Chapter 17 – Incinerator Emissions

Properly designed and operated, incineration systems can provide complete combustion of biosolids to produce carbon dioxide, water and sulfur dioxide. Incomplete combustion, however, can result in the formation of hydrocarbons, other volatile organics and carbon monoxide. There is also the potential to discharge particulate matter, metal sulfur dioxide, and nitrous oxides. To be successful, minimization and control of these emissions must be considered during the design and operation of the incinerator system and air pollution control devices (APCD).

17.1 Regulatory Summary

USEPA's 40 CFR Part 503 Rule regulates the emission of seven metals and total hydrocarbons from biosolids incinerators based on the following approaches:

- Risk-specific concentrations for arsenic, cadmium, chromium and nickel
- National Ambient Air Quality Standard (NAAQS) for lead
- Technology-based operational standard for total hydrocarbons
- National Emission Standards for Hazardous Pollutants (NESHAP) for beryllium and mercury

A summary of the Part 503 Rule is presented in Chapter 2.

17.1.1 Risk-Specific Concentrations for Arsenic, Cadmium, Chromium and Nickel

The emission of arsenic, cadmium, chromium and nickel from an incinerator are controlled by limiting the allowable concentration of each metal in the biosolids to be fed to the incinerator. The allowable concentration for each metal is determined for each individual incinerator based on the following equation:

$$C = RSC \; X \; \frac{86{,}400}{DFX\,(1 - CE)\,XSF}$$

Where:

C = The pollutant limit expressed as the allowable daily concentration of arsenic, cadmium, chromium or nickel in milligrams per kilogram to total solids, dry weight basis.

RSC = Risk specific concentration based on the allowable increase in the average daily ground level ambient air concentration for each metal at or beyond the property line of the site in micrograms per cubic meter.

86,400 = Conversion factor for seconds per day.

DF = Dispersion factor based on site specific dispersion characteristics (in micrograms per cubic meter per gram per second).

CE = Control efficiency for arsenic, cadmium, chromium or nickel based on performance test in hundreds.

SF = Biosolids feed rate in dry metric tons per day.

The allowable increases in the average daily ground level ambient air concentration for

arsenic, cadmium and nickel are based on the risk-based assessment conducted for the Part 503 Rule. The RSC for these three parameters are 0.023, 0.057 and 2 micrograms per cubic meter, respectively.

The RSC for chromium is determined based on either the type of incinerator used (option 1), or an analysis that involves sampling of the stack gas to determine the ratio of hexavalent chromium to total chromium analytes (option 2).

Option 1

Type of Incinerator	RSC (micrograms/m3)
FBF with wet scrubber	0.65
FBF with wet scrubber and wet electrostatic precipitator	0.23
Other types with wet scrubber	0.064
Other types with wet scrubber and wet electrostatic precipitator	0.016

Option 2

$$RSC = \frac{0085.0}{r}$$

Where:

R = The decimal fraction of the hexavalent chromium concentration in the total chromium concentration measured in the exit gas from the biosolids incinerator stack in hundredths.

17.1.2 NAAQS for Lead

The equation used to calculate the allowable concentration of lead in biosolids to be incinerated is similar to the equation used for arsenic, cadmium, chromium and nickel. However, rather than being based on a risk-based calculation developed for the Part Rules, the lead limit is based on a percentage of the NAAQS according to the following formula.

$$Clead = \frac{0.1 \times NAAQS \times 86{,}400}{DF \times (1-CE) \times SF}$$

Where:

Clead	=	The pollutant limit expressed as the allowable daily concentration of lead in milligrams per kilogram to total solids, dry weight basis.
0.1	=	The allowable ground level concentration of lead from biosolids is ten percent of the NAAQS for lead.
NAAQS	=	National Ambient Air Quality Standard for lead in micrograms per cubic meter.
86,400	=	Conversion factor for seconds per day.
DF	=	Dispersion factor based on site specific dispersion characteristics (in micrograms per cubic meter per gram per second).
CE	=	Control efficiency for lead based on performance test in hundreds.
SF	=	Biosolids feed rate in dry metric tons per day.

