



Mg(OH)₂ tech

Optimising Wastewater Treatment

- Phosphate removal & recovery
- pH adjustment
- Odour control
- Corrosion protection
- Metal removal



Mg(OH)₂ tech - Closing the loop on Phosphorus

Nedmag Industries is a leading producer of high purity magnesium products which are distributed throughout the world from the Netherlands. In wastewater treatment, Nedmag offers pure stabilised magnesium hydroxide **Mg(OH)₂ tech** and magnesium chloride **MgCl₂ tech** to remove and recover phosphates, to improve the economics and to optimise the sludge treatment process.

Furthermore, Nedmag's magnesium hydroxide is used for pH neutralisation, odour control, protection against corrosion and metal precipitation.

Nedmag has the experience and capability to recommend the best solution and support plant trials with the help of its specialised laboratories. A large variety of wastewater treatment plants have successfully introduced Nedmag magnesium products in their process.

Phosphate removal & recovery

The phosphate and nitrogen challenge

Removing phosphorus and nitrogen cause challenges at many wastewater treatment plants. Regulatory discharge limits require phosphorus removal processes that convert soluble phosphates into insoluble solids. Phosphorus removal from wastewater can be achieved either through chemical removal, advanced biological treatment or a combination of both.

The chemical removal of phosphorus involves the addition of iron or aluminium salts to achieve phosphorus precipitation. These chemicals are costly, increase the volume of inorganic waste, create chemical waste and cause operational side effects, such as alkalinity consumption and corrosion. In addition, costly polymers are used during the sludge treatment process to enhance the dewatering process.

Furthermore, the concentration of phosphorus causes uncontrolled formation of struvite, which causes scaling in pipes and valves, thereby reducing the capacity and requiring high maintenance costs (see figure 1).



Figure 1: Struvite scaling

The solution: Magnesium hydroxide

When using **Mg(OH)₂ tech** or **MgCl₂ tech** in the sludge treatment process (see figure 2), a significant reduction of operational costs can be achieved. Flocculation agents as FeCl₃ and AlCl₃ are no longer needed and no additional aeration energy or NaOH is required to increase the pH before the dewatering step.

Due to the formation of struvite from magnesium and free phosphate ions, the dewatering characteristics of the sludge are enhanced, resulting in an improvement in dewatering of 10-20%. As the sludge is more easily compressed, a significant reduction in dewatering polymer usage of up to 25% can be achieved.

When utilizing **Mg(OH)₂ tech** or **MgCl₂ tech**, the following is achieved:

- Reduced chemical usage (iron or aluminium salts) up to 100%
- Reduced sludge water content by 10-20%
- Reduced polymer usage, up to 25%
- Reduced energy costs (aeration)
- Reduced maintenance costs, due to controlled struvite production
- Opportunity to commercialise struvite

Commercialisation of struvite

Several commercial processes are now available which solve the main challenge to recover struvite and meeting the phosphorus discharge limits.

It is now possible to recover phosphorus and nitrogen to consistently produce struvite that can be used as a fertiliser with or without further treatment. To implement this, magnesium needs to be dosed into the sludge just before the dewatering step or into the process water extracted out of the dewatering process (see figure 2).

About struvite

Struvite (magnesium ammonium phosphate) is produced at pH > 8. Dosing of magnesium results in the formation of struvite through the following equation:

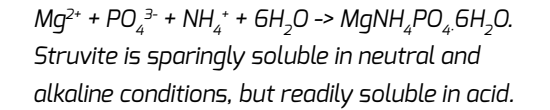
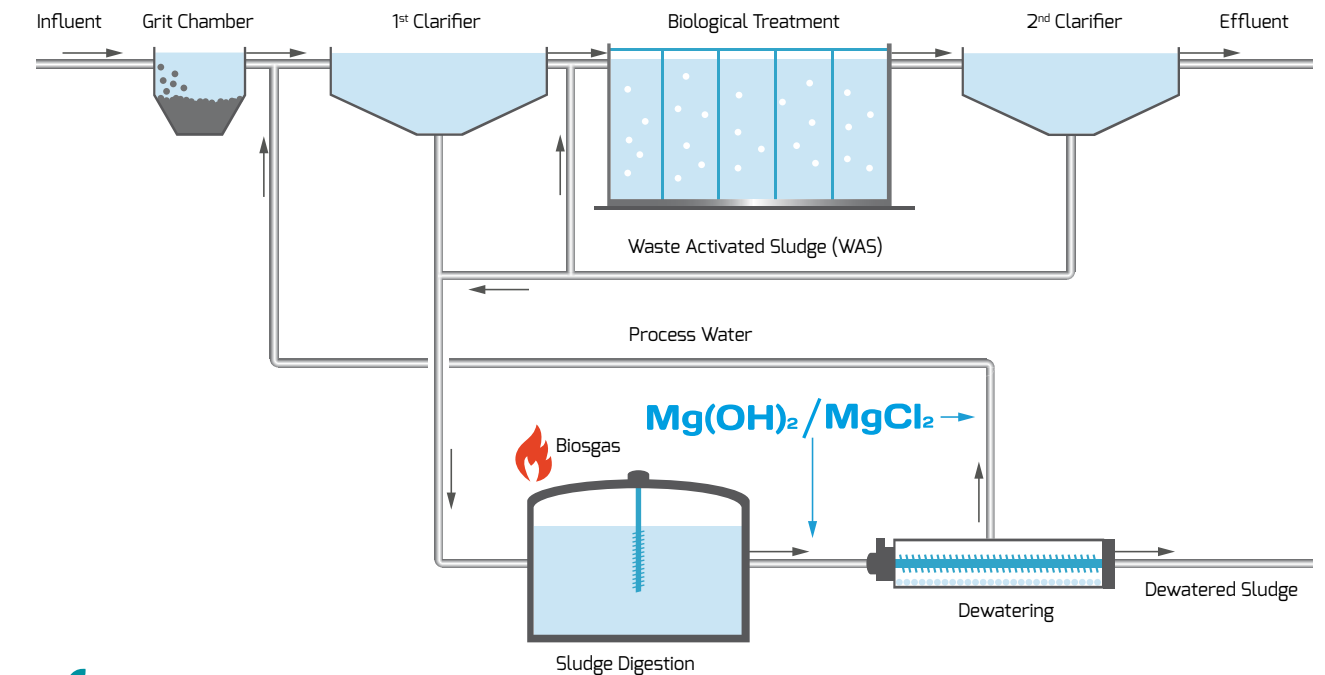


