New York State Department of Environmental Conservation
Division of Materials Management
Bureau of Waste Reduction & Recycling

Biosolids Recycling
Fact Sheet Number 1

NYSDEC SOLID WASTE FACTS

December 1999

The Basics of Biosolids

What are Biosolids ??

Anaerobic Digesters at Highland Falls STP

Biosolids are a byproduct of wastewater treatment. Biosolids, the solid or semi-solid organic material generated by a wastewater treatment plant, result from the treatment of wastewater carried through sewer lines from homes and businesses to the treatment plant. Following treatment, the liquid (effluent) is typically discharged to a nearby stream and the solids (biosolids) or a product developed from the solids are removed from the treatment plant for disposal or beneficial use.

Biosolids characteristics vary depending on the sources of wastewater to the treatment plant and the treatment methods used at the treatment plant, and these characteristics will determine if beneficial use is feasible.

Types of Biosolids Treatment

Treatment methods can be grouped in a variety of ways. The following information groups the treatment methods in two broad categories, based primarily on the reduction of harmful organisms that is achieved.

Stabilization - a process to reduce the concentration of harmful (disease-causing) organisms, odor, and in some cases the volume, of the biosolids. The methods are not exclusive - more than one method may be used at a treatment plant. Typical methods include:

Digestion - a biological method of treatment involving the use of microorganisms to break down the complex organic substances found in untreated biosolids. Digestion occurs in a vessel, in either an oxygen-free (anaerobic) environment or in the presence of oxygen (aerobic).

Lime Stabilization - the addition of an alkaline material, such as lime, to biosolids to raise the pH of the biosolids. Raising the pH reduces the concentration of disease-causing organisms and reduces the odor of the material.

Air Drying - placing biosolids in a layer on a sand bed or paved surface for an extended period of time. Evaporation and draining result in a much drier material.

New York State Department of Environmental Conservation
Division of Materials Management
Bureau of Waste Reduction & Recycling

Biosolids Recycling
Fact Sheet Number 1

Advanced Stabilization - a process used to reduce harmful organisms to below detectable levels and produce a marketable product. Typical methods include:

Composting - an aerobic biological process that accelerates the natural decomposition process under controlled conditions. The biosolids are dewatered and mixed with an amendment, such as wood chips or yard waste, and the mixture is allowed to decompose in an aerobic environment. The resultant material is a humus or soil-like material typically used for landscaping and other soil amendments.

Heat Drying - the use of a drier to remove most of the water from biosolids. In some facilities, the resultant product is in the shape of pellets, which is why the process is sometimes referred to as pelletization. The pellets can be marketed as a fertilizer or for soil conditioning purposes.

Chemical Fixation - a process involving the blending of biosolids with lime and, in some cases, kiln dust. It differs from lime stabilization because sufficient alkaline material is added to produce heat during treatment, in addition to raising the pH of the material. The resultant product is typically used as a liming agent in agriculture.

Biosolids Management Options

Beneficial Use - after stabilization, composting, heat drying, or chemical fixation, biosolids can be beneficially used at appropriate application rates as soil conditioners (fertilizers, sources of organic material, etc.) on farmland, forest land, public works projects, landscaping activities, and land reclamation.

Incineration - the firing of biosolids at high temperatures in an enclosed device. Results in an ash that must be properly disposed.

Landfilling - the placement of biosolids in a disposal facility, including monofills (sludge-only landfills) and co-disposal with mixed solid waste. Typically, landfills must have liners, groundwater monitoring, and comply with other regulatory design and operational criteria.

Facts Sheets Available:

For Additional Information Contact:
(518) 402-8706 www.dec.ny.gov Organic Recycling & Beneficial Use Section
(518) 402-9024 (Fax)

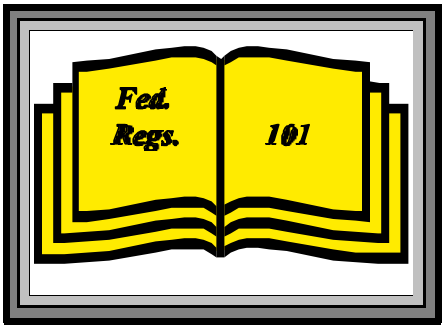
New York State Department of Environmental Conservation
Division of Materials Management
Bureau of Waste Reduction & Recycling

NYSDEC SOLID WASTE FACTS

December 1999

Federal Regulation of Biosolids Recycling

Who regulates biosolids recycling??



In New York State, the recycling of biosolids is currently regulated by both State and federal regulations. When New York State becomes authorized to administer the federal regulations (becomes a "delegated" state), the state regulations will govern. Until then, both sets of regulations apply - State (6 NYCRR Part 360) and federal (40CFR Part 503).

Federal Regulation (40 CFR Part 503)

The federal regulations governing the beneficial use of biosolids are found in 40 CFR Part 503 Standards for the Use or Disposal of Sewage Sludge, February 19, 1993, and amendments dated February 25, 1994 and October 25, 1995. These regulations are administered by the EPA. The contact for facilities in New York State is:

Alia Roufaeal
EPA Region II
290 Broadway
NY, NY 10007-1823
(212) 637-3864

The Part 503 land application regulations can be separated into the following areas:

General Requirements [503.12] - contains the notification and information requirements that apply to the use of biosolids. The requirements will depend on the quality of the biosolids land applied, how they are applied and where they are applied. For example, EQ biosolids (see below) are not subject to the general requirements, unless imposed on a case-specific basis by the permitting authority.

