Product Catalog

INDUSTRIAL DRILLING PRODUCTS

BAROID

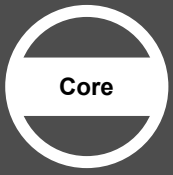
HALLIBURTON

Symbol explanation

Horizontal Directional Drilling

Micro Tunneling

Water well, Geothermal & Geotechnical



Core Drilling / Mineral Exploration

Content

Baroid Industrial Drilling Products

Baroid IDP sales and service engineers average over 40 years experience in several facets of the drilling industry. These individuals bring a comprehensive knowledge of products, drilling methods, regulations and equipment to help customers solve the toughest drilling problems facing your industry. IDP personnel can help in all areas of the drilling project. From product selection through well completion, Baroid IDP representatives are known for being there for the customer.

Baroid developed its reputation by lending expertise at the well site, and can assist the driller in the following areas:

- Solids control system components and configuration
- Circulation pit design
- Products selection and application
- Timely product delivery
- Regional and application-specific know-how

Simply stated, Baroid IDP field sales representatives help customers select the right products, and then help the customer use the products to accomplish the job in the most expedient and cost-effective manner. Regardless of the purpose for drilling the hole, Baroid IDP can provide a field specialist to ensure proper product formulation and application.

Bentonite based fluid properties

Hardness (Calcium)

Hardness of the make-up water greatly affects the hydration of the bentonite and the added polymers. When the hardness is measured and exceeds 100 ppm, bentonite will be less active and polymers lose some of the properties. For example, the hardness can be measured with indicator strips. Adding soda ash (Sodium Carbonate) to the make-up water, reduces the hardness (Ca) and reaches the desired value of <100 ppm.

PH

The acidity of the make-up water is indicated in pH. A pH of 7 is called neutral, a pH below 7 is acidic and a pH above 7 is alkaline. For example, the pH can be measured with indicator strips. Generally, the pH of water from ditches and channels end up to be somewhat acidic by influences of e.g. Peat, vegetation, rainwater. By treating make-up 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 approx. <1000 µS. If the value is higher than 1000 µS, more bentonite will be required than the standard mixing ratio to achieve similar properties. The chloride content of water is difficult and expensive to lower. It is recommended to use suitable water or specialized polymers.

Specific gravity (density)

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

Viscosity

The viscosity is the resistance to flow, also called the "thickness" of a fluid. Viscosity is measured on-site with a Marsh Funnel (measure the number of seconds that expire when 1 liter of drilling fluid flows out) and in the laboratory with a Viscometer. The use of the Viscometer has the advantage that not only Viscosity (Apparent Viscosity = Visible Viscosity) can be measured, but also Plastic Viscosity and Yield Point (carrying capacity).

Viscosity (continued)

In HDD, the viscosity is both friend and enemy. High viscosity / carrying capacity ensures that the drilled solids are transported out of the borehole, but also causes high pressure to occur at the face of the bit. This can (especially when approaching the exit point) lead to frac-outs.

During drilling, it is not always possible to increase the flow rate (pump volume) to transport more drilled solids. A high pumping speed can result in borehole erosion (washing out), resulting in a larger borehole than intended.

Filtration control and 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. Together with the overpressure in the borehole due to the density, the filter cake provides a stable borehole.

When drilling through clay layers, the filter cake ensures that minimum fluid penetrates the formation, preventing unwanted swelling or dissolving of clay.

A proper filter cake is thin and smooth. Not only does the filter cake provide borehole stabilization but it also has a lubricating effect. Measuring the filtrate loss is done with a Filter-Press. The drilling fluid is pressed through a 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 system leaves no more than 2% of sand in the drilling fluid.

Gel strength

Gel strength determines suspension of drilled solids while the fluid is static. If the pump is shut down for a short or long(er) period of time, we want to prevent any drilled solids from settling down inside the drilling fluid. This Gel strength can also be determined with the Viscometer or with a shearometer.

In HDD applications, if the Gel strengths are too low, drilled solids can settle down to the bottom of the borehole where they are difficult to remove. Only in case of a new reaming step, these solids can be removed again. The Gel strengths are measured after 10 seconds and 10 minutes. The Gel strengths are ideal if the 10 seconds Gel and the 10 minute Gel are close to each other.

Gel strength needs to build quickly to prevent drilled solids from settling out of the drilling fluid but should not keep increasing over time. The problem which can occur than is when circulation is being resumed after a long period of stand still, a burst of pressure is created at the drill bit to break the gel structure, this increases the risk of frac-outs.

