Draft
Technical Support Document for HWC MACT Standards

Volume VII

Miscellaneous Technical Issues

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ABSTRACT

This seventh volume of the *Technical Support Document for HWC MACT Standards* addresses miscellaneous technical issues and provides additional information on several topics of importance to tasks described in the other six volumes of this document. These topics include the treatment of measurements below analytical detection limits, the procedures for handling missing data, the impact of metals and chlorine spiking on trial burn results, and the rationale for grouping metals of similar volatility. The impact of these methodologies on the proposed MACT limits, the national emissions and cost estimates, and estimates of the 50th and 90th emission percentiles of HAPs are also discussed.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

ACRONYMS GLOSSARY

APCD	Air Pollution Control Device
BIF	Boiler and Industrial Furnace
CAAA	Clean Air Act Amendment of 1990
CK	Cement Kiln
EPA	environmental Protection Agency
EU	Expanded Universe
HAP	Hazardous Air Pollutant
HW	Hazardous Waste
HWC	Hazardous Waste Combustor
INC	Incinerator
LNDS	Log-Normal Data Set
LVM	Low-Volatility Metals
LWAK	Light Weight Aggregate Kiln
MACT	Maximum Achievable Control Technology
MTEC	Maximum theoretical Emission Concentration
ND	Non-Detected
OSW	Office of Solid Waste
RCRA	Resource Conservation Recovery Act
SRE	System Removal Efficiency
SVM	Semi-Volatile Metals
TCl	Total Chlorine
U.S.	United States

SECTION 1

INTRODUCTION

The U.S. Environmental Protection Agency (EPA) regulates the burning of hazardous waste in incinerators under 40 CFR Part 264/265, Subpart O, and in industrial furnaces under 40 CFR Part 266, Subpart H. The Agency is proposing revised regulations applicable to these hazardous waste combustion (HWC) devices. This document provides technical background for the MACT floor and beyond-the-floor emissions standards that are considered for the proposed rule. It is the last in a series of seven volumes of technical background documents for the rule. These include:

Technical Support Document for HWC MACT Standards, Volume I: Description of Source Categories, which provides process descriptions of major design and operating features including different process types and air pollution control devices currently in use and potentially applicable to various combustion source categories; description of air pollution control devices including design principles, performance and operating efficiency, process monitoring options, and upgrade/retrofit options; and major source determination for all sources including a discussion on the methodology used to estimate annual emissions, assumptions used, and an emissions summary for each source listing each HAP.

Technical Support Document for HWC MACT Standards, Volume II: HWC Emissions Data Base, which contains a summary of the emissions information on toxic metals, particulate matter (PM), HCl and Cl_2, hydrocarbons, carbon monoxide, semi-volatile and volatile organic compounds, and dioxins/furans from HWCs. Other detailed information encompassed in the data summary include company name and location, emitting process information, combustor design and operation information, APCD design and operation information, stack conditions during testing, feed stream feed rates, and emissions rates of HAPs by test condition.

Technical Support Document for HWC MACT Standards, Volume III: Selection of Proposed MACT Standards and Technologies, which identifies the MACT floor for each HAP and source category for existing sources and new sources and discusses the approach used to define the floor and beyond-the-floor alternatives considered for the proposed rule.

Technical Support Document for HWC MACT Standards, Volume IV: Compliance with the Proposed HWC Standards, which contains detailed discussions of continuous emissions monitors and operating limits for the proposed rule.

Technical Support Document for HWC MACT Standards, Volume V: Engineering Costs, which contains the cost estimates for APCD requirements for existing and new facilities to meet the proposed emissions standards.

Technical Support Document for HWC MACT Standards, Volume VI: Development of Comparable Fuels Specifications, which summarizes the composition including hazardous species in benchmark fossil fuels such as gasoline, #2 fuel oil, #4 fuel oil, and #6 fuel oil. This information is being used to develop specifications which EPA is considering to allow comparable fuels to be excluded from the definition of hazardous waste.

Technical Support Document for HWC MACT Standards, Volume VII: Miscellaneous Technical Issues, which provides additional information on several topics such as the treatment of measurements below analytical detection limits, the procedures for handling missing data, and the rationale for grouping metals of similar volatility. The impact of these methodologies on the proposed MACT limits, the cost estimates, and the national emissions estimates are also discussed.

The MACT emission standards are being proposed for three types of hazardous waste combustion facilities:

- Cement Kilns
- Lightweight Aggregate Kilns
- Incinerators (On-site and Commercial)

The hazardous air pollutants for which emission standards are proposed are:

- Mercury (Hg)
- Low Volatility Metals (LVM)
- Semi-Volatile Metals (SVM)
- Particulate Matter (PM)
- Hydrogen Chloride and Chlorine as Total Chlorine (HCl/Cl_2)
- Carbon Monoxide (CO)
- Hydrocarbons (HC)
- Dioxins/Furans (PCDD/PCDF)

These emission standards are being developed through the "maximum achievable control technology" (MACT) approach defined in Title 3 of the 1990 Clean Air Act Amendments (CAAA). In this approach the MACT floor standard for existing facilities is established at the level of the average performance of the best 12% of existing sources. Depending on cost effectiveness, more stringent, but technically achievable, beyond-the-floor standards for specific HAPs are considered. The proposed floor and beyond-the-floor standards have been selected based on a database (described in Volume II) of trial burn and compliance test emissions measurements from 77 incinerators, 35 cement kilns, and 12 lightweight aggregate kilns.

This report addresses and discusses miscellaneous issues and assumptions of importance to tasks described in the Technical Support Documents. In particular, this report focusses on four major topics of interest: the treatment of non-detected data (*General ND Issues*), substitution of data for cases where certain hazardous air pollutants (HAPs) were not measured during a trial burn (*Substitution Methodology for LVM, SVM, and TCl*), metals and chlorine spiking, and the selection of and justification for metals volatility groupings (*Support for Selection of Metals Volatility Groups*). These four topics are examined in detail in the remainder of this report.

SECTION 2

GENERAL ND ISSUES

In a trial burn, emission and feed rate measurements of metals and other hazardous air pollutants (HAPs) are sometimes below detection limits of analytical instruments. For such measurements, facilities are required to report the detection limit of the instrument and identify the value as ND (non-detected). The reported ND measurements may still be used to represent the emissions or feed rates of HAPs through using the full detection limit (i.e., the reported detection limit of the instrument is assumed to be equal to the feed or emission rate of the HAP) or other conventions such as ½ the detection limit (i.e., the emission or feed rate measurement is considered equal to ½ the detection limit of the instrument). The choice of ND data treatment, however, may ultimately impact the results of any analysis performed on the data. For example, using the full detection limit for emission measurements may lead to conservative emission predictions (i.e., provide an upper limit of emissions for that measurement), but also may exaggerate emissions if the actual emission value is much less than the detection limit of the instrument. Using ½ the detection limit value, however, may overestimate or underestimate emissions depending on whether the true emission value is higher or lower than ½ the detection limit.

For most of the OSW tasks, the reported ND values were generally used at the full detection limit, particularly for analyses involving stack emission measurements. Since emissions of toxic metals and other HAPs are of concern to the public and the environment, it was important to estimate an upper limit for emissions so that when emissions are used to set standards, risk analysis may indicate whether these standards are protective. HAPs are generally introduced to the combustion system through several feed streams, particularly if the system is using pumpable and non-pumpable wastes, and also may be emitted from the system through multiple stacks. The total feed rate of a HAP per run is, therefore, the sum of all metals in all feed streams, and the total emission rate of each HAP is the sum of emissions from the different stacks.

As mentioned earlier, some of these measurements in any of the feed or exit streams may be below the detection limit of the instrument used in a trial burn. The portion of the total feed and emission rate of a HAP attributable to a ND measurement per run was calculated assuming all measurements at full detection limits. These values were then averaged per condition for every HAP and combustion source (where a condition is usually composed of three runs). The feed and emission rate ND percentage contributions for HAPs and source categories per condition are shown in Table 2-1. This table also includes other results which are discussed in the various sections throughout this report.

The HAPs in Table 2-1 are represented by the low-volatility metals (LVM) group including Sb, As, Be, and Cr; by the semi-volatility metals (SVM) group encompassing Cd and Pb; by mercury; and by total chlorine (TCl) based on total chlorine measurements in the feed streams and on HCl and Cl_2 stack emissions measurements. The selection of and justification for metals groupings are discussed in detail in the last section of this report. The particulate matter (PM) is not shown in Table 2-1 because all of the reported PM measurements from all source categories (except for one run from one facility) are above the detection limit of PM measuring instruments. The feed rate in Table 2-1 is represented by the maximum theoretical emission concentration (MTEC) which is basically the feed rate of the HAP normalized by the stack gas flow rate of the facility. The results in Table 2-1 show the substance, combustion source, Condition ID, average MTECs, contribution of ND measurements to total MTEC (Avg % ND MTEC), percentage attributable to spiking, percentage attributable to waste feed, classification of each condition based on the MACT analysis (MACT Status), average emission concentrations, and corresponding percentages attributable to ND measurements at the stack and emissions substitution, respectively. The contribution of ND measurements to both feed and emissions and the impact of ND data treatment on various tasks in this program are discussed in this section, while the contributions of emissions substitution and spiking are discussed in following sections of this report. The data in Table 2-1 are sorted from low to high based on stack emissions. For some conditions, only stack measurements of some HAPs were performed and, therefore, MTECs corresponding to these conditions are designated as NA (not available) in Table 2-1. A summary of the average and median contributions of ND measurements and emissions substitution to stack emissions from all conditions, HAPs, and source categories is presented in Table 2-2, and a summary of the average

and median contributions of ND measurements and spiking to feed rate MTECs is presented in Table 2-3. Additionally, Table 2-3 shows a breakdown of ND percentages in the various feed streams.

The impact of ND data contribution on the various analyses performed in this program, based on results from Tables 2-1 through 2-3, will be discussed shortly. However, there are some general comments that can be deduced from Tables 2-1 through 2-3. The contribution of high percentage ND conditions to emissions is not generally limited to low emitting facilities, particularly for metals in cement kilns (CKs), where 100% ND contribution for LVM, for example, extends all the way to the top seven highest emitting conditions. For CKs, Table 2-2 shows that the median ND contribution to emissions appears to be significant for LVM and Hg, but not significant for SVM and TCl; while the median ND contribution for all HAPs for incinerators (INCs) and light weight aggregate kilns (LWAKs) may not be significant. Table 2-3 shows that the contribution of median ND data to total MTECs is significant only for Hg from CKs and marginally significant for Hg from INCs. The convention used for treating ND data and whether ND values were used in the analyses are discussed below for each major OSW task.

