BleachMag
By Brucite+

Recommendations

BleachMag® in pulp bleaching

Description and application

BleachMag® magnesium hydroxide is a milled brucite mineral used for different processes of pulp and paper industry. It is produced in the form of a powder and a suspension.

It is an odorless white substance, the granular product has a tint from light gray to light brown. The product is not a chemical; it is produced by grinding and subsequent hydration of the natural mineral brucite.

BleachMag® functions as an alkali, a stabilizer of hydrogen peroxide and a protector of cellulose in chlorine-free bleaching of pulp. It can be used for bleaching mechanical, thermomechanical, chemical-thermomechanical, chemical pulp, and waste paper (DIP).

It replaces more expensive alkalis at the hydrogen peroxide bleaching stage, delignification and extraction with oxygen and alkali (stages Eop, P, Ep, E). It allows 100% replacement of magnesium sulfate ($MgSO_4$) at oxygen delignification of cellulose.

Customers can prepare a diluted suspension of BleachMag® from the powder and water.

How does BleachMag® work?

Magnesium hydroxide is classified as sparingly soluble in water. Once in wastewater with an acidic reaction of the medium, BleachMag® begins to gradually dissolve with the release of magnesium cations and hydroxide anions. Hydroxide anions contribute to the dissociation of hydrogen peroxide into hydroxonium and perhydroxyl anion, which is the main driving force behind bleaching.

$H_2O_2+OH^- = H_2O+HO_2^-$

Divalent Mg^{2+} cations protect carbohydrates during oxygen delignification, forming carbohydrate complexes. Therefore, BleachMag® can replace magnesium sulfate MgSO4. Magnesium cations are also involved in the processes of coagulation, compaction of sewage sludge, and therefore reduce the COD value. Hydroxide anions BleachMag® promote the deposition of heavy metals, therefore, reduce the consumption of chelating agents and sodium silicate.

Application

The dosage of the product depends on the application. Indicative dosages of BleachMag® for different pulp types when replacing NaOH in bleaching are shown in table.

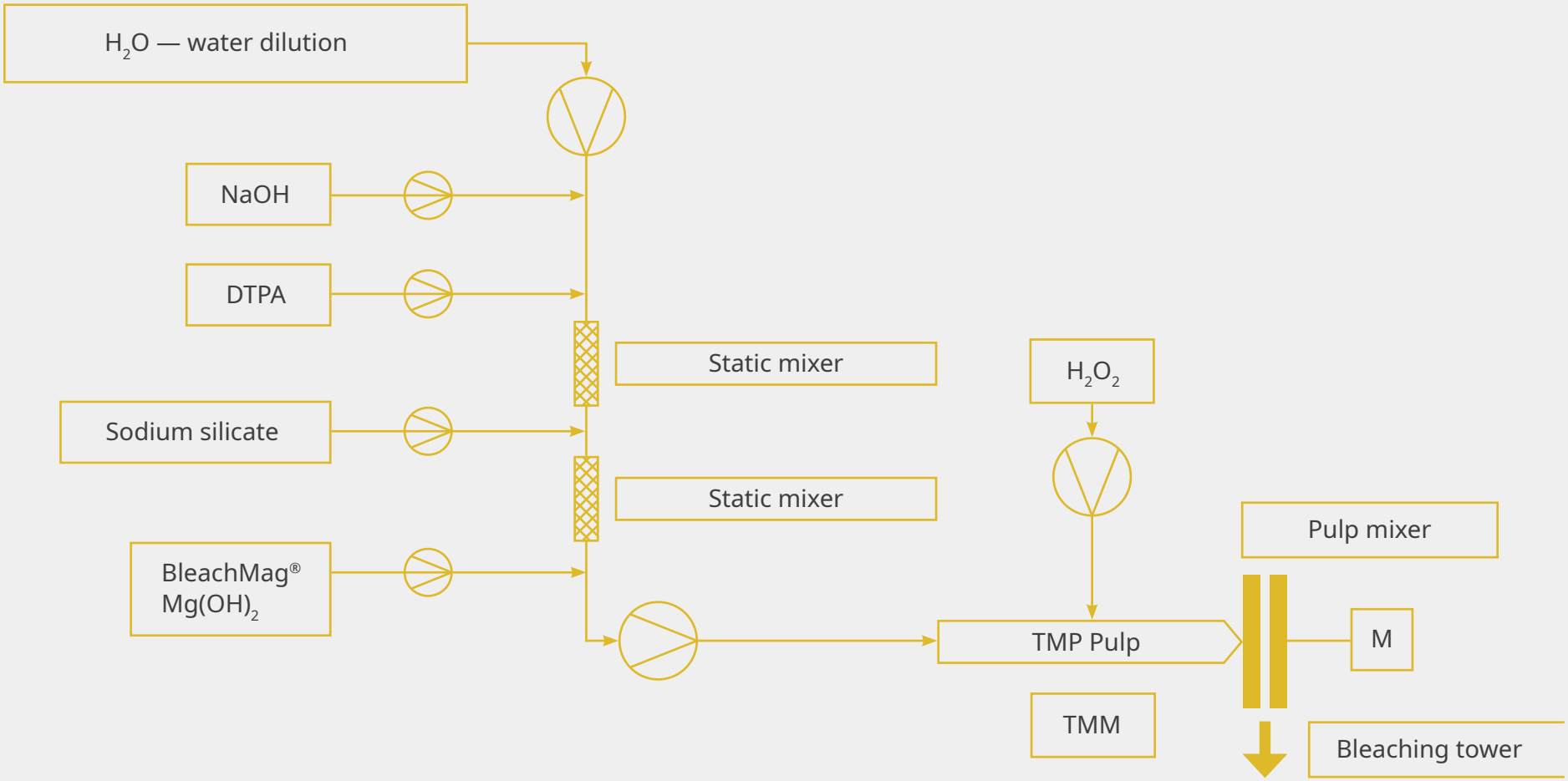
In the process of oxygen delignification of a chemical pulp, BleachMag® can replace 100% $MgSO_4$.

