Product Catalog

www.cebo.com/construction

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INTRODUCTION

Baroid Industrial Drilling Products (IDP), a Product Service Line of Halliburton, is an international supplier of drilling fluid additives and services. Supported by a network of Sales/Service Representatives, Laboratory Scientists and Support Personnel, Baroid IDP is dedicated to servicing all facets of non-oil and gas drilling industries. Baroid IDP supplies a comprehensive line of drilling, grouting, plugging, abandonment, well rehabilitation and well development products, engineered to optimize performance and cost-effectiveness for end-users in wide-ranging and diverse markets including: HDD, Mineral Exploration, Microtunneling, Water Well and Geothermal.

Baroid IDP Sales & Service Engineers average over 20 years' experience in the Industrial Drilling industry. Our expert team have an extensive knowledge of products, drilling methods, regulations and equipment to help customers solve even the toughest of drilling problems facing your industry. Baroid IDP personnel can assist at every stage of a drilling project; from product selection and fluid design, to well completion.

Baroid originally developed it's reputation by providing expertise at the well site, and can assist the driller in the following areas:

- Solids control system components and configuration
- Circulation pit design
- Product selection and application
- Timely product delivery
- Regional and application-specific knowledge

FLUID PROPERTIES

Hardness (Calcium)

The hardness of make-up water greatly affects hydration of the Bentonite and the added polymers. When the hardness is measured and exceeds 100 ppm, Bentonite will be less active and polymers will lose some of their properties. The hardness can be measured using indicator strips. Adding Soda Ash (Sodium Carbonate) to the make-up water will reduce the hardness (Ca) and reach the desired value of < 100 ppm.

pH

The acidity of the make-up water is indicated by pH. A pH of 7 is called neutral, a pH below 7 is considered acidic and a pH above 7 is alkaline. The pH can be measured using indicator strips. Generally, the pH of water from ditches and channels tends to be acidic due to factors such as: peat, vegetation and rainwater. By treating make-up water with Soda Ash (Sodium Carbonate), the desired pH of 8.5 / 9.5 can be reached.

Chlorides (conductivity)

Every Bentonite is affected by Chlorides. The boundary value for conductivity is approximately <1000 µS. If the value is higher than 1000 µS, then more Bentonite will be required than the standard mixing ratio in order to achieve similar properties. The Chloride content of water is difficult and expensive to lower; it is recommended to use suitable water or specialised polymers for this.

Specific Gravity/Density

Drilling fluid has a certain weight per unit volume (specific gravity or s.g.). The density is measured using a Mud Balance and is expressed in grams/ml or kg/l. Generally, the density of a drilling fluid is low (< 1.05), but if drilled through an artesian flow, it may be necessary to increase the density of the drilling fluid.

FLUID PROPERTIES (continued)

Viscosity

The viscosity is the resistance to flow, also referred to as the 'thickness' of a fluid. Viscosity is measured on-site with a Marsh Funnel (measure the number of seconds that pass when 1 litre of drilling fluid flows out) and in the laboratory with a Viscometer. The Viscometer can measure viscosity (apparent viscosity = visible viscosity), plastic viscosity and yield point (carrying capacity). In HDD, the viscosity is both the friend and enemy. High viscosity/carrying capacity ensures that drilled solids are transported out of the borehole, but also causes high pressure to occur at the face of the bit leading to frac-outs.

Filtration Control & Filter Cake

A very important feature of a Bentonite-based drilling fluid is filtration control. During drilling, a thin filter cake is deposited on the borehole wall to provide stability. When drilling through clay layers, the filter cake ensures that minimum fluid penetrates the formation, preventing unwanted swelling or dissolving of clay. A filter cake can also provide a lubricating effect. Measuring the filtrate loss is done with a Filter-Press. The drilling fluid is pressed through filter paper for 30 minutes at 100 PSI (7 bar). The amount of water passing the filter cake and filter paper indicates the amount of filtrate loss into the formation.

Sand

The sand content is measured with a Sand Content Kit. With this test, only a grain size above 75 microns (0.075 mm) is measured. The Sand Content Kit allows you to determine the effectiveness of a recycling installation. A well-functioning recycling unit (for HDD and Microtunneling) leaves no more than 1% of sand in the drilling fluid, whereas settling tanks can bring the sand content down to 2%.

FLUID PROPERTIES (continued)

Gel Strength

Gel strength determines suspension of drilled solids while the fluid is static. If the pump is shut down for period of time, we want to prevent any drilled solids from settling down inside the drilling fluid. The gel strength can be determined by using a Viscometer or a Shearometer and is ideally measured every 10 seconds and 10 minutes; the gel strength is ideal if the 10 seconds and 10 minutes figures are close. In HDD applications, if the gel strength is too low, drilled solids can settle to the bottom of the borehole where they can become difficult to remove. Gel strength needs to build up quickly to prevent drilled solids from settling out of the drilling fluid, but should not keep increasing over time. When circulation is resumed after a long period of standstill, a burst of pressure is created at the drill bit to break the gel structure; this increases the risk of a frac-out.

In most Vertical Drilling applications, the same gel strengths as HDD are not expected. We want drilled solids to be transported out of the borehole by a combination of carrying capacity and annular flow. In the settling tanks, the drilled solids should settle while the drilling fluid is moving at a much slower rate.

Mixed Drilling Fluid Additives

There is a specific order of addition in which Bentonites, Polymers and other additives should be mixed, in order to promote hydration:

1. Soda Ash
2. Bentonite
3. Polymers - PAC polymers before PHPA polymers
4. Surfactants
5. Thinners & Lost Circulation Materials

SYMBOL EXPLANATION

HDD — Horizontal Directional Drilling

MICRO — Micro Tunneling

VERTICAL — Water well, Geothermal & Geotechnical

CORE — Core Drilling/Mineral Exploration


TUNNEL-GEL® MAX
BAROID
INDUSTRIAL DRILLING PRODUCTS
BAROID
HALLIBURTON

BENTONITE

TUNNEL-GEL® PLUS

TUNNEL-GEL PLUS viscosifier is a specially formulated, high-yield Bentonite designed for use in tunneling and HDD operations. TUNNEL-GEL PLUS viscosifier promotes rapid viscosity development while maintaining effective borehole stabilization and enhanced filtration control in most water-based drilling fluids.

