: 400/460 V - 50/60 Hz, 3 Phase
- Main Drive Motor: 25 Hp (18.5 kW)
- Back Drive Motor: 10 Hp (7.5 kW)

Certification

- 414 Fixed Drive: ATEX CE Ex II 2G c IIB T3 or UL, Class I, Div I

Dimensions & Weights

	X	Y	Z	Weight
414 Fixed Drive:	95.4 in. (2,424 mm)	48.8 in. (1,239 mm)	70.0 in. (1,778 mm)	4,850 lbs (2,200 Kg)



414 Fixed Drive

Solids Control Systems & Products: **Centrifuges:**

CD 500 HV Centrifuge

The CD 500 High Volume (HV) centrifuge is a high-powered centrifuge designed for exceptional low gravity solids (LGS) separation and barite recovery in operations where large feed rates are a requirement.

The CD 500 HV centrifuge has been designed to process large volumes of fluids, improve barite recovery and produce solids that meet environmental regulations for disposal. Automatic PLC monitoring and adjustment compensates for varied drilling conditions and maintains maximum solids/fluids separation throughout the drilling operation.

The CD 500 HV centrifuge recovers valuable drilling fluid and barite while reducing the total volume of drilling waste that must be transported for injection, disposal or remediation.

By recovering more fluid and producing drier cuttings with a smaller volume, the CD 500 HV centrifuge helps operators reduce their drilling waste and disposal volumes.

Features

Performance

- Quasi-Axial scroll
- High bowl speed
- Double feed chamber
- Open ended & slotted feed tubes
- Oil forced lubricated main bearings
- Variable bowl, scroll & pump speed
- Split pillow blocks
- PLC control
- Stainless steel rotating assembly
- Perfectly balanced rotating assembly
- Tungsten carbide tiles (scroll)

Safety

- Vibration sensor
- Torque limiter
- Micro switches on vessel & guards
- Bearing temperature sensors
- Pressure sensors (1)
- Hydraulic oil temperature sensor (1)
- Speed sensors (1)

Benefits

Performance

- Quasi-Axial scroll provides an increased flow area which minimizes the turbulence for an improved separation efficiency and a high fluid handling capacity
- High bowl speed assures a high G-Force, solids removal efficiency, finest cut points and a high clarification capacity
- Double feed chamber & open ended/slotted feed tubes assure better configuration for barite recovery or LGS removal
- Reduced bearing wear and maintenance requirements
- Complete control of G-Force for improved separation efficiency
- Split pillow blocks for increased protection against contamination, extended material life and easier maintenance
- Programmable Logic Controller (PLC) provides continues monitoring & automatic shut-down of all critical parameters while providing automatic control to avoid centrifuge plugging

(1) Only on Fully Hydraulic Drive types

Basic technical specifications

All dimensions are expressed in inches (millimeters).

Performance

- Hydraulic Capacity: 674 GPM (2,551 LPM)
- Operating Speed: 3,200 rpm
- G-Force: 2,656 G
- Sigma Value: 49,589 ft^2 (4,607 m^2)
- Solids Discharge: 53 GPM (12.0 m^3/h)

Rotating Assembly

- Bowl Diameter: 18.6 in. (472 mm)
- Bowl Length: 67.5 in. (1,715 mm)
- Pond Depth: 2.2, 2.6, 3.0 in. (56, 66, 76 mm)
- Scroll Type: Single Lead Quasi Axial Flow
- Scroll Pitch: 5.12 in. (130 mm)
- Main Bearings: Oil Lubricated
- Internal Bearings: Grease Lubricated
- Feed Tube: Open Ended [LGS Removal] Slotted [Barite Recovery]

Rotating Assembly Material

- Bowl: Stainless Steel Duplex A890
- Scroll: Stainless Steel Duplex A890 AISI 304
- Scroll Flights: Tiles; Tungsten Carbide
- Discharge Bushings: Tungsten Carbide