Recommended dosages BleachMag®

Pulp type	Wood type	Bleaching with hydrogen peroxide in alkaline medium
TMP	soft	Up to 35% substitution of NaOH
MP	soft	Up to 35% substitution of NaOH
CTMP	hard/soft	From 2,5 till 5,1 kg/ton pulp; 16-25% substitution
Kraft pulp	hard/soft	From 0,6 till 1 kg/ton pulp; up to 10-15% substitution
DIP	—	From 15% till 35% substitution of NaOH

Application

BleachMag® should be dosed as close to the point of supply of chemicals into the system as possible. See Pic. 1 for more details.



Pic. 1. Dosing scheme for BleachMag® into TMM pulp bleaching process

Application

Recommendations for preliminary industrial product testing:

- Storage tank for ~ 1 month of use.
- Screw metering pump — Netzsch Mono or equivalent.
- Stator pump — rubber nitrile elastomer.
- Flow sensor — electromagnetic.
- Do not use check NRV.
- Use only open-close valves.
- Minimize flushing of the storage tank to avoid dilution of the suspension.

BleachMag® is supplied in suspension and powder form. Depending on the form of delivery, the product can be used in two ways:

1. Dosing the finished concentrated suspension in the system.
2. Preparation of diluted suspension by customer.

Dosing the concentrated suspension in the system

The product can be dosed from storage tanks (while delivering in trucks) and from IBCs. It is necessary to provide periodic mixing of the product.

Please read the rules for handling the finished suspension in Appendix 1.

Preparation of diluted suspension by customer

The customer can prepare a suspension with a concentration of up to 35% solids by mixing BleachMag®-P powder and water.

A further increase in concentration is impossible without the use of special dispersing agents. An example of a reactor for preparing a suspension from powder is shown in photo.

When dispensing a diluted suspension, special attention should be paid to the constant mixing of the product (as solid particles settle rapidly) and to flushing the dosing lines.

The recommendations given in Appendix 1 must be followed.

A reactor with a 2-level mixer for the preparation of BleachMag®-S suspension.

4 kW, 60-85 RPM, volume 1.5 m3

BleachMag® advantages

- The most cost effective alkali in comparison with others on the market.
- Suspension with the highest percentage of solids on the market — 65 %.
- Non-toxic, safe for the environment and handling.
- Non-corrosive.
- Reduces caustic soda (NaOH) consumption by up to 50 %.
- Free of MgO residues compared to other magnesium additives.
- Replaces magnesium sulfate ($MgSO_4$), performing all its functions.
- Keeps a high whiteness of the cellulose.
- Reduces the demand of bleaching chemicals (silicates, chelates).
- Reduces COD and wastewater treatment costs.
- Works with hard and soft wood, with various processing options (TMP, MP, CTMP).

