August '05 Volume 2.8

The Wastewater Insight

Environmental Leverage INC.

BENEFICIAL REUSE

Beneficial Reuse- The new buzzword

What does it really mean? To some people it can be translated as One man's garbage is another man's treasure!!!.

Industrial Byproduct, Waste Recycling, Beneficial Reuse, these are the same thing. American industrial facilities generate and dispose of approximately 7.6 billion tons of industrial solid waste each year.

At Environmental Leverage we bring you innovative strategies and operational experiences to help you Leverage your liabilities and turn them into assets! Innovative environmental solutions resulting in a cleaner environment!

There are numerous government grants, programs, loans and awards for development of a Beneficial Reuse or Recycling program at your plant.

Pollution Prevention Challange Grants
Governor's Awards for Environmental Excellence
Governor's Toxic Reduction Challenge
EPA Common Sense Initiatives
EPA Resource Conservation Challenge
P2 Pays

There are tons depending upon the country, region or state that you live in.

Types or sources of Beneficial Reuse
Examples of Materials in high demand

- Acids
- Alkali
- Boiler and Fly Ash
- Construction and Demolition
- Electronics
- Glass
- Gypsum
- Laboratory Chemicals
- Lime
- Metal and Metal Sludge
- Miscellaneous
- Oil
- Other Inorganic Chemicals
- Plastic
- Rubber
- Solvents
- Textile and Leather
- Wax
- Wood
- Other Organic Chemicals
- Paints and Coatings
- Paper

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, no they are not husband and wife!!!!
WWW.EnvironmentalLeverage.com

Examples by Industry

Water or Wastewater

Water conservation and efficiency- using treated effluent water- reused as Gray water- in closed recycle loops, or used in areas where critically clean water is not necessary is technically a type of Beneficial reuse. Water can be used for irrigation, washing down non-critical areas, Effluent irrigation of golf courses, parks, and recreation areas.

INSIDE

Potential Wastewater Reuse Applications, Commercial Car Washes,
Cooling, Dust Control on Roads and Streets, Fire Prevention,

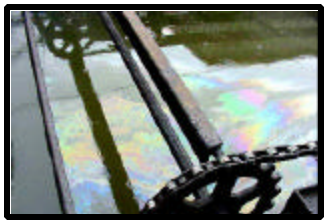
Fountains, Groundwater Recharge, Irrigation (agriculture, landscaping, recreation fields, etc.), Mixing Concrete, Snow-making for Commercial/Outdoor Use, Toilet/Urinal Flush, Wetland Restoration

Foundries:

Spent Sand can be utilized in an approved beneficial use application, Green Sand, slag, Bag house dust and wet scrubber residuals,
Here are just a few of the applications where it can be utilized: Landfill Daily Cover, Pipe Bedding, Structural Fill, Goes to Processor for Single or multiple Applications, Asphalt, Cement, Concrete, Soil Blending

Papermill-

There are numerous areas where beneficial reuse can be found in a papermill. Lime, pulp, ash, sludge, crates, paper scraps, bark, knots are just a few areas that homes can be found for these " alternative" products. Bottom ash is a good road base and construction material. Papermill biosolids and primary solids are great for use at Mine leachate.



Refinery- Again, an area that has many sidestreams that are isolated initially in the process area due to the type of equipment used and the process location. Spent caustic is the first easy one. Oil, Spent Catalysts, oily sludge, and biosolids are just a few more to be mentioned.

Food Plants- Did you know that the biosolids generated from a food plant that has it's own wastewater treatment plant are an excellent source of nutrients for crops?
Food plants have pallets, Process scraps that can be sold to agriculture for compost, silage for animal feed lots, among other things. Bones, tallow, and meat scraps found in slaughter houses are also areas for beneficial reuse.

We worked at one plant that produced high quality frosting. 16% of their product line was "Poor Quality" frosting and was off spec. Well, just because it cannot be used for cake decorations, it could be used for doughnut filling, or other uses.

Wastewater Biosolids

Use of biosolids on crops can reduce the cost of nutrient supplementation from $60-$140 per acre and provide most of the N and P needed. The biosolids are a great source of natural nutrients, minerals and can benefit your crop yield by up to 25%. Coming Soon- Biosolids reuse and Crop Benefits

Electric Utilities

Fly ash and bottom ash- landfill caps, road construction, cement, planters, statues for fill, stabilization of hazardous wastes, Decorative black glass was produced using fly ash as the main component,
Non-Hazardous Coal Power Plant Fly Ash as Flowable Fill Water

Chemical Plant-

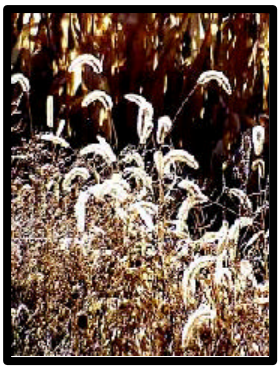
Acid or base Streams, Metals, Air pollution control technology residuals,
Streams high in Nitrogen or Phosphorus
Ferric chloride, High BTU content materials
Chlorine, Spent Catalysts,

Wineries

Lees, mach, biosolids, water reuse for irrigation or wash water

Miscellaneous

Cement Kiln Dust and Fly Ash can be used in Road Rehabilitation
Tire Chips for Highway Embankments
Wood Ash on Agricultural Land
Tire Shreds as Lightweight Fill
Aluminum, Copper and Brass Fabrication, Cement and Concrete, Coal combustion, Iron and Steel, Mini- mill byproducts,



As you can see, there are tons of sources of side streams that can be considered for beneficial reuse. The trick is finding a home for your byproduct.

