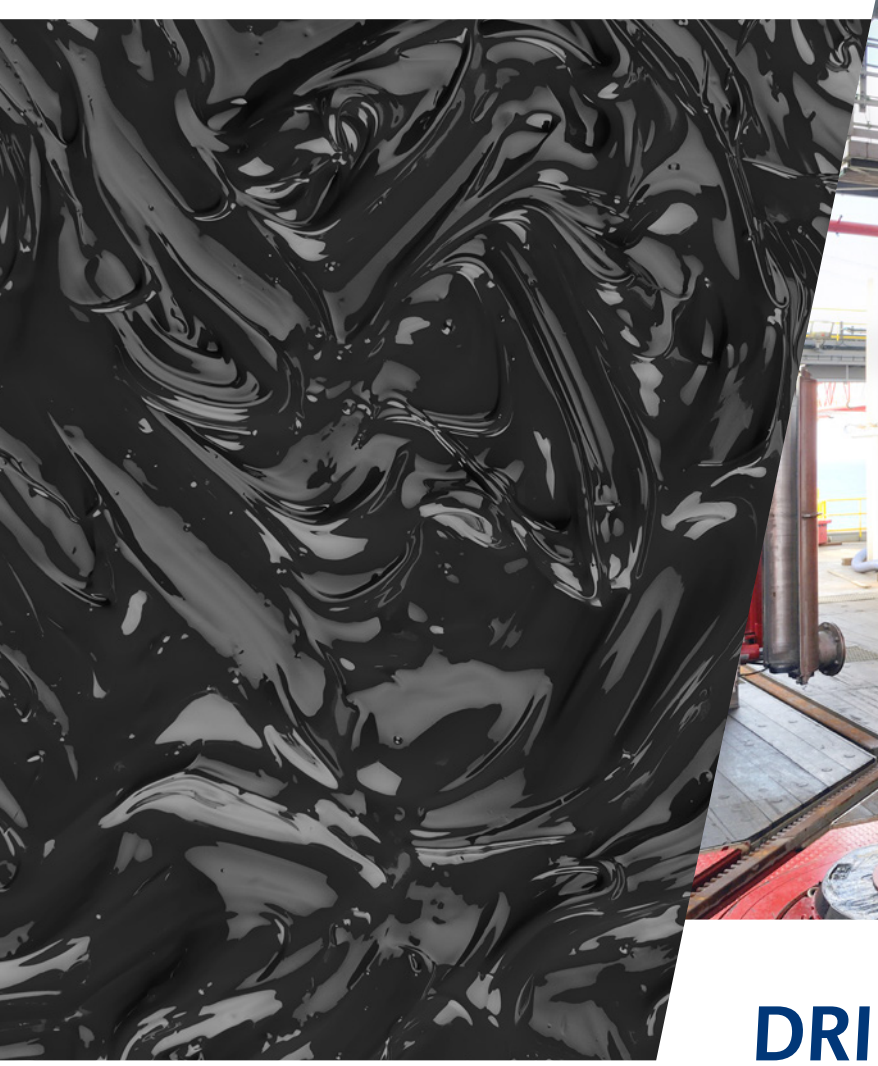
BRENNTAG

ConnectingChemistry



DRILLING

Solutions for drilling and cementing applications

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EVERYTHING AT YOUR FINGERTIPS

Oil&Gas – Service and Technology

Brenntag Polska is a leading chemical company specializing in distribution of standard and speciality chemicals on the Polish market. The company belongs to Brenntag Group, one of the largest chemical distributors in the world. Its full-line portfolio covers a wide range of industrial chemicals, functional additives, auxiliary agents and speciality chemicals for almost all branches of industry.

Brenntag Polska is the biggest Polish distributor of drilling fluids offering standard and highly specialised products for oil and gas drilling industry, including additives for drilling fluids and cement slurries. We provide non-standard solutions and products, such as design and preparation of packer fluids, acidizing fluids (inhibited) and drilling fluids.

Our products are of the highest quality, allowing to reduce financial costs, improve process performance and increase the quality of the extracted raw material.

We approach the needs and requirements of our customers individually to provide professional service and technological support tailored to their expectations.

For drilling industry we offer:

- thickeners
- lubricants
- protective colloids (filtration regulators)
- clay swelling inhibitors
- deflocculants
- biocides
- weighting agents
- fluid loss control agents (mineral and organic)
- corrosion inhibitors
- surfactants
- hydrogen sulphide and oxygen scavengers
- defoamers
- hydraulic fracturing
- functional additives

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Weighting agents

Specific gravity of the drilling fluid is the basic parameter allowing effective hydrostatic pressure control in a well. Proper balancing of formation pressure by the drilling fluid weight, makes it possible to carry out drilling work safely.