Gearbox

- Type: Planetary [Model; ZG 3700/10]
- Gear Ratio: 80:1
- Torque, maximum: 6,269 ft-lb (8,500 Nm)
- Differential Range: 1 to 40 rpm
- Weight: 474 lbs (215 Kg)

Nozzle Schedule

- Liquid Discharge: 8 in. Victaulic
- Solids Discharge: 31.9 x 17.7 in. (810 x 450 mm)
- Feed Tube: 2 in. [ANSI B 16.5]

VFD Type

- Power: 400/460 V - 50/60 Hz, 3 Phase
- Main Drive Motor: 100 Hp (75 kW)
- Back Drive Motor: 30 Hp (22 kW)

FHD Type

- Power: 400/460 V - 50/60 Hz, 3 Phase
- Main Drive Motor: 120 Hp (90 kW)
- Hydraulic Pump: Variable Displacement Pump

Certification

- CD 500 HV VFD: ATEX CE Ex II 2G c b IIB T3 or UL, Class I, Div I
- CD 500 HV FHD: ATEX CE Ex II 2G c b IIB T3
- CD 500 HV SL VFD: ATEX CE Ex II 2G c b IIB T3 or UL, Class I, Div I
- CD 500 HV SL FHD: ATEX CE Ex II 2G c b IIB T3

Dimensions & Weights

	X	Y	Z	Weight
CD 500 HV VFD:	155.4 in. (3,946 mm)	47.8 in. (1,215 mm)	79.5 in. (2,020 mm)	11,023 lbs (5,000 Kg)
CD 500 HV FHD:	163.2 in. (4,146 mm)	90.2 in. (2,290 mm)	87.4 in. (2,220 mm)	14,330 lbs (6,500 Kg)

CD 500 HV VFD

CD 500 HV FHD

(Continued on next page)

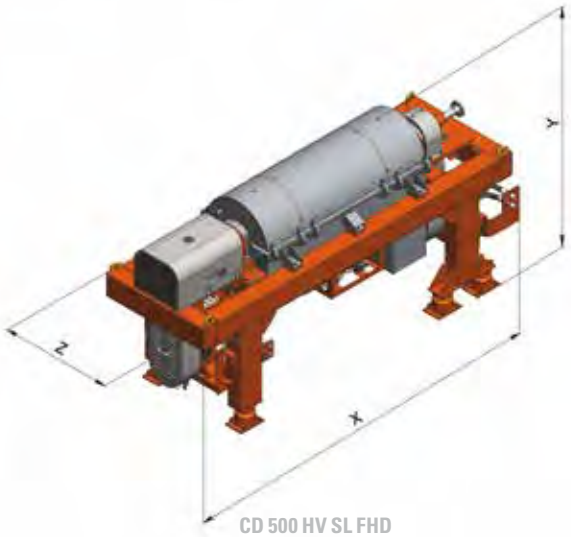
CD 500 HV Centrifuge (Continued)

Basic technical specifications All dimensions are expressed in inches (millimeters).

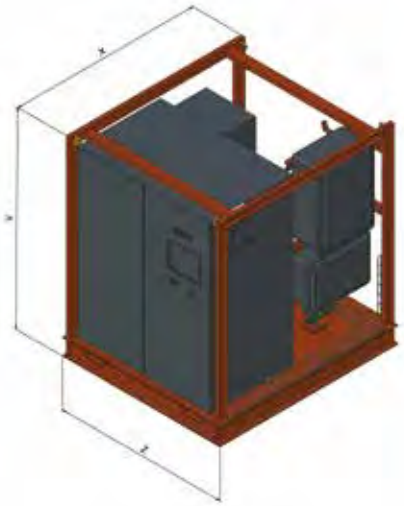
Dimensions & Weights

	X	Y	Z	Weight
CD 500 HV SL VFD:	163.3 in. (4,149 mm)	76.1 in. (1,934 mm)	48.4 in. (1,230 mm)	11,023 lbs (5,000 Kg)
CD 500 HV SL FHD: [Centrifuge Module]	157.9 in. (4,010 mm)	76.3 in. (1,937 mm)	47.6 in. (1,210 mm)	10,417 lbs (4,725 Kg)
CD 500 HV SL FHD: [Hydraulic Module]	129.9 in. (3,300 mm)	90.2 in. (2,290 mm)	68.5 in. (1,740 mm)	6,989 lbs (3,170 Kg)
VFD Control Panel :	84.6 in. (2,150 mm)	90.7 in. (2,305 mm)	4.8 in. (1,900 mm)	4,564 lbs (2,070 Kg)