Examples of Legislation or Links

Legislation enacted in 1985 [s. 289.05 (4), Wis. Stats.] encourages the beneficial use of industrial byproducts through the DNR.

http://www.p2rx.org/

The Pollution Prevention Resource Exchange (P2Rx) is a consortium of eight regional pollution prevention information centers, funded in part through grants from EPA.

Land Application of Biosolids

Rules, Regulations and Benefits

Biosolids are frequently used for land application on cropland, pastures or timberland, where they decompose and furnishing 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.

EPA regulations, under Title 40 Code of Federal Regulations Part 503 (40 CFR 503)

biosolids must meet Part 503 of the federal EPA standards regarding pathogen and heavy metal content, handling and application precautions, and other regulations.

Land Application of Biosolids Practiced for Centuries in Western Europe and North America. In the US, all 50 states practice land application of biosolids and 60% of all biosolids produced are land applied. In Europe 34% of biosolids are land applied. In Germany and Netherlands- all biosolids land applied!

In Ontario and Canada, 43% are land applied, 47% incinerated, and 4% are sent to a landfill. BC- 90% of municipal biosolids land applied. 70% is used for land reclamation, 25% for agriculture and the remaining 5% is retailed as compost. Quebec MOE- 1999, 80% of biosolids incinerated, 12% landfilled and 8% or .5 million tonnes was either land applied or composted.

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, sold 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

Procedures that may need to be undertaken in order to land apply biosolids

- Attain local government approval to spread or apply the material on agricultural land.
- Possible approval needed from MOE Biosolids Utilization Committee if in Canada
- Specific site must be assessed and approved
- Certificate of Approval- for an "Organic Soil Conditioning Site"
- Submit Detailed proposal to EPA District office
- Obtain Permits - Part V of the Environmental Protection Act.

Justification

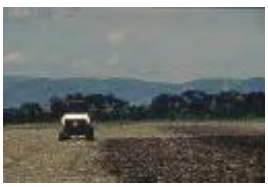
The utilization of a waste on agricultural land must benefit soil quality or crop production, and pose minimal risk to:
1) plant growth
2) crop quality
3) long-term land productivity
4) public and animal health
5) the quality of the environment.
In addition :
6) the waste will supply plant nutrients and/or
7) the waste has value as a soil amendment.

Some **Additional Requirements** may be necessary depending upon your local government regulations. Always make sure you follow federal as well as local government regulations, since regional variations may occur.

- Site Survey
- Plant Process to produce biosolids
- Waste/process Description
- Waste Analysis
- Agronomic Comments And Recommendations

Documentation- As usual, any time you do anything, there is paperwork. But, there is probably not much more paperwork that you are already doing if you are sending the biosolids out to a landfill anyhow.

- Application for a Certificate of Approval for a Waste Disposal Site
- Organic Soil Conditioning
- Site Assessment
- Maps
- Inspection Date(s)
- Source and Type of Material to be Applied
- Waste Analysis Report
- Soil Analysis Report
- Terrain Description
- Surface Physiology and Geology
- Depth to Water Table
- Direction of Shallow and Regional Groundwater Flow
- Water Wells
- Separation Distances
- Application Areas
- Crops .
- Schedule of Use
- Approval of Lessee/Landowner



- Notification To Adjacent landowners (For Other Than Sewage Biosolids)
- Confirmation from Municipality (For Other Than Sewage Biosolids)
- Confirmation From Other Agencies .
- Legal Company Name
- Other Information and Documentation Fees

You may be required to fill out a **Nutrient Management Strategy" (NMS)**

A "nutrient management strategy" (NMS) describes the generation, storage and destination of prescribed materials. Generators (those who generate a prescribed material), who are captured by the phase-in requirements of the regulation, must complete a nutrient management strategy for the farm unit or nonagricultural operation for the prescribed materials generated or received in the course of the operation: Regulation, Part 2.

Nutrient Management Plan" (NMP)

A "nutrient management plan" (NMP) describes for the nutrients received, or applied on the land, the management of the nutrients. If you own or control land to which nutrients are applied, and you are captured by the phase-in requirements of the regulation, then you must complete a nutrient management plan: Regulation, Part 2.

