FINAL
BEST DEMONSTRATED AVAILABLE TECHNOLOGY (BDAT) BACKGROUND DOCUMENT ADDENDUM FOR K015

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1. INTRODUCTION

This document provides the Agency's rationale and technical support for selecting the constituents to be regulated in K015 nonwastewaters and for developing best demonstrated available technology (BDAT) treatment standards for those regulated constituents. Treatment standards for K015 wastewaters were originally promulgated as a part of the First Third rulemaking (53 FR 31154). This document is an addendum to the supporting BDAT background document for K015 dated August 1988. Most of the information regarding untreated K015 waste and K015 wastewater standards is available in the original background document and its references. This addendum reflects only revisions pertaining to K015 nonwastewater standards development.

According to 40 CFR 261.32, waste code K015 is generated by the organic chemicals industry and is listed as "still bottoms from the distillation of benzyl chloride." Because of the high organic concentrations in K015 (88 percent benzal chloride), the Agency has determined that the BDAT for K015 waste is incineration. The treatment standard for K015 nonwastewaters (wastes with total organic carbon (TOC) or total suspended solids (TSS) greater than 1 percent) was promulgated in the First Third rulemaking as "No land disposal based on no generation of ash," because EPA believed that incineration of K015 waste was unlikely to generate ash. After promulgation of the final First Third rule, EPA learned from a K015 generator that incineration of K015 generates an ash residue. Additionally, treatment of wastewater residuals such as incineration scrubber water and landfill leachate might form nonwastewater residuals. Therefore, EPA is revising the no land disposal standard by developing numerical standards for K015 nonwastewaters to reflect these new issues.

The Agency will regulate the same five organic and two metal constituents in K015 nonwastewaters as are regulated in the wastewater forms. Treatment standards for the BDAT list organic constituents in nonwastewater forms are based on a transfer of treatment performance data from incineration of similar wastes (i.e., K019 and K087). Toluene and benzal chloride standards are based on transfer of treatment data from K019. (Benzal chloride is not present in K019, nor is it present in any other regulated waste. The Agency has decided that p-dichlorobenzene, a constituent present in treatable levels in K019, is sufficiently similar to benzal chloride. Therefore, the treatment data from p-dichlorobenzene in K019 will be used to propose treatment standards for benzal chloride in K015.) Benzo(b/k)fluoranthene, phenanthrene, and anthracene standards are based on transfer of treatment performance data from K087. For BDAT list metal constituents (nickel and chromium), the treatment standards for nonwastewaters are based on transfer of treatment performance data from stabilization of incinerator ash generated from combustion of a waste (K048-K052) containing similar concentrations of metals.

Table 1-1 presents the treatment standards for K015 nonwastewaters and the existing standards for K015 wastewaters.

Table 1-1 BDAT Treatment Standards for K015

Constituent	Maximum for any single grab sample		
	Nonwastewater		Wastewater
	Total concentration (mg/kg)	TCLP leachate concentration (mg/l)	Total concentration (mg/l)
Volatile Organics			
Toluene	6.0	NA	0.2
Semivolatile Organics			
Anthracene	3.4	NA	1.0
Benzal chloride	6.2	NA	0.3
Benzo(b/k)fluoranthene	3.4	NA	0.3
Phenanthrene	3.4	NA	0.3
Metals			
Chromium	NA	1.7	0.3
Nickel	NA	0.2	0.4

NA - Not applicable.

2. INDUSTRY AFFECTED AND WASTE CHARACTERIZATION

The Agency estimates that K015 waste is generated by two facilities in the United States, one in New Jersey and the other in Tennessee. The process description outlined in the K015 background document has not been altered; therefore, it is not repeated in this document. When the original background document was published, EPA believed that the untreated K015 waste had an average ash content of 0.09 percent, which EPA considered to be negligible. However, data submitted by industry since publication of that document shows that the ash content can range from 0.2 to 1.8 percent and averages approximately 0.7 percent. Additionally, the Agency has received characterization data for metals in untreated K015 since the original publication of the K015 background document and the K015 proposed addendum. These data are presented in Table 2-1, which incorporates characterization data for untreated K015 waste appearing in the First Thirds K015 Background Document with information received after the publication of that document.