Pollutant Limits [503.13] - contains the numerical standards that apply to biosolids use for arsenic, cadmium, chromium, copper, lead, mercury, molybdenum, nickel, selenium, and zinc. The pollutant limits are found in four tables. Table 1 are ceiling concentrations - all biosolids must comply with these limits. Table 2 contains the cumulative pollutant loading rates - the maximum amount of pollutants that can be applied to a given area of land. Table 3 are pollutant concentration limits - more stringent limits than Table 1, if met it eliminates the need to track cumulative loading. Table 4 contains annual pollutant loading rates applicable to bagged biosolids. The standards that apply depend on the biosolids quality and use.

New York State Department of Environmental Conservation
Division of Materials Management
Bureau of Waste Reduction & Recycling

Biosolids Recycling Fact Sheet Number 2

Management Practices [503.14] - contains requirements concerning the application practices and labeling. Includes items such as restrictions on application to flooded, frozen, or snow-covered land.

Operational Standards [503.15] - contains the pathogen and vector attraction reduction requirements. Pathogen reduction is designated as Class A or Class B. Class A indicates that the level of pathogens are below detectable levels. Class B pathogen reduction indicates that pathogens have been reduced but not eliminated and additional site and crop restrictions apply. Under Class A and Class B there are a number of options available to demonstrate compliance. Biosolids must also be treated by one of the vector attraction reduction methods listed (not all alternatives are available for all uses).

Frequency of Monitoring, Recordkeeping, and Reporting [503.16, 503.17, 503.18] - outlines the required monitoring frequency - 1, 4, 6, or 12 times per year, depending on the quantity of biosolids used. Records must be kept by the biosolids preparer and certification of compliance is required. Certain treatment facilities are required to report annually to the permitting authority.

> ***EQ* BIOSOLIDS - the Part 503 regulations do not contain the term Exceptional Quality (EQ) biosolids but it is used to describe certain types of biosolids. To qualify as EQ, the biosolids must meet Table 1 and Table 3 pollutants limits, Class A pathogen reduction, and use one of the first eight vector attraction reduction methods. EQ biosolids are typically not subject to the general requirements or management practices and can generally be used like any other fertilizer or soil amendment.**

Documents That Provide More Detailed Information On The Federal Regulations
[A Partial List, but a Good Place to Start]

40 CFR Part 503 Standards for the Use or Disposal of Sewage Sludge, Federal Register, February 19, 1993, Vol. 58, No. 32 and amendments. Contact Alia Roufaeal or the web.

A Plain English Guide to the EPA Part 503 Biosolids Rule, EPA/832/R-93/003, September 1994. Contact EPA Office of Water Resource Center (OWRC) at (202) 260-7786.

A Guide to the Biosolids Risk Assessments for the EPA Part 503 Rule, EPA/832-B-93-005, September 1995. Contact EPA OWRC at (202) 260-7786.

Facts Sheets Available:

No. 1 The Basics of Biosolids	No. 6 Biosolids - Pollutants of Concern
No. 2 Federal Regulation of Biosolids Recycling	No. 7 Pretreatment and Source Control
No. 3 State Regulation of Biosolids Recycling	No. 8 Biosolids Recycling Methods
No. 4 Biosolids Management in New York State	No. 9 Biosolids Recycling Case Studies
No. 5 Beneficial Properties of Biosolids	No. 10 Biosolids Terms and References

For Additional Information Contact:
(518) 402-8706 www.dec.ny.gov Organic Recycling & Beneficial Use Section
(518) 402-9024 (Fax)

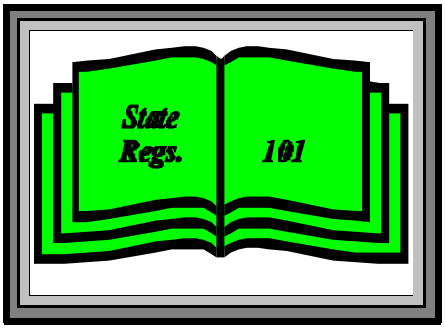
New York State Department of Environmental Conservation
Division of Materials Management
Bureau of Waste Reduction & Recycling

NYSDEC SOLID WASTE FACTS

December 1999

State Regulation of Biosolids Recycling

Who regulates biosolids recycling??



In New York State, the recycling of biosolids is currently regulated by both State (6 NYCRR Part 360) and federal (40 CFR Part 503) regulations. When New York State becomes authorized to administer the federal regulations (becomes a "delegated" state), the state regulations will govern. DEC is currently revising the State regulations to incorporate the federal regulatory criteria. The following discussion is based on the *proposed revisions* to the New York State regulations.

New York State Regulation (6 NYCRR Part 360)

The primary New York State regulations governing the beneficial use of biosolids are found in 6 NYCRR Part 360 Solid Waste Management Facilities, Subparts 360-1 (General Provisions), 360-4 (Land Application and Associated Storage Facilities), and 360-5 (Composting and Other Organic Waste Processing Facilities). A Part 360 permit is required for the construction and operation of biosolids facilities. The state biosolids criteria are briefly summarized below:

Subpart 360-4 Land Application and Associated Storage Facilities - contains the regulations applicable to the direct land application of Class B biosolids. Under 360-4, all land application sites (fields) are permitted. The Sections that apply are:

4.3(General permit application requirements for land application facilities) and 4.4 (Additional permit application requirements for biosolids land application facilities) - contains the information that must be submitted with the permit application. Includes items such as mapping, site geologic and soil information, an operation plan, biosolids quality data, pathogen and vector attraction reduction details, and proposed application rates.