17.1.3 Beryllium and Mercury

Unlike other metals, beryllium and mercury emissions are regulated as limits to air emissions either by monitoring the exhaust air from the incinerator or the ambient air around the incinerator. In either case, the concentration in the air must meet the National Emission Standards for Hazardous Air Pollutants (NESHAPs, 40 CFR Part 61).

The NESHAP for beryllium requires that the total quantity of beryllium emitted from the incinerator not exceed 10 grams during any 24-hour period. This standard does not apply if written approval has been obtained from the USEPA Regional Administrator for the following:

(1) when the ambient concentration of beryllium in the proximity of the incinerator does not exceed 0.1 micrograms per cubic meter when averaged over a 30 day period; or
(2) if the biosolids incinerator operator can prove with historical data that the biosolids fired in the incinerator do not contain beryllium.

The NESHAP for mercury requires that the total quantity of mercury emitted into the atmosphere from all incinerators at a given site does not exceed 3,200 grams during any 24-hour period.

17.1.4 Total Hydrocarbons and Carbon Monoxide

Organic compounds such as benzene, phenol and vinyl chloride may be present in the exhaust from an incinerator due to incomplete combustion or the formation of combustion by-products. Total hydrocarbons (THC) or carbon monoxide (CO) are monitored to represent all organic compounds in the exhaust gas that are covered by the Part 503 Rule. In contrast to the limits for metals, which are based on risk-based assessment or the NAAQS, the THC or CO requirement is a technology-based standard. The technology-based approach was used because the methodology for developing a site-specific risk-based approach is not well established.

The Part 503 Rule allows a monthly average concentration of up to 100 parts per million based on volume (ppmv) of THC or CO. The emission limit for THC of 100 PPMV is monitored as propane, corrected to 0 percent moisture and 7 percent oxygen. If the CO in the emission does not exceed 100 ppmv, USEPA allows CO to be used as an alternative to THC. However, a CO limit of 100 PPMV is more stringent than a THC limit of 100 PPM. In either case, the regulation requires the monthly average to be based on the arithmetic mean of 24-hourly averages, with the hourly average based on at least two readings.

17.1.5 Proposed Regulatory Changes

After the 503 Rule was promulgated, USEPA indicated that biosolids incinerators also would be regulated under Section 112 of the Clean Air Act (CAA) Amendments of 1990, and that it would promulgate additional biosolids incinerator regulations, if deemed necessary, the Part 503 Rule (referred to at “Round 2”). In addition, in 1997 USEPA proposed to further regulate biosolids incinerators under Section 129 of the CAA.

(Dominak 2001)

The proposed regulations are summarized below:

Section 112 of the CAA

The goal of Section 112 of the CAA is to reduce emission of 188 hazardous air pollutants (HAPs) through the implementation of Maximum Achievable Control Technology (MACT) Standards. (A MACT Standard is defined as "The average emission limitation achieved by the best performing 12 percent of units in this category."

Under Section 112 of the CAA, biosolids incinerators and WWTFs are subject to MACT Standards only if they emit:

1. 10 tons or more per year of any single HAP, or
2. 25 tons or more per year of any combination of HAPS.

The Association of Metropolitan Sewerage Agencies (AMSA) polled their members regarding HAPS. The poll indicated that only limited number of the 188 HAPS in the wastewater entering their facilities. In addition, neither AMSA nor USEPA found any WWTF that practices incineration to be major source of HAPs. (Dominak 2001)

Section 129 of the CAA

On January 14, 1997, USEPA published the Federal Register a "Notice of Additional Information" concerning biosolids incinerators, in which it stated its intent to:

1. Delist biosolids incinerators as major sources of HAPs under Section 112 of the CAA and,
2. List biosolids incinerators as "Other Solids Waste Incinerators" under Section 129 of the CAA, along with hazardous waste, medical waste and municipal solid waste.