Table 2-1 K015 Untreated Waste Concentration

Parameter	Untreated waste concentration (mg/kg)
BDAT Volatile Organics (mg/kg)	
Toluene	<10
BDAT Semivolatile Organics (mg/kg)	
Anthracene	<5,000
Benzal chloride	880,000
Benzo(b and/or k)fluoranthene	<5,000
Phenanthrene	<5,000
BDAT METALS (mg/kg)[a]	
Nickel	1.0 - 11.0
Chromium	<0.5 - 20.0
Other Parameters	
Ash content (%)[b]	0.2 - 1.8 (0.7 average)
Heating value (Btu/lb)	10,000
Carbon content (%)	51.0 - 51.3 (51.1 average)
Dry loss (%)	96.0 - 99.0 (97.2 average)
Sulfur content (%)	0.03 - 0.32 (0.22 average)
Water content (%)	<1

Source: USEPA 1987a, p. 6-3

[a]Monsanto 1990.
[b]Monsanto 1989.

3. APPLICABLE AND DEMONSTRATED TREATMENT TECHNOLOGIES

The applicable and demonstrated treatment technologies for K015 nonwastewaters remain as stated in the original background document. The technologies must be those that destroy or reduce the organic constituent concentration in the waste. These technologies, which include incineration and fuel substitution, are described in detail in the original background document.

Because the Agency has information indicating that nonwastewater residuals can be generated as a result of incineration of K015 wastes (i.e., ash), an additional technology for treatment of BDAT list metals in K015 nonwastewater forms must be considered. The applicable technology that EPA has identified for metals treatment in K015 nonwastewaters is stabilization. The purpose of stabilization is to immobilize the metal constituents of concern, thereby reducing their leaching potential.

EPA has identified incineration and fuel substitution as the demonstrated treatment technologies for K015 waste as generated, chromium reduction and chemical precipitation for removal of metals from any residual wastewaters (i.e., incineration scrubber water), and stabilization for metals in residual nonwastewaters (i.e., incinerator ash).

For K015 nonwastewaters containing treatable concentrations of BDAT list metals resulting from incineration, the Agency has not identified any facilities using stabilization on nonwastewater residuals. However, the Agency believes that stabilization is demonstrated for K015 nonwastewater residues because stabilization is demonstrated on other nonwastewater incineration residues containing BDAT list metals. A detailed description of stabilization appears in the Treatment Technology Background Document (USEPA 1989b).

4. PERFORMANCE DATA

This section presents the data available on the performance of incineration and stabilization in treating K015 nonwastewaters.

4.1 BDAT List Organics Treatment Data

EPA does not have performance data for treating the nonwastewater ash generated during rotary kiln incineration of K015 waste; therefore, the Agency will transfer data from the treatment of other listed wastes. Six sample sets from the treatment of K019 and five sample sets from the treatment of K087 were collected for rotary kiln incineration. Transfer from more than one waste code is necessary since all constituents to be regulated in K015 cannot be found in one single waste code. Toluene and benzal chloride standards are based on transfer of treatment data from K019. (Benzal chloride is not present in K019, nor is it present in any other regulated waste. The Agency has decided that p-dichlorobenzene, a constituent present in treatable levels in K019, is sufficiently similar to benzal chloride. Therefore, the treatment data from p-dichlorobenzene in K019 will be used to promulgate treatment standards for benzal chloride in K015.) Benzo(b/k)fluoranthene, phenanthrene, and anthracene standards are based on transfer of treatment performance data from K087.

The technology on which treatment performance is based in both the K019 and K087 wastes is incineration, which is the BDAT technology for K015 waste as generated. The Agency believes that the data from K019 and K087 wastes represent a level of treatment performance that can be achieved for K015 by using incineration because the waste constituents are similar to K015 wastes and are present at higher concentrations than in K015. The data from K019 and K087 wastes are presented in Tables 4-1 through 4-8 at the end of this section.

For more detailed information on the K019 and K087 performance data, see the background documents for these waste codes (USEPA 1988b, 1988c).