Functions

- Enhances viscosity development in freshwater drilling fluids.
- Effective cuttings transport and suspension characteristics.
- Enhances filtration control and resulting borehole stability.
- Effective lubrication fluid for micro tunneling operations.

Advantages

- Easy to mix and quickly reaches maximum viscosity.
- Enhances fluid lubricity for reduction of required jacking forces.
- Yields more than twice as much drilling fluid of the same viscosity as an equal concentration of API grade Bentonite.

Approximate amounts of TUNNEL-GEL PLUS viscosifier added to water-based fluids:

lbs/bbl	lbs/100 gallons	kg/m³
8.4 - 12.6	20 - 30	25 - 40

HDD MICRO VERTICAL

TUNNEL-GEL® MAX

TUNNEL-GEL MAX is a specially formulated, high-yield Bentonite, designed for use in Tunneling and larger diameter HDD operations. TUNNEL-GEL MAX promotes rapid viscosity development while maintaining effective borehole stabilization and enhanced filtration control in most water-based drilling fluids.

Functions

- Viscosifies water-based drilling fluids.
- Reduces filtration by forming a thin filter cake with low permeability, resulting in borehole stabilisation.
- Improves hole-cleaning capability of drilling fluids.

Advantages

- Provides lubricity.
- Easy to mix, and quickly reaches maximum viscosity.
- Can be used in a wide range of concentrations.
- Effective in a variety of drilling applications.
- Provides the option of using various additives.

Approximate amounts of TUNNEL-GEL MAX viscosifier added to water-based fluids:	
Normal drilling conditions	30 - 40 kg/m^3
Unconsolidated conditions	40 - 45 kg/m^3

HDD MICRO

TUNNEL-GEL® SW

TUNNEL-GEL SW viscosifier is a specially formulated Bentonite-based drilling fluid additive, designed to viscosify sea water into a drilling fluid. Fluid systems designed with TUNNEL-GEL SW viscosifier assist in providing borehole stability, filtration control and improved carrying capacity in Drilled Shafts, Tunneling, Horizontal Directional Drilling and other Construction applications.

Functions

- Effective viscosifier in sea (saline) make-up water.
- Improves carrying capacity.
- Enhances filtration control.
- Optimises borehole stability.

Advantages

- Allows for the use of saline water for fluid development.
- Provides lubricity in resulting drilling fluid.
- Promotes enhanced fluid stability in saline environments.

Approximate amounts of TUNNEL-GEL SW viscosifier added to saline-based fluids:

lbs/bbl	lbs/100 gallons	kg/m³
8.4 - 12.6	20 - 30	25 - 35

HDD VERTICAL

BARO-GEL™

BARO-GEL viscosifier is an easy-to-mix, finely ground (200 mesh) sodium-activated Bentonite, specially selected for use in the Vertical Drilling industry. BARO-GEL viscosifier imparts viscosity, fluid loss control and gelling characteristics in freshwater-based drilling fluids.

Functions

- Mixes with fresh water to form a low-solids drilling fluid for general drilling applications.
- Viscosifies water-based drilling fluids.
- Reduces filtration by forming a thin filter cake with low permeability.
- Improves hole-cleaning capabilities.

Advantages

- Single sack product and cost-effective.
- Provides lubricity for drilling fluids.
- Easy to mix, and quickly reaches maximum viscosity.
- Can yield more than twice as much drilling fluid of the same viscosity.

Approximate amounts of BARO-GEL viscosifier added to freshwater-based fluids:	
Normal drilling conditions	20 -30 kg/m^3
Unconsolidated formations	30 - 40 kg/m^3

VERTICAL CORE MICRO

CEBOGEL® OCMA

CEBOGEL OCMA is a sodium-activated Bentonite, defined as our most concentrated Bentonite drilling product (up to 8%). Under pumping conditions, CEBOGEL OCMA is subject to shear thinning and becomes easily flowable; when motionless, the fluid thickens into a gel-like structure, allowing for effective suspension and carrying of large cuttings. CEBOGEL OCMA is a versatile drilling Bentonite, ideal for large-diameter HDD operations due to its high gel strength and stable viscosity. CEBOGEL OCMA can be recycled and reused efficiently.

Functions

- Viscosifies water-based drilling fluids.
- Reduces filtration by forming a thin filter cake with low permeability, resulting in borehole stabilisation.
- Improves hole-cleaning capabilities.

Advantages

- High(er) mixing ratio, allowing more Bentonite particles per volume.
- Easy to mix, and quickly reaches maximum viscosity.
- Effectively used in a wide range of concentrations.
- Competent in various drilling applications.
- Provides option of using a range additives.
- LAGA certified in Germany by Horn & Co. Analytics.

Approximate amounts of CEBOGEL OCMA added to water based fluids:	
Normal drilling conditions	60 - 70 kg/m^3
Unconsolidated formations	65 - 75 kg/m^3

HDD MICRO VERTICAL

FILTRATION CONTROL ADDITIVES

PAC™-R

PAC-R additive is a modified natural cellulosic polymer and provides filtration control in most water-based drilling fluids. The product, when added to a Bentonite slurry, yields a drilling mud system suitable for drilling in sandy formations. PAC-R additive can be added to vegetable or mineral oil to provide an oil-based fluid suspension, which can be poured directly into the drill string. PAC-R additive is also used in air/gel-foam drilling.

Functions

- Provides filtration control in fresh or brackish water-based drilling fluids.
- Promotes borehole stability in water sensitive formations.
- Minimises rotational torque and circulating pressure.
- Improves hole-cleaning and core recovery.
- Stiffens foam to improve cuttings transport in air/foam drilling.
- Reduces air requirements, up hole velocity and borehole annulus pressure in air/foam drilling.
- Works as a protective colloid - protects Bentonite from contaminants in the soil & ground water.

Advantages

- Effective in fresh water, salt water and brackish water-based drilling fluids.
- Effective in small quantities for filtration control.
- Non-fermenting.
- Compatible with other Baroid drilling fluid additives.
- Resistant to harsh environments and contaminants.

