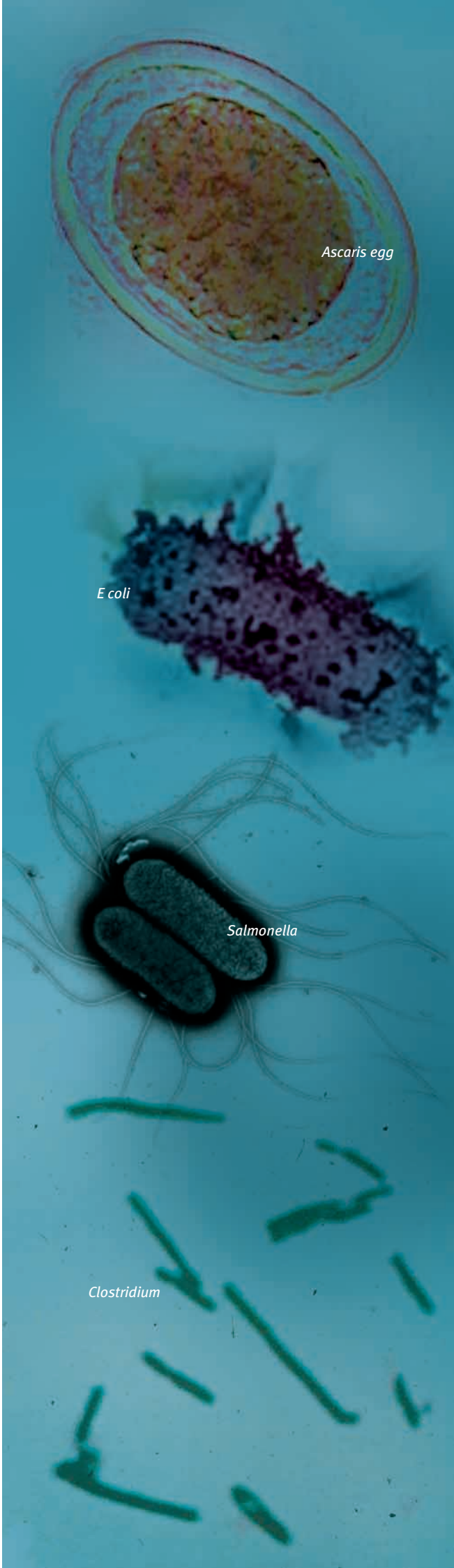
LIMING FOR SANITISATION

Liming : an advanced treatment for sewage sludge applied on land



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.

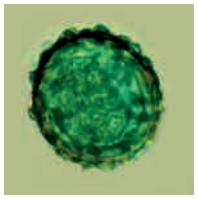
CEN-EN 12832

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

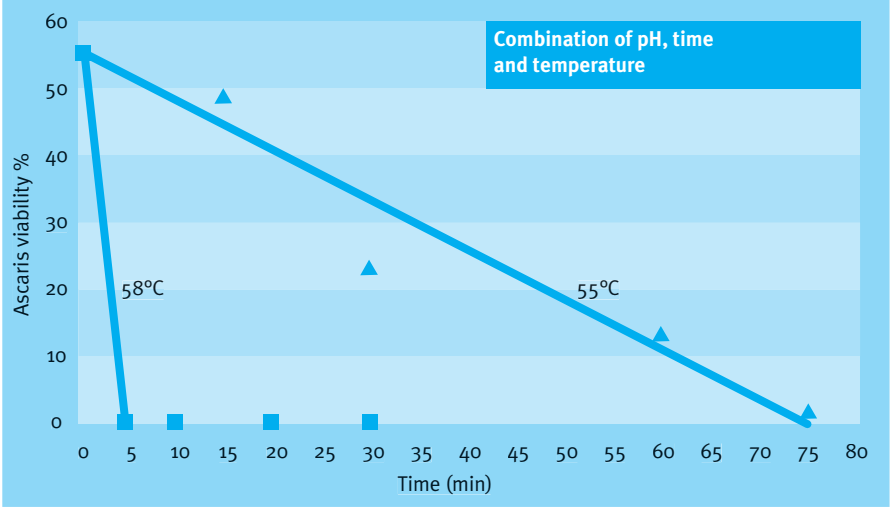
Validation procedure

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:

