EPA Region III
Guidance on Minimum Permit Conditions for Carbon Regeneration Units

Introduction

Since 1991, EPA has considered all carbon regeneration units treating hazardous wastes to be regulated units under the Resource Conservation and Recovery Act (RCRA).[1] They are regulated under the interim status provisions of 40 CFR Part 265, Subpart P (Thermal Treatment) and the permitting provisions of 40 CFR Part 264, Subpart X (Miscellaneous Treatment). Subpart X provides that "Permit terms and provisions shall include those requirements of subparts I through O and subparts AA through CC of this part, part 270 and part 146 that are appropriate for the miscellaneous unit being permitted" and that are "necessary to protect human health and the environment." Because the Subpart X standards are intended to cover a wide variety of treatment processes, they are necessarily general in scope. The purpose of this guidance is to more clearly define EPA Region III's expectations and policies regarding carbon regeneration unit (CRU) permit applications under Subpart X, or equivalent state standards. [Note that other RCRA standards, including but not limited to, 40 CFR Part 264, Subparts J, BB, and CC may apply to some carbon regeneration facilities. This document does not address those requirements.]

This guidance specifically targets CRUs that consist of a primary chamber (most often a rotary kiln), a direct-fired secondary chamber, and one or more air pollution control devices that feed the spent carbon on a continuous, or semi-continuous basis. The primary chamber is used to desorb contaminants, reactivate the carbon, and partially destroy the organic contaminants. The secondary chamber, normally fired with fossil fuel, is intended to destroy the remaining organic contaminants. The air pollution control equipment removes particulate matter, metals, and HCl/Cl_2 from the exhaust gas before it is discharged to the atmosphere. Because this process involves high temperature oxidation of organic hazardous constituents, the guidance which follows draws heavily from EPA policies and regulations for hazardous waste incinerators.

EPA Region III is aware of at least one CRU that operates as a batch feed unit. Most of this guidance is also applicable to batch units. However, the permit writer must exercise some judgment in adapting the specific recommendations contained herein to ensure an equivalent level of environmental protection at batch fed CRUs.

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[1] See 56 Fed. Reg. 7200 et seq. (February 21, 1991). As explained in that preamble, it is the Agency's interpretation that most, if not all, carbon regeneration units processing hazardous waste should have been RCRA-regulated treatment facilities even prior to 1991. However, EPA also found that there was substantial confusion regarding CRU's regulatory status. Therefore, existing CRUs would be allowed to file Part A permit applications and obtain interim status. The deadline for obtaining interim status varies according to each authorized state RCRA program.

The proposed emission standards, operating conditions, and monitoring requirements that follow should apply at all times when hazardous waste is present in the CRU, including periods of startup, shutdown, and malfunction.

Emission and Performance Standards

Metal Emission Rates-- The permit should establish maximum mass emission rates for each Appendix VIII metal. In general, allowable emission rates should be based on acceptable levels determined from a site-specific risk assessment that evaluates risks to human health and the environment.

Two less resource-intensive approaches may also be considered by the permit writer. First, emission rates may be established in accordance with procedures set forth in the Boiler and Industrial Furnace (BIF) rule, 40 CFR §266.100 et seq., **except that the inhalation-only target levels should be 1 x 10^{-7} (cumulative risk) for carcinogens and a hazard quotient of 0.01 for noncarcinogens**[2]. Second, the permit writer may apply the maximum achievable control technology (MACT) standards for hazardous waste incinerators[3]. This should be accompanied by at least a qualitative evaluation of the site characteristics (e.g., effective stack height, exhaust gas flow rates, unusual terrain or dispersion features, particularly sensitive ecosystems nearby) to determine whether any site-specific variables are likely to render the MACT standards inadequate to protect human health and the environment.

The former method (full risk assessment) is a direct application of the principles set forth in 40 CFR Part 264, Subpart X. The latter two methods are less direct applications of the same principles.