Appendix 1

Rules for handling the final suspension

The product can be dosed both from containers (IBC) and from storage tanks (for deliveries in car tanks). The suspension of magnesium hydroxide BleachMag® should be dosed in the area of maximum mixing of effluents using a peristaltic, screw or diaphragm pump. It is necessary to ensure periodic mixing of the product and follow the recommendations below.

Unloading of the material

Truck cars are unloaded by pumping or pressurizing the car. If pumping method is used it is recommended to circulate the product via pump before unloading to a storage tank. When designing unloading line, it is recommended to include mesh filters with ≤1 mm holes to prevent blockage with possible agglomerates in suspension. When unloading material from IBC, one should resuspend the suspension by folding IBC mechanical mixer or compressed air within 10 minutes.

Storage conditions

Suspension should be stored inside the warehouses or in open areas under a canopy, under conditions that exclude exposure to water and corrosive media (acids, alkalis), at positive temperatures from +2° C to +35° C. When storing outside the warehouse, please, avoid direct sun exposure. The guaranteed shelf life of the suspension is 6 months upon delivery to a customers' warehouse.

Despite the fact that BleachMag® suspension has long-term stability, when stored in the warehouse without stirring for more than 1 month, a transparent layer of water appears on top. This is normal and does not affect its mixing and transferring to a uniform state.

Mixing is necessary to prevent the deposition of solids. This can be done by mechanically mixing or sparging the air through the suspension.

During long-term storage (more than 1 month) it is necessary to periodically mix the suspension once every 2 months using a mechanical mixing device or sparging the air till suspension turns homogeneous.

Appendix 1

Rules for handling the final suspension

Mechanical stirrers come in various designs; paddle, propeller or frame mixers can be used. A sufficient speed of the stirrer for stirring the suspension during storage is 50–60 rpm.

When mixing the suspension in tanks larger than 1 m 3, stirrers with an upper inlet should be used. They provide greater efficiency (require less power) and ease of maintenance.

For mixing with compressed air, it is necessary to provide aerators at the bottom of the storage tank. For greater efficiency, place them with the holes down.

In the case of periodic supply of the suspension with interruptions of more than 24 hours, thorough mixing of the product immediately before use for 4–8 hours is recommended.

Reservoirs for storage

The most preferred materials for storage/dosing tanks are carbon steel, fiberglass or polymeric materials. Aluminum is incompatible with magnesium hydroxide suspension due to corrosion.

IMPORTANT: Storage tanks should be installed as close as possible to the dosing point in order to prevent clogging of the pipelines!

Vertical tanks are preferable to horizontal ones, since they take up less space, they are easier to fix on concrete bases, and it is easier to organize mixing in them. As a rule, a tank should have a capacity of 1.5 times the size of the tank in which the material is delivered in order to have an extra space for rinsing water. Vertical tanks with a height/diameter between 1.0 and 1.2 are preferred. All tanks should be fitted with baffles set 90° apart to prevent vortex formation during mechanical agitation. Baffles should measure 1/10th of the tank diameter and should extend to 30 cm above the bottom of the tank.

Special insulation is not required if the tank stays at a temperature above +2° C. If the ambient temperature is below +2° C, the tank must be isolated and/or heated to prevent freezing of the suspension. Heat can be applied using self-regulating electrical tape or a cable on the outside of the tank.

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When storing the material in the tank outdoors in case of high ambient temperature (above +35° C), water dispensers can be installed inside the tank to prevent evaporation losses. The dilution of the suspension should be not more than 5% of the total volume.

Tanks should have a connection to the atmosphere. This can be implemented through a vent with a water seal or by installing a ventilation pipe. It is especially important to provide an appropriate design in the case of mixing the suspension with compressed air and/or purging the dosing line with compressed air.

Dosing lines

For magnesium hydroxide suspension suitable pipes are carbon steel or plastic ones. Various hoses can be used, including reinforced PVC and rubber hoses. If possible, pipes should be installed above ground and easily accessible for maintenance. The minimum diameter of the hoses is ½" (12.7 mm).