On April 24, 2000, USEAP announced in the Federal Register, that it has decided not to regulate biosolids incinerators under Section 129 of the CAA. USEPA also indicated that:

1. Biosolids is from a municipal source and,
2. Biosolids incinerators that combust biosolids are not "solids waste incinerator units, therefore Section 129 does not apply to biosolids incinerators."

In addition, USEPA Published in the Federal Register on August 15, 2000 a statement that it would not be regulating biosolids incinerators under Section 129 of the CAA.

On December 1, 2000 USEPA again announced in the Federal Register that it will not be regulating biosolids incinerators under Section 129 of the CAA and the effective date of this rule would be January 30, 2001.

January 30, 2001 has passed and biosolids incinerators are not being regulated under

Section 112 nor 129 of the CAA. (Dominak 2001)

Part 503 Regulation - Round 2

USEPA previously indicated that it would propose dioxin, dibenzofurans and dioxin-like coplanar PCB (dioxins) emission limits for biosolids incinerators, under Round 2 of the Part 503 Regulation, if deemed necessary, to protect public health and the environment.

In December 1999, USEPA announced in the Federal Register that, based on the results of risk assessment, it is not proposing dioxins emission limits for biosolids incinerators. USEPA based its decision on the fact that the 254 biosolids incinerators emit a combined total of 6 grams TEQ (dioxins)/year out of the 2,745 grams TEQ (dioxins)/year (0.2%) released to the atmosphere in the United States. In addition, USEPA determined that the highest associated risk factor did not exceed 2.1 x 10-6. (Dominak 2001)

17.2 Critical Control Points / Operational Controls

There are a number of controls associated with incineration emissions. They include:

- Incinerator system selection and design
- Incineration system optimization
- Instrumentation operation and maintenance
- Particulate Emission Controls
- Hydrocarbon Emission Controls
- Dispersion characteristics
- Stack plume elimination
- Record keeping and reporting

17.3 Incinerator System Selection and Design

The type of incinerator used - Multiple Hearth Furnace (MHF) or Fluidized Bed Incinerator (FBI) -will dictate the extent and type of APCD that will be required to comply with emission regulations in general and with regard to products of incomplete combustion. The carbon monoxide (CO) emissions from all FBI are typically below the regulatory limit of 100 ppm at 7 percent oxygen because the temperature of the exhaust gas normally exceeds 14000F. This exhaust temperature allows the FBI to routinely meet the requirement without difficulty.

It has been demonstrated that the Total Hydrocarbon (THC) emissions from MHFs can be kept below the 100-ppm limit by sustaining the top hearth temperatures at about 1000º F. This is possible if the burning hearth is close to the top hearth. This maintains the drying hearth temperatures high enough to oxidize THCs. To keep the burning hearth close to the top hearth, it is necessary to have exceptionally dry biosolids or to use only two hearths for drying. However, when some furnaces are loaded near their design capacity, the fire moves down and the heat required to keep the top hearth temperature at about 1,000º F creates overheating the burning hearth, melts ash and causes slagging.

17.4 Air Pollution Control Device System Optimization

Optimization of the operating parameters of any type of incineration system can have a large impact on the quality of the emission and the performance of the subsequent APCDs. Factors such as air entry rate and combustion temperature must be carefully controlled. Optimization of the incinerator system is discussed in greater detail in Chapter 16.
Optimization of key parameters related to the APCDs is of paramount importance to emission control. Table 17.1 lists some of the key parameters of APCD systems that must be carefully controlled.