4.2 BDAT List Metals Treatment Data

No performance data are available for treatment of metals (nickel and chromium) in K015 nonwastewaters (i.e., incinerator ash or scrubber water treatment residuals). However, data sets are available for stabilization of metals in the incinerator ash from treatment of K048-K052 (petroleum refining wastes). Treatment performance data before stabilization in K048-K052 waste show chromium and nickel present at a level at least as high as that expected to be found in K015 nonwastewater residuals. Therefore, the Agency believes that the K048-K052 data sets represent a level of treatment performance that can be achieved for K015 nonwastewater residuals using stabilization. The performance data for ash stabilization from K048-K052 appear in Table 4-9.

Table 4-1 Treatment Performance Data Collected by EPA for K019[a]
Plant A - Rotary Kiln Incinerator

Sample Set #1

Detected BDAT list organic constituents	Untreated waste: K019 concentration mg/kg (ppm)	Untreated waste: RCRA blend[b] concentration mg/kg (ppm)	Treated waste: Kiln ash concentration mg/kg (ppm)	Treated waste: Kiln ash TCLP mg/L (ppm)
Volatiles				
43. Toluene	<200	2,300	<2	
Semivolatiles				
57. Anthracene	<10	110	<2	
65. Benzo(k)fluoranthene	<10	67	<2	
88. p-Dichlorobenzene	81	32	<2	
141. Phenanthrene	21	240	<2	
Metals				
159. Chromium	4.0	40	44	0.200
163. Nickel	3.0	8.8	66	0.680

Design and Operating Parameters

Parameter	Design	Operating value
Kiln temperature (°F)+	-[c]	1825-1900
Kiln solids residence time (min)	-[c]	120
Waste feed rate (MMBtu/hr)+	-[c]	K019: 13.1 RCRA blend, Waste burner #1: 3.9-5.5 RCRA blend, Waste burner #2: 4.4-9.7
Kiln rotational speed (rpm)	-[c]	0.19-0.21

[a]This table appears in its entirety in the K019 background document (USEPA 1988b). Only an abridged version is necessary for this document.
[b]Only one sample of RCRA blend waste was taken. The results are repeated in each sample set.
[c]This information has been claimed as RCRA Confidential Business Information.

Table 4-2 Treatment Performance Data Collected by EPA for K019[a]
Plant A - Rotary Kiln Incinerator

Sample Set #2

Detected BDAT list organic constituents	Untreated waste: K019 concentration mg/kg (ppm)	Untreated waste: RCRA blend[b] concentration mg/kg (ppm)	Treated waste: Kiln ash concentration mg/kg (ppm)	Treated waste: Kiln ash TCLP mg/L (ppm)
Volatiles				
43. Toluene	<2,000	2,300	<2	
Semivolatiles				
57. Anthracene	<10	110	<2	
65. Benzo(k)fluoranthene	<10	67	<2	
88. p-Dichlorobenzene	74	32	<2	
141. Phenanthrene	15	240	<2	
Metals				
159. Chromium	3.4	40	60	0.130
163. Nickel	3.6	8.8	89	0.560

Design and Operating Parameters

Parameter	Design	Operating value
Kiln temperature (°F)+	-[c]	1800-1880
Kiln solids residence time (min)	-[c]	120
Waste feed rate (MMBtu/hr)+	-[c]	K019: 12.2 RCRA blend, Waste burner #1: 5.2-5.5 RCRA blend, Waste burner #2: 4.4-9.7
Kiln rotational speed (rpm)	-[c]	0.19-0.21

[a]This table appears in its entirety in the K019 background document (USEPA 1988b). Only an abridged version is necessary for this document.
[b]Only one sample of RCRA blend waste was taken. The results are repeated in each sample set.
[c]This information has been claimed as RCRA Confidential Business Information.