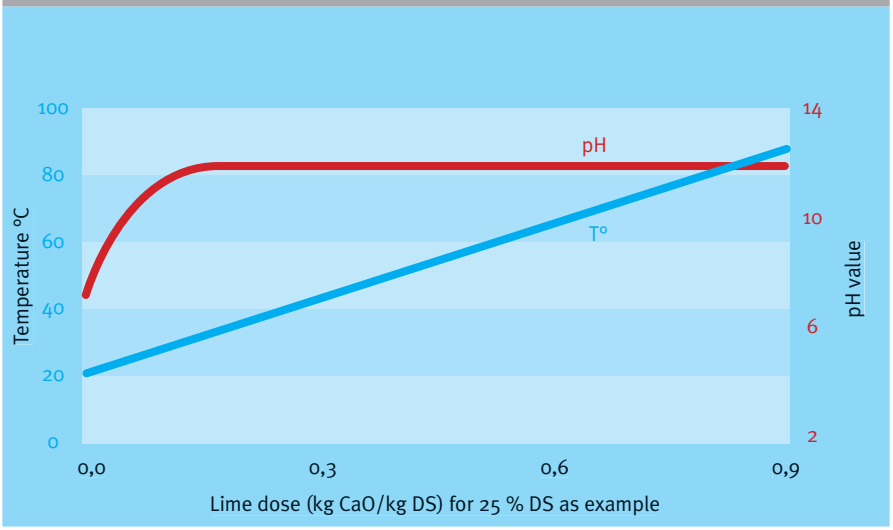
- **temperature**
  the exothermic reaction during lime slaking

CaO	+ H_2O	→ $Ca(OH)_2$	+ 1.140 kJ/ kg CaO
(quicklime)	+ (water)	→ (hydrated lime)	+ (heat)

- **pH**
  the alkalinity of $(OH)^-$ present in the hydrated lime
  1 kg of CaO generates 0,607 kg $(OH)^-$

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



Typical quicklime addition for advanced treatment

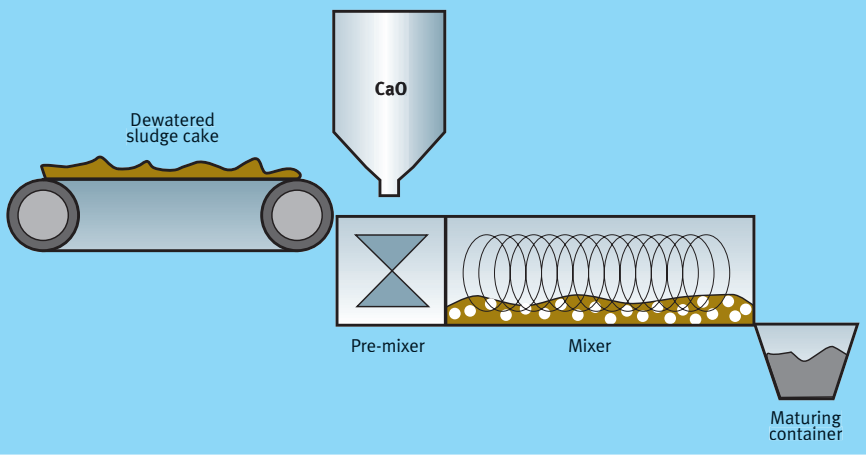
- addition of 50-90%* CaO per unit dry solids (DS) gives a treated sludge at >55 °C and pH >12 for 75 minutes
- addition of 20-40%* CaO or equivalent quantity of $Ca(OH)_2$ per unit dry solids (DS) at pH 7 gives a treated sludge at pH >12 for >3 months

** 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 nutricient bio availability

Easy to monitor

Compact planr area

Easy to spread

Inproves structure and handling properties

Efficient agronomic value

Typical properties of lime treated sludge (% on dry contents)						
N	P_2O_5	K_2O	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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