Approximate amounts of PAC-R added to water-based fluids:	
Fresh or salt water	4 - 7 kg/m^3
Added to Bentonite slurry	0.5 - 2 kg/m^3

HDD MICRO VERTICAL

PAC™-L

PAC-L modified natural cellulosic polymer provides filtration control in most water-based drilling fluids without substantially increasing viscosity. PAC-L polymer, when added to a Bentonite slurry, yields a drilling mud system suitable for drilling in sandy formations. PAC-L polymer can be added to vegetable or mineral oil to provide an oil-based fluid suspension, which can be poured directly into the drill string.

Functions

- Provides filtration control in fresh or brackish water-based drilling fluids.
- Reduces fluid loss, without significantly increasing viscosity.
- Promotes borehole stability in water sensitive formations.
- Minimizes rod chatter, rotational torque and circulating pressure.
- Improves hole cleaning and core recovery.
- Works as a protective colloid - protects Bentonite from contaminants in the soil & ground water.

Advantages

- Effective in freshwater, salt water and brackish water-based drilling fluids.
- Efficient in small quantities for filtration control.
- Non-fermenting.
- Compatible with other Baroid drilling fluid additives.
- Resistant to harsh environments and contaminants.

Approximate amounts of PAC-L polymer added to water-based fluids:	
Fresh or salt water	4 - 8 kg/m^3
Added to Bentonite slurry	0.5 - 2.5 kg/m^3

HDD MICRO VERTICAL CORE

QUIK-TROL®

QUIK-TROL is a modified natural cellulosic polymer that provides filtration control in most water-based drilling fluids. QUIK-TROL, when added to a Bentonite slurry, yields a drilling mud system suitable for drilling in sandy formations. The product can be added to vegetable or mineral oil to provide an oil-based fluid suspension, which can be poured directly into the drill string. QUIK-TROL is also used in air/gel-foam drilling.

Functions

- Provides filtration control in fresh or brackish water-based drilling fluids.
- Promotes borehole stability in water sensitive formations.
- Minimizes rotational torque and circulating pressure.
- Improves hole cleaning & core recovery.
- Stiffens foam to improve cuttings transport in air/foam drilling.
- Reduces air requirements, up hole velocity and borehole annulus pressure in air/foam drilling.
- Works as a protective colloid - protects Bentonite from contaminants in the soil & ground water.

Advantages

- NSF/ANSI Standard 60 certified.
- Effective in freshwater, salt water and brackish water-based drilling fluids.
- Efficient in small quantities for filtration control.
- Non-fermenting.
- Compatible with other Baroid drilling fluid additives.
- Resistant to harsh environments and contaminants.

Approximate amounts of QUIK-TROL polymer added to water-based fluids:	
Fresh or salt water	4 - 7 kg/m^3
Added to Bentonite slurry	0.5 - 2 kg/m^3

HDD MICRO VERTICAL

QUIK-TROL® LV

QUIK-TROL LV is a modified natural cellulosic polymer and provides filtration control in most water-based drilling fluids without substantially increasing viscosity. When added to a Bentonite slurry, the product yields a drilling mud system suitable for drilling in sandy formations. QUIK-TROL LV polymer can be added to vegetable or mineral oil to provide an oil-based fluid suspension, which can be poured directly into the drill string.

Functions

- Provides filtration control in fresh or brackish water-based drilling fluids.
- Reduces fluid loss without significantly increasing fluid viscosity.
- Promotes borehole stability in water sensitive formations.
- Minimizes rod chatter, rotational torque and circulating pressure.
- Improves hole cleaning and core recovery.
- Works as a protective colloid - protects Bentonite from contaminants in the soil & ground water.

Advantages

- NSF/ANSI Standard 60 certified.
- Effective in freshwater, salt water and brackish water-based drilling fluids.
- Efficient in small quantities for filtration control.
- Non-fermenting.
- Compatible with other Baroid drilling fluid additives.
- Resistant to harsh environments and contaminants.

Approximate amounts of QUIK-TROL LV polymer added to water-based fluids:

Fresh or salt water	4 - 8 kg/m^3
Added to Bentonite slurry	0.5 - 2.5 kg/m^3

HDD MICRO VERTICAL CORE

QUIK-TROL® GOLD

QUIK-TROL GOLD is a highly dispersible, polyanionic cellulosic (PAC) polymer that provides ease of mixing and improved filtration control in most water-based drilling fluids. When added to a Bentonite slurry, the product yields a low filtrate drilling fluid system suitable for drilling in water sensitive formations.

Functions

- Disperses and hydrates effectively at low shear.
- Provides filtration control in water-based drilling fluids.
- Promotes borehole stability in water sensitive formations.
- Minimizes rotational torque and circulating pressure.
- Improves hole cleaning and core recovery.
- Enhances foam properties to improve cuttings transport in air/foam drilling.
- Works as a protective colloid - protects Bentonite from contaminants in the soil & ground water.

Advantages

- Effective in fresh, salt and brackish water-based drilling fluids.
- Non-fermenting.
- NSF/ANSI Standard 60 certified.
- Compatible with other Baroid drilling fluid additives.

Approximate amounts of QUIK-TROL GOLD added to water based fluids:

lbs/bbl	lbs/100 gallons	kg/m³
0.1 - 2	0.25 - 4.75	0.3 - 5.7

HDD MICRO VERTICAL CORE

QUIK-TROL® GOLD LV

QUIK-TROL GOLD LV is a highly dispersible, low viscosity polyanionic cellulosic (PAC) polymer that provides filtration control in most water-based drilling fluids. When added to a Bentonite slurry, the product yields a low filtrate drilling fluid system suitable for drilling in water sensitive formations.

Functions

- Provides filtration control in fresh or brackish water-based drilling fluids.
- Promotes borehole stability in water sensitive formations.
- Minimises rod chatter, rotational torque and circulating pressure.
- Improves hole cleaning and core recovery.
- Enhances foam properties to improve cuttings transport in air/foam drilling.
- Works as a protective colloid - protects Bentonite from contaminants in the soil & ground water.

Advantages

- Disperses readily, even with low shear.
- Effective in fresh, salt and brackish water-based drilling fluids.
- Resistant to harsh environments and contaminants.
- Improves filtration control.
- Efficient at low concentrations.
- Non-fermenting.
- Compatible with other Baroid drilling fluid additives.
- NSF/ANSI Standard 60 certified.