Chlorine and Hydrogen Chloride Emission Rates-- Maximum Cl_2 and HCl emission rates should be established using one of the methods described above for metals except that the inhalation-only target levels should be a hazard quotient of 0.25 for each compound. This is a direct application of the risk management approach embodied in Subpart X. [Note: If the carbon feed profile includes significant quantities of other halogenated compounds (e.g. bromine, iodine), the permit writer should set a total halogen emission rate limit.]

Particulate Matter (PM) Emission Rates-- The target PM emission limit should be 0.030 grains per dry standard cubic foot of exhaust gas (corrected to 7% O_2). If a state air permit requires a lower emission rate, the lower rate should be incorporated into the RCRA permit. The PM emission rate limit will rarely, if ever, be directly risk-related. Rather, this target is readily

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2 This deviation from the BIF protocol is intended as a safety factor to account for indirect exposure pathways.

3 Final MACT standards are currently scheduled to be promulgated in late 1998. Draft standards should be applied only with extreme caution.

achievable, and is intended to ensure proper design and operation of air pollution control equipment. It will also serve to limit the risk uncertainties associated with organics adsorbed onto particles and with metals emissions that are not controlled by other standards (e.g. certain metals that exhibit minimal human health effects but may be associated with ecological effects).

Dioxin/Furan Emission Rates-- Because dioxins and furans (D/F) are highly persistent in the environment and background concentrations throughout the United States are already at levels of concern, EPA Region III believes that it is prudent to limit D/F emissions to the maximum extent practicable. The maximum emission rate target should be 0.20 nanograms TEQ per dry standard cubic meter of exhaust gas (corrected to 7% O_2). It may be necessary to establish lower limits based on results of a risk assessment. However, a risk assessment should not be used to justify a higher emission rate unless the facility has taken all reasonable steps to reduce D/F emissions to the maximum extent practicable.

Destruction and Removal Efficiency (DRE)-- The permit should specify a minimum DRE (as calculated by the procedure in 40 CFR §266.104(a)) of 99.99%[4]. This is a direct application of a relevant standard from Subpart O of Part 264.

Carbon Monoxide (CO) Emission Rate-- The maximum emission rate target for CO should be 100 ppmv (corrected to 7% O_2), measured as up to a 1-hour rolling average. CO is used as an indicator of proper combustion conditions. This limit is consistent with the emission rate now applied to all hazardous waste incinerators under Subpart O.

Fugitive Emissions-- Fugitive emissions from the CRU and associated air pollution control equipment should be prohibited at all times when hazardous waste is in the CRU. This is a direct application of a relevant standard from Subpart O.

CRU Operating Conditions

Bypass Dampers-- Bypass dampers, also known as thermal relief vents or dumpstacks, are safety devices intended to prevent damage to air pollution control equipment and to prevent or mitigate safety hazards that could result from certain process upsets. When a bypass damper is opened, the CRU exhaust gas is emitted directly to the atmosphere before passing through any air pollution control equipment. The Agency recognizes that it is appropriate to open a bypass damper under certain emergency conditions. However, the permit should expressly indicate that operation of the CRU in a bypass mode is not condoned as long as hazardous waste remains in the unit. The following language is recommended.

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[4] The DRE standard applies only to the principal organic hazardous constituents (POHCs) designated during a trial burn. It is not intended to apply to other organic compounds present only at low concentrations either during a trial burn or during normal operation.

> "Nothing in this permit, including activation of the automatic waste feed cutoff system, shall be construed to authorize the Permittee to bypass the air pollution control equipment at any time when hazardous waste remains in the kiln."

Metal and Chloride Feed Rates-- The permit should establish maximum feed rates for each metal (or group of metals if using the MACT emission standards) and total chlorides on a mass per unit of time (e.g. pounds/hour) basis. The permit applicant is responsible for developing an analysis and monitoring program which demonstrates ongoing compliance with those rates. The permit writer should be as flexible as possible in allowing each applicant to devise its own system provided that it meets the following principles:

- the plan must be clearly documented in writing;
- feed stream characterization must be based on actual analytical data; process knowledge alone is not sufficient; and
- constituent concentrations must be "known" to be at or below allowable limits before the material is fed to the CRU.