In (most) vertical applications we are not looking for the same gel strengths as in HDD. We want our drilled solids to be transported out of the borehole by a combination of enough carrying capacity and enough annular flow, but in our settling tanks, the drilled solids should settle out while the drilling fluid is moving at a much slower rate.

Mixing drilling fluid additives

Not only do bentonites, polymers and other additives need sufficient shear and time to physically disperse and hydrate in the make up water. There is also a certain order of addition in which they should be mixed together to promote the best hydration of each additive.
The order of addition for drilling fluid additives is as follows;

1. Soda Ash
2. Bentonite
3. Polymers
   PAC polymers before PHPA polymers
4. *Surfactants*
5. *Thinners and LCM*

Bentonite

TUNNEL-GEL® PLUS

TUNNEL-GEL PLUS viscosifier is a specially formulated, high-yield bentonite designed for use in tunneling and large diameter 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

- Enhanced viscosity development in freshwater drilling fluids
- Effective cuttings transport and suspension characteristics
- Enhanced filtration control and resulting borehole stability
- Effective lubrication fluid for Microtunneling 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/m^3
8,4 - 12,6	20 - 30	25 - 35

HDD **Micro** **Vertical**

TUNNEL-GEL® MAX

TUNNEL-GEL MAX is a specially formulated, high-yield bentonite designed for use in tunneling and large 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 filer cake with low permeability, resulting in borehole stabilization
- Improves hole-cleaning capability of drilling fluids

Advantages

- Can provide lubricity
- Can mix easily and quickly reaches maximum viscosity
- Can be effectively used in a wide range of concentrations
- Can be effective in a variety of drilling applications
- Provides the option of using a variety of additives

Approximate amounts of TUNNEL-GEL MAX viscosifier added to water based fluids	
Normal drilling conditions	30 - 40 kg/m^3
Unconsolidated formations	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 brackish or saline make-up water. 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 brackish to highly saline make-up water
- Improved carrying capacity
- Enhanced filtration control
- Enhanced 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 or freshwater based fluids		
lbs/bbl	lbs/100 Gallon	kg/m^3
8,4 - 12,6	20 - 20	25 - 35

HDD **Vertical**

BARO-GEL™

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

Functions

- Mix with fresh water to form a low-solids drilling fluid for general drilling applications
- Viscosify water-based drilling fluids
- Reduce filtration by forming a thin filter cake with low permeability
- Improve hole-cleaning capability of drilling fluids

Advantages

- Single sack product and cost-effective
- Can provide lubricity for drilling fluids
- Can mix easily 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 specially selected sodium activated bentonite. Cebogel OCMA complies with the OCMA specifications as laid down for oil drilling, is delivered with the KIWA Water Mark certificate and is tested for Germany by the “Hygiene-Institut des Ruhrgebiets”.Cebogel OCMA is an all-round drilling bentonite. Cebogel OCMA has a low fluid loss, is easy to recycle and therefore has an outstanding price—quality ration.

Functions

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

Advantages

- High(er) mixing ratio, allowing more bentonite particles per volume
- Can mix easily and quickly reaches maximum viscosity
- Can be effectively used in a wide range of concentrations
- Can be effective in a variety of drilling applications
- Provides the option of using a variety of additives

Approximate amounts of Cebogel OCMA added to water based fluids	
Normal drilling conditions	50 - 65 kg/m^3
Unconsolidated formations	55 - 70 kg/m^3

HDD **Micro** **Vertical**

Filtration Control Additives

PAC™-R

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

Functions

- Can provide filtration control in fresh or brackish water-based drilling fluids
- Can promote borehole stability in water sensitive formations
- Can minimize rotational torque and circulating pressure
- Can improve hole cleaning and core recovery
- Can stiffen foam to improve cuttings transport in air/foam drilling
- Can reduce air requirements, up hole velocity and borehole annulus pressure in air/foam drilling

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 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

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 formation. PAC-L polymer can be added to vegetable or mineral oil to provide an oil-based fluid suspension, which can be poured into drill string directly.