Figure 2: Magnesium dosing points in case of phosphate removal & recovery



Other applications

pH adjustment

Mg(OH)₂ tech is used for pH neutralisation.

It offers more alkalinity per kilogram compared to sodium hydroxide or calcium hydroxide and it has a natural buffering effect at pH 9 – 10. An accidental overdose will not increase the pH above this value unlike lime or caustic soda where the pH will instantaneously rise to 12 – 14. Magnesium hydroxide is safe to handle and it provides a long lasting alkalinity due to its high buffering capacity.

Metal removal

Mg(OH)₂ tech is able to remove metals from wastewater by precipitation. Magnesium hydroxide increases the pH to a level where metals precipitate as hydroxides. It can remove most of the metals with the exception of nickel and cadmium.

Odour control and corrosion protection

Mg(OH)₂ tech is a safe and cost effective solution to eliminate hydrogen sulfide odour and to avoid corrosion, especially in sanitary sewer systems. Hydrogen sulfide is the principal source of odour and corrosion and the generation is a function of dissolved sulfide concentration, water temperature, turbulence and pH.

At pH 7 roughly 50% of the dissolved sulfide can exist as hydrogen sulfide and this results in a bad smell and corrosion of the sewage system infrastructure. Magnesium hydroxide raises the wastewater pH to 8.0-8.5 resulting in:

- Reduced sulfide production
- Elimination of hydrogen sulfide gas production
- Reduced corrosion rate of sewer pipes
- Reduced FOG (Fats, Oils and Grease)



Our products



Nedmag Industries provides an extremely stable concentrated magnesium hydroxide suspension of fine particles in water, at a concentration of 53% by weight (see left table below).

Beside magnesium hydroxide, Nedmag also provides magnesium chloride as a liquid or solid product (see right table below for $MgCl_2$ liquid).

With **Mg(OH)₂ tech** no product stirring is required during transport and storage. Magnesium hydroxide is non-hazardous, non-corrosive and very safe and easy to handle.

Product safety

Our magnesium hydroxide is safe to use and is:

- registered with ECHA in compliance with REACH.
- not classified as so-called 'Substances of very high concern'.
- generally recognized as safe (GRAS).

Mg(OH)₂ tech

Chemical composition

On dry basis		Typical	Specification
Mg(OH) ₂	%	98.5	97.5 min
Ca(OH) ₂	%	0.65	1.20 max
Mn	%	0.05	0.10 max
Fe	%	0.25	0.30 max

Physical properties

		Typical	Specification
pH		10	
Density	kg/m ³	1440	
Solids	%		52 - 54

Particle size distribution

		Typical
d50	µm	2 - 2.5

MgCl₂ tech

Chemical composition

		Typical	Specification
MgCl ₂	%	32	30 min
MgSO ₄	%	0.25	0.40 max
Mg	%	8.10	
KCl	%	0.40	0.65 max
NaCl	%	0.45	0.70 max
CaCl ₂	%	0.02	0.10 max