2.1 MACT ANALYSIS

Details of the MACT procedure and analysis for all HAPs and source categories are presented and discussed in the *Technical Support Document for HWC MACT Standards, Volume III: Selection of MACT Standards and Technologies*. In brief, the MACT analysis was performed by selecting MACT pool facilities based on the lowest 6% emitting facilities or the lowest three emitting facilities (if the lowest 6% emitting facilities were fewer than three) for each HAP and source category. The control technologies as well as the hazardous waste (HW) MTECs for these lowest emitting conditions were then identified. The MACT expanded universe (EU) was determined by selecting all conditions with similar technologies to the MACT pool technologies with HW MTECs equal to or less than the MACT-defining HW MTEC (the highest MACT pool HW MTEC for a given control technology). The MACT floor level was then determined based on the worst emitting condition in the MACT EU. The percentages of ND emissions and feed rate MTECs were not considered in selecting the lowest 6% MACT pool facilities nor the MACT-defining HW MTECs. However, conditions with “high” percentage of ND emissions contribution were screened out

from the MACT EU, particularly, if the high percentage ND conditions correspond to relatively high detection levels (e.g., the seven highest emitting conditions for LVM from CKs in Table 2-1). In these cases, the emissions level may be significantly less than reported. What constitutes "high" for this analysis is determined in comparison with other measurements and the detection limit that should be routinely achievable.

Based on the above discussion, the choice of ND data treatment may potentially impact the selection of the MACT pool facilities as well as the MACT EU. For example, if ½ the detection limit were considered instead of the current full detection limit, it would be possible for the ranking of a facility, with low emission and high ND percentage (e.g., 315C1 for LVM from CKs, Table 2-1, has 98% ND contribution), to change and become part of the lowest emitting 6% pool, particularly, if the lowest 6% emitting facilities had detected emissions or low ND percentages. This may also act to change the definition of MACT control (i.e., air pollution control equipment and MTEC level). Similarly, if the ND MTEC data were treated at ½ the detection limit, the MACT-defining HW MTECs may change (become lower), potentially altering the MACT EU facilities. Thus, since the MACT floor level is determined by the worst emitting condition in the MACT EU, the convention for using ND data may potentially impact floor standards.

Although the contribution of ND data (at full detection limit) to emission measurements was considered when expanding the MACT universe conditions, determination of the MACT-defining HW MTEC did not consider the contribution of ND percentages to feed rate MTECs. Treating the ND feed data at ½ detection limit instead of full detection limit, however, may have an impact on the MACT-defining HW MTEC and further on the number of conditions selected while expanding the MACT universe. The ½ detection limit choice may result in selecting more or less MACT conditions than have currently been selected based on full detection limits. For example, if the MACT-defining HW MTEC has a high percentage of ND data, then using ½ the detection limit would lower the MACT-defining HW MTEC and thus increase the number of conditions screened out of the expanded universe due to high MTECs. On the other hand, the use of the ½ detection limit convention may bring additional facilities into the MACT EU which have ND-influenced MTECs that are slightly higher than the MACT-defining HW MTEC. Since the MTEC of each condition is an integral part of the MACT evaluation process, only conditions with reported emissions and feed rate MTEC measurements were considered in the MACT

analysis. Cases where stack gas emissions were available, but feed rate MTECs were not (designated as NA in Table 2-1), were excluded from the MACT analysis.

2.2 NATIONAL EMISSIONS AND COST ESTIMATES

The methodology and procedure for estimating national emissions of HAPs from combustion sources and national cost for meeting the proposed floor and beyond the floor limits are explained in the *Technical Support Document for HWC MACT Standards, Volume V: Engineering Costs*. These analyses were performed using stack emissions data only. Therefore, the choice of ND data treatment and its impact on emissions and cost estimates are important for these tasks, while the ND MTEC percentages have no direct impact on national emission/cost estimates. Note that ND MTEC treatment may have an indirect impact on costs because, as explained above, they may impact the definition of MACT and the resulting MACT floor emissions limits. For these analyses, the full detection limit was used for ND emission measurements. Hence, the impact of the percentage of ND attributable to each emission condition is to overestimate the true emission of the HAP, particularly, if the actual emission is much less than the detection limit (as is probable at facilities with "high" detection levels). Consequently, this will also lead to an overestimate of the cost required for emissions reduction to meet MACT standards for a particular HAP and facility. The national emissions and cost estimates are based on emissions data from all facilities in the United States and, therefore, the impact of using full detection limits for all facilities should be considered.

As indicated above, national emissions were estimated based on reported emissions data for each HAP from all facilities within a source category. Emission factors were then calculated based on measured data and used to predict emissions for facilities with no reported data. The percentages of ND emissions in Table 2-1 for measured data can therefore be used to give an indication of whether the ND data contribution to emissions and cost estimates is significant. In fact, the average ND emission percentages for each HAP and source summarized in Table 2-2 are good indicators of the potential impact of using full detection limit on national emission/cost estimates. Results in Table 2-2 indicate that using a full detection limit may significantly overestimate emissions of LVM and Hg from all source categories and SVM from CKs and INCs. However, the impact of using full detection limits on overestimating TCl emissions and costs does not appear to be significant for CKs and

LWAKs but may be marginally significant for INCs. For example, since national emissions are roughly proportional to average emissions, and since nearly 40% of the average mercury emissions from CKs is attributable to non-detected measurements (treated at full detection limit), treatment of non-detected data at ½ detection limit would lower the national estimate for emission of mercury from CKs by nearly 20%. Since national emission estimates for HAPs and source categories were used to calculate emission reduction requirements and subsequently to estimate national costs for meeting the proposed standards, similar qualitative conclusions to the above can be drawn regarding the impact of using full detection limit on national cost estimates.

2.3 50th AND 90th EMISSION PERCENTILES USED FOR RISK ANALYSIS

In addition to national emission estimates, characteristic risk estimates are required in order to estimate risks from typical facilities. Estimates for various HAPs of the 50th and 90th percentile emission concentrations were performed for the different hazardous waste combustors (HWC) source categories. These characteristic emission estimates served as inputs to EPA risk assessment model plants to allow estimation of local and global risks posed by current emissions; and the consequent risk reduction provided by floor and beyond-the-floor standards. 50th and 90th emission percentile results for metals and other HAPs are provided in the *Technical Support Document for HWC MACT Standards, Volume V: Engineering Costs*. The percentiles were generated assuming the emissions data have a log-normal distribution.

For this analysis, emission data below detection limits were assumed at full detection limit. Since emission data for each HAP and source category had to be ranked from low to high before the 50th and 90th percentiles can be determined, the distribution of ND percentages, shown in Table 2-1, may provide a qualitative assessment of whether the choice of ND treatment impacted the 50th and 90th percentile results for this analysis. Ideally, if the high ND conditions correspond to lowest emissions, the 50th and 90th percentile ranked emissions may not be impacted by assuming full or ½ detection limit for ND data. However, as shown in Table 2-1, the high ND percentages span the whole range of emissions for many HAPs and source categories. For example, choosing ½ detection limit instead of full detection limit for ND data may impact the ranking of emissions for LVM from CKs, INCs, and LWAKs because significant ND percentages are distributed across the whole range of emissions. Therefore, the 50th and 90th emission percentiles may be different than the ones based on full detection limit.

To thoroughly explore the impact of using ½ the detection limit instead of the current full detection limit on 50th and 90th emission percentiles, a comprehensive quantitative assessment was performed using run data to determine 50th and 90th percentiles for all HAPs and source categories based on ½ detection limits for ND data. As for full detection limit, the ½ detection limit analysis was performed assuming log-normal distribution for emissions data. The results from this analysis are summarized in Table 2-4. This table shows the substance, combustion source, 50th and 90th percentiles for ND emissions at full detection limit, and 50th and 90th percentiles for ND emissions at ½ detection limit. Results in Table 2-4 indicate:

- The most significant impact of using ½ the detection limit is on LVM and SVM from CKs where 50th and 90th percentiles dropped between 20% to 30%.
- The most significant change for Hg due to using ½ the detection limit occurred for the 90th percentiles for CKs and LWAKs.
- TCl does not show significant change when ½ the detection limit was used for both 50th and 90th percentiles for all source categories.
- Changing to ½ detection limits for ND data reduced the magnitude of all 50th emission percentiles for all HAPs and source categories, reduced the magnitude of most 90th emission percentiles, and increased the magnitude of 90th percentiles for few HAPs and source categories (e.g., Hg from LWAKs and TCl from CKs and INCs).

The increase in the magnitude of the 90th percentile when using ½ the detection limit instead of full detection limit, as shown in Table 2-4 for some cases, may be surprising. This situation may occur, however, because the 90th percentile is calculated based on the arithmetic mean and the standard deviation of each log-normal data set (LNDS). And, although the arithmetic mean of the ½ detection limit LNDS may be lower (but not higher) than the arithmetic mean of the full detection limit LNDS, the standard deviation may be higher for the ½ detection limit LNDS than the full detection limit LNDS. Therefore, if the standard deviation for the ½ detection limit LNDS is higher than the full detection limit LNDS enough to offset the potential decrease in arithmetic mean in the log-normal plane, the magnitude of the 90th percentile for the ½ detection limit LNDS may then increase relative to the full detection limit LNDS. Note that the 50th percentiles in Table 2-4 are always lower than the ½ detection limit LNDS since they are dependent only on the arithmetic mean in the log-normal plane.

2.4 EMISSION DISTRIBUTION BASED ON WASTE, FUEL, AND RAW MATERIAL FEED ("BAR CHARTS")

The methodology, procedure, and results for the "bar charts" are presented in the *Technical Support Document for HWC MACT Standards, Volume III: Selection of MACT Standards and Technologies*. For this analysis, the MACT emission bar charts for LVM, SVM, Hg, and TCl for all combustion sources were reproduced showing the contribution of waste, fuel, and raw material feed to emissions of HAPs. Figure 2-1 shows an example of these "bar charts" for mercury from CKs. It was assumed in this analysis that emission rates are proportional to feed rates and that the contribution of the various feed streams to the total feed rate of each HAP is the same as their contribution to emission rates. The purpose of these "bar charts" was to:

- determine if any of the feed streams may dominate emissions;
- study the impact of HAPs in the raw material on emissions for CKs and LWAKs; and
- identify non-MACT conditions, and study the potential impact of waste feed reduction on HAPs emissions and on meeting the proposed floor standards.

Emission and feed rate MTEC data were used during this analysis. Full detection limits were assumed for both emissions and feed rate MTECs with measurements below detection limits. As Figure 2-1 illustrates, the X-axis of the bar charts shows the Condition ID, whether the raw material MTEC has significant ND percentage, baseline conditions, whether the condition is a MACT pool facility or a MACT EU facility, and projected emissions for non-MACT facilities if retrofitted with MACT technology. The raw material ND classification on the X-axis of Figure 2-1 is important since it helps to identify conditions where emissions due to high ND level in the raw material contribute to higher than the floor emissions even if the waste feed were eliminated.