Table 17.1 - Operating Parameters for Air Pollution Control Devices

Operating Parameter	APCD	Example Measuring Instrument
Pressure Drop	Venturi scrubber, impingement scrubber, mist eliminator, fabric filter	Differential pressure gauge/transmitter
Liquid flow rates	Venturi scrubber, impingement scrubber, mist eliminator, wet electrostatic precipitator (ESP)	Orfice plate with differential pressure gauge/transmitter
Gas temperature (inlet and/or outlet)	Venturi scrubber, impingement scrubber, dry scrubber, fabric filter, wet ESP	Thermocouple/transmitter
Liquid/reagent flow rate to atomizer	Dry scrubber (spray dry absorber)	Magnetic flow meter
pH of liquid/reagent to atomizer	Dry scrubber (spray dry absorber)	Wattmeter
Atomized motor power	Dry scrubber (spray dry absorber)	Pressure gauge
Compressed airflow rate	Dry scrubber (spray dry absorber)	Differential pressure gauge/transmitter
Compressed airflow rate	Dry scrubber (spray dry absorber)	Orfice plate with differential pressure gauge/transmitter
Opacity	Fabric Filter	Transmissometer
Secondary voltage (for each transformer/rectifier)	Wet ESP	Kilovolt meters/transmitter
Secondary currents (for each transformer/rectifier)	Wet ESP	Milliammeters/transmitter

The proper range for these parameters may be defined by the performance test and stipulated in the operating permit for the facility. The equipment manufacturer can also provide supporting information.

17.5 Instrumentation Operation and Maintenance

The Part 503 Rule requires operators to use instruments to continuously measure and record certain information including:

- THC or CO in the exhaust gas.
- Oxygen in the exhaust gas.
- Information used to calculate moisture content in the exhaust gas.
- Combustion temperatures at multiple points in the incinerator.

17.6 Particulate Emission Controls

Particulates are emitted in the exhaust air from an incinerator system. "Particulate matter" means any airborne finely divided solid or liquid material with an aerodynamic diameter smaller than 100 micron. A micron is one millionth of a meter or about 0.00004 inches. The human eye cannot see particles smaller than about 50 microns or 0.002 inches. The issue is whether particulates are controlled sufficiently to protect human health and the environment.

The Clean Air Act includes a particulate standard, using "PM10" as the control. PM10 means particulate matter with an aerodynamic diameter less than or equal to a nominal 10 microns. The 50 ug/m3 PM10 standard was determined from long-term epidemiological studies that indicate health effects *likely* when the PM10 concentration is greater than 80-90 ug/m3, health effects *possible* at PM10 concentrations between 40-80 ug/m3 and *no significant effects* at PM10 concentrations less than 40 ug/m3.

The USEPA has recently announced plans to modify its air quality standards by the year 2003. USEPA cites new health studies indicating that particulate smaller than 2.5 microns (PM2.5) are the major contributor to serious respiratory health problems. These anticipated standards are expected to apply to ambient air not the air quality leaving the stack.

When the average emissions exceed 6 lb/hr. of "particulate matter" or 4 lb/hr. of "PM10," certain provisions in the Clean Air Act are triggered. These provisions may require a study of ambient air conditions. The use of best available control technology would be required, and there may have to be emission reductions somewhere else in the community to offset the incinerator emissions. The provisions may also require the use of Best Available Control Technology (BACT). Best available control technology devices include:

- as high efficiency scrubbers
- fabric filters
- electrostatic precipitators

All biosolids incinerators that were built or modified after June 11, 1973 are required to meet the particulate emission limit of 1.3 lb/ton dry solids incinerated. This equates to approximately 0.03 grains/dscf at 7 percent oxygen. A survey of incinerators indicated that those units equipped with a combination of venturi and impingement plate scrubbers are meeting this standard, with a range of 0.22 to 1.11 lb/ton. In addition, there are a significant number of biosolids incinerators equipped with air pollution control equipment that are more efficient than the combination of a venturi and impingement scrubbers. (Baturay, A. 1999). Brief descriptions of the following

technologies are provided:

- Cyclone Separator
- Spray Chamber
- Venturi/Impingement Tray Scrubber
- Venturi Scrubbers
- Wet Electrostatic Precipitator

17.6.1 Cyclone Separator

Cyclone separators are generally used as a preliminary treatment step to remove large-size particulate matter, especially from FBI. A cyclone separator, is a vertical cylinder that uses centrifugal force to separate particulate matter from the air stream. Cyclone separators can generally be classified into large and small diameter. Large diameter cyclones have lower collection efficiencies, especially for smaller particles. They usually operate at a pressure drop of 1 to 3 inches of water column.

