

Connecting**Chemistry**



## **PRODUCTION**

Solutions for Flow Assurance  
and Asset Integrity Management



**EVERYTHING AT  
YOUR FINGERTIPS**

## Oil&Gas – Service and Technology

**Brenntag Polska offers a wide range of highly specialised products for oil and natural gas extractive industry. 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 as well as the extracting conditions and the bed parameters individually. We provide professional services and technological support. Brenntag Polska operates logistic infrastructure, technical equipment, including analytical and research laboratory and highly-qualified personnel.

Continuous research development and growing number of analytical methods and laboratory tests are used to monitor the quality of delivered products and to improve and develop new products.

Our product groups:

- corrosion inhibitors
- hydrate inhibitors
- inhibitors, dispersants, paraffin and asphaltene solvents
- demulsifiers
- hydrogen sulphide scavengers
- scale inhibitors
- foaming agents
- desiccants
- biocides and others





# Corrosion inhibitors

If left unchecked, corrosion can lead to a damage or premature failure of equipment and piping. The produced water with dissolved acid gases such as  $H_2S$  and  $CO_2$  can be very corrosive under certain conditions.

Factors influencing the corrosiveness of a system include but are not limited to water chemistry, acid gas content, temperature, pressure and fluid dynamics. The type of material affected by the above factors is also important. Two types of inhibitors are available for protection against corrosion: batch and continuous inhibitors.

## Batch corrosion inhibitors

Batch inhibitors are applied by covering all bare steel surfaces to be protected with the product. This is typically done by using a pig train, although circulation applications are also possible for wells.

The volume of inhibitor, required for protection, depends on the bare steel surface area. To obtain satisfactory results, it is necessary to provide sufficient contact time to allow an inhibitor film to be laid down. Batch corrosion inhibitors are known as “greasy” inhibitors. When applied correctly, they form a thick compact film of inhibitor on the pipe wall.

This film forms a physical and chemical barrier to protect the pipe against both general and local corrosion. The film is gradually washed off over time and must be regularly re-applied to maintain anti-corrosion protection. Re-application frequency depends on the surrounding conditions. Batch inhibitors are typically hydrocarbon-soluble substances.

## Continuous corrosion inhibitors

Continuous inhibitors are applied by regular injection of inhibitor into the fluid/gas stream. The inhibitor disperses into the produced water, providing an effective film coating onto the water-wet metal surfaces within the pipelines.

Continuous inhibitors are typically water-soluble substances. Volatile components, contained in the inhibitor, disperse into the mist flow regime of the vapour phase, neutralising the pH of acidic water droplets, thereby protecting the upper quadrant of the pipeline.

Continuous inhibitors are designed to maintain an integral film on pipe walls. In practice, it means that when an inhibitor molecule detaches from the pipe surface, another inhibitor molecule takes its place.

Voids in the inhibitor film are formed constantly and are immediately healed in a “leap-frog” or “cascade” process. It is therefore critical that the minimum product level must be maintained, so an adequate inventory is always available to fill the holes in the film.

Corrosion probes or other monitoring techniques are recommended to verify the inhibitor performance during the corrosion programme.

Brenntag offers a full range of batch and continuous inhibitors to provide excellent protection against corrosion:

- TN-08243 – corrosion inhibitor for  $H_2S$  and  $CO_2$  systems
- TN-08248 – corrosion inhibitor for  $H_2S$  and  $CO_2$  systems
- TN-08980 – vapour-phase corrosion inhibitor
- TN-08510 – batch corrosion inhibitor
- TN-08515 – batch corrosion inhibitor

# Hydrate inhibitors

Traditionally, methanol has been used to control the formation of hydrates. Methanol works by lowering the temperature at which hydrates form at a given pressure. In order for methanol to be effective, the critical temperature must drop below the operating temperature.

To control severe hydrate problems, large quantities of methanol are often needed to decrease the hydrate formation temperature to the right level.

## Kinetic hydrate inhibitors

Kinetic hydrate inhibitors work in a different way than methanol. While methanol lowers the temperature in which hydrates form, kinetic inhibitors prevent their formation based on a mechanism similar to scale inhibitors formation.

The required dosage of hydrate inhibitors are determined individually, depending on the conditions. Pressure and temperature drops are also important. It is required that the inhibitor is applied upstream of the areas where hydrates are causing problems.