The impact of ND data on emissions and on the MACT analysis was discussed earlier. The impact of feed rate MTEC ND data may be important for this task since the emissions distribution is based on the distribution of feed rate data. Table 2-3 summarizes the median and average percentages of total MTECs attributable to assuming full detection level for ND measurements. This table also shows the

breakdown of ND percentages between the different feed streams. In general, average ND percentage results in Table 2-3 indicate that assuming full detection limit for ND total feed rate MTECs may be marginally significant for LVM from CKs and INCs and for SVM from INCs, and significant for Hg from all source categories. The impact of ND feed rate MTEC data on TCl results may not be significant for this analysis due to only few high condition ND percentages for TCl (as shown in Table 2-1). In the following discussion, the contribution of ND data is classified to be significant if the ND percentages are roughly greater than 25%, marginally significant if the ND percentages range between roughly 8% and 18%, and insignificant if the ND percentages are roughly 5% or less. Moreover, a significant impact means that using a different choice than full detection limit for ND data, such as ½ the detection limit, is likely to change the emissions distribution results. Table 2-3 results of ND feed breakdown indicate that, on the average:

- For Hg, the contribution of ND data is significant for CKs and marginally significant for INCs in the fuel, significant for CKs and LWAKs in the raw material, insignificant for all source categories in the spike, and significant for INCs and marginally significant for CKs and LWAKs in the waste.
- For LVM, the contribution of ND data may be marginally significant for CKs and INCs in the fuel, significant for CKs in the raw material, and insignificant for all source categories in the spike and waste (except for INCs in the waste where it may be marginally significant).
- For SVM, the contribution of ND data may be marginally significant for CKs in the fuel, for CKs and LWAKs in the raw material, and for INCs in the waste, and insignificant for all source categories in the spike.
- For TCl, the contribution of ND data may be marginally significant for CKs in the fuel, significant for CKs and LWAKs in the raw material, and insignificant for all source categories in the spike and waste.

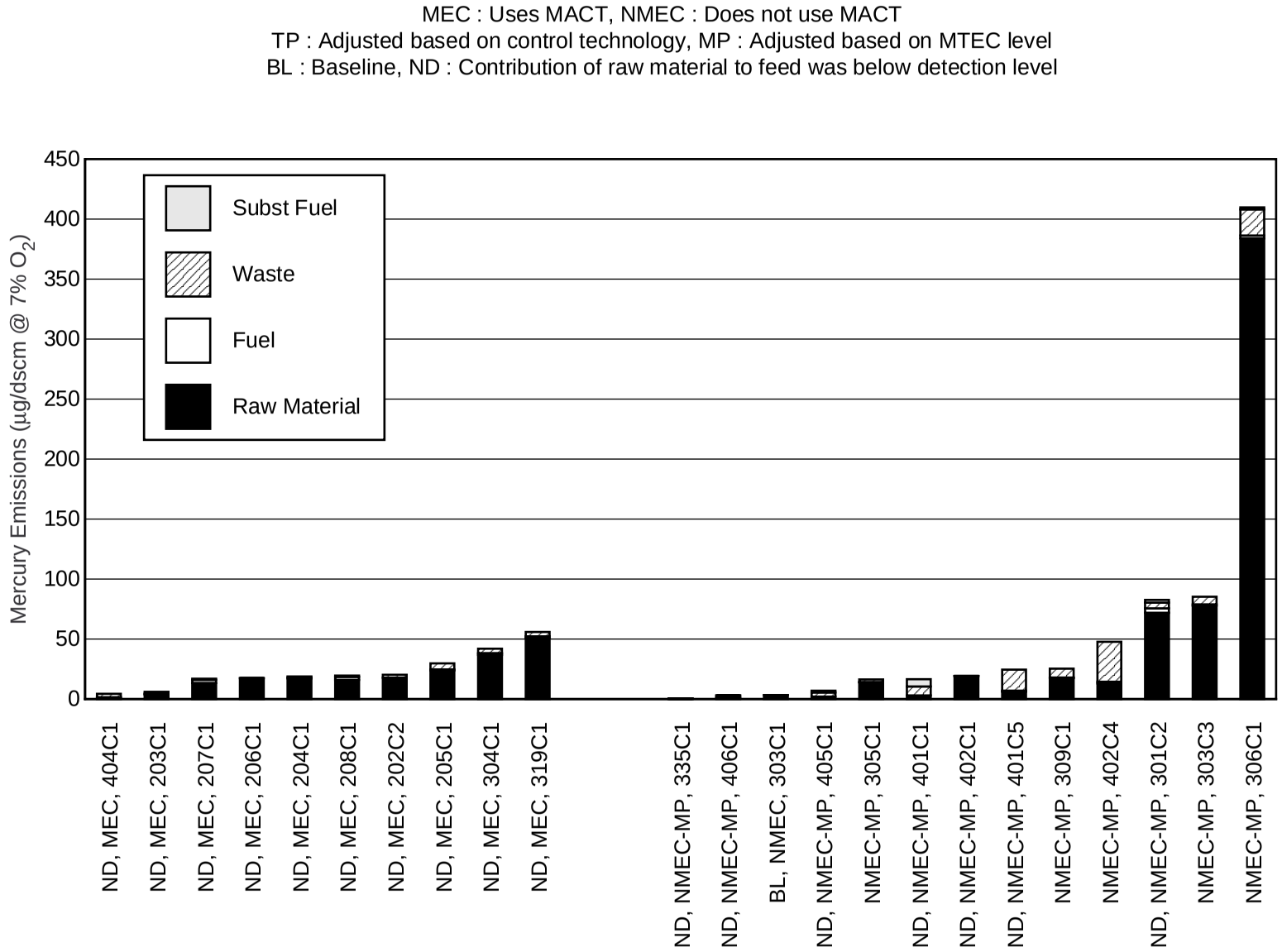

Figure 2-1. Contribution of feed streams to stack emissions of mercury for cement kilns.

TABLE 2-1. CONTRIBUTION OF SPIKING, FULL DETECTION LIMIT FOR ND DATA, AND SUBSTITUTION TO MTECs AND EMISSIONS

Substance	System Type	Condition ID	Avg MTEC (ug/dscm 7%O_2)	Avg % ND MTEC	Avg % Spike	Avg % Waste	MACT Status	Avg Emission*,**	Avg % ND Emission	Avg % Substitution
LVM	CK	320C1	68,164.6	*51*	*0*	*37*	MEC-P	**4.3**	*0*	*33*
LVM	CK	316C2	74,379.8	*1*	*54*	*5*	MEC-P	**4.8**	*18*	*13*
LVM	CK	204C1	169,503.2	*7*	*81*	*5*	MEC-P	**6.2**	*65*	*0*
LVM	CK	308C1	70,976.5	*0*	*39*	*3*	MEC-EU	**7.1**	*0*	*12*
LVM	CK	206C1	231,100.7	*0*	*87*	*2*	NMEC	**8.7**	*17*	*0*
LVM	CK	315C1	286,229.8	*0*	*83*	*8*	NMEC	**8.9**	*98*	*10*
LVM	CK	309C1	134,708.2	*0*	*79*	*0*	MEC-EU	**9.3**	*37*	*0*
LVM	CK	208C1	28,602.9	*34*	*53*	*1*	MEC-EU	**9.9**	*14*	*0*
LVM	CK	303C3	39,889.7	*0*	*6*	*57*	MEC-EU	**10.5**	*0*	*27*
LVM	CK	315C2	278,207.2	*0*	*81*	*8*	NMEC	**10.8**	*68*	*7*
LVM	CK	335C1	51,649.9	*11*	*75*	*1*	MEC-EU	**10.8**	*100*	*0*
LVM	CK	316C1	98,236.4	*0*	*62*	*4*	MEC-EU	**11.0**	*8*	*19*
LVM	CK	321C1	373,888.3	*44*	*0*	*22*	MEC-EU	**11.5**	*0*	*28*
LVM	CK	306C1	263,985.4	*1*	*85*	*0*	NMEC	**13.3**	*0*	*0*
LVM	CK	208C2	24,527.6	*45*	*29*	*0*	MEC-EU	**13.7**	*9*	*0*
LVM	CK	30142	54,284.4	*8*	*43*	*0*	MEC-EU	**16.4**	*100*	*0*
LVM	CK	30152	54,284.4	*8*	*43*	*0*	MEC-EU	**17.2**	*100*	*0*
LVM	CK	205C1	192,453.2	*0*	*86*	*3*	NMEC	**18.5**	*3*	*0*
LVM	CK	318C2	17,782.4	*0*	*88*	*0*	MEC-EU	**18.6**	*97*	*70*
LVM	CK	305C3	70,027.6	*8*	*62*	*1*	MEC-EU	**20.3**	*82*	*0*
LVM	CK	317C1	79,376.7	*0*	*49*	*0*	MEC-EU	**23.1**	*96*	*13*
LVM	CK	317C3	41,223.4	*1*	*0*	*0*	MEC-EU	**23.2**	*100*	*13*
LVM	CK	317C2	93,974.4	*1*	*38*	*0*	MEC-EU	**23.5**	*100*	*13*
LVM	CK	322C1	188,320.5	*3*	*91*	*2*	NMEC	**24.1**	*0*	*26*
LVM	CK	303C1	5,610.7	*2*	*0*	*0*	MEC-EU	**25.4**	*0*	*0*
LVM	CK	401C5	21,020.6	*4*	*5*	*66*	NMEC	**26.9**	*37*	*0*
LVM	CK	302C1	381,461.1	*21*	*47*	*22*	NMEC	**27.5**	*0*	*29*
LVM	CK	202C2	132,969.0	*0*	*83*	*8*	MEC-EU	**29.3**	*20*	*0*
LVM	CK	203C1	53,654.9	*3*	*85*	*3*	NMEC	**31.4**	*40*	*0*
LVM	CK	403C1	73,641.5	*6*	*62*	*27*	NMEC	**33.6**	*100*	*0*
LVM	CK	305C1	94,988.5	*0*	*91*	*0*	NMEC	**38.5**	*100*	*0*
LVM	CK	402C4	25,405.9	*0*	*17*	*47*	NMEC	**49.6**	*0*	*0*
LVM	CK	207C2	29,625.4	*30*	*43*	*8*	MEC-EU	**55.4**	*16*	*0*
LVM	CK	304C1	214,193.5	*1*	*76*	*5*	NMEC	**56.7**	*0*	*0*
LVM	CK	207C1	31,117.9	*32*	*51*	*2*	MEC-EU	**57.5**	*6*	*0*
LVM	CK	319C1	25,650.2	*3*	*0*	*63*	MEC-EU	**60.2**	*0*	*0*
LVM	CK	300C2	495,321.9	*0*	*99*	*0*	NMEC	**102.4**	*0*	*0*
LVM	CK	323C1	172,702.9	*12*	*74*	*10*	NMEC	**123.3**	*0*	*46*
LVM	CK	404C1	175,825.8	*2*	*67*	*28*	NMEC	**130.4**	*100*	*0*
LVM	CK	402C1	224,229.0	*7*	*84*	*5*	NMEC	**162.0**	*100*	*0*
LVM	CK	401C1	44,164.4	*11*	*35*	*23*	NMEC	**172.8**	*100*	*0*
LVM	CK	406C1	142,060.6	*14*	*69*	*16*	NMEC	**184.3**	*100*	*0*
LVM	CK	405C1	197,865.6	*3*	*71*	*18*	NMEC	**304.3**	*100*	*0*
LVM	CK	200C1	370,131.3	*3*	*94*	*1*	NMEC	**367.0**	*100*	*0*
LVM	CK	201C1	311,735.0	*4*	*93*	*2*	NMEC	**520.2**	*100*	*0*
LVM	INC	500C1	1,029.5	*74*	*0*	*100*	MEC-P	**3.5**	*31*	*0*
LVM	INC	348C1	6,237.9	*4*	*89*	*8*	MEC-P	**3.6**	*17*	*16*
LVM	INC	342C1	NA	*NA*	*NA*	*NA*	NC	**3.8**	*0*	*16*
LVM	INC	344C1	NA	*NA*	*NA*	*NA*	NC	**4.1**	*0*	*28*
LVM	INC	351C1	NA	*NA*	*NA*	*NA*	NC	**6.3**	*0*	*26*
LVM	INC	806C2	NA	*NA*	*NA*	*NA*	NC	**7.0**	*5*	*0*
LVM	INC	325C3	NA	*NA*	*NA*	*NA*	NC	**7.1**	*68*	*0*
LVM	INC	347C1	NA	*NA*	*NA*	*NA*	NC	**7.2**	*24*	*0*
LVM	INC	351C2	NA	*NA*	*NA*	*NA*	NC	**7.5**	*0*	*27*