If the pipelines are located in areas with extreme temperatures (below +2° C or above +35° C), they should be heated or insulated. This can be performed with self-regulating heating tape or cable. It is not recommended to use steam heating of the tank, as high temperatures can dry magnesium hydroxide on the walls of tanks and pipes. To prevent blockages, it is important to ensure that the suspension circulates through all the pipelines and to plan a minimum of turns in the system, as well as provide a flushing circuit with tap water supply. To remove residual water

Appendix 1

Rules for handling the final suspension

and suspension material after washing, it is recommended to connect a compressed air line to the system (see Appendix 2).

Pipes should go horizontally or be below the valves and inlets of the pumps, which prevents the precipitation of magnesium hydroxide particles in these places. Since friction and pressure loss in suspension pipelines are higher than those of water, a minimum pipe diameter of 1.25 times the discharge size of the pump is recommended. Suction lines from the storage tank to the feed pump should be kept as short as possible. Suction lines should be at least two times the size of the suction of the pump being used. Minimum pump or valve inlet diameter is ½" (12.7 mm).

The storage tank discharge and dosing pump inlet must be located less than 1 m of one another. Piping from the tank and pump should be installed in the following manner: from the storage tank start with a close nipple, valve, close nipple, tee, nipple (30 cm or less), pump, close nipple, tee then continue with discharge piping. On the tee's install a close nipple and ball valve for water flushing. For details, see the diagram in Appendix 2. It is recommended to install a transparent section of polycarbonate pipe for visual control of the suspension supply.

Additionally, it is recommended to install a pressure gauge on the material supply line to control the operating pressure in the system. A decrease in operating pressure is a signal that the system is not tight, the pump is worn, or the suspension is solidified.

Valves and fittings

Ball valves are preferable to wedge gate valves and other types of valves. Use a pinch type valves to control the flow of the suspension (pneumatically or mechanically actuated). Such valves are closed to 100% even in the presence of solid particles in the pipe.

For connecting flexible hoses with a pump and an IBC, it is recommended to use quick-disconnect fittings.

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Rules for handling the final suspension

Pumps

When high capacity is required, for example, when unloading suspension from or loading it into a tank, it is recommended to use a screw or industrial peristaltic (hose) pump.

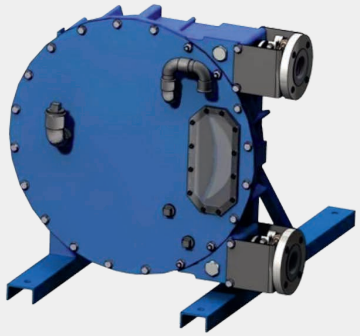
The minimum diameter of the pump inlet is ½" (12.7 mm).

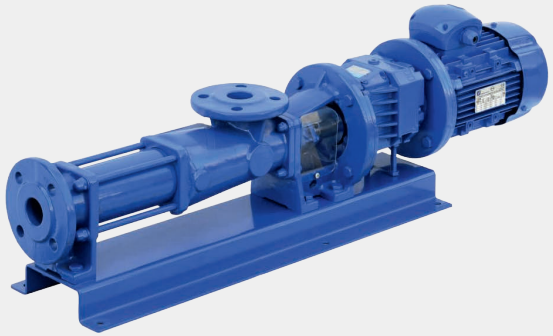
When accurate dosing and low capacity are required, it is recommended to use peristaltic laboratory or industrial pumps.

Such devices are often equipped with LED displays to indicate information on the dosage of the material.

For internal hoses, natural rubber is the preferred material. Calibration of the pump flow with a graduated measuring cylinder and a balance is mandatory.

When choosing a pump, it is necessary to pay attention to the characteristics of the material: viscosity 100–650 cPs, the concentration of solids (65 %) and their hardness (2,7 on the Mohs scale), as well as take into account the maximum speed and recommendations for pumping abrasive suspension. All these parameters have a direct impact on the service life of the pump components. Please contact your local pump manufacturers for more detailed service.





Appendix 1

Rules for handling the final suspension

Maintenance

Handling the suspension requires routine maintenance. If dosing occurs daily in a continuous mode, then during operation a monthly inspection of the storage tank for leakages is required. Also material accumulated on the side walls of the storage tank should be cleaned every month. Cleaning the bottom of the tank should be carried out before the next filling of the tank or every 6 months.