4.6 (General design criteria and operational requirements for land application facilities) and 4.7 (Additional design and operational requirements for biosolids land application facilities) - contains the requirements that must be followed. Includes items such as pollutant limits, design criteria (buffer zones, groundwater and bedrock buffers, slope restrictions, etc.), monitoring, record keeping and reporting requirements, and pathogen and vector attraction reduction criteria.

New York State Department of Environmental Conservation
Division of Materials Management
Bureau of Waste Reduction & Recycling

Biosolids Recycling Fact Sheet Number 3

Subpart 360-5 Composting and Other Organic Waste Processing Facilities - contains the regulations applicable to processing facilities that turn biosolids into products that are used as soil conditioners, such as composting, heat drying, and chemical stabilization. These facilities employ a Class A pathogen reduction method. The production facility (not the product application sites) is permitted under 360-5. The Sections that apply are:

5.4 (General permit application requirements for organic waste processing facilities) and 5.5 (Organic waste processing facilities for biosolids, mixed solid waste, septage, and other sludges) - contains the permit application requirements for the processing facility including mapping, equipment specifications, biosolids data, monitoring plan, product distribution plan, etc. Section 5.5 also contains the design and operational requirements including pathogen and vector attraction reduction requirements, pollutant limits and product use, design criteria such as pad requirements, and monitoring, record keeping, and reporting requirements.

NYSDEC Regional Contacts

Part 360 permits for biosolids recycling are issued by the DEC regional offices. A preapplication meeting with the appropriate regional staff is useful in determining what will be needed to develop a complete application. The Regional Solid & Hazardous Materials Engineer is the appropriate contact for these types of biosolids facilities. The telephone numbers are:

Region 1 - (516) 444-0375 [Nassau, Suffolk]
Region 2 - (718) 482-4996 [Bronx, Kings, New York, Queens, Richmond]
Region 3 - (845) 256-3123 [Dutchess, Orange, Putnam, Rockland, Sullivan, Ulster, Westchester]
Region 4 - (518) 357-2243 [Albany, Columbia, Delaware, Greene, Montgomery, Otsego, Rensselaer, Schenectady, Schoharie]
Region 5 - (518) 897-1241 [Clinton, Essex, Franklin, Fulton, Hamilton, Saratoga, Warren, Washington]
Region 6 - (315) 785-2522 [Herkimer, Jefferson, Lewis, Oneida, St. Lawrence]
Region 7 - (315) 426-7419 [Broome, Cayuga, Chenango, Cortland, Madison, Onondaga, Oswego, Tioga, Tompkins]
Region 8 - (585) 226-5408 [Chemung, Genesee, Livingston, Monroe, Ontario Orleans, Schuyler, Seneca, Steuben, Wayne, Yates]
Region 9 - (716) 851-7220 [Allegany, Cattaraugus, Chautauqua, Erie, Niagara, Wyoming]

Facts Sheets Available:

For Additional Information Contact:
(518) 402-8706 www.dec.ny.gov Organic Recycling & Beneficial Use Section
(518) 402-9024 (Fax)

New York State Department of Environmental Conservation
Division of Materials Management
Bureau of Waste Reduction & Recycling

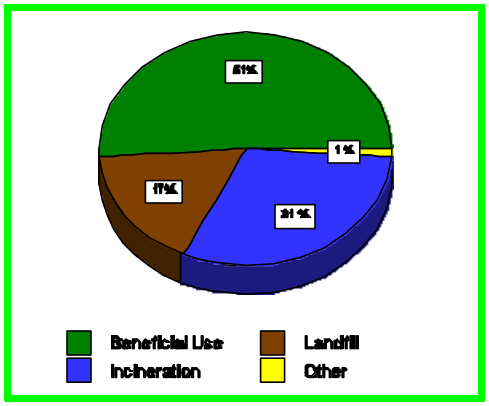
Biosolids Recycling
Fact Sheet Number 4

NYSDEC SOLID WASTE FACTS

December 1999

Biosolids Management in New York State

Sources for Information



The data and information in this fact sheet are compiled from a number of sources including: a Department survey of all publicly-owned treatment facilities (POTWs) in the State, monitoring and information required by State permits, sampling and analysis conducted by the Department, and the existing databases on wastewater treatment and biosolids management maintained by the Division of Materials Management and the Division of Water.

Basic Information

There are currently 584 POTWs in the state of New York that are producing biosolids. The total design capacity of these POTWs is about 3,600 million gallons of wastewater per day (MGD). The operating volume of the POTWs is about 2,970 MGD. Sixty-six percent of the treatment works have a design capacity of less than 1 MGD. The total biosolids generated rate is 360,000 dry tons per year or about 1,000 dry tons per day. The following table summarizes the treatment and dewatering methods used by the POTWs in New York State. There are also methods for more advanced treatment including composting and others that are discussed in greater detail under Beneficial Use.