Approximate amounts of QUIK-TROL GOLD LV added to water-based fluids:

lbs/bbl	lbs/100 gallons	kg/m³
0.1 - 2	0.25 - 4.7	0.3 - 5.7

HDD MICRO VERTICAL CORE

Barasol-R

Barasol-R is a granular, modified cellulose, designed to increase viscosity and improve fluid loss in drilling fluids. The product can be used as a pure polymer system but can also be added to a Bentonite-based drilling fluid for use in Vertical Drilling operations. When mixed with Bentonite, Barasol-R can improve specific drilling fluid properties such as filtration control. In water sensitive formations, Barasol-R promotes borehole stability, hole cleaning and core recovery. The product's granular composition makes it easy to disperse and minimizes the likelihood of lumps or fish-eyes forming.

Functions

- Can provide filtration control in fresh or brackish water-based drilling fluids.
- Easy dispersable due to its granular form.
- Can promote borehole stability in water sensitive formations.
- Can improve hole cleaning and core recovery.
- Works as a protective colloid - protects Bentonite from contaminants in the soil & ground water.

Advantages

- Effective in fresh water, brackish water and sea water.
- Breaks down quickly with Calcium Hypochlorite.
- Temperature stable up to 120°C.

Approximate amounts of Barasol-R to be used:	
When being used as a standalone product	2 - 5 kg/m^3
When being mixed into Bentonite/ used as an additive	0.5 - 1.5 kg/m^3

VERTICAL CORE

CLAY INHIBITORS / STABILIZERS

EZ-MUD®

EZ-MUD liquid polymer emulsion contains partially hydrolysed polyacrylamide/polyacrylate (PHPA) copolymer, and is used primarily as a borehole stabilizer to prevent reactive shale and clay from swelling and sloughing. EZ-MUD is also added to low-solids drilling fluids to increase lubricity, fluid viscosity, and to improve carrying capacity of air/foam injection fluids.

Functions

- Stabilizes reactive shale and clay formations.
- Improves borehole stability.
- Alleviates mud rings, bit balling and booting-off in clay formations.
- Reduces drill pipe torque and pumping pressure.
- Minimizes rod chatter in diamond core drilling.
- Can create "stiff-foam" and maintain foam integrity.
- Flocculates non-reactive solids in reserve pit at low concentrations.

Advantages

- Easy to disperse.
- Helps provide effective clay and shale stabilization.
- Imparts high degrees of lubricity.
- Non-fermenting.
- Breaks down chemically with bleach (sodium hypochlorite).
- NSF/ANSI Standard 60 certified.

Approximate amounts of EZ-MUD polymer added to a drilling fluid system:

Added to fresh water	Added to Bentonite fluids	Added to air/foam injection liquid
1 - 5 litres/m^3	1 - 2.5 litres/m^3	1 - 2.5 litres/m^3

HDD CORE VERTICAL

EZ-MUD® DP

EZ-MUD DP is a borehole stabilizing dry synthetic polymer, and contains high molecular weight, partially hydrolysed polyacrylamide/polyacrylate (PHPA) copolymer. When mixed with fresh water, the product hydrates quickly and forms a clear, viscous fluid. EZ-MUD DP provides excellent borehole stability through a coating mechanism (encapsulation).

Functions

- Stabilizes reactive shale & clay formations.
- Keeps trench excavation open during the construction.
- Produces a high viscosity, solids-free slurry.
- Enhances rheological properties of a low-solids drilling mud.
- Improves core recovery in continuous wireline coring operations.
- Flocculates non-reactive solids in the reserve pit at low concentrations.
- Reduces torque and drag.

Advantages

- Easy to disperse.
- Efficient shale/clay stabilizer and viscosifier.
- Helps impart high degrees of lubricity.
- Compatible with other drilling fluid additives when added in proper sequence.
- Non-fermenting.
- No petroleum distillates involved.
- Breaks down chemically with bleach (sodium hypochlorite).
- NSF/ANSI Standard 60 certified.

Approximate amounts of EZ-MUD DP polymer added to a drilling fluid system:

Added to fresh water	Added to Bentonite fluids	Added to air/foam injection liquid
0.5 - 2.5 kg/m^3	0.3 - 1 kg/m^3	0.5 - 1 kg/m^3

HDD MICRO VERTICAL CORE

EZ-MUD® GOLD EU

EZ-MUD GOLD EU is a clay and shale stabilizer that provides inhibition of clay and shale formations in water-based drilling fluids, without substantially increasing viscosity. When added to a Bentonite slurry, the product yields an inhibitive drilling fluid system, while maintaining manageable and effective fluid properties. The unique beaded structure of EZ-MUD GOLD EU allows the material to be mixed easily at minimal shear, thereby eliminating the need for liquid emulsions.

Functions

- Promotes clay and shale stabilization to prevent swelling and/or dispersion; does so without significantly increasing viscosity as much as other PHPA polymers.
- Improves borehole stability in water sensitive formations.
- Minimizes rotational torque and circulating pressure.
- Promotes enhancement of air-foam system capabilities.
- Enhances core recovery in continuous wireline coring operations.

Advantages

- NSF/ANSI Standard 60 certified.
- Allows for increased concentrations to gain inhibition without excess viscosity
- No petroleum distillates present.
- Breaks down chemically with bleach (sodium hypochlorite).
- Compatible with other Baroid drilling fluid additives when added in proper sequence.
- Non-fermenting.

Approximate amounts of EZ-MUD GOLD EU polymer added to a drilling fluid system:

Added to fresh water	Added to Bentonite fluids	Added to air/foam injection liquid
1 - 3 kg/m^3	0.3 - 1 kg/m^3	1 -3 kg/m^3

HDD MICRO VERTICAL CORE

EZ-MUD® PLUS

EZ-MUD PLUS liquid polymer emulsion contains partially hydrolysed polyacrylamide polyacrylate (PHPA) copolymer and is used primarily as a viscosifier and borehole stabilizer to prevent reactive shales and clays from swelling and sloughing. EZ-MUD PLUS is also added to low-solids drilling fluids to increase lubricity and to improve the carrying capacity of air/foam injection fluids. EZ-MUD PLUS polymer emulsion is a high molecular weight version of EZ-MUD polymer emulsion with improved properties.