Small diameter systems are capable of removing more than 90 percent of particles greater than 10 microns and usually operate at a pressure drop of 3 to 5 inches water column.

17.6.2 Spray Chamber

A spray chamber may be a round or rectangular tank, into which water is introduced by a series of spray nozzles. There are three different methods of introducing the scrubbant spray: concurrent with the airflow, counter-current to the airflow and perpendicular to the airflow. Spray chambers are typically used as an initial process with an air pollution control system.

17.6.3 Venturi/Impingement Tray Scrubber

Flue gas enters the precooling section of the Venturi/Impingement Tray scrubber, where spray nozzles provide cooling water. The cooled air then enters the venturi throat where high gas velocity and additional scrubbing water create a high degree of turbulence, which ensures contact between the water droplets and particulate matter.

The more the throat of the venturi is restricted, the greater the headloss through the unit and, up to a point, the greater the removal efficiency. The air then passes up through the base of an impingement scrubber, which consists of trays mounted perpendicularly to the flow in a large vessel. Scrubbing water is introduced from ports along the side of the trays and flows out on the tray surface. As the air passes through each perforation in the tray, it creates a jet that bubbles up through the water and entrains particulate matter. A mist eliminator at the top of the unit reduces water carryover into subsequent APCDs.

17.6.4 Venturi Scrubber

Most venturi scrubbers have a rectangular flange to expose the dirty gases to a multi-rod deck.

Scrubbing liquid is introduced through a series of nozzles ahead of the deck and in the direction of the gas flow. As the liquid and gas pass through the multi-rod deck, the stream effectively forms a series of several venturis between the rods.

The saturated gas, with entrained particles, is forced to change direction and enter the expanded area prior to the pre-demist vanes. Chevron type vanes remove more than 90 percent of the free liquid and serve as a distribution baffle for the final demist section. The final demist section removes the remainder of the liquid droplets with the entrained particulate, and the clean gas passes through to the outlet.

17.6.5 Wet Electrostatic Precipitator

The Wet Electrostatic Precipitator (WESP) is a fine particulate scrubber, and performs best when used as a final polishing device downstream of a primary scrubber. Currently at least thirteen MHFs and two FBIs are equipped with WESPs. The average particulate emission rate from the MHFs equipped with WESPs is 0.19 lb/ton dry solids, ranging from 0.02 to 0.5 lb/ton. However, two of these WESPs were installed without venturis and one was sized for only 75 percent removal efficiency. If these two scrubbers are not included, the average particulate emission rate for WESPs becomes 0.10 lb/ton, with a range of 0.02 to 0.27 lb/ton. The WESPs installed for FBIs have a similar range of particulate emissions. A properly designed and sized WESP installed upstream of a combination of a venturi/impingement plate scrubber is capable of reducing the particulate emissions from biosolids incinerators to less than 0.1 lb/ton. The materials of construction are very important corrosion problems have been experienced with WESPs. (WEF 1999)

17.7 Organics Emission Controls

As previously discussed, Total Hydrocarbons (THC) or Carbon Monoxide (CO) are monitored to represent all organic compounds in the exhaust gas that are covered by the Part 503 Rule. The discharge limit from the dispersion stack is 100 parts per million based on volume (ppmv) of THC or CO at standardized oxygen and moisture content.

The oxidation of organics requires high ignition energy. The parameters affecting the oxidation rate are temperature, time, turbulence, oxygen availability, size, location, and proximity of the flame relative to the gas flow. The extent of afterburning required to reduce THC and CO levels to 100 ppm at 7 percent oxygen depends on the concentration and oxygen level in flue gas.

A survey was performed that included twenty-two MHFs with an average CO emission rate of less than 100 ppm at 7 percent oxygen. Four of these MHFs are equipped with internal afterburners, five with conventional-external (detached) units, two with side-flue, two with side-exit and nine with post-scrubber devices. (WEF 1999)

17.7.1 Internal Afterburner

As mentioned above, four of the MHFs included in the survey are maintaining CO concentrations below 100 ppm at 7 percent oxygen with internal afterburners. These MHFs have been modified to use upper hearths as internal afterburners, and biosolids incinerated in these furnaces are thermally conditioned. Because thermally conditioned biosolids dewater well and are void of bond-water, they can be ignited easily and burn quickly without predrying. In this case, the MHF functions like a mono-hearth with the

upper hearths being utilized as an internal afterburner while the lower hearths are used to burn char and cool ashes. These furnaces have no drying hearths.