Treatment Method	% of POTWs	Dewatering Method	% of POTWs
Aerobic Digestion	36.4	Drying Beds	26.2
Anaerobic Digestion	26.8	Belt Filter Press	22.4
Septic Tank or Imhoff	14.5	Centrifuge	4.6
Lagoon	4.3	Plate & Frame Press	2.2
Lime Stab. & Other	3.1	Vacuum Filter	1.0
None	14.9	None	43.6

Management Practices

The biosolids generated from POTWs in New York are managed as follows:

Beneficial Use	51 %	510 dry tons/day
Incineration	31 %	310 dry tons/day
Landfill	17 %	170 dry tons/day
Other	1 %	10 dry tons/day

New York State Department of Environmental Conservation
Division of Materials Management
Bureau of Waste Reduction & Recycling

Biosolids Recycling
Fact Sheet Number 4

In terms of the number of treatment plants in the State, 158 POTWs are currently involved in beneficial use, representing 29 percent of the plants. Landfilling is used by 246 POTWs, representing 40 percent of the POTWs. The remaining 196 POTWs use either incineration (114 POTWs) or other methods (82 POTWs).

Beneficial Use

There are many methods for beneficial use of biosolids including direct land application of digested (or other Class B treated) biosolids, composting, chemical stabilization, and heat drying. The methods used, number of facilities, number of POTWs, and quantity (in dry tons per day) are outlined below:

	# of Facilities	# of POTWs	Biosolids Quantity
Direct Land Application	30	78	102
Heat Drying	2	14	148
Composting	30	67	143
Chemical Stabilization	3	22	117

Landfilling, Incineration, and Other Methods

Of the 170 dry tons of biosolids landfilled per day, 64 percent is landfilled in-state, the remainder leaves the State for disposal. In New York State, biosolids are landfilled in municipal solid waste landfills that accept primarily municipal solid waste (refuse). At present there are 23 landfills accepting biosolids in the State.

There are 22 biosolids incinerators in the State. These incinerators, located at POTWs, handle a total of 300 dry tons per day. Also, about 10 dry tons per day are incinerated at out-of-state facilities. Incineration by itself is not a disposal method. Incineration does reduce biosolids quantity by at least 70 percent but results in a residue, ash, that must be properly managed. Ash from biosolids incineration in New York State is currently landfilled.

Other management/disposal methods, used for 1 percent of the biosolids generated, include treatment lagoons and storage on-site.

Facts Sheets Available:

For Additional Information Contact:
(518) 402-8706 www.dec.ny.gov Organic Recycling & Beneficial Use Section
(518) 402-9024 (Fax)

New York State Department of Environmental Conservation
Division of Materials Management
Bureau of Waste Reduction & Recycling

NYSDEC SOLID WASTE FACTS

December 1999

Beneficial Properties of Biosolids

Biosolids Benefits

Biosolids contain several plant macronutrients, primarily nitrogen (N) and phosphorus (P) and varying amounts of micronutrients such as boron, copper, and zinc. The quantity of nutrients in a particular biosolids or biosolids product will depend on the input to the wastewater treatment plant and the treatment methods employed at the treatment plant or at an off-site facility.

Storage Bunker at Rockland County Composting Facility

Biosolids also contain organic matter. Organic matter in biosolids is useful for both fine-textured (clay) soils and coarse-textured (sandy) soils. Organic matter added to fine soils can help make the soils looser or more friable and can increase the amount of pore space available for root growth. In coarse soils, organic matter can increase the water-holding capacity of the soil.

Effects of Biosolids Treatment on Characteristics

The type of biosolids treatment will affect the nutrient and other agronomic properties of the biosolids or biosolids products. In general, the primary agronomic characteristics are as follows:

Digestion or Other Class B - most Class B treatments involve biological treatment. The primary agronomic properties of these biosolids are nitrogen, phosphorus, and organic matter.

Composting - composting involves more advanced biological treatment of biosolids. It results in further degradation of organic matter and results in a stable, humus-like material. Due to the degradation and mixing with amendments, the nutrient content of compost is low. The primary agronomic benefit is organic matter.

Heat Drying - Heat drying involves the use of heat to remove moisture from biosolids, resulting in a very dry product, typically in the shape of a pellet. Heat treatment does not significantly affect the nutrient content of the biosolids. The primary properties are nitrogen, phosphorus, and organic matter.

New York State Department of Environmental Conservation
Division of Materials Management
Bureau of Waste Reduction & Recycling

Biosolids Recycling Fact Sheet Number 5

Chemical Stabilization - chemical stabilization typically involves the addition of lime, and possible other additives, to biosolids. Due to the addition of lime, the primary agronomic property of the material is pH adjustment (lime equivalence).

Typical Quality in New York State

	Class B	Compost	Heat Dried	Chem. Stab.
% N (TKN)	4.7	1.9	4.5	0.7
% P	1.2	0.5	2.0	0.4
% K	0.2	0.2	0.1	0.1
pH	7.1	7.1	7.1	12.4

Sample Calculation - Nutrient Availability For Agricultural Use (see 360-4 for terms)

Biosolids Data: TKN: 47,000 ppm (4.7%), NH_3: 6,400 ppm (0.64 %), NO_3: 100 ppm (0.01%), P:12,000 ppm (1.2%), K: 2,000 ppm (0.2%)
Biosolids and Site Info.: Anaerobic digestion, 200 dry tons per year at 5% solids, corn silage grown, biosolids incorporated, no previous biosolids application

Nitrogen Availability - see 360-4.4c

Lbs. Available N per dry ton biosolids = (%NI x 20) + (%NO x A)
%NI = $\%NH_3$ + $\%NO_3$ = 0.64 + 0.01 = 0.65
%NO = %TKN - $\%NH_3$ = 4.7 - 0.64 = 4.06 A = 4 (anaerobic digestion)
Lbs. N per dry ton biosolids = (0.65 x 20) + (4.06 x 4) = 29.2 Lbs. N/dry ton