Kinetic hydrate inhibitors do not cause problems with the formation of scales or insoluble salts, nor are they known to cause problems with pumping water into wells. What is more, they will not cause problems in gas purification systems as they degrade harmlessly in gas facilities and amine systems.

The use of hydrate inhibitors instead of methanol offers other advantages as well. For example, there are no problems with dissolved oxygen, which could initiate corrosion of the system, the volumes involved are much more manageable and inhibitors do not interfere with any other chemical processes.

Brenntag offers a full range of kinetic hydrate inhibitors, including products designed specifically for low fluid wells, bifunctional hydrate and corrosion inhibitors and ether-based products for quick removal of the existing hydrate plugs. Inhibited methanol is also available:

- TN-10410 – kinetic hydrate inhibitor
- TN-11360 – kinetic corrosion and hydrate inhibitor
- TN-11515 – kinetic corrosion and hydrate inhibitor
- TN-11820 – kinetic corrosion and hydrate inhibitor
- TN-11930 – kinetic corrosion and hydrate inhibitor
- TN-10100 – inhibited methanol
- TN-10500 – de-icer



## Paraffin and asphaltene inhibitors

Paraffin and asphaltenes are natural compounds that often occur during the production of oil and gas. Paraffins are mixtures of linear or branched alkanes containing more than fifteen carbon atoms per molecule. These substances are solid at room conditions and melt at higher temperatures.

Asphaltenes are mixtures of cyclic compounds (mostly aromatic) with high molecular weight. They contain many impurities, including for example nitrogen, oxygen, sulphur and a number of heavy metals. Unlike paraffin, asphaltenes do not melt at higher temperatures. They decompose above 300°C producing coke and gas.

The presence of paraffin and asphaltene deposits can cause many problems. Waxes and asphaltenes can deposit as low as at the bottom of the well, in consequence restricting the flow or even completely blocking the pipeline. Asphaltenes can also cause problems in gas facilities.

Control of paraffins and asphaltenes is essential for trouble-free exploitation of oil and gas. The optimum choice of a product preventing the deposit formation or removing the existing deposits often depends on the possibility of applying the appropriate technology, the system parameters and the actual facility condition.

## Inhibitors and dispersants

Inhibitors and dispersants have very much in common, but they work in a different way. Inhibitors interfere with the formation of wax crystals, thus preventing their deposition. Dispersants emulsify the existing microscopic crystals and prevent them from accumulating, sticking together and creating deposits. To properly select the product and its injection rates, many parameters must be known, including in particular the temperature at which paraffin crystals occur. In case of paraffin deposits, the inhibitor should be applied before formation of any crystals.

Inhibitors are typically used where the water content is low, while dispersants where the water content is high (over 50%).

Asphaltene inhibitors offer protection against the formation of large agglomerations formed by individual asphaltene molecules, which have a tendency for attracting one another if the volume of liquid, in which they are located, is limited. Inhibitors are applied on a continuous basis. Dispersants may be applied either on a batch or on a continuous basis, depending on the situation.

## Solvents

Solvents are widely used to remove the existing organic deposits. They are designed for specific uses and applications. Due to diversity of deposits, solvents with different components are developed to maximise product performance and optimise its quantity.

Brenntag selects the type of solvent from a wide range of products, basing on the field and laboratory tests.

Our offer includes a full range of inhibitors and dispersants as well as paraffin and asphaltene solvents:

- TN-09020 – paraffin inhibitor
- TN-09100 – paraffin inhibitor
- TN-09150 – paraffin inhibitor
- TN-12020 – paraffin dispersant
- TN-13010 – paraffin solvent

# Demulsifiers

The most common type of emulsion found in oil fields is water-in-oil. Emulsions are problematic for extraction companies and refineries. Water introduced into systems contributes to a number of problems, including corrosion. In refineries, chlorides contained in water damage catalysts.

In order to produce oil in accordance with the specification (less than 0,5% BS&W), any water produced alongside hydrocarbons must be removed prior to being shipped. There is a wide variety of equipment designed to aid in the process of separating water from the obtained hydrocarbons. To ensure that water/oil emulsion separation is timely, complete and economical, demulsifiers are typically applied.