Table 4-3 Treatment Performance Data Collected by EPA for K019[a]
Plant A - Rotary Kiln Incinerator

Sample Set #3

Detected BDAT list organic constituents	Untreated waste: K019 concentration mg/kg (ppm)	Untreated waste: RCRA blend[b] concentration mg/kg (ppm)	Treated waste: Kiln ash concentration mg/kg (ppm)	Treated waste: Kiln ash TCLP mg/L (ppm)
Volatiles				
43. Toluene	<2,000	2,300	<2	
Semivolatiles				
57. Anthracene	<10	110	<2	
65. Benzo(k)fluoranthene	<10	67	<2	
88. p-Dichlorobenzene	80	32	<2	
141. Phenanthrene	11	240	<2	
Metals				
159. Chromium	3.5	40	202	0.260
163. Nickel	2.3	8.8	169	0.960

Design and Operating Parameters

Parameter	Design	Operating value
Kiln temperature (°F)+	-[c]	1850-1900
Kiln solids residence time (min)	-[c]	120
Waste feed rate (MMBtu/hr)+	-[c]	K019: 12.4 RCRA blend, Waste burner #1: 5.2-5.8 RCRA blend, Waste burner #2: 4.4-8.4
Kiln rotational speed (rpm)	-[c]	0.19-0.21

[a]This table appears in its entirety in the K019 background document (USEPA 1988b). Only an abridged version is necessary for this document.
[b]Only one sample of RCRA blend waste was taken. The results are repeated in each sample set.
[c]This information has been claimed as RCRA Confidential Business Information.

Table 4-4 Treatment Performance Data Collected by EPA for K019[a]
Plant A - Rotary Kiln Incinerator

Sample Set #4

Detected BDAT list organic constituents	Untreated waste: K019 concentration mg/kg (ppm)	Untreated waste: RCRA blend[b] concentration mg/kg (ppm)	Treated waste: Kiln ash concentration mg/kg (ppm)	Treated waste: Kiln ash TCLP mg/L (ppm)
Volatiles				
43. Toluene	<2,000	2,300	<2	
Semivolatiles				
57. Anthracene	<10	110	<2	
65. Benzo(k)fluoranthene	<10	67	<2	
88. p-Dichlorobenzene	84	32	<2	
141. Phenanthrene	19	240	<2	
Metals				
159. Chromium	1.8	40	28	0.110
163. Nickel	2.2	8.8	69	0.870

Design and Operating Parameters

Parameter	Design	Operating value
Kiln temperature (°F)+	-[c]	1775-1900
Kiln solids residence time (min)	-[c]	120
Waste feed rate (MMBtu/hr)+	-[c]	K019: 12.7 RCRA blend, Waste burner #1: 5.2-5.8 RCRA blend, Waste burner #2: 4.4-7.3
Kiln rotational speed (rpm)	-[c]	0.19-0.21

[a]This table appears in its entirety in the K019 background document (USEPA 1988b). Only an abridged version is necessary for this document.
[b]Only one sample of RCRA blend waste was taken. The results are repeated in each sample set.
[c]This information has been claimed as RCRA Confidential Business Information.

Table 4-5 Treatment Performance Data Collected by EPA for K019[a]
Plant A - Rotary Kiln Incinerator

Sample Set #5

Detected BDAT list organic constituents	Untreated waste: K019 concentration mg/kg (ppm)	Untreated waste: RCRA blend[b] concentration mg/kg (ppm)	Treated waste: Kiln ash concentration mg/kg (ppm)	Treated waste: Kiln ash TCLP mg/L (ppm)
Volatiles				
43. Toluene	<2,000	2,300	<2	
Semivolatiles				
57. Anthracene	<10	110	<2	
65. Benzo(k)fluoranthene	<10	67	<2	
88. p-Dichlorobenzene	90	32	<2	
141. Phenanthrene	19	240	<2	
Metals				
159. Chromium	3.2	40	125	0.210
163. Nickel	4.8	8.8	166	1.270

Design and Operating Parameters

Parameter	Design	Operating value
Kiln temperature (°F)+	-[c]	1775-1800
Kiln solids residence time (min)	-[c]	120
Waste feed rate (MMBtu/hr)+	-[c]	K019: 11.7 RCRA blend, Waste burner #1: 5.5-6.0 RCRA blend, Waste burner #2: 5.2-9.7
Kiln rotational speed (rpm)	-[c]	0.19-0.21

[a]This table appears in its entirety in the K019 background document (USEPA 1988b). Only an abridged version is necessary for this document.
[b]Only one sample of RCRA blend waste was taken. The results are repeated in each sample set.
[c]This information has been claimed as RCRA Confidential Business Information.