Phosphorus Availability

Lbs. Available P_2O_5 per dry ton biosolids = (%P x 20 x 2.3) x 0.5
2.3 - needed to convert P to P_2O_5 0.5 - EPA recommendation of 50% availability
Lbs. Available P_2O_5 per dry ton = (1.2 x 20 x 2.3) x 0.5 = 27.6 lbs. P_2O_5/dry ton

Potassium Availability

Lbs. Available K_2O per dry ton biosolids = (%K x 20 x 1.2)
1.2 - needed to convert K to K_2O
Lbs. Available K_2O per dry ton biosolids = (0.2 x 20 x 1.2) = 4.8 lbs. K_2O/dry ton

Facts Sheets Available:

For Additional Information Contact:
(518) 402-8706 www.dec.ny.gov Organic Recycling & Beneficial Use Section (518) 402-9024 (Fax)

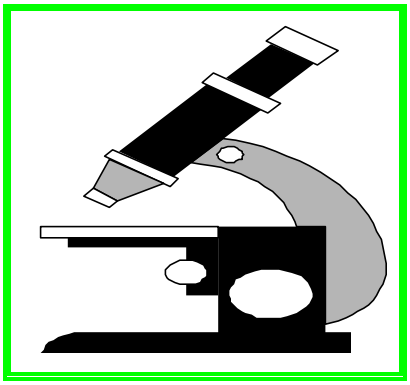
New York State Department of Environmental Conservation
Division of Materials Management
Bureau of Waste Reduction & Recycling

NYSDEC SOLID WASTE FACTS

December 1999

Biosolids - Pollutants of Concern

Introduction



Biosolids quality depends on the characteristics of the wastewater entering the wastewater treatment plant and the treatment processes used. The amount of pollutants present in the biosolids depends on the pretreatment and source control program in use, the sources for the wastewater, the treatment of the wastewater, and the treatment of the biosolids.

There are a number of federal, State, and local regulations that have resulted in the reduction in pollutants in biosolids and there are federal and State regulations that control biosolids quality for materials destined for beneficial use.

Metals

Metals can enter wastewater from industrial drains, from homes and from water supply pipes. Typical metals include cadmium, lead, copper, and zinc. At a wastewater treatment plant, these metals end up in the biosolids. The amount of metals entering from industrial drains is regulated by the federal pretreatment program and State and local source control regulations and programs. Metals entering the wastewater from metal pipes can be reduced by adjusting the pH of water supplies. Biosolids that are destined for beneficial use must be routinely tested and must meet State and federal metal standards.

In general, source control programs have reduced the amount of metals found in biosolids. In New York State, biosolids quality has increased significantly in the last decade. The following table shows the mean metal concentration for biosolids generated in New York State for the time periods indicated:

	1980-1989	1995-1998*	Draft 360-5 Standards*
Cadmium	18.8	5.5	10
Chromium	306.4	130.2	1000
Copper	1104.0	695.3	1500
Lead	306.4	130.2	300
Mercury	7.4	2.8	10
Nickel	103.6	46.3	200
Zinc	1377.0	815.4	2500

*** mean concentrations all below draft standards**

New York State Department of Environmental Conservation
Division of Materials Management
Bureau of Waste Reduction & Recycling

Biosolids Recycling Fact Sheet Number 6

Pathogens

A pathogen is an organism or substance capable of causing disease. Pathogens infect humans through several different pathways including ingestion, inhalation, and dermal contact. The infective dose, or the number of a pathogenic organism to which a human must be exposed to become infected, varies depending on the organism and on the health status of the exposed individual.

Pathogens which propagate in the enteric or urinary systems of humans and are discharged in feces or urine pose the greatest risk to public health with regard to the use of biosolids. The four major types of human pathogenic organisms that may be present in sewage are bacteria, viruses, protozoa, and helminths. The actual species and quantity of pathogens present in domestic sewage from a particular municipality depend on the health status of the local community. The level and types of pathogens in biosolids depends on the content of the sewage and the reductions achieved by the wastewater and biosolids treatment processes.

State and federal regulations protect public health by limiting the potential for public exposure to pathogens. This is accomplished through treatment of the sewage sludge or through a combination of sewage sludge treatment and restrictions on the land application site that prevent exposure to the pathogens in the biosolids and allow time for the environment to reduce the pathogens to below detectable levels. The regulations establish two classifications of biosolids based on the level of pathogen reduction the biosolids have undergone. Class A biosolids are treated to the point at which pathogens are no longer detectable. For Class B biosolids, a combination of treatment and site restrictions is designed to provide adequate protection of public health and environment.

Organic Chemicals

Biosolids may also contain synthetic organic chemicals from industrial wastes, household products, and pesticides. Most sewage sludge contains low levels of these chemicals and does not pose a significant human health or environmental threat. The federal Part 503 regulations do not regulate organic chemicals in biosolids because the organic chemicals of potential concern have been banned or restricted for use in the United States, are no longer manufactured in the United States, are present at low levels in biosolids based on data from a national survey, or because the limit for an organic pollutant based on a risk assessment is not expected to be exceeded in biosolids. New York State draft regulations require testing of biosolids for organic chemicals prior to land application.