Physical properties

		Typical	Specification
pH		4.0 - 6.0	
Density	kg/m ³	1290 - 1330	





Nedmag Industries - Getting you closer to perfection

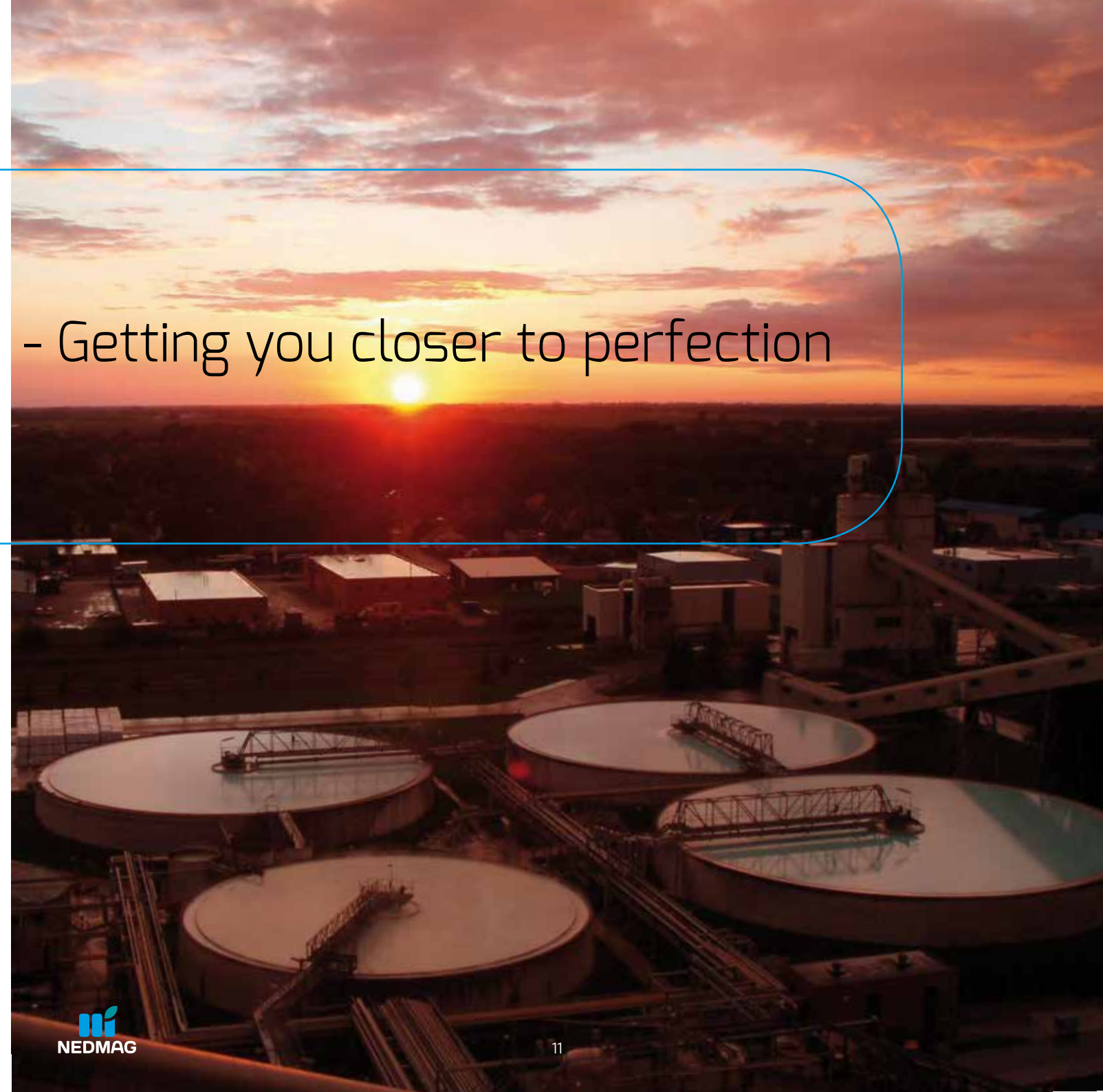
Nedmag Industries Mining & Manufacturing B.V. is a Netherlands based producer of magnesium oxide, magnesium hydroxide, magnesium chloride and calcium chloride. Nedmag's products find their way to customers in several market segments and applications worldwide. The main markets served by Nedmag are the refractory market, pulp & paper industry, oil & gas exploration, de-icing and de-dusting applications, food industry and wastewater treatment.

Nedmag Industries was founded in 1981, by Shell/Billiton, after very pure and unique magnesium salt deposits were discovered in the North-East part of The Netherlands. The salt deposits, situated at a depth of over 1500 meters, were formed in the later Permian 250 million years ago. Nedmag succeeded in extracting these salts to the surface by using a unique mining method, called solution mining. The thus obtained magnesium chloride brine is the key raw material for the production of Dead Burned Magnesia.

Another crucial material in the production process is selective mined dolomite from the Belgian Meuse-valley. Our dolime supplier Lhoist is one of our shareholders, granting continuous availability of this raw material.

Nedmag Industries Mining & Manufacturing BV is owned by the Lhoist group and the NOM. Lhoist is a leading Belgium producer of lime and dolime. NOM is a Dutch direct investment agency for the Northern Netherlands.

Nedmag is certified for ISO 9001 and ISO 14001.





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