Refer to the "EPA Region III Guidance on Feed Stream Analysis for Hazardous Waste Combustion Facilities" (rev. 3/95) for further discussion of acceptable feed stream monitoring strategies.

Minimum Temperature(s)-- The permit should specify a minimum temperature for the exhaust gas from the secondary combustion chamber. The minimum temperature should be set at the highest average temperature demonstrated during any of the following tests:

- particulate emission testing
- dioxin emission testing
- DRE testing
- product of incomplete combustion (PIC) emission testing

If, in the permit writer's judgment, conditions in the primary chamber contribute significantly to the overall destruction of organic compounds, then (s)he may also establish a minimum temperature at the exit of the primary chamber.

Maximum Temperature-- If the allowable metal feed rates are based, in part, on retention of metals in the carbon, then the permit should also specify a maximum temperature at the exit of the primary chamber. This temperature should be set at the average temperature demonstrated during any metals emission testing that serves as a basis for the permitted metal feed rates.

Air Pollution Control Equipment Operating Conditions-- The permit should specify allowable operating conditions for key air pollution control equipment operating conditions. The permit writer should refer to the Technical Implementation Document for EPA's Boiler and Industrial

Furnace Regulations (EPA 530/R/92/011, March 1992), and Guidance on Setting Permit Conditions and Reporting Trial Burn Results (EPA 625/6-89/019, January 1989) for further guidance.

Automatic Waste Feed Cut Off (AWFCO) Requirements-- Each CRU should be equipped with a system that immediately and automatically shuts off the hazardous waste feed when any of the following conditions occur:

- a portion of the AWFCO is inoperable (e.g. loss of data signal from a required monitor) for any reason other than instrument calibration[5];
- secondary combustion chamber temperature is less than the permit limit;
- carbon monoxide concentration in the exhaust gas is greater than the permit limit;
- pressure anywhere in the system is greater than atmospheric (unless the system is designed to run under positive pressure, in which case an alternative maximum pressure should be set);
- a bypass damper is open; or
- air pollution control equipment is not within the operating range(s) specified in the permit.

Monitoring Requirements

Feed Stream Analysis-- At a minimum, each feed stream[6] must be fully characterized for all Appendix VIII metals[7] and total chloride before it is fed to the CRU. The level of characterization must be sufficient to ensure that emissions do not exceed any limits established in the permit. For further discussion of feed characterization, refer to the "EPA Region III Guidance on Feed Stream Analysis for Hazardous Waste Combustion Facilities" (rev. 3/95) which is attached to this guidance.

The permit should also include safeguards to ensure that the incoming spent carbon does not contain significant concentrations of dioxins, furans, and PCBs unless the CRU has been explicitly permitted to handle such wastes. Similarly, if a DRE trial burn has been structured to represent only a limited scope of organic hazardous constituents (i.e. "easy to burn" compounds,

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5 Calibrations required more frequently than monthly may be performed while waste feed continues provided that no monitoring system is off-line for more than 20 minutes, or a comparable time period approved by the permit writer. Calibrations required monthly or less frequently should be conducted while no wastes are in the CRU.

6 This includes the contaminated carbon and all other feed streams, including fossil fuels. However, commercially produced natural gas may be assumed to contain no metals or chlorides.

7 See 40 CFR Part 261, Appendix VIII. This includes the following 12 metals: antimony, arsenic, barium, beryllium, cadmium, chromium, lead, mercury, nickel, selenium, silver, and thallium.

or nonchlorinated compounds), the permit should include safeguards to ensure that the spent carbon does not contain other hazardous constituents. The ongoing sampling and analysis requirements for all of these circumstances should be considered on a case-by-case basis.

Operating Conditions-- Each CRU should meet the minimum monitoring guidelines set forth below. Additional monitoring should be considered on a case-by-case basis. Each "continuous" monitor should, at a minimum, meet the requirements of 40 CFR 266.103(c)(4)(iv)(B)(*i*).