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

Disadvantages or drawbacks

- Lots of Paperwork
- Monitor and control
- Increased Analytical
- Time allowances for application and storage
- Weather limitations- rain or snow
- Labor Intensive
- Public opposition
- Odors
- Soil pH in the range of 5.5 to 7.5

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 m^3/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 (CO_2), water (H_2O) and humus (organic matter). Release or mineralization, of N as ammonium (NH_4N), P and S as sulfate occurs. The ammonium nitrogen may also be oxidized to produce nitrate (NO_3). 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	

Grass Hay

If the biosolids have 3 percent N per dry ton, then they have 60 pounds N per ton. If 40 percent of the N is available the first year, then the application rate in dry tons of biosolids will be as follows:

160 pounds N ÷ (0.4 x 60 pounds N/ton) = 6.6 tons/acre

If you use the medium potassium concentration of Table 2, the 6.6 tons of dry biosolids will supply 35 pounds K per acre (42 pounds K2O per acre). This is less than is needed for 4 tons of grass hay, so you must apply more K.

TABLE 2 TYPICAL BIOSOLIDS APPLICATION SCENARIOS

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

Source: U.S. EPA, 1994.

****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.**

Application Rates

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

- 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.

Additional Example

Guides or Publications

- MOE Fact Sheet: Application of Sewage Sludge to Agricultural Land (PIBS 608b)
- 1996 Guidelines for the Utilization of Biosolids and Other Wastes On Agricultural Land
- Interim Guidelines for the Production and Use of Aerobic Compost in Ontario-MOE November 1991
- Class Environmental Assessment for Municipal Water and Wastewater Projects
- OMAFRA Publications
  - Publication 29: Drainage Guide for Ontario
  - Publication 296: Field Crop Recommendation
  - Publication 360: Fruit Crop Recommendation
  - Fact Sheet AGDEX 540: Land Application of Sewage Biosolids for Crop Production
  - Report -Analytical Results, Findings, and Recommendations of the 1995 OMAFRA Sewage Biosolids Field Survey

http://www.ene.gov.on.ca/water.htm
http://www.cwwa.ca/legislation/faqs/links.htm

Misc. websites

Department of Homeland Security Funds Creation of Process Control Systems Forum

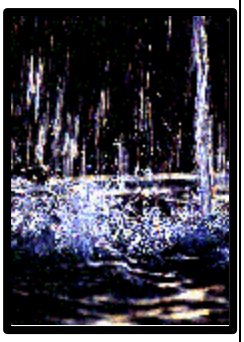
Protecting our nation's power and energy systems, refineries, water management, and factory automation from a devastating

cyber attack is critical for homeland security.

Many of our most vital infrastructure assets are operated by computerized automated control systems such as Process Control Systems (PCS) and Supervisory Control and Data Acquisition (SCADA) systems. Adoption of PCS and SCADA technology has allowed for great improvements in efficiency, safety, and response to market forces. However, there is increasing concern that this has come at the price of increased vulnerability to network attacks. To address this concern, the Department of Homeland Security (DHS) has funded the establishment of the ***Process Control Systems Forum (PCSF)***.

The goal of the PCSF is to protect our nation by developing next-generation core architecture that offers security, reliability, resiliency, and continuity in the face of disruptions and major incidents.

https://www.pcsforum.org/faqs.php



Environmental Leverage Inc. offers consulting services, beneficial reuse, training and bioaugmentation programs that can help reduce your surcharges.

Contact our office today to find out how your can start saving money and become more efficient at your plant!!!

Many times we have suggested articles for the next months issues. Sometimes we change what we will be featuring based upon critical issues that surface during our contacts with our customers. We hope this does not inconvenience you. If you have a specific topic you are interested and do not want to wait to see if it shows up in our newsletters, call us direct. We do have over 20 gigabytes of information on file on every subject around on water and waste issues.

of standards to IPCB are due by mid 2007. Calls for adoption of standards by IPCB are due by end of 2008. Components of Plan- there will likely be standards will be for total phosphorus and chlorophyll. These standards will be based on a cause/effect basis – nutrient levels/resulting in algae growth in lakes and streams. Nitrogen standard will not be likely given current knowledge that phosphorus is the limiting nutrient in Illinois waters. WQS for phosphorus and chlorophyll that will be set at protective levels to prevent excess algae growth and the resultant dissolved oxygen depletion/environmental degradation for lakes, rivers and streams

Interim Phosphorus Effluent Standard

On May 14, 2004 IEPA filed the Interim Effluent Phosphorus Standard with the Illinois Pollution Control Board
-1 mg/L total phosphorus as a monthly ave.
-New or expanded discharges 1 MGD or greater
-25 ppd or greater for non-domestic discharges

Questions? Paul Terrio, Water Quality Specialist with USGS, will spend a two-year assignment at IEPA Paul Terrio 217/558-2012 Paul.terrio@epa.state.il.us

COMING IN THE NEXT MONTHS . . . . .

Tank Remediation
Polymer Optimization