Table 4-6 Treatment Performance Data Collected by EPA for K019[a]
Plant A - Rotary Kiln Incinerator

Sample Set #6

Detected BDAT list organic constituents	Untreated waste: K019 concentration mg/kg (ppm)	Untreated waste: RCRA blend[b] concentration mg/kg (ppm)	Treated waste: Kiln ash concentration mg/kg (ppm)	Treated waste: Kiln ash TCLP mg/L (ppm)
Volatiles				
43. Toluene	<2,000	2,300	<2	
Semivolatiles				
57. Anthracene	<10	110	<2	
65. Benzo(k)fluoranthene	<10	67	<2	
88. p-Dichlorobenzene	90	32	<2	
141. Phenanthrene	17	240	<2	
Metals				
159. Chromium	5.3	40	141	0.092
163. Nickel	6.0	8.8	288	0.690

Design and Operating Parameters

Parameter	Design	Operating value
Kiln temperature (°F)+	-[c]	1775-1850
Kiln solids residence time (min)	-[c]	120
Waste feed rate (MMBtu/hr)+	-[c]	K019: 11.5 RCRA blend, Waste burner #1: 5.2-5.8 RCRA blend, Waste burner #2: 5.2-9.7
Kiln rotational speed (rpm)	-[c]	0.19-0.21

[a]This table appears in its entirety in the K019 background document (USEPA 1988b). Only an abridged version is necessary for this document.
[b]Only one sample of RCRA blend waste was taken. The results are repeated in each sample set.
[c]This information has been claimed as RCRA Confidential Business Information.

Table 4-7 Analytical Results for K087 Untreated Waste Collected Prior to Treatment by Rotary Kiln Incinerator[a]

Constituent/parameter (units)	Concentration				
	Sample set #				
	1	2	3	4	5
BDAT Semivolatile Organics (mg/kg)					
Anthracene	7,500	8,100	7,100	8,100	6,700
Benzo(b)fluoranthene	3,200	<1,010	3,100	<982	5,300
Benzo(k)fluoranthene	3,100	7,500	3,100	9,300	<1,026
Phenanthrene	34,000	34,000	15,000	41,000	15,000

[a]This table appears in its entirety in the K087 background document. Only these selected data are necessary for this document.

Note: This table shows concentrations or maximum potential concentrations in the untreated waste for all constituents detected in the untreated waste or detected in the residuals generated by treatment of the waste.

Table 4-8 Analytical Results for Kiln Ash Generated by Rotary Kiln Incineration of K087 Waste[a]

Constituent/parameter (units)	Concentration				
	Sample set #				
	1	2	3	4	5
BDAT Semivolatile Organics (mg/kg)					
Anthracene	<1,000	<1,000	<1,000	<1,000	<1,000
Benzo(b)fluoranthene	<1,000	<1,000	<1,000	<1,000	<1,000
Benzo(k)fluoranthene	<1,000	<1,000	<1,000	<1,000	<1,000
Phenanthrene	<1,000	<1,000	<1,000	<1,000	<1,000

[a]This table appears in its entirety in the K087 background document. Only these selected data are necessary for this document.

Note: This table shows concentrations or maximum potential concentrations in the untreated waste for all constituents detected in the untreated waste or detected in the residuals generated by treatment of the waste.

Table 4-9 Treatment Performance Data Collected by EPA for K048 and K051[a]
Plant 1 - Stabilization of Incinerator Ash

Detected BDAT list metal constituents	Untreated waste TCLP extracts of K048 and K051 incinerator ash	Treated waste: TCLP extracts of stabilized fluidized bed incinerator ash								
		Cement binder			Kiln dust binder			Lime and fly ash binder		
		Run 1 mg/L (ppm)	Run 2 mg/L (ppm)	Run 3 mg/L (ppm)	Run 1 mg/L (ppm)	Run 2 mg/L (ppm)	Run 3 mg/L (ppm)	Run 1 mg/L (ppm)	Run 2 mg/L (ppm)	Run 3 mg/L (ppm)
159. Chromium (total)	2.1-2.6	2.11	2.12	2.16	1.78	1.92	1.87	1.13	1.21	1.08
163. Nickel	0.02-0.03	<0.018	<0.018	<0.018	<0.018	<0.018	<0.018	<0.018	<0.018	<0.018

[a]This table appears in its entirety in the K048-K052 background document. Only these selected data are necessary for this document.