Demulsifiers are specifically formulated mixtures of surfactants designed to remove water contained in the extracted oil. Demulsifiers affect the water/oil mutual influence and improve the efficiency of separation.

In addition, they enable to eliminate solids, reduce the amount of slop or off-spec oil and obtain clean water.

Brenntag offers a wide range of speciality demulsifiers, based on various active compounds. Selection of the correct product is usually made directly in the oilfield using bottle tests.

To protect the environment, Brenntag offers also a number of “green” demulsifiers. They consist of environmentally friendly active ingredients. Both batch and continuous demulsifiers are available.

- TN-02940 – water clarifier
- TN-02175 – demulsifier (for heavy oil)
- TN-02111 – demulsifier (for medium oil)
- TN-02342 – demulsifier (for light oil)
- TN-02100, TN-02107 – demulsifiers/ desalters

# Hydrogen sulphide scavengers

H<sub>2</sub>S is a poisonous gas often present in the produced fluids. Apart from being toxic, H<sub>2</sub>S can cause severe corrosion problems. For this reason, H<sub>2</sub>S is often removed from the produced gas. In marginally sour systems the most economical and efficient method of purifying gas is through the use of hydrogen sulphide scavengers.

As opposed to amine compounds, these substances require only minimal investments. They are ideal for use in marginally sour systems that cannot economically justify more elaborate amine systems but still require the use of gas free of corrosive components. H<sub>2</sub>S scavengers are formulated to quickly and selectively remove H<sub>2</sub>S from a gas stream. Hydrogen sulphide scavengers may be applied by either continuous injection into the gas stream or through the use of bubble columns.

## Continuous injection

Hydrogen sulphide scavengers injected continuously into the gas stream require only a liquid pump and a sprayer. This method, although less efficient than bubbling, is very economical. The spent scavenger dissolves into the produced water and is disposed of when the water is re-injected into the well.

## Bubble column applications

Bubble columns are charged with a specific volume of scavenger to provide an extended surface of fluid contact with hydrogen sulphide. Bubble columns are sized in such a way as to make sure that the scavenger volume, contained in the column, will make it possible for the contact of gas with scavenger to be long enough.

A gas distributor at the inlet of gas into the column is recommended to improve the contact and thus the efficiency of the scavenger. The columns can also be filled with rings extending the surface of gas contact with the scavenger.

Once the charge of the scavenger in the column is used, the spent product must be removed and replaced with a fresh one. Anti-foaming agents may be used to prevent carry-over of the scavenger from the column.

H<sub>2</sub>S scavengers offered by Brenntag do not contain free formaldehyde. Although formaldehyde is a very effective H<sub>2</sub>S scavenger, its toxic properties increase risks to public health.

In addition to the toxicity problems, another problem with formaldehyde is that the reaction of formaldehyde with H<sub>2</sub>S forms solid precipitates. These solids can cause problems with the processing equipment, so they need to be properly eliminated.

Although adding formaldehyde to formulations is known to enhance the product performance, this practice is unacceptable to Brenntag as it poses serious health and safety risks.

- TN-04056 – H<sub>2</sub>S scavenger
- TN-04060 – H<sub>2</sub>S scavenger
- TN-04070 – H<sub>2</sub>S scavenger





**OIL & GAS**  
technology and service





# Foaming agents

Under certain conditions, production in low pressure gas wells may become blocked by the development of water plugs. Water accumulates down-hole in the well since the gas pressure is not sufficient to lift the water out of the well.

The water build-up down-hole may be reduced or even stopped by water head accumulation. When the produced water head pressure is balanced by gas diffusion pressure, applied to the water inside the geological formation, the wells load up and stop functioning. To revive the well, water must be removed. This is often done by blowing the well down manually.

The application of foaming agents is an alternative to the practice of manually blowing down the well when it loads up with water. They work by foaming the water down-hole so that the gas may lift it out of the well.

The foam lifetime is short, so problems in downstream separators are not an issue. Sometimes it is necessary to administer an antifoamer.

The foaming water in order to unload the well has numerous advantages as improved gas inflow and production with less downtime is achieved. A significant increase in productivity is often possible with foaming programmes in place. Brenntag offers both liquid and solid foaming agents together with speciality solid foamers.