Brenntag offers unfloated drilling barite as per API standard and high-quality marble powder of high purity, used while performing reconstruction work that requires the use of ultra- pure materials and while performing standard drilling operations, available in a wide range of particle sizes from 2 to 2,000 microns.

Brenntag offers a broad range of drilling weighting agents, meeting the API standards:

- barite API
- hematite
- Brenntaseal ML (sized ground marble – $CaCO_3$)
- calcium carbonate (all grades)

Filtration control

Filtration is an important feature of each drilling fluid. This parameter is continuously monitored and controlled. Even when filtration control additives are not used, it is usually a conscious decision based on the evaluation of potential consequences, that include tightening of the drill string, falling of the well walls and loss of rheological parameters of the drilling fluid.

High filtration results in a thick filter cake on the permeable formations in the well. An extremely thick filter cake on the well wall can cause significant resistance for the drill and stabilizers. This can eventually lead to tightening of the drill string, resulting in closing of some parts of the well on the drill string or stabilizers due to formation of such filter cake.

The likelihood of the drill string tightening (similarly to the possibility of damaging the production formation) is the most common reason why additives reducing filtration of the drilling fluid or maintaining filtration at a relatively low level during most of the drilling operations are used. Filtration is controlled in order to reduce filtrate losses in permeable sections.

Excessive filtration of the drilling fluid adversely affects the drilling process, as it can cause damage to the production zone and result in an unstable well wall. In addition, a filter cake that is too thick, forming a deposit on walls, leads to various drilling problems.

Brenntag offers highly effective protective colloids, starch-base products (resistant to temperatures up to 150°C) and synthetic polymers (resistant to temperatures up to 210°C).

- CMC
- PAC
- Brenntaper 3100 (drilling starch)
- Brenntaper 3101 (drilling starch up to 150°C)
- D-3018 (HTHP synthetic polymer)
- CMS – carboxymethyl starch
- gilsonite

Viscosifiers

Viscosity is a measure of the drilling fluids internal resistance to flow, or how thick or thin it is. Viscosifier additives are used in order to ensure the desired rheological properties of the drilling fluid to keep the cuttings in suspension, similarly to other drilling fluid additives.

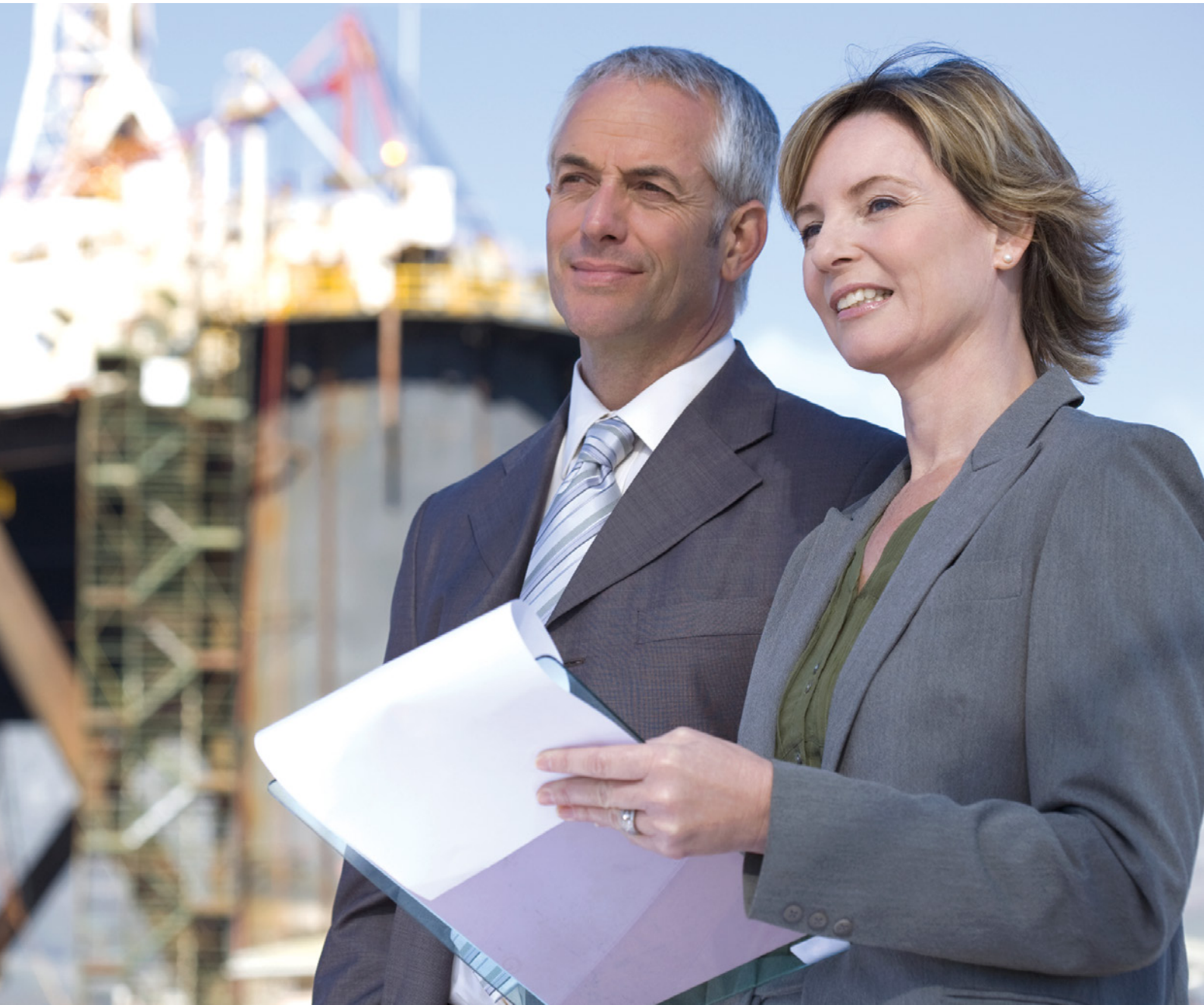
Organic viscosifiers are based on carbohydrates such as cellulose or starch. Viscosity of the fluid can be adjusted. These additives can be anionic, non-ionic and cationic.