Functions

- Can provide filtration control in fresh or brackish water-based drilling fluids
- Can reduce fluid loss without significantly increasing fluid viscosity
- Can encapsulate shale to prevent swelling and disintegration
- Can promote borehole stability in water sensitive formations
- Can minimize rod chatter, rotational torque and circulating pressure
- Can improve hole cleaning and core recovery

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-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, modified natural cellulosic polymer, 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 formation. QUIK-TROL can be added to vegetable or mineral oil to provide an oil-based fluid suspension, which can be poured into drill string directly. QUIK-TROL is also used in air/gel-foam drilling.

Functions

- Can provide filtration control in fresh or brackish water-based drilling fluids
- Can promote borehole stability in water sensitive formations
- Can minimize rotational torque and circulating pressure
- Can improve hole cleaning and core recovery
- Can stiffen foam to improve cuttings transport in air/foam drilling
- Can reduce air requirements, up hole velocity and borehole annulus pressure in air/foam drilling

Advantages

- NSF/ANSI Standard 60 certified
- 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 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 modified natural cellulosic polymer provides filtration control in most water-based drilling fluids without substantially increasing viscosity. QUIK-TROL LV modified natural cellulosic polymer when added to a bentonite slurry, yields a drilling mud system suitable for drilling in sandy formation. QUIK-TROL LV polymer can be added to vegetable or mineral oil to provide an oil-based fluid suspension, which can be poured into drill string directly.

Functions

- Can provide filtration control in fresh or brackish water-based drilling fluids
- Can reduce fluid loss without significantly increasing fluid viscosity
- Can encapsulate shale to prevent swelling and disintegration
- Can promote borehole stability in water sensitive formations
- Can minimize rod chatter, rotational torque and circulating pressure
- Can improve hole cleaning and core recovery

Advantages

- NSF/ANSI Standard 60 certified
- 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 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, highly dispersible, polyanionic cellulosic (PAC) polymer, provides ease of mixing and improved filtration control in most water-based drilling fluids. QUIK-TROL GOLD, highly dispersible polymer, when added to a bentonite slurry, 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

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/m^3
0.1 - 2	0.25 - 4.75	0.3 - 5.7

HDD Micro Vertical Core

QUIK-TROL® GOLD LV

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

Functions

- Filtration control in fresh or brackish water-based drilling fluids
- Borehole stability in water sensitive formations
- Encapsulation of shale to prevent swelling and disintegration
- Minimized rod chatter, rotational torque and circulating pressure
- Improved hole cleaning and core recovery
- Enhanced foam properties to improve cuttings transport in air/foam drilling

Advantages

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

Approximate amounts of QUIK-TROL GOLD LV filtration control additive added to water-based fluids		
lbs/bbl	lbs/100 gallons	kg/m^3
0.1 - 2	0.25 - 4.7	0.3 - 5.7

HDD **Micro** **Vertical** **Core**

Clay Inhibitors/ Stabilizers

EZ-MUD®

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

Functions

- Can stabilize reactive shale and clay formations
- Can improve borehole stability
- Can enhance slurry rheological properties
- Can alleviate mud rings, bit balling and booting-off in clay formations
- Can reduce drill pipe torque and pumping pressure
- Can minimize rod chatter in diamond core drilling
- Can create "stiff-foam" and maintain foam integrity
- Can flocculate non-reactive solids in reserve pit at low concentrations

Advantages

- Mixes easily with minimum shear in fresh water
- Helps provide effective clay and shale stabilization with lower viscosity
- Helps impart high degree of lubricity
- Non-fermenting
- Breaks down chemically with bleach (sodium hypochlorite)
- NSF/ANSI Standard 60 Certified

Approximate amounts of EZ-MUD polymer added to drilling fluid system		
Added to fresh water	Added to bentonite fluids	Added to air/foam injection liquid
1 - 5 liters/m^3	1 - 2.5 liters/m^3	1 - 2.5 liters/m^3

HDD **Core** **Vertical**

EZ-MUD® DP

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

Functions

- Stabilize reactive clay and shale formations
- Keep trench excavation open during the construction
- Produce high viscosity solids-free slurry
- Enhance rheological properties of a low-solids drilling mud
- Enhance core recovery in continuous wireline coring operations
- Flocculate non-reactive solids in reserve pit at low concentrations
- Reduce torque and drag

Advantages

- Can disperse easily with minimal shear
- Efficient shale/clay stabilizer and viscosifier
- Helps impart high degree 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 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

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

Functions

- Enhances rheological properties of a low-solids drilling mud
- Promotes clay and shale stabilization to prevent swelling and/or dispersion
- Promotes 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
- Unique physical structure allows for easy dispersion and mixing with minimal shear
- Allows for use of 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 polymer added to 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