Parameter	**Monitoring**	**Recording**	**Calibration**
Hazardous Waste Feed Rate	continuous	continuous	semiannual
Secondary Chamber Exit Temperature	continuous	continuous	semiannual
CO/O_2 System	continuous	continuous	daily
Primary Chamber Pressure	continuous	continuous	semiannual
Bypass Damper Status	continuous	hourly	not applicable
Air Pollution Control Equipment Conditions[8]	continuous[8]	continuous[8]	semiannual[8]

The carbon monoxide and oxygen monitoring system should be operated, maintained, calibrated and tested in accordance with 40 CFR Part 266, Appendix IX, Section 2.1.

Emission Testing-- Emission testing should be required prior to permit issuance (for existing units) or within 720 operating hours after startup (for new units) and at least every 5 years thereafter. The process of trial burn plan approval should follow the procedures established for hazardous waste incinerators.[9]

Every CRU should be tested for particulate and dioxin emissions. DRE testing should generally be required for all CRUs. However, if a unit consistently operates at CO emission rates below 10 ppmv (corrected to 7% O_2), the permit writer may consider that as data which demonstrates that the DRE standard is achieved in lieu of testing[10]. Metals and HCl/Cl_2 testing should be required only if the desired permit feed rate(s) exceed the allowable emission rate(s) (i.e. "credit" is taken for removal processes within the CRU).

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8 The key parameter(s) and associated monitoring requirements must be reviewed on a case-by-case basis. For some types of equipment, less frequent monitoring and recording may be appropriate.

9 See 40 CFR 270.62.

10 This waiver of DRE testing is only appropriate for systems with direct-fired afterburners that operate at oxygen levels well above stoichiometric.

If a comprehensive risk assessment is required, testing should follow the EPA guidance for risk assessment trial burns.

Miscellaneous Testing and Inspections-- Each CRU should be subject to the general inspection, AWFCO testing, and record keeping requirements of 40 CFR §264.347(b), (c), and (d).

Risk Assessment

The need to conduct a comprehensive site-specific risk assessment should be evaluated by the permit writer on a case-by-case basis. This guidance does not recommend that they be required for all facilities. However, some risk screening is recommended for all CRUs. The screening should include:

> for metals and chlorides, any one of the evaluations described previously under "Metal Emission Rates";
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> for non-dioxin PICs, consideration of whether the CO emission rate is consistently below 10 ppmv (corrected to 7% O_2); and
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> for dioxins and furans, evaluation of direct inhalation risks using the measured dioxin TEQ emission rate and screening procedures similar to those described in this guidance for metals. The inhalation-only screening benchmark for cancer effects should be 1×10^{8}. For noncancer effects, the benchmark should be an adult dose of less than 3×10^{17} grams TEQ/kg bodyweight/day.

If a CRU cannot pass the screening criteria, a comprehensive multi-pathway risk assessment should be submitted as part of the permit application. The risk assessment should follow established guidelines for RCRA hazardous waste combustion facilities.

Treatment of Residues

If a CRU is used to treat hazardous wastes "listed" in 40 CFR Part 261, Subpart D, then all residues derived from the treatment process (e.g. scrubber blowdown, air pollution control dust, treated carbon that is not suitable for reuse as an adsorbent) are hazardous wastes by the "derived from" rule (40 CFR §261.3(c)(2)) unless they have been excluded under 40 CFR §§260.20 or 260.22. The permit should ensure that derived-from residues are managed in accordance with applicable RCRA requirements. Regenerated carbon that is destined for reuse as an adsorbent is not regulated.

Attachment

EPA REGION III GUIDANCE ON FEED STREAM ANALYSIS FOR HAZARDOUS WASTE COMBUSTION FACILITIES

EPA's Boiler and Industrial Furnace (BIF) rule and some hazardous waste incinerator permits require hazardous waste combustion facilities to monitor the feed rate of metals, chlorine/chlorides, and ash on a quasi-continuous basis. That is, the feed rate of each feed stream must be continuously monitored and the facility must "know" the concentration of each constituent at any time. The Agency has clearly defined what constitutes a continuous monitor (see, for instance, 40 CFR §266.103(c)(4)(iv)(B)(*i*)). Therefore, this guidance focusses on EPA Region III's minimum expectations in regard to "knowing" feed stream concentrations and ways of combining that knowledge with the continuous feed rate measurement to ensure that the maximum constituent feed rates are not exceeded at any time.