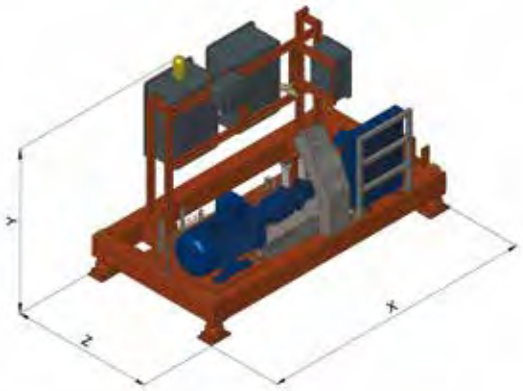
CD 500 HV SL VFD



CD 500 HV SL FHD
[Centrifuge Module]

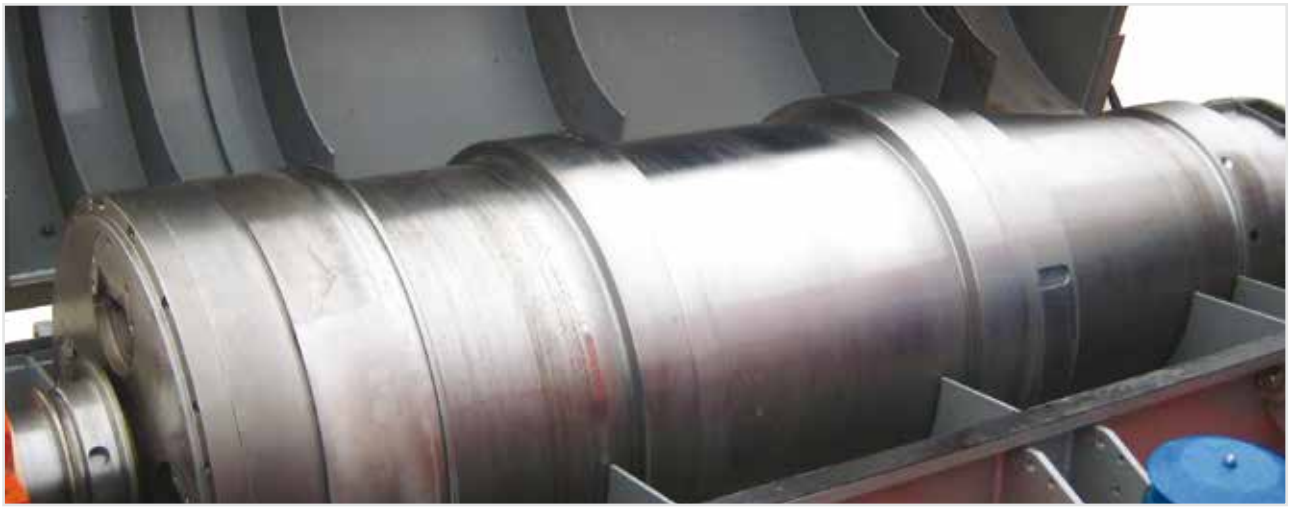


VFD Control Panel



CD 500 HV SL FHD
[Hydraulic Module]

CD 500 XV Centrifuge



The CD 500 XV Slim Line unit is designed for high-volume drill-solids removal within a relatively small footprint. The high bowl rotational speed generates high G forces and excellent fluid separation. The result is drier cuttings and cleaner liquid discharge with lower oil-on-cuttings percentages and less probability of solids packoff than with conventional centrifuges.