For Additional Information Contact:
(518) 402-8706 www.dec.ny.gov Organic Recycling & Beneficial Use Section
(518) 402-9024 (Fax)

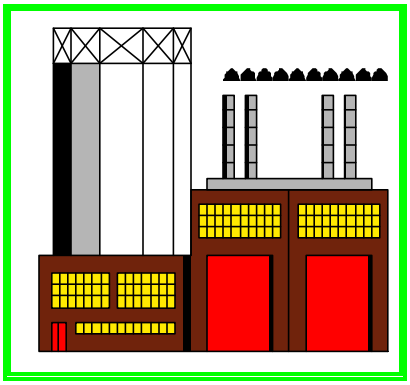
New York State Department of Environmental Conservation
Division of Materials Management
Bureau of Waste Reduction & Recycling

NYSDEC SOLID WASTE FACTS

December 1999

Pretreatment and Source Control

The Need For Pretreatment



Publicly-owned treatment works (POTWs) collect wastewater from homes, commercial buildings, and industrial facilities. Primary treatment is designed to remove large solids and small grit. Secondary treatment removes non-settleable organic material using microorganisms to consume biodegradable organics. Both primary and secondary treatment processes generate waste solids known as sewage sludge or biosolids.

As mentioned above, POTWs are designed to treat typical household wastes and biodegradable commercial and biodegradable industrial wastes. EPA defines these contaminants as conventional pollutants. Commercial and industrial facilities may, however, discharge toxic pollutants that the treatment plants are not designed to remove. The act of treating wastewater prior to sending it to a POTW is called "pretreatment". The federal regulations governing pretreatment (40 CFR Part 403) outline the objectives of the program:

- **prevent the introduction of pollutants into a POTW that will interfere with the operation of the POTW, including use or disposal of biosolids**
- **prevent the introduction of pollutants into a POTW that will pass through the treatment works**
- **improve opportunities to recycle and reclaim municipal and industrial wastewaters and sludges**

General Pretreatment Regulations

The General Pretreatment Regulations apply to all nondomestic sources which introduce pollutants into a POTW. These sources are commonly referred to as Industrial Users (IUs). Those industrial users which have a greater potential impact on the POTW are defined as Significant Industrial Users (SIUs). Unlike other environmental programs that rely on Federal or a State government to implement and enforce specific requirements, the pretreatment program places most of the responsibility on local municipalities. The regulations state that any POTW with a design flow greater than 5 million gallons per day (MGD) or smaller POTWs with SIUs must establish a local pretreatment program. Nationwide, these POTWs represent more than 80 percent of the wastewater flow. The local pretreatment program must be approved by EPA or the State, if authorized.

New York State Department of Environmental Conservation
Division of Materials Management
Bureau of Waste Reduction & Recycling

Biosolids Recycling
Fact Sheet Number 7

Pretreatment Standards

Prohibited Discharge Standards - All IUs are subject to general and specific prohibitions outlined in federal regulation. General prohibitions forbid the discharge of any pollutant to a POTW that cause pass-through or interference. Specific prohibitions forbid eight categories of pollutant discharges.

Categorical Standards - Categorical pretreatment standards are national, uniform, technology-based standards that apply to discharges to POTWs from specific industrial categories and limit the discharge of specific pollutants. Industries identified as major sources of toxic pollutants are typically targeted for categorical standard development. EPA implements pretreatment standards for 32 categories, such as electroplating, petroleum refining, and metal finishing.

Local Limits - Prohibited discharge standards are designed to protect against pass-through and interference generally. Categorical pretreatment standards are designed to ensure that IUs implement technology-based controls to limit the discharge of pollutants. Local limits address the specific needs and concerns of a POTW and its receiving waters. Typically, local limits are developed to regulate the discharge from all IUs, not just CIUs, and are usually imposed at the point the industry connects to the public sewer.

Impact on Biosolids Quality

Source control programs have reduced the amount of metals found in biosolids. The following table shows the mean concentration for biosolids generated in New York State for the time periods indicated:

	1980-1989	1995-1998	Draft 360-5 Standards
Cadmium	18.8	5.5	10
Chromium	306.4	130.2	1000
Copper	1104.0	695.3	1500
Lead	306.4	130.2	300
Mercury	7.4	2.8	10
Nickel	103.6	46.3	200
Zinc	1377.0	815.4	2500

Facts Sheets Available:

No. 1 The Basics of Biosolids
No. 2 Federal Regulation of Biosolids Recycling
No. 3 State Regulation of Biosolids Recycling
No. 4 Biosolids Management in New York State
No. 5 Beneficial Properties of Biosolids
No. 6 Biosolids - Pollutants of Concern
No. 7 Pretreatment and Source Control
No. 8 Biosolids Recycling Methods
No. 9 Biosolids Recycling Case Studies
No. 10 Biosolids Terms and References

For Additional Information Contact:
(518) 402-8706 www.dec.ny.gov Organic Recycling & Benefical Use Section
(518) 402-9024 (Fax)

New York State Department of Environmental Conservation
Division of Materials Management
Bureau of Waste Reduction & Recycling

NYSDEC SOLID WASTE FACTS

December 1999

Biosolids Recycling Methods

Introduction

Curing Piles at Lockport Composting

There are a number of methods for treating biosolids prior to use. The treatment method used as well as the biosolids quality will determine how the material is used and how it is regulated. In New York State, the use of Class B treated biosolids is considered direct land application, and each application site is permitted under Subpart 360-4. Production facilities, such as composting, heat drying, and chemical stabilization that use Class A treatment methods are regulated under Subpart 360-5.