Functions

- Stabilizes reactive shale and clay formations.
- Improves borehole and excavation stability.
- Alleviates mud rings, bit balling and booting-off in clay formations.
- Reduces drill pipe torque and pumping pressure.
- Minimizes rod chatter in diamond core drilling.
- Creates "stiff-foam" and maintains foam integrity.
- Flocculates non-reactive solids in reserve pit at low concentrations.

Advantages

- Liquid form – easy to disperse.
- Efficient shale/clay stabilizer and viscosifier.
- Non-fermenting.
- Cost-effective - small amounts produce desired results.
- Breaks down chemically with bleach (sodium hypochlorite).
- NSF/ANSI Standard 60 certified.

Approximate amounts of EZ-MUD PLUS polymer added to a drilling fluid system:

Added to fresh water	Added to Bentonite fluids	Added to air/foam injection liquid
2.5 - 6.5 litres/m^3	1 - 2.5 litres/m^3	1 - 2.5 litres/m^3

HDD MICRO VERTICAL CORE

LOST CIRCULATION MATERIALS

N-SEAL™

N-SEAL acid soluble lost circulation material is a specially formulated extrusion spun mineral fiber. Due to its solubility in weak acids, N-SEAL lost circulation material is easily removed from production zones in water well applications.

N-SEAL can be use in case of small to medium losses of circulation. It is one of the easiest to use LCM's, as it can be mixed into the Bentonite or polymer-based drilling fluid, handled as a fluid additive. N-SEAL can be added directly through a Venturi-Hopper into the mixing system.

Functions

- N-SEAL material can be used as an additive for loss of circulation in concentrations of up to 86 kg/m^3 of drilling fluid.

Advantages

- NSF/ANSI Standard 60 certified.
- Acid soluble.
- Easily-wetted.
- Inorganic and non-fermenting.
- Minimal to no effect on rheological properties of the drilling fluid.
- Suitable for the limited annular spaces in wireline drilling applications.

Approximate amounts of N-SEAL added to Bentonite or polymer-based fluids:	
Normal treatment (to the active system)	3 - 24 kg/m^3
As a pill	24 - 86 kg/m^3

HDD MICRO VERTICAL CORE

DIAMOND SEAL®

DIAMOND SEAL is a water-swellable (but not water-soluble), 100% crystalline synthetic polymer. DIAMOND SEAL absorbs hundreds of times its own weight in water. It is intended for use primarily as a lost circulation material for HDD operations.

Functions

- Lost circulation material for horizontal directional drilling.
- Prevents inadvertent returns in river crossing applications.
- Stabilizes borehole in cobble and gravel.
- Stabilizes unconsolidated formations.

Advantages

- Rapid water absorption.
- Effective in mitigating lost circulation.
- Economical – small quantity yields large volume.
- Easy to use.
- Non-fermenting.

As a pill	Add DIAMOND SEAL at 12 - 24 kg/m^3 of drilling fluid.
Treatment for loss of circulation	Prior to pumping, remove all inline screens in circulation system. Add the following to existing drilling fluid and displace: N-SEAL: 3.5 - 6 kg/m^3 DIAMOND SEAL: 12 - 24 kg/m^3

HDD CORE VERTICAL

FUSE-IT®

FUSE-IT lost circulation material is a fast-acting, synthetic polymer-based lost circulation material, designed to help seal off even the most severe loss zones in as little as 30 minutes; this allows the operator to return to normal drilling activities.

Functions

- Lost circulation material for vertical and horizontal drilling applications.
- Suitable for addressing fractured and vugular formations.
- Effective LCM for sand, gravel and cobble environments.
- Stabilizes unconsolidated formations.

Advantages

- NSF/ANSI Standard 60 certified.
- Rapid reaction upon contact with water.
- Enables quick response to loss of circulation.
- Easy to use.
- Non-fermenting.
- Temperature tolerant.
- Compatible with other Baroid products.

As a slug treatment	• Add 20 - 40 litres of vegetable oil directly into drill string to pre-coat metal surfaces of drill string. • Follow immediately into drill string with 1 - 2 buckets of FUSE-IT. • Follow addition of FUSE-IT lost circulation material with 20 - 40 litres of vegetable oil and displace. Following displacement allow 30 - 60 minutes for hydration prior to attempt to regain circulation.
As a pill	Add FUSE-IT lost circulation material to drilling fluid at a concentration of 0.5 - 1.0% by volume (2 - 4 qts/100 gallons or 5 - 10 litres/ml) and displace mixture immediately into zone of interest.

HDD MICRO VERTICAL CORE

Cebo F-SEAL

Cebo F-SEAL is an acid soluble granulated lost circulation material, composed of synthetic resin-bound stone wool. Cebo F-SEAL can be used as an additive for loss of circulation in concentrations of up to 20 kg/m³. The product's fibrous composition builds a structure against high-permeable formations on which a Bentonite fluid can create a filter cake; this effectively prevents drilling fluids from seeping into the surrounding formation. Cebo F-SEAL can be used in case of medium to full losses of circulation.

Cebo F-SEAL can be added directly through a Venturi-Hopper into the mixing system.

Functions

- Cebo F-SEAL can be used as an additive for loss of circulation in concentrations of up to 20 kg/m³.

Advantages

- Acid soluble.
- Easy to mix.
- Inorganic and non-fermenting.
- Immediate results.
- High performance.
- Low mixing ratio.

Approximate amounts of Cebo F-SEAL added to Bentonite or polymer-based fluids:	
Normal treatment (to the active system)	3 - 10 kg/m³
As a pill	10 - 20 kg/m³

HDD CORE VERTICAL

SUSPENSION ENHANCERS

BARAZAN® D

BARAZAN D suspension enhancer is a premium quality, powdered biopolymer that is used to enhance the carrying capacity of both clay and polymer-based drilling fluids without significantly increasing the viscosity of the slurry. BARAZAN D is easily dispersible in fresh or brackish water.

Functions

- Increases gel strength of the drilling fluid for better suspension of the drilled cuttings, coarse sand and gravel.
- Enhances carrying capacity for solids suspension at lower viscosity to further ensure flowability on longer length bores and backreams.
- Improves resistance to contamination when drilling in brackish and salt water environments.