A VFD (Variable Frequency Drive) module monitors and controls both the main and rear electric drives.

The operator can manage bowl and scroll speeds via a touch screen that also displays input from the various sensors, including temperature, current, rotational speed and vibration.

By recovering more fluid and producing drier cuttings with a smaller volume, the CD 500 XV centrifuge helps operators reduce their drilling waste and disposal volumes.

Features

Performance

- Quasi-Axial scroll
- Smaller electric motors
- Slim line
- High bowl speed
- Variable bowl, scroll & pump speed
- User-friendly touch screen
- Split pillow blocks
- PLC control
- Stainless steel rotating assembly
- Perfectly balanced rotating assembly
- Tungsten carbide tiles (scroll)

Safety

- Vibration sensor
- Torque limiter
- Micro switches on vessel & guards
- Bearing temperature sensors

Benefits

Performance

- Quasi-Axial scroll provides an increased flow area which minimizes the turbulence; for an improved separation efficiency and a high fluid handling capacity
- Reduced power requirements and overall weight (compared with CD 500 HV)
- Reduced footprint requirements
- High bowl speed assures a high G-Force, solids removal efficiency percentage, finest cut points and a high clarification capacity
- Complete control of G-Force and differential settings for improved separation efficiency
- Split pillow blocks for increased protection against contamination, extended material life and easier maintenance
- Programmable Logic Controller (PLC) provides continues monitoring and automatic shut-down of all critical parameters while providing automatic control to avoid centrifuge plugging

(Continued on next page)

CD 500 XV Centrifuge (Continued)

Basic technical specifications

All dimensions are expressed in inches (millimeters).

Performance

- Hydraulic Capacity: 454 GPM (1,719LPM)
- Operating Speed: 3,000 rpm
- G-Force: 2,334 G
- Sigma Value: 43,583 ft^2 (4,049 m^2)
- Solids Discharge: 53 GPM (12.0 m^3/h)

Rotating Assembly

- Bowl Diameter: 18.6 in. (472 mm)
- Bowl Length: 67.5 in. (1,715 mm)
- Pond Depth: 2.2, 2.6, 3.0 in. (56, 66, 76 mm)
- Scroll Type: Single Lead Quasi Axial Flow
- Scroll Pitch: 5.12 in. (130 mm)
- Main Bearings: Grease Lubricated
- Internal Bearings: Grease Lubricated
- Feed Tube: Open Ended

Rotating Assembly Material

- Bowl: Stainless Steel Duplex A890
- Scroll: Stainless Steel Duplex A890 AISI 304
- Scroll Flights: Tiles; Tungsten Carbide
- Discharge Bushings: Tungsten Carbide

Gearbox

- Type: Planetary [Model; ZG 3700/10]
- Gear Ratio: 80:1
- Torque, maximum: 6,269 ft-lb (8,500 Nm)
- Differential Range: 1 to 40 rpm
- Weight: 474 lbs (215 Kg)

Nozzle Schedule

- Liquid Discharge: 8 in. Victaulic
- Solids Discharge: 31.9 x 17.7 in. (810 x 450 mm)
- Feed Tube: 2 in. [ANSI B 16.5]

VFD Type

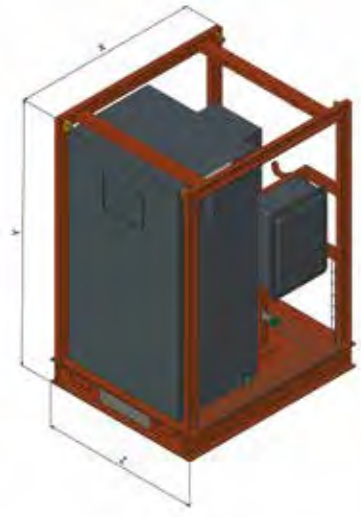
- Power: 400/460 V - 50/60 Hz, 3 Phase
- Main Drive Motor: 60 Hp (45 kW)
- Back Drive Motor: 20 Hp (15 kW)