In case of a periodic dosing system, pumps and valves should be checked before each start and rinsed with water not later than in 2 hours after dosing stop in order to avoid clogging with the dried material!

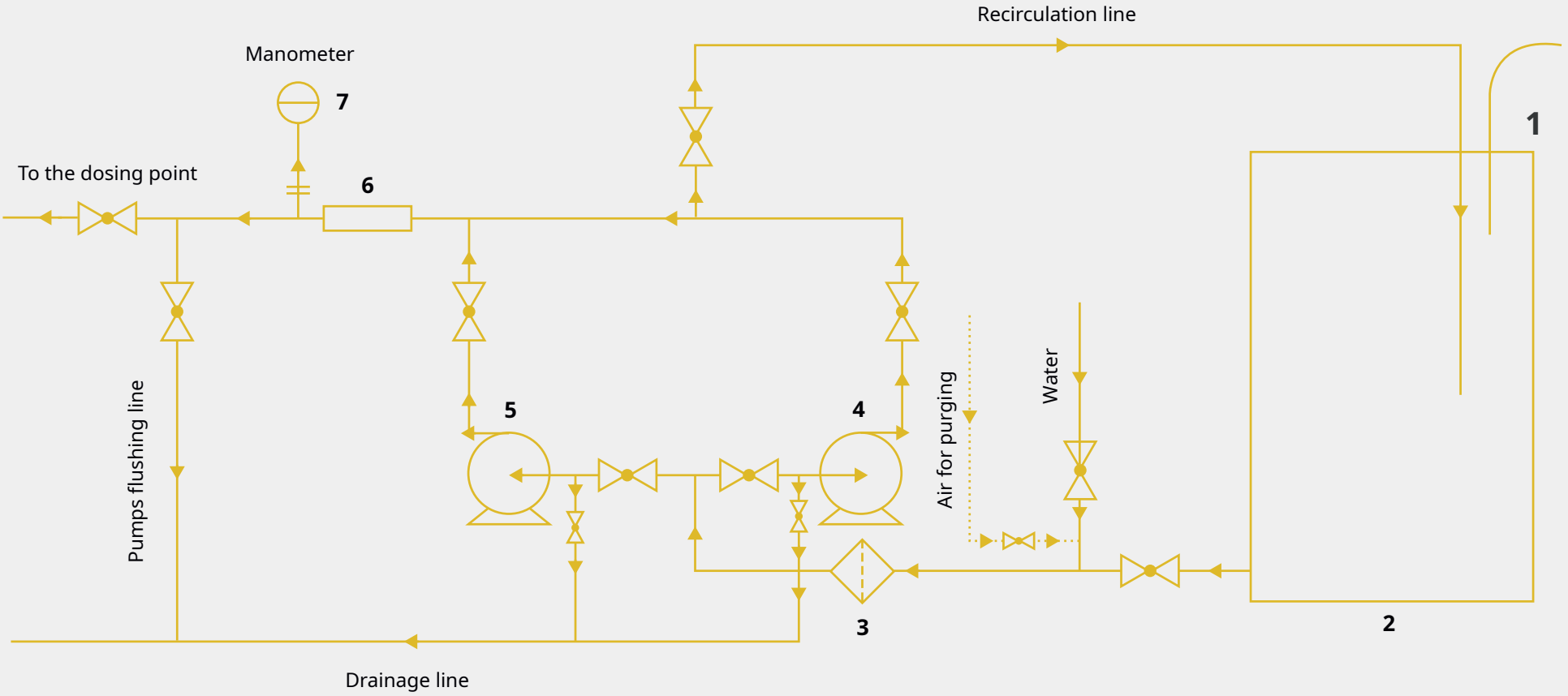
Flush the dosing lines only with tap water without adding any special agents, acids, alkalis or surfactants. When flushing the pump into the storage tank through the drainage line, it is important not to add too much water. Excess water will affect the stability of the suspension and lead to more rapid precipitation of the solids.

At the end of flushing, it is advisable to blow the system with compressed air if the air supply line is included in the general circuit (see Appendix 2).

Monthly, one should check the wear of the pump or track it with the pressure level in the system. This will prevent material leakage and supply problems, will allow to determine the schedule for replacing the hose or stator.