TABLE 2-1. CONTRIBUTION OF SPIKING, FULL DETECTION LIMIT FOR ND DATA, AND SUBSTITUTION TO MTECs AND EMISSIONS

Substance	System Type	Condition ID	Avg MTEC (ug/dscm 7%O_2)	Avg % ND MTEC	Avg % Spike	Avg % Waste	MACT Status	Avg Emission[*,**]	Avg % ND Emission	Avg % Substitution
LVM	INC	341C2	1,214.1	*78*	*0*	*100*	MEC-P	**7.7**	*100*	*0*
LVM	INC	347C2	NA	*NA*	*NA*	*NA*	NC	**7.8**	*21*	*0*
LVM	INC	806C1	NA	*NA*	*NA*	*NA*	NC	**8.7**	*5*	*0*
LVM	INC	902C1	1,438.7	*0*	*0*	*100*	NMEC	**9.5**	*17*	*0*
LVM	INC	354C1	26,731.4	*1*	*2*	*98*	NMEC	**10.1**	*100*	*2*
LVM	INC	712C2	2.7	*29*	*0*	*100*	NMEC	**10.5**	*4*	*9*
LVM	INC	341C1	775.1	*100*	*0*	*100*	MEC-EU	**11.0**	*100*	*0*
LVM	INC	340C2	27,852.8	*16*	*0*	*100*	NMEC	**11.2**	*97*	*0*
LVM	INC	325C8	NA	*NA*	*NA*	*NA*	NC	**12.1**	*81*	*0*
LVM	INC	325C4	5,672.4	*0*	*0*	*100*	MEC-EU	**12.8**	*5*	*0*
LVM	INC	209C2	248,537.0	*0*	*100*	*0*	NMEC	**13.8**	*0*	*0*
LVM	INC	346C1	NA	*NA*	*NA*	*NA*	NC	**14.9**	*17*	*60*
LVM	INC	347C4	NA	*NA*	*NA*	*NA*	NC	**16.6**	*12*	*0*
LVM	INC	351C3	NA	*NA*	*NA*	*NA*	NC	**17.2**	*0*	*35*
LVM	INC	221C2	1,042.2	*31*	*5*	*95*	MEC-EU	**18.2**	*19*	*18*
LVM	INC	327C3	7,558.6	*6*	*0*	*100*	NMEC	**20.3**	*65*	*0*
LVM	INC	327C2	4,589.5	*11*	*0*	*100*	MEC-EU	**22.7**	*61*	*0*
LVM	INC	221C3	12,503.5	*2*	*0*	*100*	NMEC	**28.2**	*11*	*15*
LVM	INC	705C1	0.6	*71*	*0*	*100*	NMEC	**28.3**	*20*	*0*
LVM	INC	353C1	NA	*NA*	*NA*	*NA*	NC	**28.7**	*99*	*0*
LVM	INC	347C3	NA	*NA*	*NA*	*NA*	NC	**31.2**	*9*	*0*
LVM	INC	209C1	215,384.9	*0*	*100*	*0*	NMEC	**31.5**	*0*	*0*
LVM	INC	325C6	7,344.1	*0*	*0*	*100*	NMEC	**34.1**	*1*	*0*
LVM	INC	214C3	88,167.5	*0*	*0*	*100*	NMEC	**34.3**	*0*	*5*
LVM	INC	327C1	66,577.5	*3*	*0*	*100*	NMEC	**38.2**	*27*	*0*
LVM	INC	330C2	50.0	*33*	*0*	*27*	NMEC	**40.1**	*42*	*0*
LVM	INC	229C1	699.5	*7*	*0*	*100*	MEC-EU	**40.8**	*1*	*11*
LVM	INC	216C6	NA	*NA*	*NA*	*NA*	NC	**46.7**	*10*	*0*
LVM	INC	325C5	3,203.9	*0*	*0*	*100*	MEC-EU	**48.2**	*1*	*0*
LVM	INC	331C1	NA	*NA*	*NA*	*NA*	NC	**50.0**	*1*	*25*
LVM	INC	725C1	NA	*NA*	*NA*	*NA*	NC	**50.7**	*1*	*0*
LVM	INC	216C5	NA	*NA*	*NA*	*NA*	NC	**50.9**	*19*	*0*
LVM	INC	221C1	118.1	*77*	*0*	*100*	MEC-EU	**53.1**	*7*	*12*
LVM	INC	807C3	271,670.8	*7*	*88*	*12*	NMEC	**55.2**	*88*	*18*
LVM	INC	712C1	1.4	*24*	*0*	*100*	NMEC	**56.5**	*2*	*10*
LVM	INC	214C2	57,412.3	*0*	*0*	*100*	NMEC	**59.0**	*0*	*3*
LVM	INC	229C2	1,406.7	*5*	*0*	*100*	MEC-EU	**59.9**	*1*	*9*
LVM	INC	330C1	12.5	*51*	*0*	*0*	NMEC	**62.9**	*54*	*0*
LVM	INC	229C6	803.8	*0*	*0*	*100*	MEC-EU	**66.0**	*1*	*10*
LVM	INC	502C1	57.7	*100*	*0*	*100*	NMEC	**66.1**	*100*	*22*
LVM	INC	229C3	251.1	*1*	*0*	*100*	MEC-EU	**67.9**	*1*	*8*
LVM	INC	338C2	NA	*NA*	*NA*	*NA*	NC	**71.9**	*84*	*0*
LVM	INC	229C5	587.6	*0*	*0*	*100*	MEC-EU	**77.5**	*1*	*8*
LVM	INC	338C1	NA	*NA*	*NA*	*NA*	NC	**97.1**	*63*	*0*
LVM	INC	324C1	5,424.9	*0*	*0*	*100*	NMEC	**97.7**	*0*	*16*
LVM	INC	325C7	3,868.0	*0*	*0*	*100*	MEC-EU	**100.7**	*0*	*0*
LVM	INC	400C1	622,483.6	*0*	*85*	*2*	NMEC	**102.1**	*69*	*0*
LVM	INC	324C2	3,308.8	*0*	*0*	*100*	NMEC	**111.8**	*0*	*15*
LVM	INC	324C3	3,238.2	*0*	*0*	*100*	NMEC	**114.6**	*0*	*12*
LVM	INC	216C7	NA	*NA*	*NA*	*NA*	NC	**120.8**	*67*	*0*
LVM	INC	824C1	8,552.2	*0*	*0*	*100*	NMEC	**123.0**	*0*	*28*
LVM	INC	221C5	9,805.4	*3*	*0*	*100*	NMEC	**135.0**	*0*	*7*
LVM	INC	221C4	500.8	*61*	*4*	*96*	MEC-EU	**144.9**	*3*	*7*
LVM	INC	340C1	35,258.9	*14*	*0*	*100*	NMEC	**147.4**	*54*	*0*