Certification

- CD 500 XV SL VFD: ATEX CE Ex II 2G c IIB T3 or UL, Class I, Div I

Dimensions & Weights

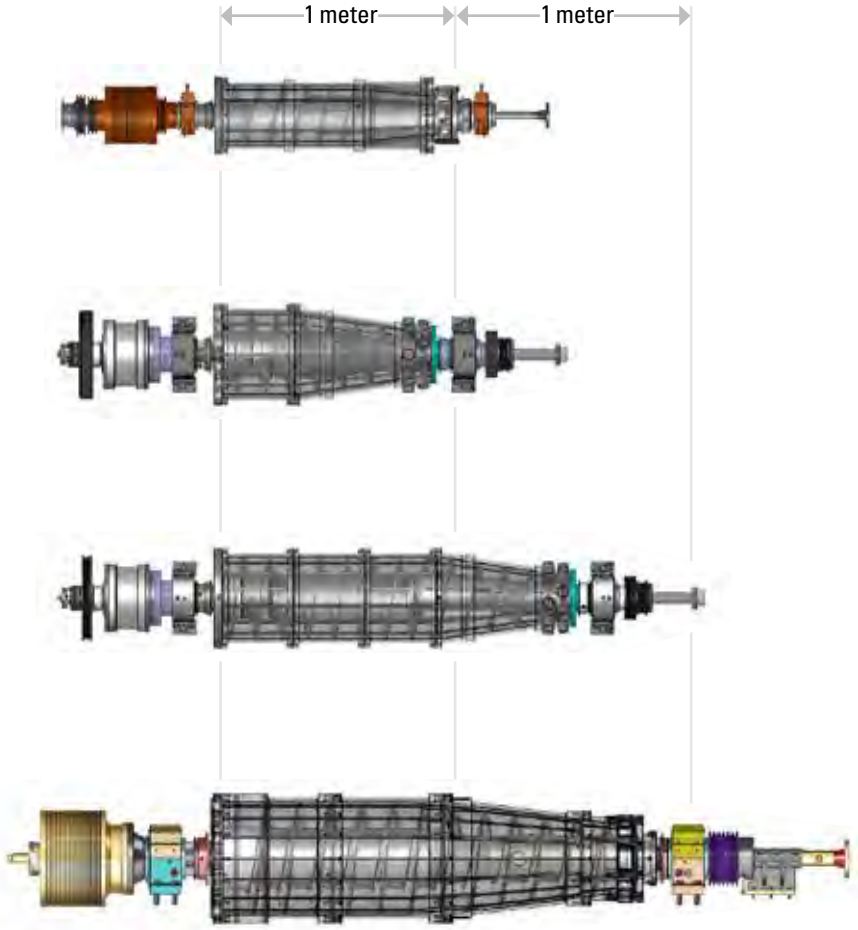
X	Y	Z	Weight	
CD 500 XV SL VFD:	149.5 in. (3,797 mm)	70.4 in. (1,788 mm)	49.2 in. (1,250 mm)	9,802 lbs (4,446 Kg)
VFD Control Panel (ATEX):	55.1 in. (1,400 mm)	90.7 in. (2,305 mm)	65.7 in. (1,670 mm)	2,646 lbs (1,200 Kg)



VFD Control Panel

CD 500 XV SL VFD

Centrifuge Rotating Assemblies



Bowl Type: CD 250
- Int. Diameter: 253 mm (9.96 in.)
- Int. Length: 941.5 mm (37.07 in.)

Bowl Type: 414
- Int. Diameter: 353 mm (13.9 in.)
- Int. Length: 860 mm (33.86 in.)

Bowl Type: 518 HV
- Int. Diameter: 353 mm (13.90 in.)
- Int. Length: 1,461 mm (57.51 in.)

Bowl Type: CD 500 HV
- Int. Diameter: 472 mm (18.58 in.)
- Int. Length: 1,715 mm (65.52 in.)