- Stabilize reactive shale and clay formations
- Improve borehole and excavation stability
- Enhance slurry rheological properties
- Alleviate mud rings, bit balling and boot-ing-off in clay formations
- Reduce drill pipe torque and pumping pressure
- Minimize rod chatter in diamond core drilling
- Create "stiff-foam" and maintain foam integrity
- Flocculate non-reactive solids in reserve pit at low concentrations

Advantages

- Liquid form – mixes easily with minimum shear in fresh water
- 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 drilling fluid system		
Added to fresh water	Added to bentonite fluids	Added to air/foam injection liquid
2.5 - 6.5 liters/m^3	1 - 2.5 liters/m^3	1 - 2.5 liters/m^3

HDD **Micro** **Vertical** **Core**

Lost Circulation Materials

N-SEAL™

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

Functions

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

Advantages

- NSF/ANSI Standard 60 certified
- Acid soluble
- Easily-wetted
- Inorganic and non-fermenting

For normal treatment to the active system, add 6.-.24 kg/m^3 drilling fluid
As a pill, add 24.-.86 kg/m^3 of drilling fluid

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 horizontal directional drilling.

Functions

- Lost circulation material for horizontal directional drilling
- Prevent inadvertent returns in river crossing applications
- Stabilize borehole in cobble and gravel
- Stabilize 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 in-line 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 allowing 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
- Can stabilize 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 liters 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 liters 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 liters/m^3) 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 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/m^3.

Functions

Cebo F-Seal can be used as an additive for loss of circulation in concentrations of up to 20 kg/m^3.

Advantages

- Acid soluble
- Inorganic and non-fermenting
- Easily-wetted

For normal treatment to the active system, add 3.-.10 kg/m^3 drilling fluid
As a pill, add 10.-.20 kg/m^3 of drilling fluid

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

- Increased gel strength of the drilling fluid for better suspension of the drilled cuttings, coarse sand and gravel
- Enhanced carrying capacity for solids suspension at lower viscosity to further ensure flowability on longer length bores and backreams
- Improved 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

- Increased gel strength of the drilling fluid for better suspension of the drilled cuttings, coarse sand and gravel
- Enhanced carrying capacity for solids suspension at lower viscosity to further ensure flowability on longer length bores and backreams
- Improved 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

- Can reduce or eliminate bit balling
- Can reduce surface tension of drilling fluid, which allows faster chip removal without continuously grinding the hard shale formations
- Can improve drilling efficiency by preferentially coating the bottom-hole assembly and drill string
- Can minimize differential sticking
- Can increase bit life and reduce drill pipe and bottom-hole assembly wear

Advantages

- Easy to mix
- Effective in low concentrations
- Compatible with other Baroid drilling fluid additives
- Biodegradable

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

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, kg/m^3
0,6 - 3,6

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. Cebo Drill-Grout provides flexibility to the user by providing significant working time and gradual development of compressive strength in the resultant slurry.

Functions

- Filling 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

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/liter 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.

Functions

- Filling 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

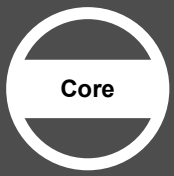
For use in Horizontal applications: add between 320 - 350 kg Cebo Drill-Grout Plus to 1m^3 water. Fine adjustments are made to the consistency by varying the solid content; recommended Marsh time minimal 45s. S.G. should be min. 1.19
For use in Vertical applications: add between 320 - 600 kg Cebo Drill-Grout Plus to 1m^3 water. Mixing ratio's above 350 should be mixed with low shear mixing system like a grout mixer and/or pedal mixer.
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 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 e.g. 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	Special 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 x 10^{-9} m/s	1 x 10^{-12} m/s
Swell pressure	n/a	18 - 21 kN/m^2



Cebo Conduct-Gel

Cebo Conduct-Gel is a unique range of products, composed of a specially selected bentonite and graphite mixture that allows heat transfer from power cables to the surround soil. The Cebo Conduct-gel range of products are non-hardening suspensions and therefore easy to remove after a certain period of time.

Advantages

- High flowability over long distances
- Low weight suspensions
- Can be mixed with a standard mud mixing system
- Minimal dilution with water present in the duct
- Stiffens up like a thick gel
- No water/product separation

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**

Specialty Products

Tunnel-Lube

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. Tunnel-Lube torque reducer can be used in horizontal directional drilling, microtunneling, construction applications and vertical drilling to aid in the reduction of rotational torque, pull back pressures or jacking forces when used as a component of water-based drilling fluids.