TABLE 2-1. CONTRIBUTION OF SPIKING, FULL DETECTION LIMIT FOR ND DATA, AND SUBSTITUTION TO MTECs AND EMISSIONS

Substance	System Type	Condition ID	Avg MTEC (ug/dscm 7%O_2)	Avg % ND MTEC	Avg % Spike	Avg % Waste	MACT Status	Avg Emission*,**	Avg % ND Emission	Avg % Substitution
LVM	INC	504C1	73,630.6	*37*	*34*	*26*	NMEC	**156.8**	*5*	*0*
LVM	INC	344C2	NA	*NA*	*NA*	*NA*	NC	**177.0**	*67*	*88*
LVM	INC	807C1	239,157.3	*8*	*82*	*18*	NMEC	**177.3**	*47*	*50*
LVM	INC	905C1	6,831.7	*1*	*89*	*11*	NMEC	**178.9**	*0*	*45*
LVM	INC	324C4	3,844.5	*0*	*0*	*100*	NMEC	**194.3**	*0*	*12*
LVM	INC	807C2	367,261.6	*5*	*84*	*16*	NMEC	**199.3**	*46*	*53*
LVM	INC	503C2	538,274.5	*0*	*0*	*100*	NMEC	**245.9**	*0*	*0*
LVM	INC	337C1	4,247.5	*4*	*0*	*100*	NMEC	**261.3**	*99*	*0*
LVM	INC	216C3	NA	*NA*	*NA*	*NA*	NC	**268.5**	*0*	*0*
LVM	INC	705C2	797.3	*29*	*10*	*90*	NMEC	**301.0**	*0*	*0*
LVM	INC	810C1	55,023.1	*0*	*0*	*100*	NMEC	**321.6**	*0*	*1*
LVM	INC	214C1	NA	*NA*	*NA*	*NA*	NC	**338.5**	*6*	*0*
LVM	INC	353C2	NA	*NA*	*NA*	*NA*	NC	**353.2**	*17*	*0*
LVM	INC	809C1	56,047.4	*0*	*0*	*100*	NMEC	**397.1**	*0*	*0*
LVM	INC	334C2	6,827.4	*49*	*0*	*100*	NMEC	**451.3**	*4*	*0*
LVM	INC	915C4	NA	*NA*	*NA*	*NA*	NC	**622.6**	*0*	*11*
LVM	INC	503C1	194,078.5	*0*	*0*	*100*	NMEC	**634.4**	*0*	*0*
LVM	INC	915C1	NA	*NA*	*NA*	*NA*	NC	**684.1**	*0*	*54*
LVM	INC	700C1	6,850.8	*3*	*97*	*2*	NMEC	**720.6**	*0*	*0*
LVM	INC	334C1	21,901.0	*15*	*23*	*77*	NMEC	**819.8**	*0*	*0*
LVM	INC	810C2	2,250,206.7	*0*	*0*	*100*	NMEC	**837.0**	*0*	*1*
LVM	INC	359C4	NA	*NA*	*NA*	*NA*	NC	**1,064.4**	*87*	*0*
LVM	INC	809C2	1,332,198.8	*0*	*0*	*100*	NMEC	**7,224.1**	*0*	*1*
LVM	INC	359C5	NA	*NA*	*NA*	*NA*	NC	**10,971.2**	*100*	*0*
LVM	INC	359C6	NA	*NA*	*NA*	*NA*	NC	**132,677.9**	*0*	*0*
LVM	LWAK	225C1	38,989.8	*0*	*0*	*53*	MEC-P	**10.3**	*6*	*0*
LVM	LWAK	224C1	69,452.8	*0*	*8*	*45*	MEC-P	**21.7**	*0*	*0*
LVM	LWAK	227C1	225,748.9	*0*	*0*	*3*	MEC-P	**25.0**	*2*	*0*
LVM	LWAK	223C1	90,620.0	*0*	*8*	*28*	MEC-P	**34.1**	*1*	*0*
LVM	LWAK	312C1	129,394.2	*0*	*33*	*3*	MEC-P	**37.2**	*44*	*0*
LVM	LWAK	311C1	126,402.5	*0*	*28*	*5*	MEC-EU	**41.4**	*77*	*0*
LVM	LWAK	310C1	5,792.0	*11*	*3*	*0*	NMEC	**59.6**	*5*	*0*
LVM	LWAK	307C1	126,378.9	*0*	*42*	*1*	NMEC	**66.8**	*2*	*0*
LVM	LWAK	307C3	102,580.4	*0*	*45*	*4*	NMEC	**121.8**	*0*	*0*
LVM	LWAK	307C4	106,283.4	*0*	*47*	*2*	NMEC	**145.4**	*0*	*0*
LVM	LWAK	307C2	108,824.3	*0*	*46*	*1*	NMEC	**206.4**	*2*	*0*
LVM	LWAK	314C1	91,885.9	*0*	*53*	*1*	MEC-EU	**227.3**	*19*	*0*
LVM	LWAK	313C1	110,430.6	*0*	*52*	*8*	NMEC	**289.5**	*5*	*0*
Mercury	CK	303C1	217.9	*0*	*0*	*0*	NMEC	**3.4**	*0*	*NS*
Mercury	CK	404C1	42.6	*23*	*0*	*65*	MEC-P	**4.4**	*100*	*NS*
Mercury	CK	305C3	130,020.7	*0*	*0*	*100*	NMEC	**5.0**	*0*	*NS*
Mercury	CK	201C1	NA	*NA*	*NA*	*NA*	NC	**5.4**	*0*	*NS*
Mercury	CK	203C1	41.9	*64*	*0*	*23*	MEC-P	**6.0**	*100*	*NS*
Mercury	CK	406C1	117.3	*31*	*0*	*82*	MEC-P	**7.7**	*100*	*NS*
Mercury	CK	200C1	NA	*NA*	*NA*	*NA*	NC	**11.1**	*0*	*NS*
Mercury	CK	305C1	229.7	*0*	*0*	*13*	MEC-EU	**16.3**	*0*	*NS*
Mercury	CK	207C1	107.2	*79*	*6*	*0*	MEC-EU	**17.0**	*0*	*NS*
Mercury	CK	206C1	20,854.7	*83*	*0*	*17*	MEC-EU	**17.4**	*0*	*NS*
Mercury	CK	204C1	105.2	*100*	*0*	*4*	MEC-EU	**18.9**	*0*	*NS*
Mercury	CK	402C1	10,286.0	*99*	*0*	*1*	NMEC	**19.5**	*100*	*NS*
Mercury	CK	208C1	104.5	*82*	*2*	*4*	MEC-EU	**19.5**	*25*	*NS*
Mercury	CK	202C2	56.8	*95*	*0*	*12*	MEC-EU	**20.2**	*0*	*NS*
Mercury	CK	405C1	169.8	*14*	*0*	*90*	NMEC	**20.8**	*100*	*NS*
Mercury	CK	205C1	58.2	*83*	*0*	*17*	MEC-EU	**29.8**	*0*	*NS*

TABLE 2-1. CONTRIBUTION OF SPIKING, FULL DETECTION LIMIT FOR ND DATA, AND SUBSTITUTION TO MTECs AND EMISSIONS

Substance	System Type	Condition ID	Avg MTEC (ug/dscm 7%O_2)	Avg % ND MTEC	Avg % Spike	Avg % Waste	MACT Status	Avg Emission*,**	Avg % ND Emission	Avg % Substitution
Mercury	CK	401C5	58.0	*19*	*0*	*78*	MEC-EU	**36.1**	*75*	*NS*
Mercury	CK	304C1	96.5	*92*	*0*	*9*	MEC-EU	**41.9**	*0*	*NS*
Mercury	CK	309C1	151.1	*0*	*58*	*0*	MEC-EU	**42.6**	*0*	*NS*
Mercury	CK	402C4	45.6	*0*	*0*	*72*	MEC-EU	**51.5**	*0*	*NS*
Mercury	CK	319C1	75.3	*100*	*0*	*7*	MEC-EU	**55.9**	*0*	*NS*
Mercury	CK	335C1	25,928.4	*2*	*0*	*98*	NMEC	**59.7**	*0*	*NS*
Mercury	CK	303C3	377.8	*0*	*0*	*14*	MEC-EU	**91.6**	*0*	*NS*
Mercury	CK	30152	680.9	*62*	*0*	*35*	NMEC	**105.5**	*33*	*NS*
Mercury	CK	30142	680.9	*62*	*0*	*35*	NMEC	**127.7**	*0*	*NS*
Mercury	CK	401C1	556.4	*6*	*0*	*94*	NMEC	**148.2**	*0*	*NS*
Mercury	CK	403C1	75.8	*27*	*0*	*70*	NMEC	**1,014.2**	*100*	*NS*
Mercury	CK	306C1	3,835.8	*0*	*83*	*0*	NMEC	**2,987.8**	*0*	*NS*
Mercury	INC	221C5	51.1	*5*	*0*	*100*	MEC-P	**0.1**	*0*	*NS*
Mercury	INC	221C3	35.2	*40*	*0*	*100*	MEC-P	**0.1**	*0*	*NS*
Mercury	INC	216C7	NA	*NA*	*NA*	*NA*	NC	**0.3**	*67*	*NS*
Mercury	INC	346C1	NA	*NA*	*NA*	*NA*	NC	**0.4**	*0*	*NS*
Mercury	INC	347C4	NA	*NA*	*NA*	*NA*	NC	**0.5**	*0*	*NS*
Mercury	INC	824C1	5.1	*3*	*0*	*100*	MEC-P	**0.8**	*0*	*NS*
Mercury	INC	341C2	18.5	*44*	*0*	*100*	MEC-P	**0.9**	*100*	*NS*
Mercury	INC	216C5	NA	*NA*	*NA*	*NA*	NC	**1.0**	*0*	*NS*
Mercury	INC	503C1	NA	*NA*	*NA*	*NA*	NC	**1.2**	*0*	*NS*
Mercury	INC	341C1	9.0	*100*	*0*	*100*	MEC-EU	**1.3**	*100*	*NS*
Mercury	INC	354C1	1,861.7	*0*	*0*	*100*	NMEC	**1.4**	*50*	*NS*
Mercury	INC	725C1	NA	*NA*	*NA*	*NA*	NC	**1.7**	*100*	*NS*
Mercury	INC	353C1	NA	*NA*	*NA*	*NA*	NC	**2.5**	*0*	*NS*
Mercury	INC	209C1	234.1	*0*	*100*	*0*	NMEC	**2.5**	*75*	*NS*
Mercury	INC	705C1	0.1	*100*	*0*	*100*	NMEC	**2.8**	*33*	*NS*
Mercury	INC	500C1	106.1	*99*	*0*	*100*	NMEC	**2.9**	*100*	*NS*
Mercury	INC	209C2	253.8	*0*	*100*	*0*	NMEC	**3.1**	*50*	*NS*
Mercury	INC	347C2	NA	*NA*	*NA*	*NA*	NC	**3.4**	*100*	*NS*
Mercury	INC	334C2	37.8	*45*	*0*	*100*	MEC-EU	**4.0**	*0*	*NS*
Mercury	INC	347C1	NA	*NA*	*NA*	*NA*	NC	**4.1**	*75*	*NS*
Mercury	INC	221C1	8.5	*67*	*0*	*100*	MEC-EU	**4.3**	*0*	*NS*
Mercury	INC	330C1	0.1	*100*	*0*	*0*	MEC-EU	**4.6**	*100*	*NS*
Mercury	INC	700C1	9.4	*100*	*2*	*73*	MEC-EU	**4.7**	*0*	*NS*
Mercury	INC	807C3	0.7	*33*	*0*	*100*	MEC-EU	**5.3**	*33*	*NS*
Mercury	INC	330C2	0.2	*80*	*0*	*21*	MEC-EU	**5.8**	*50*	*NS*
Mercury	INC	342C1	NA	*NA*	*NA*	*NA*	NC	**6.2**	*0*	*NS*
Mercury	INC	353C2	NA	*NA*	*NA*	*NA*	NC	**6.5**	*0*	*NS*
Mercury	INC	340C1	182.6	*45*	*0*	*100*	NMEC	**7.6**	*0*	*NS*
Mercury	INC	334C1	296.9	*0*	*70*	*30*	NMEC	**9.9**	*0*	*NS*
Mercury	INC	807C1	14.3	*0*	*0*	*100*	MEC-EU	**10.7**	*0*	*NS*
Mercury	INC	340C2	135.7	*31*	*0*	*100*	NMEC	**12.3**	*0*	*NS*
Mercury	INC	347C3	NA	*NA*	*NA*	*NA*	NC	**16.1**	*0*	*NS*
Mercury	INC	807C2	1.8	*0*	*0*	*100*	NMEC	**17.9**	*0*	*NS*
Mercury	INC	221C4	15.4	*100*	*0*	*100*	MEC-EU	**19.2**	*0*	*NS*
Mercury	INC	705C2	9.3	*100*	*0*	*100*	NMEC	**19.3**	*0*	*NS*
Mercury	INC	400C1	27,680.5	*0*	*100*	*0*	NMEC	**19.4**	*100*	*NS*
Mercury	INC	325C7	52.1	*0*	*0*	*100*	NMEC	**25.2**	*0*	*NS*
Mercury	INC	325C6	95.8	*0*	*0*	*100*	NMEC	**27.1**	*0*	*NS*
Mercury	INC	221C2	30.2	*57*	*0*	*100*	MEC-EU	**27.2**	*0*	*NS*
Mercury	INC	338C1	NA	*NA*	*NA*	*NA*	NC	**27.7**	*0*	*NS*
Mercury	INC	325C5	263.1	*0*	*0*	*100*	NMEC	**30.1**	*0*	*NS*
Mercury	INC	214C3	3,357.9	*0*	*0*	*100*	NMEC	**31.7**	*0*	*NS*