Many MHFs are equipped with top hearth afterburners, which are currently being used for the control organic emissions. In the top hearth afterburner configuration, biosolids are fed into the second hearth and the top hearth is equipped with auxiliary fuel burners. The disadvantages to achieve the required CO reduction with a top hearth afterburner are the reduction of the incineration capacity and the cost of auxiliary fuel. (WEF 1999)

17.7.2 Conventional - External Afterburner

The conventional-external afterburner is a detached refractory lined vessel equipped with auxiliary burners. Although carbon monoxide can be oxidized in a conventional afterburner to the required levels, the cost of auxiliary fuel is prohibitive. The addition of conventional afterburners to existing MHFs also is often difficult due to space restrictions in the buildings where MHFs are housed. (WEF 1999)

17.7.3 Side Flue Afterburner

This is a variation of the top hearth afterburner. In the side-flue afterburner configuration, biosolids are fed into the second hearth and all the drop holes in the top hearth are blocked to force flue gases to go through a side flue equipped with auxiliary fuel burners. As in the top hearth afterburner, the incineration capacity of the furnace is reduced and the requirement for auxiliary fuel is high. (WEF 1999)

17.7.4 Side Exit Afterburner

In the side-exit afterburner configuration, flue gas is exhausted from the burning hearth and retained in an external chamber to oxidize carbon monoxide and other products of incomplete combustion. A portion of combustion products is used for drying biosolids at top hearths, and recycled back to the furnace below the burning hearth. In this configuration, some furnace capacity is lost. In addition, maintaining furnace draft can be difficult. (WEF 1999)

17.7.5 Post Scrubber Afterburner

In the post-scrubber afterburner configuration, flue gases are scrubbed then subcooled in an impingement plate or packed tower followed by an afterburner with heat recovery. The heat recovery may be accomplished with a regenerative thermal oxidizer (RTO) or a recuperative heat exchanger.

17.7.6 Regenerative Thermal Oxidizers

Thermal oxidation is a process where exhaust gas is drawn into equipment and heated to an oxidation temperature of 1500 °F. Any volatile organic compounds in the flue gases are converted in a half of a second or less into water vapor and carbon dioxide before being harmlessly discharged into the atmosphere.

The RTO unit consists of a central combustion chamber and two or more media filled recovery chambers. The incoming process gases are directed up into an "inlet" chamber through the heat recovery media into the combustion chamber to be destroyed then drawn

down through an "outlet" chamber releasing up to 95 percent of its heat for preheating of the next inlet cycle. Chambers regularly cycle from inlet mode to outlet mode regenerating the heat exchange media.

17.7.7 Flue Gas Recirculation

Flue gas recirculation (FGR) is a process where flue gas from the feed hearth of a multiple hearth incinerator is transferred to a hearth below the volatile burning hearth.(CBE)

In this process, 20 to 30 percent of the flue gas (at 350° to 400°C) is recirculated and mixed with the combustion air. The resulting dilution in the flame decreases the temperature and availability of oxygen therefore reducing thermal nitrogen oxide formation. The flue gas is usually recirculated subject to the operational constraints of flame stability, impingement, and boiler vibration.

Retrofitting an existing incinerator with flue gas recirculation involves installation of a system to extract the flue gas from the boiler unit, additional ductwork, fan and a fly ash collecting device. The fly ash control device is necessary to clean the flue gas prior to recirculation. Excessive flue gas recirculation can result in flame instability problems and increased steam temperatures.

17.8 Dispersion Characteristics

As indicated previously, the dispersion characteristics of the site have a significant impact on the discharge limitations for several of the regulated metals. The dispersion factor used in calculating the allowable metals concentration in the biosolids to be incinerated is determined through the use of air dispersion models.