As used in this guidance, the term *waste analysis plan* refers to a written document, prepared by the regulated facility, which defines the sampling and analysis protocols and frequency through which the facility will "know" the concentration of regulated constituents in each feed stream at all times. This is not limited to hazardous waste feed streams. It also includes nonhazardous wastes, fossil fuels and raw materials, as appropriate.

REQUIRED ELEMENTS OF THE WASTE ANALYSIS PLAN (WAP)

At a minimum, "knowledge" of the constituent concentrations in each feed stream must be based on actual sampling and analytical data. "Process knowledge" alone is not an acceptable substitute. [Note: Until further notice, the only exception to this requirement is for natural gas feed streams supplied by commercial gas companies. Concentrations of metals, ash, and chlorine/chlorides may be assumed to be zero for those streams.]

The WAP must specify sampling methods for each feed stream. This may be done either by reference to standard sampling methods (e.g. specific methods in EPA publication SW-846, specific ASTM methods) or by specifying a step-by-step standard sampling procedure. The WAP must describe procedures used to ensure that the sample is representative of the feed stream.

In general, sample composites should only be used to account for spatial variations within a single heterogeneous sample lot (e.g. a rail car load of coal, or a truckload of limestone). If the facility's regulatory feed rate limits are specified on a time-averaged basis (i.e. hourly rolling average), then composites may also be used to account for temporal variations. In those cases, the composite period should not exceed the regulatory averaging period. If the facility is subject to an instantaneous constituent feed rate limit, then no temporal compositing should be used.

The WAP must specify sample preparation and analysis methods for each regulated constituent in each feed stream. This may be done either by reference to standard sample preparation and analysis methods (e.g. specific methods in EPA publication SW-846, specific ASTM methods) or by specifying a step-by-step sample preparation and analysis procedure. It is recommended that SW-846 methods be used whenever they are both available and appropriate for the sample matrix; however, other appropriate methods may also be used.

The WAP must also specify a sampling and analysis strategy for each feed stream. An acceptable strategy is one that, in combination with the continuous feed rate monitoring data, provides reasonable assurance that all constituent feeds are within allowable limits before they are fed. It is not necessary to know the exact constituent feed rate as long as it is known to be at or below the allowable limit. Three acceptable sampling and analysis strategies are outlined below. However, this does not preclude the use of other strategies as long as they comply with the principle that the constituent feed rate must be "known" to be at or below the allowable limit when the material is fed to the combustor. After-the-fact knowledge of constituent feed rates is not acceptable.

SAMPLING STRATEGY: FEED BATCHING

This strategy is most often applicable to commercial off-site burners and large on-site burners with numerous feed sources. In most cases, it requires multiple feed tanks. In this system, after a given feed tank (or other container) is filled, a representative sample is taken and the tank is "sealed." The samples are then fully analyzed for all required constituents before the contents of that tank are burned. The "known" concentration of each constituent is the actual concentration measured in the sample[11]. Maximum feed stream rates are then established based on those concentrations.

SAMPLING STRATEGY: FEED STREAM "QUALIFICATION"

This is a variation of the feed batching strategy. In this system, each batch of waste or other feed material is sampled and analyzed before being accepted into the combustor's feed management system (e.g. before accepting a shipment from off-site or before accepting transfer of a waste from a production area to the waste management area of a plant). If each constituent is determined to be below a predetermined maximum concentration, then that batch is "qualified" for use as a combustor feed. The material may subsequently be blended with other "qualified" materials without restriction and without any further analysis prior to burning. The "known" concentration, for purposes of determining compliance with the BIF constituent feed limits, is the predetermined maximum concentration at which the material may be "qualified." The actual constituent concentration in the combustor feed is likely to be considerably lower than that value at any given time.

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11 Regulated constituents that are not detected must be considered to be present at the analytical detection limit.