Design and operating parameters	Stabilization process: Cement			Kiln dust			Lime and fly ash		
	Run 1	Run 2	Run 3	Run 1	Run 2	Run 3	Run 1	Run 2	Run 3
Binder-to-ash ratio	0.2	0.2	0.2	0.2	0.2	0.2	NA	NA	NA
Lime-to-ash ratio	NA	NA	NA	NA	NA	NA	0.2	0.2	0.2
Fly ash-to-ash ratio	NA	NA	NA	NA	NA	NA	0.2	0.2	0.2
Water-to-ash ratio	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Ambient temperature (°C)	23	23	23	19	19.5	20	19	19	19
Mixture pH	11.6	11.5	11.5	12.1	12.1	12.1	12.0	12.1	12.1
Cure time (days)	28	28	28	28	28	28	28	28	28
Unconfined compressive strength (lb/in^2)	943.5	921.6	1,270	222.8	267.7	241.0	565.8	512.6	578.8

NA = Not applicable.

5. DETERMINATION OF BEST DEMONSTRATED AVAILABLE TECHNOLOGY (BDAT)

This section presents the rationale for the determination of best demonstrated available technology (BDAT) for K015 nonwastewater organics and metals treatment. As discussed in Section of the original background document on K015, the Agency examined all the available data for the demonstrated technologies to determine whether one of the technologies performed significantly better than the others. Next, the "best" performing treatment technology was evaluated to determine whether the resulting treatment was available. To be "available," a technology (1) must provide substantial treatment and (2) must be commercially available to the affected industry. If the "best" demonstrated technology is "available," then the technology represents BDAT.

As discussed in Section 5 of the original background document for K015, the BDAT treatment for organics is incineration; this technology remains applicable for K015 as generated nonwastewaters.

5.1 BDAT for Treatment of Organics

For treatment of organics in K015 nonwastewaters, the Agency has data only from incineration. The data sets were collected during tests in which wastes similar to the K015 waste (i.e., K019, K087) were incinerated. Because data from the other demonstrated technologies such as fuel substitution are not available, the Agency cannot compare performance to determine which technology is "best." EPA believes that well-designed and well-operated fuel substitution systems could not achieve better treatment than incineration since both technologies operate at approximately the same temperatures and turbulent conditions.

EPA's determination that substantial treatment occurs is based on the reduction of the concentration of all BDAT list organic constituents to nondetectable levels. In addition to the substantial reduction, incineration is commercially available and therefore meets the second criterion of "availability." As "best," "demonstrated," and "available," the technology represents BDAT for the organics present in K015.

5.2 BDAT for Treatment of Metals

Incineration of K015 generates wastewater and nonwastewater residuals both requiring treatment for BDAT list metals. The BDAT for treatment of metals in the wastewater residual is discussed in the original background document for K015. For BDAT treatment of metals in the nonwastewater residual from incineration of K015 waste, no treatment data are available. EPA does, however, have treatment data for metal-containing nonwastewater incinerator ash residuals (K048-K052) believed to be similar to K015 ash. Stabilization is the demonstrated technology for which the Agency has data in treating BDAT list metals in the K048-K052 ash. The Agency determined that the treatment performance data for the K048-K052 BDAT list metals represent a well-designed and well-operated treatment system.

The ash stabilization data for K048-K052 show TCLP chromium reduction from a range of 2.1 to 2.6 mg/l in the untreated waste down to a level of 1.0 to 2.1 mg/l in the stabilized waste. Nickel is reduced from an untreated TCLP level of 0.02 to 0.03 mg/l to a level of <0.018 mg/l in the stabilized waste.

The Agency has no reason to believe that the use of other processes could improve the level of performance achieved by stabilization. Therefore, stabilization is "best." This treatment system is "available"

because the components of the treatment system are commercially available and provide substantial treatment. Therefore, stabilization represents BDAT for BDAT list metals in K015 ash residues and also in the nonwastewater residuals from treatment of incinerator scrubber waters.

