

**BENEFICIAL REUSE OF BIO-SOLIDS
THE NATURAL CYCLE**

by

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Waste Water Treatment and Disposal: The Natural Cycle is Beneficial Reuse. We grow food - plant and animal sources, and humans and animals consume foods, generating waste. That waste is spread upon the land, fertilizing the soil to grow more food. A beautiful, beneficial reuse - Nature's way of maintaining soil fertility. It is a good plan!

Then, as humans began to congregate into cities - the crowding of many people and animals together - waste could not easily be hauled and spread on the land - and the wastes became a nuisance and harmful to our health.

No longer being recycled as nature intended, we looked for other solutions. About 1900, we developed waste water treatment plants to digest waste - actually use up the beneficial materials that are natural fertilizers, and only spread the residuals - sludge - on the land - certainly not the beneficial reuse as God had planned. Now this concentrated waste can and does cause problems: Odors, Diseases, and later heavy metal concentrations in the soil, poisoning the soil.

So, why do we treat sewage?

1. Reduce Volume
2. Odor control - H₂S
3. Disease Control - Bacteria/Virus
(Typhoid, Salmonella, etc.)
4. To Chemically Fix Heavy Metals (Lead, Cadmium, etc.) that are carried in the sludge to prevent migration to our soils and water

Ideally a treatment process would disinfect, deodorize, and fix heavy metals, so they would not spread into the food chain causing additional disease of man and animal.

LIME TREATMENT of sewage sludge is an old tried and true process. It's origin is lost in history. Some of the ancient's writings talk of using lime to control odor from both animal and human waste, especially in army camps of Ancient Egypt, where great numbers of people and animals congregated.

It's also interesting to note that our grandparents recognized the value of lime stabilization - as it was, and is used extensively in outhouses to control odor and disease.

Sportsmen recognize its value in controlling odors and disease around their dog pens. Farmers utilize lime's deodorizing ability to treat hog pens, animal stalls and poultry house odors - and to control disease.

Chemical lime (Calcium Oxide/Calcium Hydroxide) a natural chemical has been used so successfully because it does meet those requirements of: Odor Control, Disease Control - (both bacterial and virus control), and Heavy Metals.

Its use is probably the most economical method of treating waste materials available to any municipality! And because it is such a simple, straight forward natural process, it often is the choice process for treating wastes.

Will it solve all problems? NO. Does it always work? Yes, well Maybe. Let me explain: man can mess it up!

There are some pitfalls I would like to point out, that would cause odor problems. And if you have odor problems, there needs to be changes in the way the process is used and controlled.

Odor can be from several causes, I would like to briefly discuss them:

Rotten Egg Odor or Hydrogen Sulfide is no longer smelly above pH 9 - the problem is insufficient lime mixed with the sludge. You must add sufficient lime to achieve a pH of 12 @ 25°C in the mixture after 2 hours - Why 2 Hours? (US EPA Requirement - 40CFR 257 - Lime Stabilization)

Note this, when lime is added to sludge at about pH of 10-10.5 Ammonia Gas is given off - Ammonia Gas can generate a pH of 13 or so!

Now if in mixing lime to determine the correct amount to use, if you read the pH of the mix before the Ammonia Gas is fully released, then the pH you read is not due to the lime dose, but to the Ammonia.

Now, once the Ammonia is released, gasses off, the pH due to lime may only be 10 or so. At this pH range, bacteria and viruses will have survived and rapidly re-grow, causing offensive odors!

Process control is simple but, it must be understood and one must not be misled by this Ammonia reaction.

I have laboratory reports here from Ft. Smith, showing pH readings of 12.8 - 13 etc. on treated sludge that became offensive.
Why? Well, I know the problem is too little lime.

Why? Because lime can only generate a pH of 12.4 @ 25°C and the samples are 12.8 to 13 - therefore the pH reading is due to Ammonia being released! The test program is flawed, not understood! Suggesting sufficient lime is being used - when in fact, too little lime is being used.

Reaction between lime and polymer is another possible odor problem that can occur with this lime stabilization. That is the reaction between lime and a polymer used for de-watering. If the polymer is incompatible with lime it will create a very offensive odor - hard to describe. The answer here is to use a suitable substitute polymer - there are polymers that do not react with lime in this manner.

Use of Waste/By-Products as Substitutes for chemical lime is a third problem, not really an additional one. The use of waste or by-products as a substitute for chemical lime. These products can be used, and are used successfully; but one has to recognize that by-products/waste products are not quality controlled as to the calcium hydroxide - lime content. And while a certain dose rate may work today, it may not tomorrow, due to the variation in lime content.

The odor solution is not to prohibit any process (and certainly not one that historically has been used all over the world to control odor, kill bacteria, virus, and limit heavy metals) but to require operators to understand and control their processes so they will produce an acceptable beneficial reusable product, that is odor free and disease free.

Let me briefly address the proposed 40CFR - 503 regulation that became effective in March '93. Lime treatment or a combination of lime and other processes is probably the most economical method of achieving the highest treatment level - Class "A". Lime stabilization is a valuable process option needed by your plant operators.

National Lime Association offers assistance to a better understanding of the lime stabilization process and how to achieve beneficial reuse of bio-solids to municipalities, state regulators and staff members.

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