TABLE 2-1. CONTRIBUTION OF SPIKING, FULL DETECTION LIMIT FOR ND DATA, AND SUBSTITUTION TO MTECs AND EMISSIONS

Substance	System Type	Condition ID	Avg MTEC (ug/dscm 7%O_2)	Avg % ND MTEC	Avg % Spike	Avg % Waste	MACT Status	Avg Emission[*,**]	Avg % ND Emission	Avg % Substitution
Mercury	INC	331C1	NA	*NA*	*NA*	*NA*	NC	**38.8**	*0*	*NS*
Mercury	INC	503C2	NA	*NA*	*NA*	*NA*	NC	**42.9**	*0*	*NS*
Mercury	INC	325C4	60.1	*0*	*0*	*100*	NMEC	**44.4**	*0*	*NS*
Mercury	INC	216C6	NA	*NA*	*NA*	*NA*	NC	**44.6**	*67*	*NS*
Mercury	INC	902C1	32.3	*0*	*0*	*100*	MEC-EU	**47.7**	*0*	*NS*
Mercury	INC	214C2	70,348.9	*0*	*0*	*100*	NMEC	**48.8**	*0*	*NS*
Mercury	INC	325C8	NA	*NA*	*NA*	*NA*	NC	**69.3**	*0*	*NS*
Mercury	INC	338C2	NA	*NA*	*NA*	*NA*	NC	**89.6**	*0*	*NS*
Mercury	INC	806C2	NA	*NA*	*NA*	*NA*	NC	**117.8**	*0*	*NS*
Mercury	INC	806C1	NA	*NA*	*NA*	*NA*	NC	**172.6**	*0*	*NS*
Mercury	INC	325C3	NA	*NA*	*NA*	*NA*	NC	**177.8**	*0*	*NS*
Mercury	INC	337C1	69.7	*25*	*0*	*100*	NMEC	**188.1**	*0*	*NS*
Mercury	INC	216C3	NA	*NA*	*NA*	*NA*	NC	**261.0**	*0*	*NS*
Mercury	INC	327C2	75.6	*13*	*0*	*100*	NMEC	**394.5**	*0*	*NS*
Mercury	INC	214C1	NA	*NA*	*NA*	*NA*	NC	**481.6**	*0*	*NS*
Mercury	INC	327C3	123.3	*3*	*0*	*100*	NMEC	**1,121.5**	*0*	*NS*
Mercury	INC	504C1	2,146.1	*40*	*58*	*2*	NMEC	**1,322.7**	*40*	*NS*
Mercury	INC	327C1	477.4	*9*	*0*	*100*	NMEC	**1,360.7**	*0*	*NS*
Mercury	LWAK	313C1	49.9	*22*	*0*	*35*	MEC-P	**0.4**	*100*	*NS*
Mercury	LWAK	225C1	14.0	*0*	*0*	*21*	MEC-P	**4.6**	*0*	*NS*
Mercury	LWAK	312C1	42.8	*72*	*0*	*28*	MEC-P	**8.8**	*100*	*NS*
Mercury	LWAK	310C1	38.4	*72*	*0*	*28*	MEC-EU	**15.2**	*0*	*NS*
Mercury	LWAK	311C1	58.0	*60*	*0*	*40*	NMEC	**15.2**	*100*	*NS*
Mercury	LWAK	224C1	28.6	*0*	*0*	*33*	MEC-EU	**15.8**	*0*	*NS*
Mercury	LWAK	227C1	63.6	*100*	*0*	*15*	MEC-EU	**17.0**	*0*	*NS*
Mercury	LWAK	314C1	115.1	*13*	*0*	*51*	NMEC	**22.2**	*0*	*NS*
Mercury	LWAK	223C1	45.7	*0*	*0*	*37*	MEC-EU	**31.7**	*0*	*NS*
Mercury	LWAK	307C1	2,419.8	*0*	*95*	*1*	NMEC	**421.8**	*0*	*NS*
Mercury	LWAK	307C3	2,065.2	*0*	*95*	*1*	NMEC	**471.8**	*0*	*NS*
Mercury	LWAK	307C4	2,295.4	*0*	*95*	*1*	NMEC	**493.4**	*0*	*NS*
Mercury	LWAK	307C2	2,217.4	*0*	*96*	*1*	NMEC	**561.3**	*0*	*NS*
SVM	CK	320C1	35,653.6	*0*	*0*	*94*	MEC-P	**3.6**	*0*	*0*
SVM	CK	316C2	77,748.9	*0*	*61*	*24*	MEC-P	**5.6**	*0*	*0*
SVM	CK	316C1	95,860.8	*0*	*71*	*16*	MEC-P	**6.2**	*0*	*0*
SVM	CK	30142	79,473.3	*2*	*95*	*1*	MEC-P	**8.6**	*100*	*0*
SVM	CK	321C1	227,155.4	*0*	*0*	*91*	NMEC	**11.4**	*0*	*0*
SVM	CK	303C1	13,035.9	*0*	*0*	*0*	MEC-EU	**12.9**	*0*	*0*
SVM	CK	30152	79,473.3	*2*	*95*	*1*	MEC-EU	**14.8**	*100*	*0*
SVM	CK	306C1	61,753.0	*0*	*70*	*6*	MEC-EU	**16.6**	*0*	*0*
SVM	CK	315C2	164,643.8	*0*	*72*	*23*	NMEC	**18.3**	*78*	*0*
SVM	CK	315C1	171,614.3	*0*	*72*	*23*	NMEC	**21.1**	*72*	*0*
SVM	CK	317C1	48,622.4	*0*	*88*	*0*	MEC-EU	**28.3**	*100*	*0*
SVM	CK	317C3	5,701.1	*1*	*0*	*0*	MEC-EU	**28.8**	*100*	*0*
SVM	CK	317C2	56,230.0	*0*	*73*	*2*	MEC-EU	**28.9**	*100*	*0*
SVM	CK	403C1	128,894.9	*1*	*76*	*23*	NMEC	**29.7**	*91*	*0*
SVM	CK	303C3	35,633.3	*0*	*3*	*70*	MEC-EU	**32.5**	*0*	*0*
SVM	CK	404C1	63,093.1	*4*	*4*	*92*	NMEC	**57.4**	*100*	*0*
SVM	CK	200C1	32,707.1	*18*	*55*	*27*	NMEC	**62.0**	*95*	*0*
SVM	CK	208C2	22,120.4	*8*	*69*	*1*	NMEC	**86.9**	*0*	*0*
SVM	CK	308C1	58,155.3	*0*	*47*	*0*	NMEC	**93.2**	*0*	*0*
SVM	CK	208C1	35,692.5	*1*	*81*	*4*	NMEC	**98.0**	*0*	*0*
SVM	CK	202C2	214,452.0	*0*	*84*	*3*	NMEC	**109.1**	*0*	*0*
SVM	CK	318C2	123,342.7	*0*	*92*	*0*	NMEC	**140.1**	*0*	*0*
SVM	CK	322C1	140,893.6	*0*	*14*	*84*	NMEC	**150.8**	*0*	*0*