Typical Brenntag foamers:

- TN-01040 – liquid foamer
- HighFoam 30 – solid foamer
- AcidStick 30 – acid stick

## Solid foaming agents

Foaming sticks are specifically formed rolls containing 100% of water-soluble surfactants, lubricants and foam stabilisers. Foaming candles support the carryover of the bed water from gas wells, especially those exploiting under-packer horizons and from low productivity wells with lowered bed pressures. They are used in concentrations of 0.2-0.6kg per 1m<sup>3</sup> of water.

## Liquid foaming agents

Liquid foaming agents are applied by means of continuous injection. Typical injection rates are in the range of 0.5 to 4 litres per day. Batch application of foamers is not recommended due to uncontrollable foam carry-over to compressors or other equipment with separators.

# Defoamers

Defoamers (anti-foaming agents) are chemical additives that reduce and hinder the formation of foam in oil & gas production process.

Foam can occur in heavy oils, where dispersed gas bubbles drive up the liquid and produce foam at the top of the liquid surface. The nature of gas dispersions in oil distinguishes foamy oil behavior from conventional heavy oil.

The gas does not coalesce into large gas bubbles nor into a continuous flowing gas phase. Instead it remains, as small bubbles entrained in the crude oil, keeping the effective oil viscosity low while providing expansive energy that helps drive the oil towards the producing well.

An essential feature of a defoamer product is a low viscosity and a facility to spread rapidly on foamy surfaces. It has affinity to the air-liquid surface where it destabilizes the foam lamellas. This causes rupture of the air bubbles and breakdown of surface foam. Entrained air bubbles are agglomerated and the larger bubbles rise to the surface of the bulk liquid more quickly.

Defoamers can be used to reduce frothy crude oil production – to control and eliminate foam in gas scrubbers, surge tanks, crude oil treating units and drilling, work-over and coil tubing applications.

Defoamers destroy an existing foam, they are used in concentration between 1 and 3 l per m<sup>3</sup> of oil.

Brenntag offers below mentioned kinds of defoamers:

- TN-03010 – polymer based
- TN-03050 – silicone based
- TN-03060 – silicone based

## Scale inhibitors

Many produced waters are highly prone to the formation of mineral scales. There are two main mechanisms for scale formation: a change in system conditions (temperature or pressure) can promote carbonate scale formation and co-mingling of incompatible waters (formation water and injection water) can result in the formation of sulphate scale. Oilfield scale most commonly consists of sulphates or carbonates, however the formation of sulphides and oxides is also possible. If left untreated, scale deposition can lead to numerous problems such as poor heat transfer in heat exchangers, plugging of pipelines and valves and even equipment damage.

In addition to causing deposition problems, barium sulphate scales are also radioactive, which poses a health risk. Existing calcium carbonate and calcium sulphate scales can be removed chemically or using acid. Others, such as barium sulphate deposits, may require to be removed mechanically as acids are ineffective, while other chemical treatments are very slow and inefficient. It is generally felt that the prevention of inorganic deposits is a better option than trying to remove them after they have formed.

Brenntag supplies a wide variety of the phosphonate and polymer based scale inhibitors formulated for use in various conditions to prevent the formation of such deposits in pipe-lines and oil facilities.