SAMPLING STRATEGY: STATISTICAL APPROACH (General)

A statistical approach may be used to characterize fossil fuels, raw materials, or wastes generated onsite. It is expressly not applicable to hazardous waste generated at a facility that is not under the same ownership and control as the waste burning facility. (This approach may be used, however, with raw materials and fossil fuels produced by entities other than the waste burning facility, provided that there is a contractual requirement that the burner be notified of changes that could significantly affect constituent concentrations in those feeds.) When applied to the characterization of hazardous waste feed streams, this approach is only applicable to the waste as generated. It may not be applied after the waste has been blended with any other waste, fuel, or raw material.

Statistical characterization is only applicable to "consistent" feed streams (e.g. hazardous waste generated by a specific production process, coal produced from a specific mine or seam, limestone ore produced from a specific quarry) where there is a reasonable expectation that each constituent concentration will be normally distributed about a mean. (This should be verified via an appropriate statistical test for normality.) It requires that the facility operator have sufficient knowledge of the source of the feed material to know when there has been a change that is likely to affect the sample distribution. When such a change is known to have occurred, the facility operator may not use this approach until a statistical profile of the "new" feed stream has been developed.

When using any statistical approach, facilities should be guided by the following principles:

- It must be based on actual analytical results. Process knowledge alone is not sufficient.
- The facility operator must demonstrate at least a 95% probability that the concentration of any sample will not exceed an allowable limit 95% of the time.
- There must be a continuing sampling and analysis program to confirm the nature of the statistical distribution over time. This should incorporate the use of control charts or other methods to ensure that the key statistics do not change substantially over time.

Statistical Approach: Upper Tolerance Limits

One approach that satisfies the above criteria is based on upper tolerance limits. This approach is outlined in the paragraphs below. For a more detailed description, see Meeker and Hahn (1991).

If a variable is normally distributed and the sample mean, standard deviation, and number of samples are known, then, for any value, it is possible to estimate the probability that a fixed percentage of the sample population will not exceed that value. That value is known as an upper tolerance limit (UTL). For purposes of this guidance, the minimum UTL that may be used in lieu of continuous waste analysis is the value of the one-sided upper 95% tolerance bound that exceeds at least 95% of the sample population. In other words, we can say with 95% confidence that 95% of all individual samples will not exceed the UTL.

Although constituent concentrations in any single sample are likely to be well below the UTL, feed rates must always be calculated as though each constituent were present at its UTL. The UTL is continually adjusted based on new analytical results. The UTL for each constituent is calculated as follows:

<u>Step 1.</u> Using all valid analyses of the subject feed stream, calculate the mean concentration (x) and the sample standard deviation (s) using the following formulas.

$$\bar{x} = \frac{X_1 + X_2 + X_3 + \ldots + X_n}{n}$$

$$s = \sqrt{\frac{(X_1 - \bar{x})^2 + (X_2 - \bar{x})^2 + \ldots + (X_n - \bar{x})^2}{n - 1}}$$

where: x = the mean concentration of a given constituent
X_i = the constituent concentration in the ***i***th sample
n = the number of samples
s = the sample standard deviation

<u>Step 2.</u> Using the equation below, calculate the upper tolerance limit, $UTL_{(0.95;0.95)}$, such that there is at least 95% confidence that at least 95% of all samples will not exceed the UTL. Values for **T** are obtained from a table for calculating one-sided tolerance bounds for a normal distribution.

$$UTL_{(1-\alpha;p)} = \bar{x} + (T_{(1-\alpha;p,n)} \times s)$$

where: 1- = the desired level of confidence that at least 100(p)% of the individual samples will be below the UTL

p = the decimal fraction of samples that will be predicted to fall below the UTL

n = the number of samples

Table 1 lists values of **T** for 1- =0.95, 0.975 and 0.99 [all with p=0.95]. Statistical references may be consulted for other values of 1- . Linear interpolation may be applied for values of n that are not tabulated.

This guidance requires that, for a UTL to be used to demonstrate compliance, 1- must be 0.95 and *p* must be 0.95. A more conservative (i.e. higher) UTL may be used in order to decrease the required frequency of sampling and analysis as described in the following step.