The choice of viscosifiers is important – it has to be compatible with other additives in the drilling fluid. They are water-soluble biopolymers and are used in water-based drilling fluids. Inorganic thickeners can be added to the oil-based or water-based drilling fluids.

Effective control of rheological parameters is the basic function of viscosifiers used in drilling. The main purpose of using viscosifiers, both natural and synthetic, is to guarantee proper viscosity and liquid limit of drilling fluids to make them perform their basic function, namely carrying out cuttings effectively.

Brenntag offers a broad range of drilling fluid viscosifiers, meeting the API standards:

- bentonite API
- xanthan gum
- xanthan gum TNO (high temperature)
- HEC
- Brenntadrill 1020 (bentonite extender)
- guar gum
- welan gum and other



Shale stabilizers/ Clay inhibitors

Many problems associated with the use of water-based drilling fluids in drilling operations and reconstruction works are due to absorption of water (from the drilling fluid) by clays. They can cause washing out of the well walls, increased drilling costs (e.g. costs associated with the control of cuttings, drilling time and dilution of the drilling fluid) and exfoliation of the clay formation during drilling.

The presence of reactive clay deposits that soak up water and swell is one of the most important factors affecting clay swelling (falling of the walls, which causes sanding up problems).

Hydration, swelling and dispersion of shale lead to the well wall stability loss, manifested by washing out, caverning or well tightening.

Such a technical condition of a well can result in many drilling failures and requires fluids offering special inhibiting properties.

Brenntag offers products used as swelling inhibitors, including anionic and cationic PHPA polymers. Additionally, we offer highly effective clay swelling inhibitors based on polyglycols (cloud point glycols) and polyamines.

- Brenntahib 2040 (anionic PHPA polymer)
- Brenntahib 2056 (cationic PHPA polymer)
- Brenntahib 2033 (liquid PHPA polymer)
- Brenntahib 2068 (drilling glycol)
- Brenntahib 2802 (drilling glycol)
- Brenntahib 2142 (polyamine)
- gilsonite

Dispersants/ Deflocculants

Excessive content of solids in the drilling fluid or its contamination can lead to a considerable increase in viscosity, which adversely affects the drilling fluid parameters or, in extreme cases, can stop the drilling fluid flow.

Dispersants are applied to deflocculate (reduce viscosity) the drilling fluid.

Brenntag offers lignosulphonate-based deflocculants and deflocculants based on highly effective synthetic acrylic polymers.