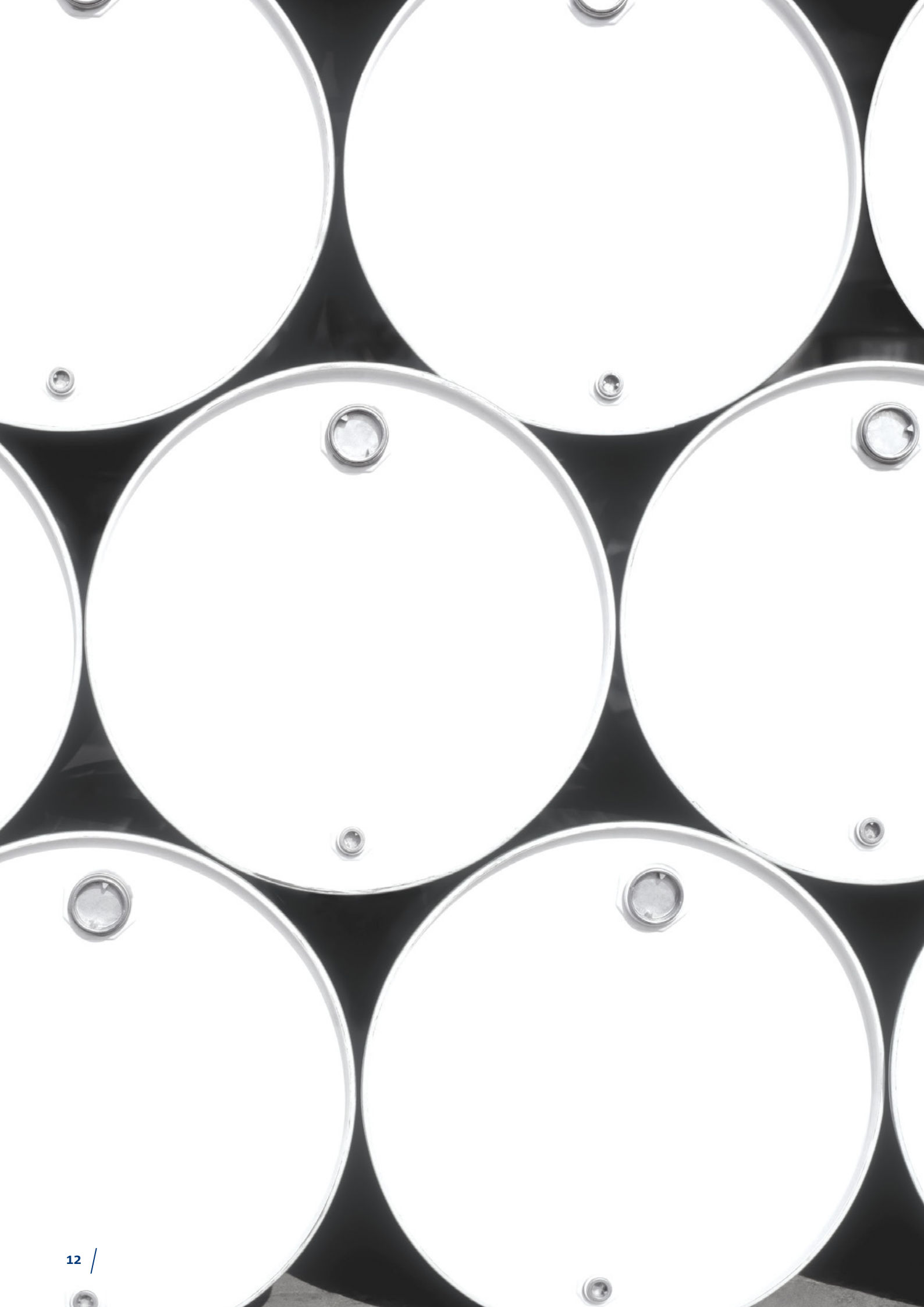
Scale inhibitors disrupt the growth of salt crystals and thus the deposition of scales on equipment is prevented. Scale inhibitors are typically injected on a continuous basis into the water, although certain products may be squeezed into the reservoir to protect down-hole drilling equipment against deposit formation. In order to be effective, the scale inhibitor must be applied upstream of where the scale deposit is occurring.

The choice of a scale inhibitor depends on the severity of the scaling problem, water chemistry (calcium tolerance) and the application method.

The scaling tendency of water is calculated by analysing the minerals dissolved in water and then using advanced software to calculate a scaling index. These calculations are included in a routine full water analysis.

We offer a range of scale inhibitors, including products formulated for high temperatures, varying calcium tolerances and various methods of squeezing into the reservoir.

- TN-06340 – scale inhibitor
- TN-07355 – salt (NaCl) inhibitor
- TN-06332 – scale inhibitor
- TN-06335 – scale inhibitor
- TN-06338 – scale inhibitor





# Desiccants

## Continuous application

Desiccant tablets consist of hygroscopic compounds, which absorb water vapour from the compressed air or gas streams. The surface of a desiccant tablet dissolves slowly forming brine, which drips from the tablet surface onto the bottom of the drying column.

Tablets dissolve steadily until their complete consumption. They are produced in a conventional tableting process in which raw materials are ground and mixed and then formed into tablets using a 15-tonne press.

Brenntag offers three types of tablets for economical gas drying to the desired parameters.