Functions

- Enhanced lubricating properties in most water-based drilling fluids
- Reduced rotational torque and drag on the drill pipe while drilling
- Reduced potential for differential sticking
- Enhanced torque reduction in continuous wireline coring operations
- Increased wellbore stability by producing a compact and slick filter cake

Advantages

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

Approximate Amounts of Tunnel-Lube added to water-based Drilling Fluids
2.5 – 20 Liter/m^3

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AQUA-CLEAR® PFD

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

Functions

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

Advantages

- NSF/ANSI Standard 60 certified
- Helps reduce development time
- Helps increase 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 liter of AQUA-CLEAR PFD to 1 m^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

- Easy sliding of the core into the inner tube
- Lubrication of the core lifter
- Minimized wear on the inner tube
- Formulation of 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 liters of CORE-LUBE lubricant per m^3 of water.

Cebo Hybrid-Gel

Cebo Hybrid-Gel is a high yield biodegradable fluid system based on natural polymers. Cebo Hybrid-Gel provides high viscosity, excellent carrying capacity, low filtration loss and strong clay and shale inhibition.
Cebo Hybrid-Gel can be used as a single-product solution in various drilling applications, especially to be used in situations where clay-based drilling fluids are restricted.

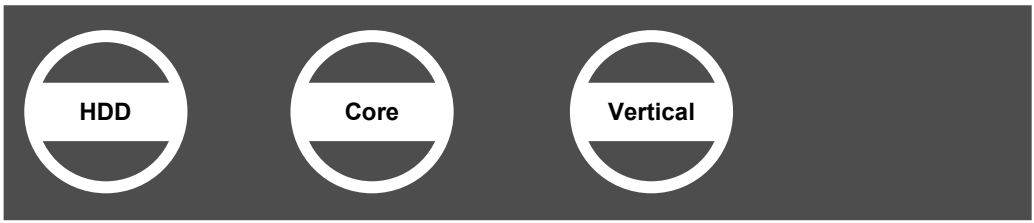
Functions

- Quickly build viscosity
- Improving clay and shale inhibition
- Improve fluid loss
- Increased carrying capacity and gel strength

Advantages

- Biodegradable
- Low mixing ratio
- Non-toxic
- PLONOR compliant
- CEFAS registered
- Can be mixed in a wide range of make-up waters
- Single-product solution
- Can be broken down chemically

Cebo Hybrid-Gel mixing ratio	Fresh water	Salt water
Consolidated formations	2 - 4 kg/m^3	2 - 4 kg/m^3
Unconsolidated formations	3 - 5 kg/m^3	3 - 5 kg/m^3



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

- Treat out calcium hardness in make-up water
- Raise pH

Advantages

- Can eliminate calcium ions by converting to insoluble carbonate
- Can maximize the performance of bentonite and polymer products

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

HDD | Micro | Vertical | Core

BARO-LUBE NS™

BARO-LUBE NS lubricant is an environmentally acceptable blend of acids, esters and natural oils, which can effectively reduce torque and drag in water-based drilling fluids. It carries environmental ratings of Gold in UK, yellow in Norway and an R in the Netherlands. BARO-LUBE NS lubricant is an effective extreme pressure lubricant. BARO-LUBE NS lubricant can be added through the hopper or directly to the suction pit if sufficient agitation is available. An injection pump can also be used to inject the product directly into the suction. BARO-LUBE NS lubricant is suitable for applications up to 149 °C

Functions

- Enhanced lubricating properties in most water-based drilling fluids
- Reduced rotational torque and drag on the drill pipe while drilling
- Reduced potential for differential sticking
- Enhanced torque reduction in continuous wireline coring operations
- Increased wellbore stability by producing a compact and slick filter cake
- Generally lowers the fluid loss

Advantages

- Easy to mix
- Effective torque reduction in a wide-range of geologic conditions
- Effective at moderate to low concentrations
- Fluid properties are not adversely affected

Approximate amounts of BARO-LUBE NS lubricant added to water-based drilling fluids
Optimum concentration is 2.5 - 4%
A concentrated pill of BARO-LUBE NS lubricant can also be beneficial if elevated torque is experienced. It is recommended to double the concentration in spots to 5-8%

HDD **Micro** **Vertical** **Core**

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