6. SELECTION OF REGULATED CONSTITUENTS

As discussed in Section 1 of the original background document on K015,* the Agency has developed a list of BDAT hazardous constituents (Table 1-1 of original background document) from which the constituents to be regulated are selected. EPA may revise this list as additional data and information become available. The list is divided into the following categories: volatile organics, semivolatile organics, metals, inorganics other than metals, organochlorine pesticides, phenoxyacetic acid herbicides, organophosphorous insecticides, PCBs, and dioxins and furans.

This section describes the process used to select the constituents to be regulated in K015 nonwastewaters. The process involves developing a list of potential regulated constituents and then eliminating those constituents that would not be treated by the chosen BDAT or that would be controlled by regulation of other constituents in the waste.

6.1 Identification of BDAT List Constituents in K015

As discussed in Sections 2 and 4, the Agency has characterization data for untreated K015 nonwastewaters, but no data characterizing treated K015 nonwastewaters. The characterization data and the performance data from K015 wastewaters from the original background document on K015 have been used to determine which BDAT list constituents may be present in the waste and thus which ones are potential candidates for regulation in the nonwastewater forms of K015.

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*Section 1 of the original background document describes BDAT methodology. This methodology has since been updated in a separate document, Methodology for Developing BDAT Treatment Standards (USEPA 1989a).

Information presented in the original background document for K015 waste describes, for the untreated waste, which constituents were detected and which constituents the Agency believes could be present though not detected. These constituents are toluene, anthracene, benzal chloride, benzo(b/k)fluoranthene, phenanthrene, chromium, and nickel.

6.2 Constituents Selected for Regulation

The Agency has no information to suggest that different constituents will be present in the nonwastewater forms of K015 than were present in the wastewater forms; therefore, the same five organic and two metal constituents will be regulated in the nonwastewater form of K015 were regulated as in the wastewater form. These constituents are toluene, anthracene, benzal chloride, benzo(b/k)fluoranthene, phenanthracene, chromium, and nickel.

7. CALCULATION OF BDAT TREATMENT STANDARDS

This section presents the calculation of the actual treatment standards for the regulated constituents determined in Section 6. EPA has five sets of treated data for K087 and six sets of treated data from K019 using rotary kiln incineration. EPA also has three data sets for treatment of metal-bearing ash residues by stabilization from K048-K052. As discussed in Section 1 of the original background document for K015, the following steps were taken to derive the BDAT treatment standards for K015 nonwastewaters.

The Agency evaluated the 11 data sets collected from the rotary kiln incineration of K019 and K087 to determine whether any of the data represent poor design or poor operation of the treatment system. The available data show that none of the data sets represent poor design or poor operation. Hence, all data sets for rotary kiln incineration of K019 and K087 are used for establishing treatment standards for regulation of the BDAT list organic constituents in K015 nonwastewaters.

Treatment standards for the BDAT list organic constituents (toluene, anthracene, benzal chloride, benzo (b/k) fluoranthene, and phenanthrene) in nonwastewater forms are based on transfer from incineration of similar wastes. For BDAT list metal constituents (nickel and chromium), the treatment standards for nonwastewaters are based on transferred performance data from stabilization of incinerator ash from combustion of a waste containing similar concentrations of metals.

Because benzal chloride was not a constituent in any other tested waste, no treatment performance data were available. However, it was regulated in the wastewater form of K015 in the First Third rulemaking. EPA believes that benzal chloride can be treated in nonwastewater residuals because it is similar to several constituents in wastes that

have been tested. Specifically, its structure and boiling point are similar to those of p-dichlorobenzene. P-dichlorobenzene was treated sucessfully in K019. Hence, EPA believes that benzal chloride can be treated as well as p-dichlorobenzene.

Toluene is being regulated based on the fact that it is present in similar wastes that were treated by incineration (K019) at higher levels than in untreated K015 waste. Therefore, treatment of K015 by incineration should result in at least as low a level of toluene in K015 nonwastewater as in K019.

