

# Liming : an advanced treatment for sewage sludge applied on land



*Ascaris egg*



*E coli*



*Salmonella*



*Clostridium*



European Lime Association  
Association européenne de la Chaux  
Europäischer Kalkverband

# LIMING IS AN ADVANCED SLUDGE TREATMENT

## Advanced treatment

“Advanced Treatment” is a European Union designated term for the level of treatment which sanitises sludge by reducing the number of micro organisms to a negligible level.

## CEN-EN 12832

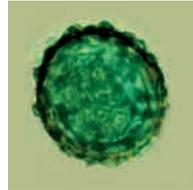
Sanitized (hygienised) sludge : sludge which has been treated for inactivation of parasites and pathogens or decreasing their numbers below a specific level.

## Protection of human health and the environment

The recycling of treated sludge to land is the preferred EU solution. In this context, lime treatment provides a safe and environmentally friendly material suitable for land spreading as a valuable fertiliser and soil conditioner. After advanced treatment, limed sludge may be applied as an exogenous organic matter with minimal restrictions.



Salmonella



Ascaris egg

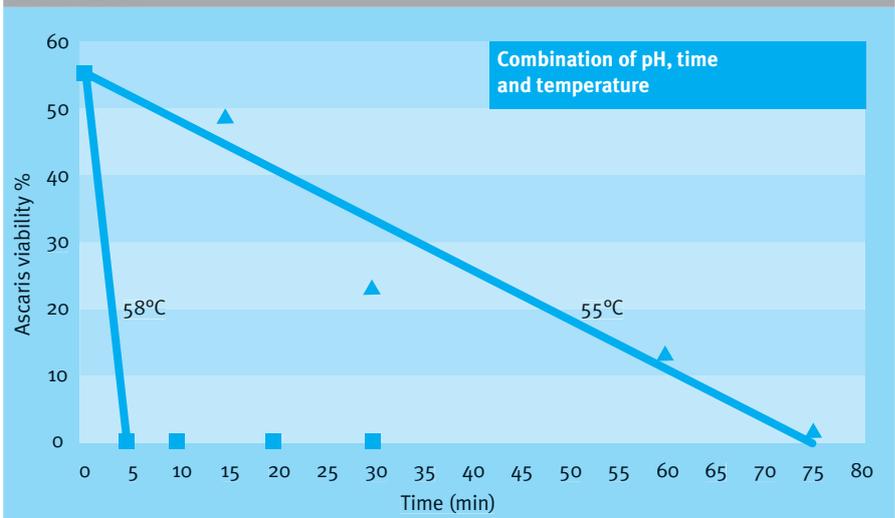
## Validation procedure

The sanitation performance is validated when parasites (*Ascaris* eggs) and bacteria (*Salmonella*) are reduced to a negligible level.

## Recent scientific research

Multiple international scientific researches provides evidence that lime lime treatment reduces most bacteria, viruses and even one of the most resistant parasites, *Ascaris* eggs, to a negligible level. These results were based on the effects of high pH or high temperature from the lime-sludge reaction over a period of time. Recent laboratory and industrial scale research concentrated its work on the effects of the combination of high pH and high temperature from the quicklime-sludge reaction. It proves that *Ascaris* eggs are reduced to a negligible level at a high pH but at a lower combination of time/temperature than previously determined in earlier research.

Effect of time and temperature on the viability of *Ascaris* eggs in sludge treated with quicklime on an industrial scale. A pH > 12 due to the presence of the quicklime is maintained throughout the treatment.



## Conclusion of scientific experts

Applying the precautionary principle, the scientific experts recommend the following operating conditions for sludge sanitisation with lime :

“Conditioning sludge with lime, reaching a homogeneous mixture at a pH of 12 or more and maintaining either a temperature of at least 55°C for 75 minutes or any other validated time/temperature equivalent”  
or  
“Conditioning with lime reaching and maintaining a pH of 12 or more for three months”.

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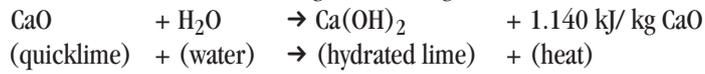
# THE LIME PROCESS