TABLE 2-1. CONTRIBUTION OF SPIKING, FULL DETECTION LIMIT FOR ND DATA, AND SUBSTITUTION TO MTECs AND EMISSIONS

Substance	System Type	Condition ID	Avg MTEC (ug/dscm 7%O_2)	Avg % ND MTEC	Avg % Spike	Avg % Waste	MACT Status	Avg Emission*,**	Avg % ND Emission	Avg % Substitution
SVM	CK	207C2	54,835.3	*1*	*83*	*6*	NMEC	**257.9**	*0*	*0*
SVM	CK	206C1	170,002.5	*0*	*89*	*8*	NMEC	**272.9**	*0*	*0*
SVM	CK	401C1	80,892.8	*1*	*0*	*86*	NMEC	**381.5**	*76*	*0*
SVM	CK	204C1	216,633.7	*1*	*89*	*9*	NMEC	**505.4**	*0*	*0*
SVM	CK	207C1	90,579.4	*0*	*86*	*4*	NMEC	**506.9**	*0*	*0*
SVM	CK	203C1	162,344.6	*0*	*98*	*0*	NMEC	**528.3**	*0*	*0*
SVM	CK	309C1	119,654.5	*0*	*68*	*0*	NMEC	**543.1**	*0*	*0*
SVM	CK	304C1	142,852.2	*1*	*80*	*17*	NMEC	**599.3**	*0*	*0*
SVM	CK	406C1	138,740.7	*10*	*73*	*16*	NMEC	**661.7**	*100*	*0*
SVM	CK	319C1	24,613.1	*3*	*0*	*89*	NMEC	**677.8**	*0*	*0*
SVM	CK	335C1	80,258.0	*0*	*94*	*0*	NMEC	**752.5**	*33*	*0*
SVM	CK	402C1	210,733.1	*0*	*93*	*6*	NMEC	**814.8**	*100*	*0*
SVM	CK	305C3	72,776.5	*0*	*90*	*0*	NMEC	**897.3**	*34*	*0*
SVM	CK	201C1	178,734.7	*4*	*87*	*9*	NMEC	**924.5**	*75*	*0*
SVM	CK	323C1	151,036.2	*0*	*14*	*82*	NMEC	**972.7**	*0*	*0*
SVM	CK	205C1	143,721.6	*0*	*86*	*11*	NMEC	**1,169.4**	*0*	*0*
SVM	CK	405C1	84,185.0	*0*	*0*	*92*	NMEC	**1,169.9**	*79*	*0*
SVM	CK	305C1	161,791.3	*0*	*94*	*0*	NMEC	**1,321.7**	*100*	*0*
SVM	CK	302C1	370,797.0	*0*	*100*	*0*	NMEC	**1,529.0**	*0*	*0*
SVM	CK	401C5	152,359.7	*0*	*0*	*95*	NMEC	**1,966.2**	*1*	*0*
SVM	CK	300C2	458,435.5	*0*	*99*	*0*	NMEC	**2,345.3**	*0*	*0*
SVM	CK	402C4	50,808.1	*0*	*31*	*57*	NMEC	**6,047.0**	*0*	*0*
SVM	INC	325C3	NA	*NA*	*NA*	*NA*	NC	**1.5**	*0*	*0*
SVM	INC	712C1	0.2	*50*	*0*	*100*	NMEC	**2.2**	*33*	*78*
SVM	INC	354C1	48,776.5	*0*	*0*	*100*	MEC-P	**2.5**	*56*	*0*
SVM	INC	712C2	0.8	*42*	*0*	*100*	NMEC	**2.6**	*67*	*77*
SVM	INC	222C5	NA	*NA*	*NA*	*NA*	NC	**3.2**	*0*	*23*
SVM	INC	500C1	168.5	*54*	*0*	*100*	MEC-P	**3.6**	*0*	*0*
SVM	INC	347C4	NA	*NA*	*NA*	*NA*	NC	**4.0**	*75*	*0*
SVM	INC	325C8	NA	*NA*	*NA*	*NA*	NC	**4.9**	*36*	*0*
SVM	INC	340C1	5,795.5	*4*	*0*	*100*	MEC-P	**5.7**	*22*	*0*
SVM	INC	209C2	188,532.5	*0*	*100*	*0*	NMEC	**6.9**	*0*	*0*
SVM	INC	341C2	494.7	*100*	*0*	*100*	MEC-EU	**10.4**	*100*	*0*
SVM	INC	209C1	129,450.2	*0*	*100*	*0*	NMEC	**10.7**	*0*	*0*
SVM	INC	353C1	NA	*NA*	*NA*	*NA*	NC	**11.1**	*84*	*0*
SVM	INC	347C1	NA	*NA*	*NA*	*NA*	NC	**11.8**	*16*	*0*
SVM	INC	347C3	NA	*NA*	*NA*	*NA*	NC	**12.9**	*10*	*0*
SVM	INC	221C2	4,666.0	*25*	*0*	*100*	NMEC	**13.2**	*17*	*0*
SVM	INC	340C2	3,785.9	*7*	*0*	*100*	MEC-EU	**13.3**	*0*	*0*
SVM	INC	347C2	NA	*NA*	*NA*	*NA*	NC	**13.6**	*0*	*0*
SVM	INC	341C1	439.3	*100*	*0*	*100*	MEC-EU	**17.3**	*73*	*0*
SVM	INC	342C1	NA	*NA*	*NA*	*NA*	NC	**20.7**	*0*	*0*
SVM	INC	348C1	904.3	*0*	*86*	*14*	MEC-EU	**22.1**	*0*	*82*
SVM	INC	221C3	2,077.3	*2*	*0*	*100*	NMEC	**22.5**	*0*	*0*
SVM	INC	229C1	89.0	*100*	*0*	*100*	MEC-EU	**23.4**	*100*	*85*
SVM	INC	327C2	3,798.5	*1*	*0*	*100*	MEC-EU	**23.4**	*55*	*0*
SVM	INC	902C1	240.1	*0*	*0*	*100*	NMEC	**23.9**	*2*	*0*
SVM	INC	344C2	NA	*NA*	*NA*	*NA*	NC	**24.1**	*0*	*15*
SVM	INC	327C1	11,147.7	*4*	*0*	*100*	MEC-EU	**24.6**	*0*	*0*
SVM	INC	229C3	0.6	*0*	*0*	*100*	NMEC	**25.1**	*100*	*85*
SVM	INC	338C1	NA	*NA*	*NA*	*NA*	NC	**27.5**	*100*	*0*
SVM	INC	221C5	1,290.0	*5*	*0*	*100*	NMEC	**28.9**	*0*	*0*
SVM	INC	229C2	124.9	*100*	*0*	*100*	MEC-EU	**31.2**	*100*	*86*
SVM	INC	338C2	NA	*NA*	*NA*	*NA*	NC	**31.4**	*100*	*0*

TABLE 2-1. CONTRIBUTION OF SPIKING, FULL DETECTION LIMIT FOR ND DATA, AND SUBSTITUTION TO MTECs AND EMISSIONS

Substance	System Type	Condition ID	Avg MTEC (ug/dscm 7%O_2)	Avg % ND MTEC	Avg % Spike	Avg % Waste	MACT Status	Avg Emission[*,**]	Avg % ND Emission	Avg % Substitution
SVM	INC	327C3	10,365.5	*4*	*0*	*100*	MEC-EU	**37.3**	*0*	*0*
SVM	INC	725C1	NA	*NA*	*NA*	*NA*	NC	**37.4**	*13*	*0*
SVM	INC	349C3	532,412.1	*0*	*0*	*100*	NMEC	**39.8**	*0*	*12*
SVM	INC	824C1	375.0	*4*	*0*	*100*	NMEC	**41.5**	*0*	*0*
SVM	INC	221C4	443.1	*37*	*0*	*100*	NMEC	**43.5**	*0*	*0*
SVM	INC	504C1	14,632.0	*40*	*46*	*14*	NMEC	**44.0**	*18*	*0*
SVM	INC	807C3	48,240.5	*39*	*41*	*59*	NMEC	**56.5**	*0*	*0*
SVM	INC	325C7	10,715.7	*0*	*0*	*100*	MEC-EU	**57.6**	*0*	*0*
SVM	INC	229C5	0.9	*0*	*0*	*100*	NMEC	**62.9**	*100*	*90*
SVM	INC	229C6	0.5	*0*	*0*	*100*	NMEC	**68.8**	*100*	*90*
SVM	INC	346C1	NA	*NA*	*NA*	*NA*	NC	**89.3**	*0*	*0*
SVM	INC	325C4	4,884.1	*0*	*0*	*100*	NMEC	**91.1**	*0*	*0*
SVM	INC	337C1	45,855.7	*0*	*0*	*100*	MEC-EU	**93.8**	*48*	*0*
SVM	INC	221C1	162.6	*29*	*0*	*100*	MEC-EU	**100.9**	*0*	*0*
SVM	INC	216C3	NA	*NA*	*NA*	*NA*	NC	**102.5**	*0*	*0*
SVM	INC	705C1	0.3	*34*	*0*	*100*	NMEC	**116.3**	*0*	*0*
SVM	INC	214C1	NA	*NA*	*NA*	*NA*	NC	**200.7**	*7*	*0*
SVM	INC	353C2	NA	*NA*	*NA*	*NA*	NC	**210.2**	*0*	*0*
SVM	INC	325C6	5,805.1	*0*	*0*	*100*	NMEC	**224.9**	*0*	*0*
SVM	INC	359C4	NA	*NA*	*NA*	*NA*	NC	**227.2**	*1*	*0*
SVM	INC	330C2	357.7	*0*	*0*	*33*	NMEC	**244.0**	*0*	*0*
SVM	INC	325C5	4,360.1	*0*	*0*	*100*	NMEC	**245.2**	*0*	*0*
SVM	INC	807C1	174,719.8	*4*	*8*	*92*	NMEC	**261.5**	*0*	*0*
SVM	INC	705C2	152.8	*0*	*0*	*100*	NMEC	**301.1**	*0*	*0*
SVM	INC	807C2	230,683.1	*5*	*10*	*90*	NMEC	**311.6**	*0*	*0*
SVM	INC	359C5	NA	*NA*	*NA*	*NA*	NC	**331.9**	*0*	*0*
SVM	INC	330C1	108.4	*0*	*0*	*0*	NMEC	**418.0**	*0*	*0*
SVM	INC	806C2	NA	*NA*	*NA*	*NA*	NC	**460.5**	*0*	*0*
SVM	INC	324C1	3,849.3	*0*	*0*	*100*	NMEC	**537.0**	*0*	*0*
SVM	INC	806C1	NA	*NA*	*NA*	*NA*	NC	**590.9**	*0*	*0*
SVM	INC	400C1	2,538,984.8	*0*	*6*	*2*	NMEC	**656.3**	*6*	*0*
SVM	INC	214C2	151,644.3	*0*	*0*	*100*	NMEC	**689.3**	*0*	*0*
SVM	INC	503C1	302,755.9	*0*	*0*	*100*	NMEC	**720.6**	*0*	*0*
SVM	INC	216C7	NA	*NA*	*NA*	*NA*	NC	**826.4**	*0*	*0*
SVM	INC	324C4	13,446.0	*0*	*0*	*100*	NMEC	**837.7**	*0*	*0*
SVM	INC	809C1	20,803.1	*0*	*0*	*100*	NMEC	**864.6**	*0*	*0*
SVM	INC	810C1	56,371.0	*0*	*0*	*100*	NMEC	**881.8**	*0*	*0*
SVM	INC	503C2	68,334.4	*0*	*0*	*100*	NMEC	**910.7**	*0*	*0*
SVM	INC	359C6	NA	*NA*	*NA*	*NA*	NC	**992.6**	*1*	*0*
SVM	INC	214C3	343,542.0	*0*	*0*	*100*	NMEC	**999.7**	*0*	*0*
SVM	INC	216C5	NA	*NA*	*NA*	*NA*	NC	**1,020.7**	*0*	*0*
SVM	INC	216C6	NA	*NA*	*NA*	*NA*	NC	**1,044.6**	*0*	*0*
SVM	INC	915C1	NA	*NA*	*NA*	*NA*	NC	**1,283.6**	*0*	*0*
SVM	INC	502C1	NA	*NA*	*NA*	*NA*	NC	**1,508.9**	*100*	*89*
SVM	INC	334C2	566.1	*20*	*0*	*100*	NMEC	**1,705.8**	*0*	*0*
SVM	INC	810C2	653,522.8	*0*	*0*	*100*	NMEC	**1,776.7**	*0*	*0*
SVM	INC	324C2	3,282.9	*0*	*0*	*100*	NMEC	**3,040.5**	*0*	*0*
SVM	INC	331C1	NA	*NA*	*NA*	*NA*	NC	**3,465.5**	*0*	*0*
SVM	INC	334C1	122,028.5	*0*	*14*	*86*	NMEC	**7,963.8**	*0*	*0*
SVM	INC	324C3	228.7	*0*	*0*	*100*	NMEC	**8,261.8**	*0*	*0*
SVM	INC	809C2	205,716.7	*0*	*0*	*100*	NMEC	**19,769.5**	*0*	*0*
SVM	INC	700C1	222,056.8	*0*	*7*	*93*	NMEC	**29,350.3**	*0*	*0*
SVM	INC	905C1	13,398.2	*1*	*99*	*1*	NMEC	**29,762.5**	*0*	*94*
SVM	LWAK	225C1	277,211.2	*0*	*0*	*97*	MEC-P	**1.1**	*22*	*0*

