Environmental Leverage INC.

Turning Liabilities into Leverage

December 2010

The Wastewater Insight

MYSTERY BUG OF THE MONTH

We started this month out with a new

Mystery Bug of the month!

Check out our website for more photos of our new mystery bug!!!! WWW.EnvironmentalLeverage.com

Inside this issue:

Biosolids Handling

Where do biosolids go after the wastewater treatment plant?

Biosolids are frequently used for land application on cropland, pastures or timberland, where they decompose and furnish N-nitrogen, P-phosphorus and K-potash to growing plants. This method offers an ecologically sound and practical alternative to domestic and industrial waste biosolids disposal than landfills or incineration.

The purpose of land application of biosolids is to supply essential plant nutrients and/or organic matter, or other constituents that will maintain crop production or soil health. These nutrients are organic and provide slow release, therefore there is less run-off possibilities.

Some application areas include: forests, field and cereal crops, mine reclamation, parks, resale for compost, pasture land, citrus groves.

Benefits include:

Reduction in solids handling costs

Reduction in cost of supplemental nutrients for crops

Increased crop yields-more natural nutrients

Issues that most people don't think about are weather conditions, soil conditions, nutrient content of the biosolids, as well as transportation issues to get the biosolids from the treatment plant to the actual field.

Some fields are quite a distance away from the actual treatment plant. Small rural roads may not be equipped to handle heavy trucks or may sustain minor damage from the heavy load. Road commissioners all along the path from point A to delivery must be dealt with in order to get correct permits to deliver the biosolids.

Farmer's Benefits

A typical biosolids application program has the potential to supplement the soil with:

135 kg per ha / 120 lbs per acre of nitrogen

250 kg per ha / 223 lbs per acre of total phosphorous

250 kg per ha / 223 lbs per acre of organic nitrogen

30 kg per ha / 27 lbs per acre of total potash

4,000 kg per ha / 3,600 lbs per acre of organic matter

Other nutrients such as magnesium, zinc and copper

**Biosolids provide farmers with $60 to $160 per acre worth of fertilizer, including many essential nutrients that the farmer may not normally replenish in the soil

Advantages and Benefits

Improves soil properties for optimum plant growth, including texture, tilth, friability, fertility and water holding capacity
Improve drainage of wet clay
Reduce need for commercial fertilizers
Less leachate
Organic
Slow-release nutrients
Enhances conditions for vegetative growth
Decrease the need for pesticide use
Decrease erosion
Easy to store, transport and use
"Green" Grants and Awards
*2002 CWA Recognition Awards Program

There are some limitations

Nutrients
The guidelines limit sewage biosolid application to fields with a soil test of less than 60 parts per million (ppm) of available phosphorous in the top 15 cm, as measured by the Olsen sodium bicarbonate extraction method
Soil pH >6
Heavy metal limitations
11 heavy metals in sewage biosolids of concern to agriculture. These are: arsenic, cadmium, chromium, cobalt, copper, lead, mercury, molybdenum, nickel, selenium, and zinc. (Not present in food plant biosolids)
Physical limitations
The maximum depth of a fluid sewage biosolid that can be surface applied at any one time is 1.3 cm. This depth is equivalent to an application rate of 130 m3/ha
A maximum application rate of 8 tonnes per hectare every 5 years
Separation distances to groundwater, surface water courses, wells and other environmentally sensitive features
Weather- Rain, snow
Application only to mineral soils are defined as having less than 17% organic carbon by weight

What are Biosolids and how does it work?

Biosolids are microbial bodies that contain carbon (C), oxygen (O), hydrogen (H), nitrogen (N), sulfur (S) and phosphorus (P).

Decomposition by Soil organisms-This produces carbon dioxide (CO2), water (H2O) and humus (organic matter). Release or mineralization, of N as ammonium (NH4N), P and S as sulfate occurs. The ammonium nitrogen may also be oxidized to produce nitrate (NO3). These can be taken up by plants and reused.

*Mineralization, cation exchange, anion exchange, retention and soil pH adjustment may affect the availability of elements in the biosolids.