- regular deflocculants
- chrome free deflocculants
- D-3020 (synthetic deflocculant)

Lost circulation materials

Circulation losses (drilling fluid losses) are probably the most time-consuming and costly problems that are encountered during drilling. It is estimated, that they cost the drilling industry over a billion dollars a year in the form of downtime and other financial resources.

Drilling fluid circulation losses are common in horizontal drilling in naturally permeable reservoirs. Many wells require drilling fluids, that are made heavier or high-weight brines. Horizontal wells drilled in highly extracted areas and in areas with high gas pressure gradient values (> 14 ppg) often pose economic problems, due to significant drilling fluid losses. They have to be taken into account when planning each well.

The drilling fluid is a priority. Fluid losses are among the most serious drilling problems encountered during drilling work. They pose a threat to the well safety and considerably increase the costs related to the drilling fluid.

Brenntag offers a number of products, both mineral and organic, for effective loss control.

- Brenntaseal ML (sized ground marble – $CaCO_3$)
- calcium carbonate (all grades)
- granular hemicelluloses (GN series)
- mica
- nutshells

Lubricants

Lubricants are specially designed drilling fluid additives that increase lubrication in contact of the drill and the drill string with the drilled formation. They reduce the coefficient of friction of drilling fluids, resulting in minimized torque and drag.

Brenntag offers lubricants designed for all well conditions:

- Brenntalube 5000
- Brenntalube 5010

Defoamers/ Surfactants

Brenntag represents the European largest surfactant manufacturers. Surfactants reduce interfacial tension between water/oil, water/solid, water/air, and other contacting surfaces.

We offer all types of surfactants, including a number of detergents used in various drilling applications.

Brenntag offers a broad range of drilling fluid surfactants, such as:

- Brenntadrill 9000 (drilling surfactant)
- Brenntaskim 7594
- and other

Biocides

Biocides are designed to destroy, deter, render harmless, prevent from acting or exert a controlling effect on any harmful organism by chemical or biological means.

A great variety of organic substances added to the drilling fluid are conducive to the multiplication of microorganisms causing fluid fermentation.

Brenntag offers a wide selection of broad spectrum biocides:

- triazine based
- MBO based
- gluteraldehyde based
- THPS based
- DBNPA based

Corrosion inhibitors

In the oil industry, economic losses and environmental damage caused by corrosion are due to prolonged exposure to very corrosive conditions, to which metal equipment used in drilling is exposed.

The most important tasks in the area of corrosion inhibition include ensuring reliable operation and long service life of the equipment, which translates into real economic benefits.

More than one type of corrosion can be found on oilfields, including electrochemical corrosion (drilling fluids are most often aqueous salt solutions, which are highly conducive to electrochemical corrosion), corrosion caused by oxygen, dissolved hydrogen sulphide or dissolved carbon dioxide.

Corrosion processes, pitting corrosion in particular, can lead to failures resulting from pipe damage, where deep pits occur.

Severe problems can also be caused by intercrystalline corrosion resulting in a significant reduction in strength properties of metal elements, also carrying failures with it. High-quality corrosion inhibitors can considerably extend the life of drilling equipment and most of all prevent failures.

Specially selected inhibitors form a durable protective layer preventing the formation of new pits and passivating the existing ones. Brenntag offers a broad range of corrosion inhibitors commonly used in the drilling industry.

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Scavengers H_2S and O_2

The presence of hydrogen sulphide in the drilling fluid is mainly caused by its occurrence in the bed along with gas or oil. Apart from the fact, that it is toxic to human health, hydrogen sulphide is conducive to corrosion of the drill string and casing pipes.

Dissolved oxygen present in the drilling fluid creates favourable conditions for the formation of corrosion centres.

Brenntag offers hydrogen sulphide and oxygen scavengers:

- zinc oxide
- zinc carbonate
- Brenntadrill 7303 (hydrogen sulphide scavenger)
- TN- 05016 (oxygen scavenger)
- and other

Cementing additives

The most important function of Oil & Gas well cementing is to isolate the various zones within wellbore. Additives are used to enhanced cement slurries in all wellbore conditions.