Calcium chloride tablets for gas pre-drying, used in the first column, absorb a large portion of the moisture contained in the gas. This solution is the most economical one, as it allows lithium chloride tablets in the second stage to perform in-depth drying of gas while prolonging their lifetime.

Lithium chloride tablets are three times more efficient than standard desiccants. They make it possible for moisture to be thoroughly eliminated from gas (air).

They can be used individually or in conjunction with calcium chloride tablets. The latter option offers the most optimum drying results in terms of value for money.

Hydroxylith tablets combine the properties of chloride calcium and chloride lithium tablets. They are characterised by excellent drying properties and are recommended for use as independent charge.

## Molecular sieves

Molecular sieves are absorbents widely used in oil and gas production and petro-chemicals industry. They are nanoporous materials with a precise pore size range and the ability to selectively adsorb molecules of particular chemical compounds. Molecular sieves are also used as desiccants for most gases and liquids.

Brenntag offers mainly zeolite molecular sieves of various pore diameter ranging from 3Å to 10Å and of the bead size ranging from 1.6mm to 5mm.

Using the proper type of aluminosilicate molecular sieves or a combination thereof enables the adsorption of many types of gases and gas mixtures. These include water, hydrogen sulphide, carbon monoxide and dioxide, oxygen and nitrogen.

Molecular sieves are valued for their high adsorption capacity and high selectivity. It is also important that they are chemically inert recoverable materials. Molecular sieves retain their capacity at temperatures higher than alumina or silica gel.

Brenntag also offers the above-listed desiccants such as activated alumina and silica gel as well as active carbon, which adsorbs heavy metals and is used to remove many impurities.

## Biocides

Micro-organisms in oil and gas systems may be naturally occurring or be the result of contamination from poor operational practices, such as using untreated water for well work-overs.

Bacteria typically found in oilfield applications are anaerobic (organism which can live under oxygenfree conditions). The presence of bacteria in oil facilities can have numerous negative repercussions. Bacteria may foul the equipment or lead to other operational problems.

They may foul the equipment or accelerate corrosion in oil production facilities (SRBs). Not only do they form colonies providing perfect conditions for under-deposit corrosion but their metabolism also contributes to corrosion by the formation of acidic or sour conditions.

Micro-organisms can be identified by testing water samples using field test kits. The presence of bacteria may also be confirmed by the services which are offered by external laboratories. These tests are based on epifluorescence and other microscopic techniques.

It is critical for the operation of the production facilities to control the bacterial cultures present. The use of biocides makes an economic way of bacteria control and prevention. They penetrate into the bio-film and create the environment

which is toxic to bacteria. They are usually water-soluble as water makes the habitat for most bacteria.

Biocides should be used periodically; they will offer a higher biocidal activity and a better cost-effectiveness then. Moreover, the risk will be lower that bacteria may become inured to the specific biocide in time. It is very important above all, that bacterial contamination should be controlled from its source.

In case of any biocidal control programme, it is recommended to implement the programme as early as possible to eliminate bacteria at the very initial point. A biocide may then be employed at further locations to eliminate the colonies, which may have developed within downstream equipment.

This approach effectively neutralises bacteria from the entire facility and minimises the risk of re-contamination by colonies flowing from untreated areas to that parts of the facility that have already been cleaned.

After biocide programmes have been initiated, the performance of the biocide should be evaluated by running cultures on water samples using field test kits. Brenntag offers a full range of biocides.

## Commodities

Brenntag Group company which is the world's market leader in chemical distribution also offers a wide selection of commodity chemicals commonly used in the oil & gas industry.

These include but are not limited to:

- monoethylene glycol (MEG)
- diethylene glycol (DEG)
- triethylene glycol (TEG)
- ethylene glycol monobutyl ether (EGMBE)
- monoethanolamine (MEA)
- diethanolamine (DEA)
- methyldiethanolamine (MDEA)
- solvent naphtha 100 and 150
- xylene



**OIL & GAS**  
technology and service





## Contact

**Brenntag Polska Sp. z o.o.**  
Oil & Gas Division  
ul. Przemysłowa 2, Jankowice  
62-080 Tarnowo Podgórne, Poland

Phone: +48 61 893 65 07  
Fax: +48 77 47 21 600  
[ropaigaz@brenntag.pl](mailto:ropaigaz@brenntag.pl)

**[www.brenntag.com](http://www.brenntag.com)**