## Principle

### process based on:

#### • temperature

the exothermic reaction during lime slaking



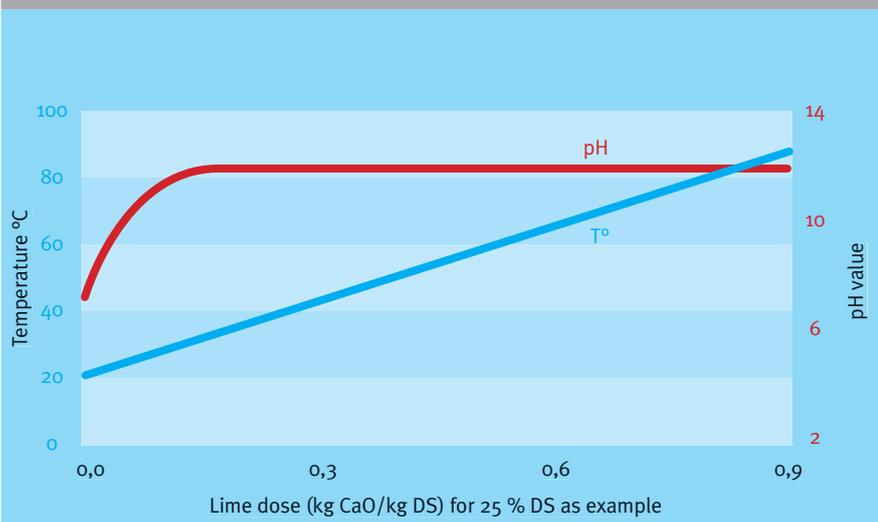
#### • pH

the alkalinity of  $(\text{OH})^-$  present in the hydrated lime

1 kg of CaO generates 0,607 kg  $(\text{OH})^-$

In a homogeneous mixture, the quicklime reacts with the moisture present in the sludge. In doing so, the CaO combines with 32% of it's own weight of water thus causing a significant drying effect and a temperature increase.

Example of temperature and pH increase on addition of quicklime to sludge at 25% DS



### Typical quicklime addition for advanced treatment

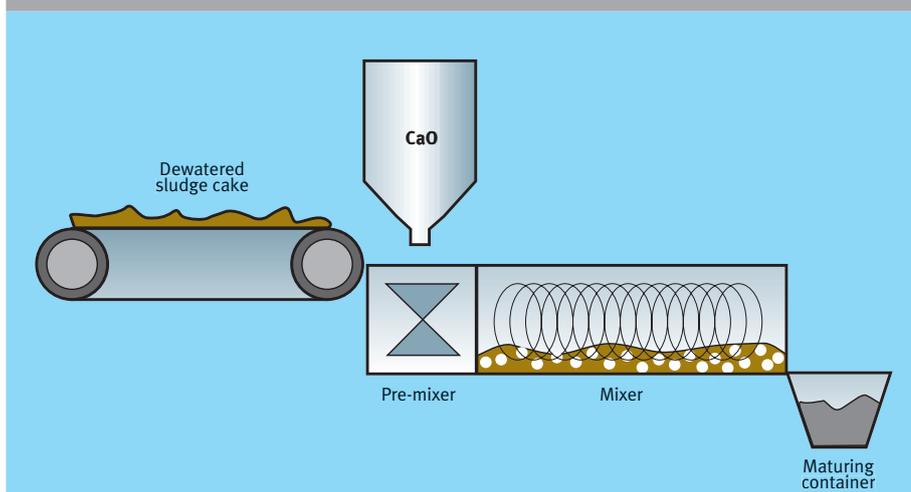
- addition of 50-90%\* CaO per unit dry solids (DS) gives a treated sludge at  $>55^\circ\text{C}$  and  $\text{pH} >12$  for 75 minutes
- addition of 20-40%\* CaO or equivalent quantity of  $\text{Ca(OH)}_2$  per unit dry solids (DS) at  $\text{pH} 7$  gives a treated sludge at  $\text{pH} >12$  for  $>3$  months

\* depending on DS contents

## Industrial flow sheet

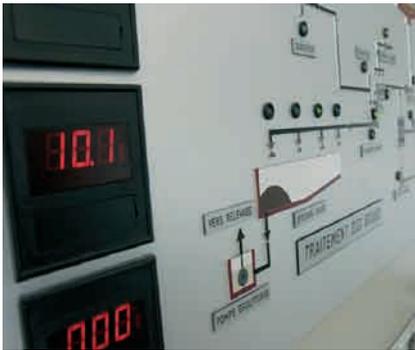
The sludge and lime shall be thoroughly mixed in order to achieve a homogeneous mixture.

Example of a typical lime treatment plant



## ADVANTAGES OF LIME TREATMENT

- achieves up to 6Log reduction of pathogens
- stabilises sludge with no risk of pathogen regrowth
- eliminates odour, reduces vector attraction
- low investment costs, area required for plant
- simple to run, easily automated, available as mobile plant
- converts sewage sludge into a biosolid product
- increases the dry solids content, improves structure, handling properties and spread ability
- adds calcium hydroxide (pH) and organic matter to improve the soil structure, enhances growth environment in the soil
- maintains nutrient bio availability



Easy to monitor



Compact plant area



Easy to spread



Improves structure and handling properties



Efficient agronomic value

Typical properties of lime treated sludge (% on dry contents)

N	P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O	CaO	MgO	O.M.*	C/N
3,3	3,5	0,3	22,3	0,6	46	9,7

\* Organic Matter



Advanced treated sludge : biosolid ready for use

With compliments



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