Nitrogen demand of some crops

Agricultural Crops	Nitrogen Demand
Winter wheat, Winter barley	90
Winter triticale	80
Winter rye	90
Corn (in SW Ont.)3	170
Corn (in other counties)3	100
Soybeans	0
Field beans, peas	10
Sweet corn	90
Carrots	50
Spinach	100

****Nitrogen (N) is the most yield-limiting nutrient in Corn production**

****Rate of biosolids, not to exceed 135 kg of nitrogen/ha over five yr. period for crops, or a 4-yr period for sod.**

Nutrient Removal by Crops Application Rates

Table 1. Estimated nutrient removals by row and/or grain crops in product removed from fields for sale or feeding

Crop	Removal Yield Unit	N	P	K
		(pounds/yield unit)		
Barley	Bushel	0.96	0.016	0.19
Buckwheat	Pound	0.02	0.003	0.002
Corn, Wheat	Bushel	0.9	0.2	0.24
Oat	Bushel	0.64	0.11	0.15
Popcorn	Pound	0.016	0.003	0.004
Rye	Bushel	1.18	0.15	0.27
Grain sorghum	Pound	0.014	0.004	0.004
Soybeans[1]	Bushel	---	0.37	1.2
Sunflower	Pound	0.026	0.004	0.006
Wheat	Bushel	1.26	0.26	0.24

[1]Nitrogen(N) is fixed by bacteria in soybean nodules. When N is available in the soil, the soybean plant will use the soil N.
Source Buchholz, D.D., 1983. *Soil Test Interpretations and Recommendations Handbook*, Department of Agronomy, University of Missouri.

Application rates may vary depending upon soil conditions, regional limitations, climate and crop. Make sure to check all with your local regulations.

Example of Biosolids Application

TABLE 2 TYPICAL BIOSOLIDS APPLICATION SCENARIOS

Type of Site/ Vegetation	Schedule	Application Frequency	Application Rate
Agricultural land			
Corn	April, May, after harvest	Annually	5-10 dry tons per acre
Small grains	March-June, August, fall	Up to 3 times per year	2-5 dry tons per acre
Soybeans	April-June, fall	Annually	5-20 dry tons per acre
Hay	After each cutting	Up to 3 times per year	2-5 dry tons per acre
Forest land	Year round	Once every 2-5 years	5-100 dry tons per acre
Range land	Year round	Once every 1-2 years	2-60 dry tons per acre
Reclamation sites	Year round	Once	60-100 dry tons per acre

Source: U.S. EPA, 1994

Typical corn crop needs 120 lbs N per acre
If Biosolids ~ 3% nitrogen -up to 5.4 dry tons per acre if used to supply all the nitrogen needed by the crop (i.e., no other nitrogen fertilizers used.)

Note**- Different crops have different nutrient loading requirements

Different Types of Biosolids

The most common biosolids types are class AA and class B residuals. Class AA biosolids contain negligible concentrations of pathogens and can be used without restriction. Certain class AA biosolids are labeled as fertilizer and marketed to the public.

There are no grazing, harvesting, or public restrictions associated with class AA biosolids. Class B biosolids are treated to reduce pathogens but some pathogens may still remain in the residue. Contrary to class AA, class B materials are subjected to more strict restrictions. For instance, a 30-day restriction on grazing is required when applying class B biosolids to pastures. This allows time for destruction of pathogens which may not have been controlled during the wastewater treatment process. Regardless of the class, pathogens present no danger to grazing animals when biosolids are properly handled and applied.

Both class AA and B materials pose no risks in terms of heavy metal contamination. Extensive research has shown that heavy metal availability and potential toxicity to plants and cattle grazing biosolids-amended pastures are minimal (Lane, 1988; Tiffany et al., 2000a,b; Gaskin, et al., 2003). Although heavy metals represented a serious concern 20 to 30 years ago, biosolids currently produced and marketed contain very low concentrations of heavy metals and are seldom a cause for concern.

New issues that local and regional regulatory bodies are discussing:

Radon and Dioxins are the new issues that may wind up entering into permit limits. Check your local EPA or DNR for guidelines in your area. State and Federal requirements are not always the same.

We are pleased to announce the beginning of next year's training classes.

First to host a class is Thorn Creek Sanitary Basin- Chicago Heights

Filamentous Identification the Easy Way!

March 23-24th 2011

Thorn Creek Basin Sanitary District

700 W. End Ave

Chicago Heights, IL 60411

This will be our Two day Advanced Filamentous Identification Class

March 23 and 24th. Brochure to follow next week, but this class does have limited space, so if you have been on our waiting list for classes, be sure to contact us quickly, as the class fills up very fast.

We would like to thank Stewart Spreading for help with this month's newsletter. We toured their facility and then went into the field to see land spreading of municipal solids. If you need help or have additional questions on biosolids please give us a call or Michelle at Stewart Spreading

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Last Month's
MYSTERY BUG OF THE MONTH

Did you guess what we had zoomed in on?

This is a photo taken at 400x of the front end of a water bear!

http://www.environmentalleverage.com/2010/water%20bears/waterbear1110.htm
When you zoom in, you can see more details! Water bears are always found with older sludge.

You might have solids build up though in a clarifier center well, or scum and foam on the surface somewhere that has gotten older, so do not assume your entire system is old if you only find one of these in your sample. Make sure to do a quick maintenance check first before you crank up your wasting!

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Check out our website for more photos of our new mystery bug!!!!
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