Advantages

- Can mix easily into pre-hydrated Bentonite-based fluids.
- Helps enhance system by increasing the suspension properties of the base drilling fluid with a minimal increase in viscosity.

Approximate amounts of BARAZAN D suspension enhancer added to water-based drilling fluids:	
Added to Bentonite fluids	0.5 - 2.5 kg/m^3
Added to pure polymer systems	1 - 5 kg/m^3

HDD MICRO VERTICAL

NO-SAG®

NO-SAG suspension enhancer is a premium quality, powdered biopolymer that is used to enhance the carrying capacity of both clay and polymer-based drilling fluids, without significantly increasing the viscosity of the slurry. NO-SAG is easily dispersible in fresh or brackish water.

Functions

- Increases gel strength of the drilling fluid for better suspension of the drilled cuttings, coarse sand and gravel.
- Enhances carrying capacity for solids suspension at lower viscosity to further ensure flowability on longer length bores and backreams.
- Improves resistance to contamination when drilling in brackish and salt water environments.

Advantages

- Can mix easily into pre-hydrated Bentonite-based fluids.
- Helps enhance system by increasing the suspension properties of the base drilling fluid with a minimal increase in viscosity.
- Small packaging for ease of handling and reduction of waste.

Approximate amounts of NO-SAG suspension enhancer added to water-based drilling fluids:	
Added to Bentonite fluids	0.5 - 2.5 kg/m^3
Added to pure polymer systems	1 - 5 kg/m^3

HDD MICRO VERTICAL

DETERGENTS

PENETROL® EU

PENETROL EU water miscible, non-ionic wetting agent is designed to counteract the sticking tendencies of clay.

Functions

- Reduces or eliminates bit balling.
- Reduces surface tension of drilling fluid, which allows faster chip removal without continuously grinding the hard shale formations.
- Improves drilling efficiency by preferentially coating the bottom-hole assembly and drill string.
- Minimizes differential sticking.
- Increases bit life and reduces drill pipe and bottom-hole assembly wear.

Advantages

- Effective in low concentrations.
- Compatible with other Baroid drilling fluid additives.
- Biodegradable.

Added uniformly through circulation system	0.5 - 3 litres/m^3
Added as a slug down drill rods	1 - 2 litres/drill rod

HDD CORE VERTICAL

PENETROL® DRY EU

PENETROL DRY EU surfactant is used to assist in counteracting the sticking tendencies of encountered clay or shale during drilling operations. The product is non-foaming when mixed with a Bentonite-based drilling fluid.

Functions

- Reduces and/or minimizes bit balling.
- Improves drilling efficiency by preferentially coating the bottom-hole assembly and drill string.
- Minimizes potential for accretion and agglomeration of cuttings.

Advantages

- Free-flowing granular product.
- Easy to mix and readily dispersible.
- Effective at low concentrations.
- Minimal to no foaming produced during high shear mixing or surface agitation.
- Compatible with other Baroid drilling fluid additives.
- Low aquatic toxicity.

Approximate amounts of PENETROL DRY EU surfactant added to water-based fluids:
0.6 - 3.6 kg/m^3

HDD MICRO VERTICAL CORE

GROUTS

Cebo Drill-Grout

Cebo Drill-Grout sealing material is a self-setting suspension which can be used in HDD and Vertical applications to fill annular spaces or abandon open boreholes after drilling is complete. The product provides flexibility to the user by providing significant working time and gradual development of compressive strength in the resultant slurry.

Cebo Drill-Grout can also be used in other applications such as for sealing holes of pulled pipes. The product hardens into a plastic material with a low water permeability, preventing underground water layers from mixing.

Functions

- Fills the annular space surrounding product line installations.
- Hardens into a solid set material with low permeability which prevents comingling of aquifers.
- Prevention of ground subsidence.
- Protection of steel pipes against corrosion.

Advantages

- Easy to mix and pump.
- Can be mixed with standard centrifugal pumps.
- Effective annular sealing or borehole abandonment material.
- Compatible with potable groundwater as assessed by the German Hygiene Institute.
- Workability <48 hours.
- Certified in The Netherlands with BRL5078 for grouting.

Add Cebo Drill-Grout at a concentration of approximately 160 - 180 kg/m^3 of freshwater. Fine adjustments are made to the consistency by varying the solids content; recommended Marsh time minimal 45 sec/litre prior to use and introduction into the borehole. S.G. should be min. 1.11

The volume of Cebo Drill-Grout must be 15% more than the calculated volume to be sure that the drilling fluid is fully replaced with Cebo Drill-Grout.

HDD MICRO VERTICAL CORE

Cebo Drill-Grout Plus

Cebo Drill-Grout Plus sealing material is a self-setting suspension which can be used in HDD and Vertical applications to fill annular spaces or abandon open boreholes after drilling is complete. Cebo Drill-Grout Plus provides flexibility to the user by providing significant working time and gradual development of compressive strength in the resultant slurry.

Cebo Drill-Grout Plus can also be used in other applications such as for sealing holes of pulled pipes. The product hardens into a plastic material with a low water permeability, preventing underground water layers from mixing.

Functions

- Fills the annular space surrounding product line installations.
- Hardens into a solid set material with low permeability which prevents comingling of aquifers.
- Prevention of ground subsidence.
- Protection of steel pipes against corrosion.

Advantages

- Easy to mix and pump.
- Can be mixed with standard centrifugal pumps.
- Effective annular sealing or borehole abandonment material.
- Enhanced compressive strength development.
- Compatible with potable groundwater as assessed by the German Hygiene Institute.
- Workability <8 hours.
- Certified in The Netherlands with BRL5078 for grouting.

For use in Horizontal applications: add between 320 - 350 kg Cebo Drill-Grout Plus to 1m^3 water. Fine adjustments are made to the consistency by varying the solid content; recommended Marsh time minimal 45s. S.G. should be min. 1.19.

For use in Vertical applications: add between 320 - 600 kg Cebo Drill-Grout Plus to 1m^3 water. Mixing ratios above 350 should be mixed with low shear mixing system like a grout mixer and/or pedal mixer.

The volume of Cebo Drill-Grout Plus must be 15% more than the calculated volume to be sure that the drilling fluid is fully replaced with Cebo Drill-Grout Plus.