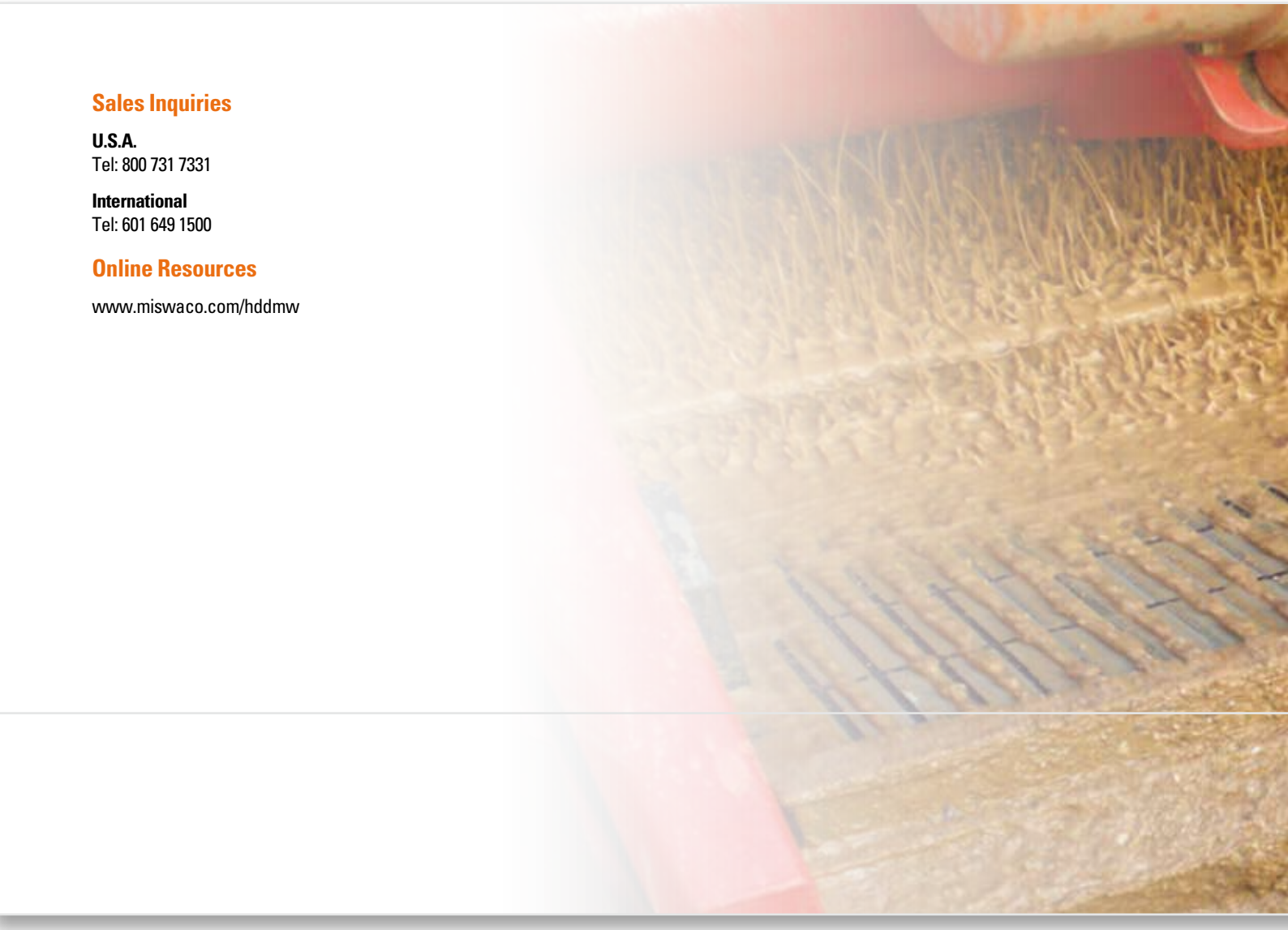
Sales Inquiries

U.S.A.
Tel: 800 731 7331

International
Tel: 601 649 1500

Online Resources

www.miswaco.com/hddmw



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