Dispersion models include parameters such as local topography, land uses in the area, nearby buildings, and design characteristics of the exhaust air stack. While there may be little that can be done to improve the dispersion characteristics in terms of topography or land uses, good engineering practices should be applied to design of the exhaust stack. Factors such as location of the stack relative to other structures, exhaust gas velocity and stack height must be carefully considered.

Models were developed by USEPA to provide guidance on determining stack height and to ensure that excessively tall stacks would not be constructed solely for the purpose of achieving dilution (USEPA 1979). The maximum height stack that can be used in modeling to determine maximum metals concentration in biosolids to be incinerated is determined by the following equation.

$$Hg = H + 1.5L$$

Where:

Hg = Good engineering practice stack height measured from ground level elevation at stack base

H = Height of nearby structure(s) measured from ground level elevation at base of stack.

L = Lesser of height or width of nearby structure.

17.9 Stack Exhaust Plumes

Steam plumes from dispersion stacks are not typically a problem with MHF because many of these incinerators have been equipped with RTOs as the last treatment process to reduce organics. As a result, the discharge temperature is too high to allow a visible steam plume to form. With efficient gas cooling systems that are provided for most FBI, the exhaust from Air Pollution Control systems is generally about 200F above the scrubbant water temperature, or approximately 70° to 1000F. Although steam plumes will not be visible under most ambient conditions at these temperatures, there will be conditions under which a stack plume will be obvious. While these occasional plumes may not have any harmful effects, the aesthetic effects may be an issue.

17.10 Record Keeping and Reporting

Table 17.2 summarizes the air quality related monitoring requirements for a biosolids incinerator.

Table 17.2 - Air Quality Monitoring Requirements for Biosolids Incinerators

Parameters	Amount of Biosolids Incinerated (metric tons per year, dry-weight basis)	Required Monitoring Period
Arsenic, cadmium, chromium, lead and nickel in biosolids	< 290 ≥ 290 but ≤ 1,500 ≥ 1,500 but ≤ 15,000 ≥ 15,000	1x/year 1x/quarter year 1x/60 days 1x/30 days
Beryllium and mercury in biosolids or exhaust gas	Not applicable	As required by permitting authority
THC or CO in exhaust gas	Not applicable	Continuously. Monthly averages reported that equal arithmetic average that include at least two readings per hour.
Oxygen content in exhaust gas	Not applicable	Continuously.
Information needed to determining moisture content in exhaust gas	Not applicable	Continuously.
Combustion temperature in incinerator	Not applicable	Continuously.
Air pollution control device conditions as required by permitting authority.	Not applicable	As require by permitting authority.

The air pollution control device conditions that must be monitored and reported will be based on the results of the performance test. Examples of the types of parameters monitored include the

pressure drop in a venturi scrubber, gas temperature entering various devices, and operating temperature of afterburning devices.

References

Baturay, A., (1999), *"How Biosolids Incinerators are Meeting More Stringent Air Pollution Regulations",* WEF/AWWA Joint Residuals and Biosolids Management Conference

Chavond-Barry Engineering Corp., Blawenburg, N.J., (1999), *"Flue Gas Recirculation in Multiple Hearth Sewage Sludge Incinerators",*

Coalition for Responsible Waste Incineration, *"Particulate Emissions from Hazardous Waste Incinerators"*

Dominak, R.P., (February, 2001), "*Incineration: Current Practices and Future Direction for Biosolids Incinerators",* Proceedings of the Residuals and Biosolids Management Conference, February, 2001

Eastern Research Group*, (November, 1992), "Technical Support Document for Sewage Sludge Incineration",* National Technical Information Service

Graham, G., *"Controlling Stack Emissions in the Wood Products Industry",* PPC Industries *17IEA, "Flue Gas Recirculation for NOx Control"*

Pacific Gas & Electric *"Industrial Heat-Recovery Strategies"*

Saint, W. W., (July, 1996), "Thermal Dewatering of Biosolids at Bird Island STP, Buffalo, NY", ES&E