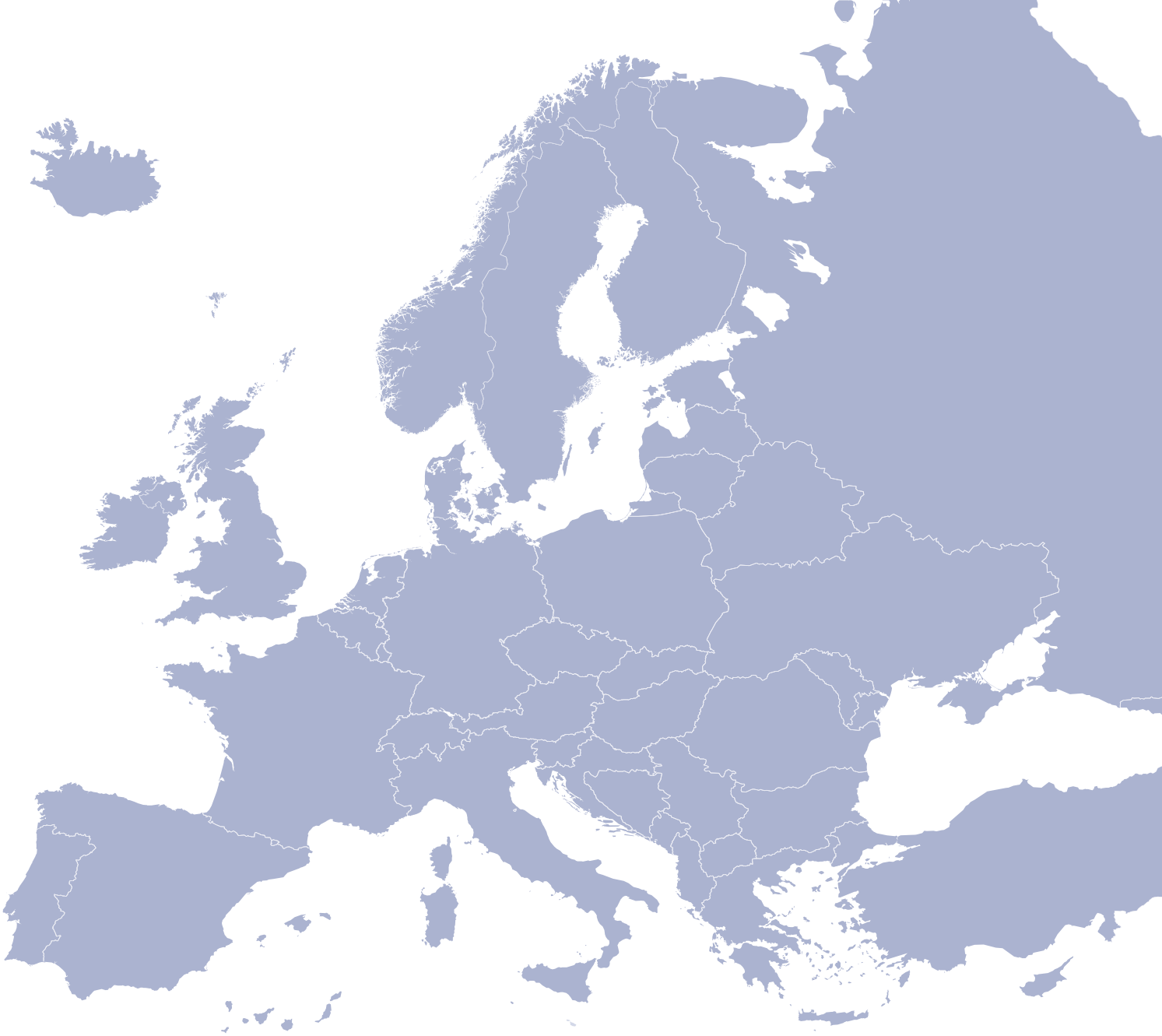
Brenntag offers a wide variety of specialized cementing additives for oilfield needs. We have developed a line of retarders, fluid-loss reducers, dispersants, and extenders for oilfield cementing needs.

- filtration control
- lost circulation materials (LCM)
- deflocculants
- mud removal and spacers
- accelerators
- defoamers (alcohol and silicone based)
- weighting agents
- retarders
- latex for gas migration control

Functional additives

Brenntag offers a wide selection of chemical substances commonly used in drilling. We also prepare mixtures tailored to the customer's needs. Among others, our products include the following:

- citric acid
- sodium carbonate (Na_2CO_3)
- potassium carbonate (K_2CO_3)
- sodium bicarbonate ($NaHCO_3$)
- caustic soda (NaOH)
- potassium hydroxide (KOH)
- potassium chloride (KCl)
- sodium chloride (NaCl)
- calcium chloride ($CaCl_2$)
- monoethylene glycol, etc.
- potassium acetate
- packer fluids (depending on requirements)
- granulated bentonite (for waterproofing)
- hekoterm
- cenospheres
- sodium acid pyrophosphate (SAPP)
- and other



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