HDD MICRO VERTICAL CORE

Cebo Thermo-Grout Lite

Cebo Thermo-Grout Lite is a specially formulated, high yield, self setting higher thermal conductive grout. The product can be used in Vertical Drilling applications as well as in HDD applications to completely fill annular spaces where a high thermal conductivity is required. Cebo Thermo-Grout Lite sets as a plastic seal with a low water permeability which prevents mixing for underground water layers. By using this product, heat can be conducted more efficiently from or towards the ground.

Functions

- Seals annular space.
- Enhances heat transfer in the annular space.

Advantages

- Easy to pump.
- Low mixing ratio.
- High flowability.
- Minimum sag.
- Lower density compared to most other thermal enhanced grouts.
- Can be mixed with a large variety of existing mixing equipment.
- Not based on sand, therefore minimal wear and tear.
- Thermal conductivity of 1.4 W/m*K (proven in field and laboratory).

Add slowly and uniformly through a Venturi-Hopper into a high shear mixing system. Circulate the slurry until the Cebo Thermo-Grout Lite is fully dispersed and hydrated.

Formulation/m^3: 400 kg Cebo Thermo-Grout Lite and 840 litres water.

HDD VERTICAL

Cebo QS Products

Cebo Holland pellets are made of pressed Bentonite or pressed clay. High quality Bentonite pellets have a high swelling and water absorption capacity. The advantage of pellets is that they can be added into boreholes without any specialized equipment. They can be used for repair of punctured or damaged clay layers, making dams water impermeable, rapid sealing of damaged wells or to backfill all types of boreholes.

	Cebo QSL	CEBOGEL® QSE
Description	Natural clay pellet	Specially selected sodium activated Bentonite pellet
Certificates	KIWA BRL-K265	KIWA BRL-K265 KIWA Water Mark
Size	Ø 10 mm, length 5 - 25 mm	Ø 6.5 mm, length 5 - 20 mm
Sinking Speed	23 m/min	17 m/min
Saturated Density	1.6 t/m^3	1.55 t/m^3
Bulk Density	1.1 t/m^3	1.1 t/m^3
Swelling Capacity	120%	220%
Water Absorption	120%	800%
Permeability	1×10^{-9} m/s	1×10^{-12} m/s
Swell Pressure	N/A	18 - 21 kN/m^2

HDD CORE VERTICAL

Cebo Conduct-Gel

Cebo Conduct-Gel is composed of a specially selected Bentonite/graphite mixture and is a unique, all-in-one solution for promoting efficient heat transfer from power cables to the surrounding soil. Cebo Conduct-Gel is a non-hardening suspension and therefore easy to remove after a certain period, if required.

Advantages

- Cement-free and provides high flowability over long distances.
- Non hardening suspension–easily removed, if required.
- High thermal conductivity.
- No water/product separation.
- Can be mixed with a standard mud mixing system.

PRODUCT	MIXING RATIO PER m^3	THERMAL CONDUCTIVITY	THERMAL RESISTIVITY
Water	n/a	0.58 W/m*K	1.72 m*K/W
Bentonite slurry	25 - 70 kg	0.6 W/m*K	1.67 m*K/W
Cement grouts	160 - 220 kg	0.8 W/m*K	1.25 m*K/W
Cebo Conduct-Gel 1.0	175 kg	1.05 W/m*K	0.95 m*K/W
Cebo Conduct-Gel 1.3	844 kg	1.25 W/m*K	0.8 m*K/W
Cebo Conduct-Gel 1.5	844 kg	1.43 W/m*K	0.7 m*K/W
Cebo Conduct-Gel 2.0	844 kg	2.0 W/m*K	0.5 m*K/W

HDD VERTICAL

SPECIALITY PRODUCTS

Cebo Tunnel-Lube

Cebo Tunnel-Lube torque reducer is a specially formulated, aqueous solution designed to help provide friction reduction and improve lubrication characteristics of water-based drilling fluids. Cebo Tunnel-Lube can be used in Horizontal Directional Drilling, Microtunneling, Construction and Vertical Drilling to aid the reduction of rotational torque, pull back pressures or jacking forces when used as a component of water-based drilling fluids.

Functions

- Enhances lubrication properties in most water-based drilling fluids.
- Reduces rotational torque and drag on the drill pipe while drilling.
- Reduces potential for differential sticking.
- Enhances torque reduction in continuous operations.
- Increases wellbore stability by producing a compact and slick filter cake.

Advantages

- Easy to mix.
- Effective torque reduction in a wide range of geologic conditions.
- Works well at moderate to low concentrations.
- Compatible with other Baroid IDP drilling fluid additives.

Approximate amounts of Cebo Tunnel-Lube added to water-based drilling fluids:

2.5 - 20 litres/m^3

HDD MICRO VERTICAL CORE

AQUA-CLEAR® PFD

AQUA-CLEAR PFD (Phosphate-Free Dispersant) is a concentrated liquid polymer dispersant and provides superior mud and sediment removal from the producing formation and gravel pack. The product is also a highly effective mud thinner and contains no phosphates.

Functions

- Disperses mud, sediment and clay from the producing formation and gravel pack in the screened interval.
- Reduces viscosity and gel strength of drilling fluids.

Advantages

- NSF/ANSI Standard 60 certified.
- Reduces development time.
- Increases well yield and capacity.
- Safe to use on most plastics, rubber and metals.
- Non-fermenting.
- Can reduce pumping costs.

As a well development aid	AQUA-CLEAR PFD (gal or L) = 0.002 x water volume (gal or L)
As a mud thinner	Start by adding 0.25 litre of AQUA-CLEAR PFD to 1m^3 of mud. Increase concentration until desired viscosity is achieved.

HDD MICRO VERTICAL CORE

CORE-LUBE™

CORE-LUBE natural, linseed-based soft soap is used as a core barrel lubricant on diamond core drills.

Functions

- Allows for easy sliding of the core into the inner tube.
- Lubricates the core lifter.
- Minimizes wear on the inner tube.
- Formulates a non-polluting water-based solution for cleaning inner tube components and rig equipment.

Advantages

- Helps improve core recovery. Helps extend length of core run in broken ground.
- Can lengthen useable life of downhole wireline components.