Benzo(b/k)fluoranthene is being regulated based on the fact that it is present in similar wastes that were treated by incineration (e.g., K019, K087). Both the b and k forms are found in K087, whereas only the k form is present in K019. Additionally, the untreated benzo(b/k)fluoranthene is present at higher concentrations in K087 than in K019. Therefore, the Agency believes that the benzo(b/k)fluoranthene in K087 should be more difficult to treat than in K019 and, hence, should be a better source of incineration treatment data for benzo (b/k) fluoranthene.

Anthracene and phenanthrene are being regulated based on the fact that they are present in similar wastes that were treated by incineration (K019, K087). However, the concentrations of these constituents in K019 are not as high as in untreated K015. Anthracene and phenanthrene are present at higher concentrations in K087 than in K015. Therefore, treatment by incineration should result in a level of these constituents in K015 that is at least as low as in K087.

There were no data for metals in untreated K015 incinerator ash, but nickel and chromium were found in the incinerator scrubber water. Hence, the Agency believes nickel and chromium can be waste constituents in the

ash. Therefore, they are being chosen for regulation in the nonwastewater form of K015.

For the selected BDAT list metal constituents chromium and nickel, treatment data were transferred from K048-K052. Characterization data for untreated K015 show nickel ranging from 1-11 ppm and chromium ranging from <0.5 to 20 ppm. For untreated K048-K052, nickel levels range from 0.025 - 390 ppm, and chromium values range from 0.04 to 3400 ppm. Data are not available for stabilization of metals in incinerator ash of K015; however, data are available for stabilization of metals in the incinerator ash of K048-K052. Based on the similarity and amount of the constituents expected to be found in the untreated K015 ash compared to K048-K052 ash, it is believed that K015 incinerator ash would be sufficiently similar to the ash generated by the destruction of K048-K052. The design and operating data for K048-K052 stabilization were examined and they indicated that the system was well designed and well operated. EPA, therefore, believes that K048-K052 treatment data for metals can be transferred to K015.

As described in the original background document, analytical accuracy-corrected constituent concentrations were calculated for all regulated BDAT list constituents. An arithmetic average of concentration levels for each constituent and a variability factor for each wastewater constituent were then determined. The variability factor represents the variability inherent in the treatment process and the sampling and analytical methods. Variability factors are calculated based on the treatment data for each of the regulated constituents. The general methodology for calculating variability factors is presented in Appendix A of the original background document for K015.

The BDAT treatment standard for each constituent to be regulated in this rulemaking was determined by multiplying the average

accuracy-corrected total composition by the appropriate variability factor. The calculation of treatment standards for the organic constituents is shown in Table 7-1. The calculation of the treatment standards for chromium and nickel is presented in Table 7-2.

Table 7-1 Organic Standards for K015 Nonwastewaters

	Untreated waste (mg/kg)	Average of treatment values (mg/kg)	Average of corrected[a] treatment values (mg/kg)	Variability factor	Treatment standard (mg/kg)
Benzal chloride (K015) (not present in any other tested waste)[b]	880,000	<2.0	<2.2	2.8	6.2
Toluene (K015)	<10				
Toluene (K019)	2,000	<2.0	<2.1	2.8	6.0
Benzo(b/k)fluoranthene (K015)	<5,000				
Benzo(b/k)fluoranthene (K087)	982-10,345	<1.0	<1.2	2.8	3.4
Anthracene (K015)	<5,000				
Anthracene (K087)	6,700-14,200	<1.0	<1.2	2.8	3.4
Phenanthrene (K015)	<5,000				
Phenanthrene (K087)	15,000-43,200	<1.0	<1.2	2.8	3.4

[a]Corrected treatment value is average treatment value multiplied by the reciprocal of the fractional recovery.

[b]Performance data from treatments of p-dichlorobenzene were used to calculate treatment levels for benzal chloride.

Table 7-2 Metal Standards for K015 Nonwastewaters

	Unstabilized ash (TCLP)[b] (mg/l)	Average of corrected[a] treatment values (TCLP)[b] (mg/l)	Variability factor	Treatment standard (mg/l)
Chromium (total)	2.64 -3.26	1.48	1.14	1.7
Nickel	0.07	0.07	2.86	0.2

[a]Corrected treatment value is average treatment value multiplied by the reciprocal of the fractional recovery.

[b]Unstabilized and treated ash data are from treatment tests of K048-K052 wastes.

8. REFERENCES

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