The following discussion encompasses the types of facilities currently in operation in New York State. The list does not include all technologies available.

Direct Land Application

Direct land application of biosolids is the placement of Class B biosolids on or in the soil to benefit the crop grown and the soil present. Application can occur on agricultural land, forest land, and for land reclamation. In New York State, agricultural use is currently the only type of use for Class B biosolids. The biosolids is used because it provides nutrients (nitrogen and phosphorus) and organic matter to the soil and plants grown.

Biosolids can be applied as either a liquid or semi-solid (dewatered) material, similar to animal manure. Biosolids are either directly injected into the soil or spread onto the soil surface and then incorporated into the soil (New York State regulations require incorporation within 24 hours). The application rate is determined by the crop grown and the nutrient content of the biosolids. The rate of nitrogen application must not exceed the needs of the crop grown. In New York State, the proposed application rates must be approved as part of the permit application.

Composting

Composting involves the aerobic decomposition of organic material, such as biosolids, using controlled temperature, moisture, and oxygen levels. Composting results in a humus-like material that is typically used in landscaping to enhance topsoil.

New York State Department of Environmental Conservation
Division of Materials Management
Bureau of Waste Reduction & Recycling

Biosolids Recycling
Fact Sheet Number 8

Composting can be either a Class B or Class A treatment; however, this discussion focuses on composting as a Class A treatment.

All composting methods are aimed at optimizing conditions for microorganisms to efficiently degrade the material. Bulking agents such as sawdust, woodchips, or leaves are added to the biosolids to absorb moisture, increase porosity, and add carbon. The mixture is stored (in windrows, static piles, or a vessel) for a period of intense decomposition. Following this active period, the material is stored for an additional period to cure prior to use.

Windrow composting involves stacking the biosolids/bulking agent mixture into long piles about 6 feet high and 12 feet wide. The piles are routinely turned.

Aerated static pile composting uses forced-air rather than mechanical turning to supply air. An aeration system (pipes, etc.) is placed under the piles.

In-vessel composting involves the highest capital cost but provides the best process control. There are many vessel systems available.

Heat Drying

Heat drying is a treatment process in which almost all water is removed from biosolids by exposure to a heat source. The chemical composition of the biosolids remains essentially the same but the percent of solids of the resultant material is 90 percent or greater. Depending on the system, the end product is a powder-like material or grain-sized pellets. The heat dried product is typically used directly as a fertilizer or blended with other material to produce a higher grade fertilizer. There are two general types of rotary driers:

Direct heating involves the direct contact between the hot gases and the biosolids.

Indirect heating separates the hot gases and the biosolids.

Chemical Stabilization

Chemical stabilization is a process in which chemicals are mixed with sludge to achieve a Class A level of treatment. Alkaline materials, such as lime or cement kiln dust, are added to dewatered biosolids. The chemicals react with the biosolids and generate heat and increase the pH of the biosolids. The combination of heat and high pH serves to eliminate viable pathogenic organisms. Due to the lime addition, the resultant product is used primarily as a lime substitute in agriculture. These facilities are relatively simple, consisting of storage facilities, mixing equipment, and an area where the material is allowed to cure.

For Additional Information Contact: Organic Recycling & Benefical Use Section
(518) 402-8706 www.dec.ny.gov (518) 402-9024 (Fax)

New York State Department of Environmental Conservation
Division of Materials Management
Bureau of Waste Reduction & Recycling

NYSDEC SOLID WASTE FACTS

December 1999

Biosolids Recycling - Case Studies

Introduction

As outlined in Fact Sheet Number 4, there are dozens of biosolids beneficial use facilities in New York State. The types of beneficial use include direct land application, heat drying, composting, and chemical stabilization. This fact sheet contains more detailed information for a few of the facilities currently in operation.

Compost Piles at Newfane Compost Facility

Ticonderoga

Type of Facility: Direct land application (Class B biosolids)
Operator: Town of Ticonderoga
P.O. Box 471 Ticonderoga, NY 12883
Contact: Tracy Smith (518) 585-7855
Biosolids Source: Town of Ticonderoga WWTF
Biosolids Quantity: 210 dry tons/year
Facility Address: Bernard Leerkes Farm
Delano Road Ticonderoga, NY 12883
Acreage: 147 acres **Use:** Agriculture
In Operation Since: 1983

Manchester - Shortsville

Type of Facility: Composting (Aerated static pile)
Operator: Manchester-Shortsville Joint
Box 188 8 Clifton St. Manchester, NY 14504
Contact: Brian Romeiser (716) 289-6018
Biosolids Source: Manchester-Shortsville Joint WWTP
Biosolids Quantity: 71 dry tons/year
Facility Address: Manchester-Shortsville Compost
Route 96 Manchester, NY 14504
Product Use: Landscaping
In Operation Since: 1987

New York State Department of Environmental Conservation
Division of Materials Management
Bureau of Waste Reduction & Recycling

Biosolids Recycling
Fact Sheet Number 9

Lockport

Type of Facility: Composting (In-vessel system - IPS)
Operator: City of Lockport
One Locks Plaza/Municipal Bldg. Lockport, NY 14014
Contact: Michael Diel (716) 433-1613
Biosolids Source: City of Lockport WWTP
Biosolids Quantity: 2628 dry tons/year
Facility Address: Lockport Compost Facility
611 West Jackson St. Lockport, NY 14094
Product Use: Landscaping
In Operation Since: 1991

NYOFCO

Type of Facility: Heat Drying (Indirect)
Operator: New York Organic Fertilizer Company
120 Mineola Blvd, Ste 500 Mineola, NY 11501
Contact: James Carmichael (718) 991-7417
Biosolids Source: City of New York WWTPs
Biosolids Quantity: 47,000 dry tons/year
Facility Address: NYOFCO Heat Drying Facility
1108 Oak Point Ave Bronx, NY 10474
Product Use: Agriculture - Fertilizer
In Operation Since: 1993

Waste Stream Environmental, Inc.