As aid in core recovery	A handful or saturated swab of CORE-LUBE lubricant may be smeared inside the bottom of the inner tube before it is inserted into the drill rods. Also, a liberal amount may be applied to the core lifter parts.
As a cleaning solution for drill rig components	Mix 5 litres of CORE-LUBE lubricant per m^3 of water.

CORE

Cebo Hybrid-Gel

Cebo Hybrid-Gel is a high yield biodegradable fluid system based on natural polymers. The product provides high viscosity, excellent carrying capacity, low filtration losses and minimizes clay degradation. Cebo Hybrid-Gel can be used as a single sack, Bentonite-free, drilling fluid system in small diameter HDD operations (e.g. installation of glass fibre optic cables). The name Hybrid results from its second application possibility -adding it at low concentrations to a Bentonite-based drilling fluid to enhance its carrying capacity and gel strength. This makes Cebo Hybrid-Gel your number one fluid additive in most HDD operations under several geological conditions.

Functions

- Quickly builds viscosity at low concentrations.
- Minimizes clay and shale degradation.
- Supports workable fluid loss as a single sack solution.
- Works as a stabilizer and fluid enhancer in Bentonite-based fluids.
- Increases carrying capacity and gel strength.

Advantages

- Biodegradable.
- Higher yield at lower transportation costs compared to Bentonite.
- Can be mixed in a wide range of make-up waters (including salt water).
- Can be broken down chemically.
- Can be stabilized chemically for longer operation time.
- Certified as not water hazardous and environmentally harmless by Horn & Co. in Germany.
- PLONOR compliant.
- CEFAS registered.

	In fresh and salt water as single sack solution	In freshwater as a Bentonite fluid enhancer
Consolidated formations	2 - 4 kg/m^3	0.25 - 1 kg/m^3
Unconsolidated formations	4 - 6 kg/m^3	0.25 - 1 kg/m^3

HDD CORE VERTICAL

SODA ASH

SODA ASH alkalinity agent is a granular powder form of sodium carbonate, primarily used to condition and soften make-up water and to raise pH.

Functions

- Treats calcium hardness in make-up water.
- Raises pH.

Advantages

- Eliminates calcium ions by converting to insoluble carbonate.
- Maximizes the performance of Bentonite and polymer products.

General Treatment
0.5 - 2.5 kg/m^3 of make-up water

HDD MICRO VERTICAL CORE

BARALUBE NS™

BARALUBE NS lubricant is an environmentally acceptable blend of acids, esters and natural oils, used to effectively reduce torque and drag in Bentonite or polymer-based fluid systems. The product is an effective extreme pressure lubricant, suitable in a wide range of geological conditions. BARALUBE NS lubricant do not affect existing drilling fluid properties. It can be added through the hopper or directly to the suction pit if sufficient agitation is available.

Functions

- Enhances lubricating properties in most water-based drilling fluids.
- Reduces rotational torque and drag on the drill pipe while drilling.
- Reduces potential for differential sticking.
- Enhances rate of penetration and torque reduction in continuous wireline coring operations.
- Increases wellbore stability by producing a compact and slick filter cake.

Advantages

- Filming type extreme pressure lubricant.
- Easy dispersion and mixing with minimal shear.
- Effective at moderate to low concentrations.
- No significant effect on rheological parameters.
- Does not create significant amount of foam.
- Higher thermal stability – up to 149°C.
- Low freezing point (-23°C).
- Can be used for the preparation of polymer liquid emulsions.
- Compatible with other Baroid drilling fluid additives, when added in proper sequence.

Approximate amounts of BARALUBE NS lubricant added to water-based drilling fluids:

Optimum concentration is 0.3 - 3%. A concentrated pill of BARALUBE NS lubricant can also be beneficial if elevated torque is experienced. It is recommended to double the concentration in spots to 0.6 - 6%.

HDD MICRO VERTICAL CORE

ULTRAFOAM™ EU

ULTRAFOAM EU liquid foaming agent is an anionic surfactant which can be added to fresh water for air/foam, air/gel-foam or mist drilling applications. ULTRAFOAM EU is primarily used in drilling operations involving unstable formations and large diameter holes, or alternatively when risk of lost circulation is heightened.

ULTRAFOAM EU produces high quality foam of an ideal consistency for efficient air-foam drilling. The product is based on high quality expansion foam with a consistency similar to shaving foam. Using ULTRAFOAM EU enhances the efficiency of cuttings removal and increases the ability to lift large volumes of water. ULTRAFOAM EU reduces sticky tendencies of wet clays, minimizing the risk of mud rings and wall packing.

Functions

- Reduces erosion of poorly consolidated formations.
- Increases borehole stability.
- Promotes efficient hole cleaning.
- Reduces air volume requirement.
- Reduces sticking tendencies of wet clays.

Advantages

- High stability with excellent retention time.
- High expansion foam with consistency similar to shaving foam.
- Higher flash point allows easier shipping.
- Useful in multiple applications.

Foam mixing/injection procedure	Add ULTRAFOAM EU to injection water. Inject into the air stream at a rate necessary to maintain hole stability and penetration rate. Increase amount of ULTRAFOAM EU as required to compensate for downhole water dilution.
To build a stiff-foam drilling system	Mix NO-SAG 0.5 - 1 kg/m³ and/or EZ MUD 1 - 2 l/m³ with water before adding ULTRAFOAM EU. Inject into the air stream at a rate necessary to maintain hole stability and penetration rate.

HDD MICRO VERTICAL

EUROPEAN CONTACTS

FRED BLOMSMA
E: fred.blomsma@cebo.com **T:** +31 651 553 286

MARCEL BIJLEVELD
E: marcel.bijleveld@cebo.com **T:** +31 651 660 092

FRANK OOMS
E: frank.ooms@cebo.com **T:** +31 631 745 248

DAVE BELL
E: dave.bell@cebo-uk.com **T:** +44 7753 819 151

PETYO TOSHEV
E: petyo.toshev@cebo.com **T:** +359 882 943 136

RUSLAN MEKHDIKHANOV
E: ruslan.mekhdikhanov@cebo.com **T:** +7 915 460 3196

FERENC KRIWITZKI
E: ferenc.kriwitzki@halliburton.com **T:** +49 172 6693 663

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www.cebo.com