Step 3. Determine the appropriate sampling and analysis frequency according to the following equation.

$$\frac{\textbf{number of samples}}{\textbf{year}} = \alpha_{\textbf{calc}} \times \begin{bmatrix} \textbf{days per year} \\ \textbf{on which waste} \\ \textbf{is generated} \end{bmatrix}$$

where: $_{calc}$ = one minus the level of confidence used to calculate the UTL; at a 95% confidence level, $_{calc}$=(1-0.95)=0.05

For facilities meeting the minimum requirements of this methodology (i.e. estimating concentrations based on $_{calc}$=0.95), the feed stream should be sampled and analyzed on at least 5% of the days on which it is generated. If the facility chooses to use a more conservative UTL, where (1- $_{calc}$)>0.95, the sampling and analysis burden will be reduced.

In qualitative terms, as the statistical confidence that an allowable constituent feed limit will not be exceeded increases, the necessary sampling and analysis frequency decreases. However, at a minimum, each feed stream must be analyzed at least once per year. Sampling dates must be evenly spaced throughout the year.

Table 1 presents values of $T_{(1- ;0.95,n)}$ for 1- =0.95, 1- =0.975, and 1- =0.99.

Statistical Approach: Compliance Issues

No statistical approach can guarantee true continuous compliance with short term feed rate limits. There is always a finite probability that any given sample concentration will exceed the UTL. This is an accepted fact of statistical characterization. Occasional samples that exceed the UTL notwithstanding, facilities may continue to calculate constituent feed rates using the UTL, provided that:

1. Immediately following receipt of an analysis that exceeds the UTL for any constituent, the facility shall begin daily sampling and analysis of that feed. Daily analyses shall continue until all regulated constituents are below their UTL for 3 consecutive days.

2. If the feed stream exceeds the UTL for the same constituent 2 or more times while daily sampling is required, the facility shall immediately cease using the statistical approach for that feed stream until a new feed profile is developed (using only data obtained after the initial UTL exceedance).

Statistical Approach: Summary

Although this policy sets forth several examples of acceptable waste and other feed stream characterization procedures, it is not intended to be all-inclusive. Any combination of the procedures described herein and alternative procedures may be acceptable provided that they meet the following principles:

- the facility operator must follow written procedures for characterizing each feed stream
- characterization must be based on actual analytical data; process knowledge alone is not sufficient
- the constituent concentrations must be "known" before the material is fed to the combustor
- any statistical approach must provide at least 95% confidence that the regulatory limit will not be exceeded for any constituent at any time
- any indirect characterization approach must be validated by a continuing program of periodic sampling and analysis
- regulated constituents that are not detected must be assumed to be present at the detection limit[12]

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12 This principle applies to feed stream analyses conducted to verify continuing compliance with the regulatory limit. When measuring constituent feed rates as part of a trial burn or BIF compliance test, nondetect values shall be considered as "zero" for purposes of calculating system removal efficiencies and determining maximum allowable feed rates.

Table 1

n	1 -		
	0.950	0.975	0.990
2	26.260	52.559	131.426
3	7.656	10.927	17.370
4	5.144	6.602	9.083
5	4.203	5.124	6.578
6	3.708	4.385	5.406
7	3.399	3.940	4.728
8	3.187	3.640	4.285
9	3.031	3.424	3.972
10	2.911	3.259	3.738
11	2.815	3.129	3.556
12	2.736	3.023	3.410
13	2.671	2.936	3.290
14	2.614	2.861	3.189
15	2.566	2.797	3.102
16	2.524	2.742	3.028
17	2.486	2.693	2.963
18	2.453	2.650	2.905
19	2.423	2.611	2.854
20	2.396	2.576	2.808
21	2.371	2.544	2.766
22	2.349	2.515	2.729
23	2.328	2.489	2.694
24	2.309	2.465	2.662
25	2.292	2.442	2.633
26	2.275	2.421	2.606
27	2.260	2.402	2.581
28	2.246	2.384	2.558
29	2.232	2.367	2.536
30	2.220	2.351	2.515
35	2.167	2.284	2.430
40	2.125	2.232	2.364
50	2.065	2.156	2.269
60	2.022	2.103	2.202
120	1.899	1.952	2.015