Type of Facility: Chemical Stabilization
Operator: Waste Stream Environmental, Inc.
P.O. Box 1300 Weedsport, NY 13166
Contact: C. Wesley Gregory (315) 689-1380
Biosolids Source: Syracuse Metro WWTP
Biosolids Quantity: 10,153 dry tons/year
Facility Address: Syracuse Metro N-Viro Facility
650 Hiawatha Blvd. West Syracuse, NY 13204
Additives Used: Lime, cement kiln dust
Product Use: Agricultural lime
In Operation Since: 1994

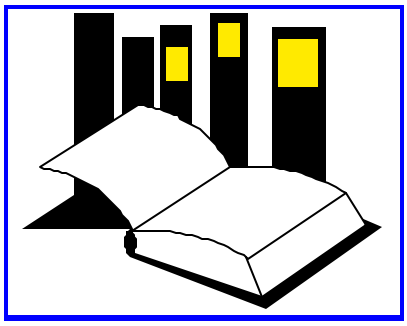
New York State Department of Environmental Conservation
Division of Materials Management
Bureau of Waste Reduction & Recycling

Biosolids Recycling
Fact Sheet Number 10

FACTS
SOLID WASTE
NYSDEC
December 1999

Biosolids Terms and References

General Terms



The following definitions are general in nature and may not reflect the official definition found in State or federal regulation.

Biosolids - a primarily organic solid product produced by wastewater treatment processes that can be beneficially recycled.

Sewage - wastewater that is carried by sewer lines into sewage treatment facilities.

Composting - the aerobic, thermophilic decomposition of organic waste to produce a stable, humus-like material.

Dry Weight Basis - calculated on the basis of having been dried at 105 degrees Celsius until reaching a constant mass (essentially 100 percent solids content).

Pelletization (Heat Drying) - the drying of biosolids to achieve, in many cases, a moisture content of 10 percent or less. The product may be in the shape of a pellet or other granular structure.

Class A - a treatment process or testing protocol that results in or indicates that pathogens in the biosolids are below detectable levels. Includes methods known as processes to further reduce pathogens (PFRP).

Class B - a treatment process or testing protocol that results in or indicates that pathogens in the biosolids have been reduced, but not necessarily eliminated. Includes methods known as processes to significantly reduce pathogens (PSRP).

EQ (Exceptional Quality) - biosolids that meet the ceiling concentration (Table 1) limits, the pollutant concentration (Table 3) limits, one of the Class A pathogen requirements, and one of the first eight vector attraction reduction methods found in federal Part 503.

Pathogenic organism - disease-causing organisms, including, but not limited to , certain bacteria, viruses, protozoa, and viable helminth ova.

Direct Land Application - the application of Class B biosolids to the soil surface or injected into the upper layer of the soil to improve soil quality and/or provide plant nutrients.

New York State Department of Environmental Conservation
Division of Materials Management
Bureau of Waste Reduction & Recycling

Biosolids Recycling
Fact Sheet Number 10

References (Government Documents)

40 CFR Part 503 Standards for the Use or Disposal of Sewage Sludge, Federal Register, February 19, 1993, Vol.58, No. 32 and amendments.

A Plain English Guide to the EPA Part 503 Biosolids Rule, EPA/832/R-93/003, September 1994.

A Guide to the Biosolids Risk Assessments for the EPA Part 503 Rule, EPA/832-B-93-005, September 1995.

6 NYCRR Part 360 Solid Waste Management Facilities, New York State Department of Environmental Conservation, January 1997.

Biosolids Management in New York State, New York State Department of Environmental Conservation, October 1998.

Environmental Regulations and Technology - Control of Pathogens and Vector Attraction in Sewage Sludge, EPA/625/R-92/013, December 1992.

Land Application of Sewage Sludge - A Guide for Land Appliers on the Requirements of the Federal Standards for the Use or Disposal of Sewage Sludge, 40 CFR Part 503, EPA/831-B-93-002b, December 1994.

Process Design Manual - Land Application of Sewage Sludge and Domestic Septage, EPA/625/R-95/001, September 1995.

Introduction to the National Pretreatment Program, EPA-833-B-98-002, February 1999.

Part 503 Implementation Guidance, EPA 833-R-95-001, October 1995.

Facts Sheets Available:

No. 1 The Basics of Biosolids
No. 2 Federal Regulation of Biosolids Recycling
No. 3 State Regulation of Biosolids Recycling
No. 4 Biosolids Management in New York State
No. 5 Beneficial Properties of Biosolids
No. 6 Biosolids - Pollutants of Concern
No. 7 Pretreatment and Source Control
No. 8 Biosolids Recycling Methods
No. 9 Biosolids Recycling Case Studies
No. 10 Biosolids Terms and References

For Additional Information Contact:
(518) 402-8706
www.dec.ny.gov
Organic Recycling & Beneficial Use Section
(518) 402-9024 (Fax)