Appendix 2

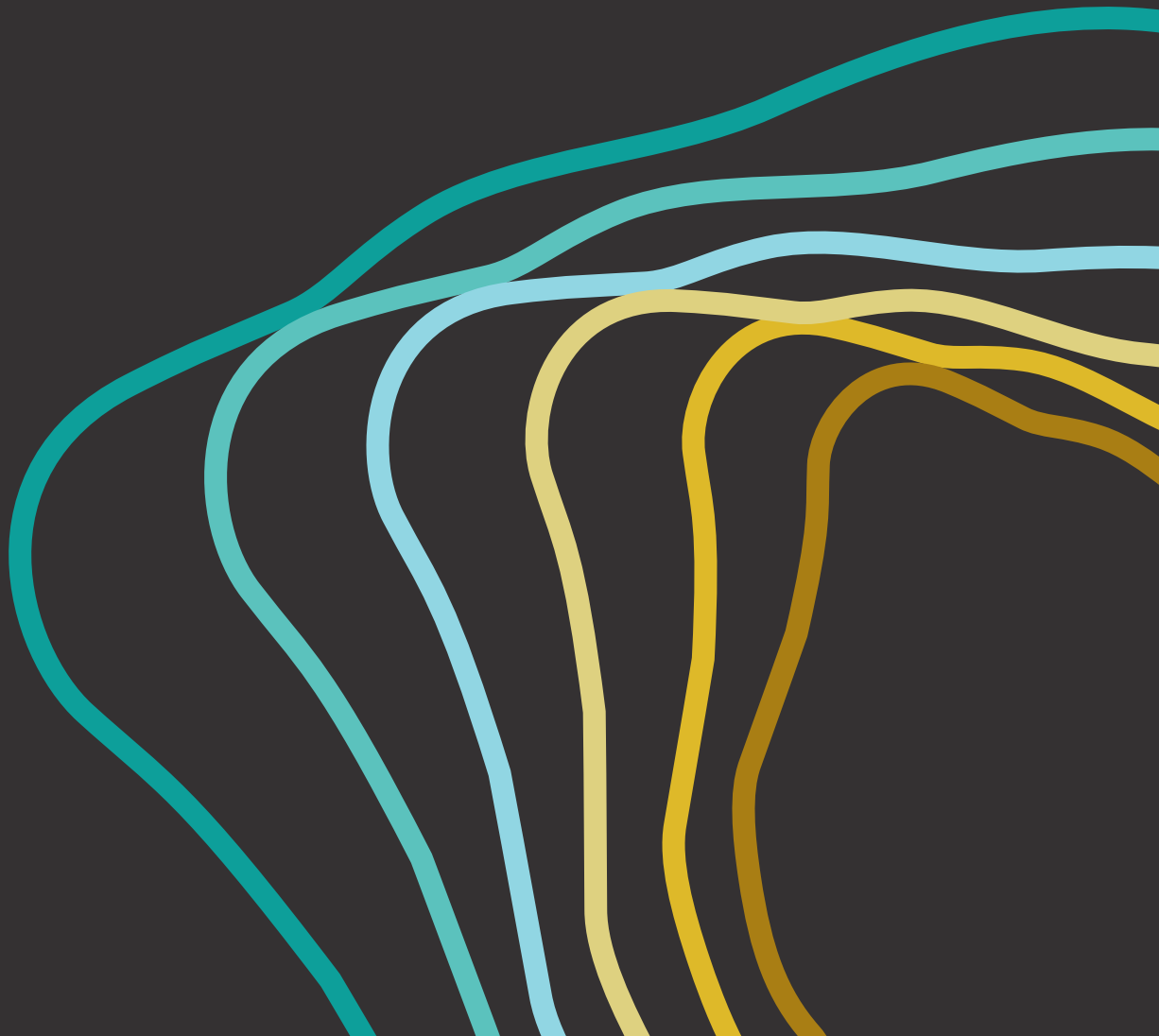
Storage and dosing scheme for magnesium hydroxide suspension



1 — ventilation; 2 — reservoir for suspension storage; 3 — mesh filter; 4 — main dosing pump; 5 — reserved dosing pump; 6 — area from transparent material (polycarbonate); 7 — manometer for detection of working pressure and possible leakages

By choosing BleachMag® products you ensure best technical support for application of product and receive a possibility to develop a custom solution with individual properties.

Please contact us via request form.



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