TABLE 2-1. CONTRIBUTION OF SPIKING, FULL DETECTION LIMIT FOR ND DATA, AND SUBSTITUTION TO MTECs AND EMISSIONS

Substance	System Type	Condition ID	Avg MTEC (ug/dscm 7%O_2)	Avg % ND MTEC	Avg % Spike	Avg % Waste	MACT Status	Avg Emission*,**	Avg % ND Emission	Avg % Substitution
SVM	LWAK	307C4	70,856.3	*0*	*73*	*3*	MEC-P	**3.9**	*0*	*0*
SVM	LWAK	224C1	22,808.6	*0*	*0*	*65*	MEC-P	**4.0**	*0*	*0*
SVM	LWAK	307C3	75,129.6	*0*	*64*	*12*	NMEC	**4.2**	*0*	*0*
SVM	LWAK	223C1	751,196.6	*0*	*0*	*97*	NMEC	**5.2**	*15*	*0*
SVM	LWAK	307C2	67,879.8	*0*	*74*	*1*	MEC-EU	**7.5**	*0*	*0*
SVM	LWAK	307C1	73,305.8	*0*	*74*	*1*	NMEC	**10.2**	*0*	*0*
SVM	LWAK	227C1	999,463.7	*0*	*0*	*3*	NMEC	**31.0**	*0*	*0*
SVM	LWAK	312C1	459,621.6	*0*	*100*	*0*	NMEC	**403.2**	*0*	*0*
SVM	LWAK	310C1	6,028.5	*8*	*5*	*0*	NMEC	**495.4**	*0*	*0*
SVM	LWAK	311C1	381,753.3	*0*	*98*	*0*	NMEC	**515.9**	*23*	*0*
SVM	LWAK	313C1	701,322.0	*0*	*98*	*0*	NMEC	**663.2**	*0*	*0*
SVM	LWAK	314C1	706,422.1	*0*	*97*	*0*	NMEC	**1,667.1**	*0*	*0*
TCl	CK	204C2	1,742,478.8	*0*	*0*	*93*	MEC-P	**0.1**	*100*	*0*
TCl	CK	304C2	NA	*NA*	*NA*	*NA*	NC	**0.4**	*2*	*0*
TCl	CK	30141	1,462,098.2	*3*	*65*	*15*	MEC-P	**0.4**	*0*	*0*
TCl	CK	403C1	2,057,846.9	*21*	*0*	*78*	MEC-P	**0.7**	*1*	*0*
TCl	CK	30151	1,462,098.2	*3*	*65*	*15*	MEC-EU	**0.7**	*0*	*0*
TCl	CK	403C2	2,696,105.5	*21*	*22*	*57*	NMEC	**0.9**	*0*	*0*
TCl	CK	315C1	684,170.8	*0*	*0*	*69*	MEC-EU	**1.4**	*4*	*0*
TCl	CK	202C1	1,062,500.4	*0*	*0*	*25*	MEC-EU	**1.7**	*59*	*0*
TCl	CK	303C1	226,256.9	*0*	*0*	*0*	MEC-EU	**2.0**	*0*	*0*
TCl	CK	315C2	636,172.8	*0*	*0*	*61*	MEC-EU	**2.7**	*2*	*0*
TCl	CK	317C1	292,532.1	*0*	*37*	*5*	MEC-EU	**2.9**	*2*	*0*
TCl	CK	306C1	771,595.2	*0*	*0*	*96*	MEC-EU	**2.9**	*12*	*0*
TCl	CK	405C1	2,484,312.1	*34*	*0*	*66*	NMEC	**3.2**	*25*	*0*
TCl	CK	317C2	612,614.4	*0*	*40*	*2*	MEC-EU	**3.7**	*3*	*0*
TCl	CK	208C1	633,861.1	*27*	*0*	*67*	MEC-EU	**4.5**	*0*	*0*
TCl	CK	207C1	965,856.8	*18*	*0*	*76*	MEC-EU	**4.9**	*0*	*0*
TCl	CK	308C1	1,002,525.1	*0*	*0*	*78*	MEC-EU	**5.6**	*0*	*0*
TCl	CK	320C1	444,012.7	*0*	*0*	*75*	MEC-EU	**5.9**	*0*	*3*
TCl	CK	317C3	196,062.0	*0*	*0*	*0*	MEC-EU	**7.0**	*1*	*0*
TCl	CK	321C1	1,658,457.7	*0*	*0*	*70*	MEC-EU	**9.5**	*0*	*0*
TCl	CK	302C1	2,380,025.6	*0*	*0*	*93*	NMEC	**10.2**	*0*	*0*
TCl	CK	401C5	2,399,051.9	*21*	*24*	*53*	NMEC	**10.4**	*0*	*0*
TCl	CK	205C1	610,896.6	*27*	*0*	*62*	MEC-EU	**16.6**	*2*	*0*
TCl	CK	200C1	3,258,074.9	*0*	*1*	*99*	NMEC	**18.2**	*0*	*0*
TCl	CK	201C1	3,052,481.2	*0*	*1*	*98*	NMEC	**20.1**	*0*	*0*
TCl	CK	402C1	3,298,287.4	*12*	*0*	*84*	NMEC	**21.6**	*1*	*0*
TCl	CK	402C4	3,429,472.1	*0*	*58*	*24*	NMEC	**22.0**	*0*	*0*
TCl	CK	316C2	816,673.0	*0*	*0*	*53*	MEC-EU	**22.2**	*0*	*0*
TCl	CK	322C1	3,065,543.7	*0*	*0*	*97*	NMEC	**22.6**	*0*	*0*
TCl	CK	319C2	974,869.9	*0*	*0*	*94*	NMEC	**27.1**	*2*	*0*
TCl	CK	305C3	598,282.2	*0*	*0*	*78*	MEC-EU	**28.4**	*0*	*0*
TCl	CK	202C2	1,998,943.1	*0*	*0*	*47*	MEC-EU	**31.1**	*2*	*0*
TCl	CK	300C1	2,247,132.9	*0*	*0*	*99*	NMEC	**33.8**	*0*	*0*
TCl	CK	316C1	1,095,120.5	*0*	*0*	*64*	MEC-EU	**35.1**	*0*	*0*
TCl	CK	309C1	1,089,309.8	*0*	*0*	*94*	MEC-EU	**35.7**	*0*	*2*
TCl	CK	303C2	1,518,538.0	*0*	*0*	*79*	MEC-EU	**36.0**	*0*	*0*
TCl	CK	401C1	4,234,415.2	*0*	*0*	*86*	NMEC	**36.2**	*1*	*0*
TCl	CK	319C8	404,984.8	*0*	*0*	*100*	MEC-EU	**42.4**	*0*	*0*
TCl	CK	319C7	NA	*NA*	*NA*	*NA*	NC	**42.5**	*0*	*3*
TCl	CK	406C1	1,738,244.5	*52*	*0*	*47*	MEC-EU	**42.8**	*0*	*0*
TCl	CK	318C2	NA	*NA*	*NA*	*NA*	NC	**50.6**	*0*	*0*
TCl	CK	319C4	1,514,611.3	*0*	*0*	*98*	NMEC	**51.1**	*1*	*0*

TABLE 2-1. CONTRIBUTION OF SPIKING, FULL DETECTION LIMIT FOR ND DATA, AND SUBSTITUTION TO MTECs AND EMISSIONS

Substance	System Type	Condition ID	Avg MTEC (ug/dscm 7%O_2)	Avg % ND MTEC	Avg % Spike	Avg % Waste	MACT Status	Avg Emission[*,**]	Avg % ND Emission	Avg % Substitution
TCl	CK	318C1	900,677.7	*0*	*82*	*0*	MEC-EU	**51.3**	*0*	*0*
TCl	CK	404C2	2,654,836.3	*23*	*19*	*58*	NMEC	**56.8**	*0*	*0*
TCl	CK	309C2	1,072,723.4	*0*	*0*	*94*	MEC-EU	**57.0**	*1*	*0*
TCl	CK	323C1	3,546,560.8	*2*	*0*	*98*	NMEC	**71.9**	*0*	*0*
TCl	CK	404C1	2,123,539.7	*23*	*0*	*77*	NMEC	**76.6**	*0*	*0*
TCl	CK	206C1	1,083,502.9	*6*	*0*	*91*	MEC-EU	**81.2**	*0*	*0*
TCl	CK	203C1	1,342,501.0	*0*	*0*	*99*	MEC-EU	**117.2**	*0*	*0*
TCl	CK	335C1	805,239.2	*0*	*0*	*77*	MEC-EU	**121.9**	*0*	*0*
TCl	CK	305C1	4,389,885.2	*0*	*0*	*64*	MEC-EU	**157.2**	*0*	*0*
TCl	CK	319C6	824,518.1	*0*	*0*	*100*	MEC-EU	**220.8**	*0*	*0*
TCl	INC	347C2	NA	*NA*	*NA*	*NA*	NC	**0.1**	*100*	*4*
TCl	INC	358C2	11,104,454.0	*0*	*0*	*100*	MEC-P	**0.2**	*100*	*10*
TCl	INC	338C1	NA	*NA*	*NA*	*NA*	NC	**0.2**	*85*	*0*
TCl	INC	342C2	4,360,000.0	*0*	*0*	*100*	MEC-P	**0.3**	*0*	*13*
TCl	INC	706C3	17,288,058.0	*0*	*0*	*100*	MEC-P	**0.3**	*100*	*16*
TCl	INC	338C2	NA	*NA*	*NA*	*NA*	NC	**0.3**	*100*	*0*
TCl	INC	808C2	20,900,959.4	*0*	*0*	*100*	NMEC	**0.3**	*0*	*9*
TCl	INC	706C1	15,581,600.7	*0*	*0*	*100*	MEC-EU	**0.4**	*33*	*16*
TCl	INC	354C3	14,130,722.0	*0*	*0*	*100*	MEC-EU	**0.4**	*0*	*0*
TCl	INC	222C1	NA	*NA*	*NA*	*NA*	NC	**0.4**	*35*	*0*
TCl	INC	337C2	95,948.7	*0*	*0*	*100*	NMEC	**0.4**	*100*	*17*
TCl	INC	728C1	18,261,591.2	*0*	*0*	*100*	NMEC	**0.4**	*33*	*12*
TCl	INC	347C1	NA	*NA*	*NA*	*NA*	NC	**0.5**	*100*	*7*
TCl	INC	600C1	30,545,151.4	*0*	*0*	*100*	NMEC	**0.6**	*0*	*18*
TCl	INC	707C7	NA	*NA*	*NA*	*NA*	NC	**0.6**	*0*	*16*
TCl	INC	358C3	42,204,909.6	*0*	*0*	*100*	NMEC	**0.6**	*0*	*16*
TCl	INC	327C2	NA	*NA*	*NA*	*NA*	NC	**0.6**	*37*	*0*
TCl	INC	808C1	25,837,359.1	*0*	*0*	*100*	NMEC	**0.7**	*0*	*16*
TCl	INC	711C1	908,974.0	*0*	*0*	*100*	MEC-EU	**0.8**	*0*	*13*
TCl	INC	346C1	NA	*NA*	*NA*	*NA*	NC	**0.9**	*100*	*14*
TCl	INC	348C1	98,473,465.6	*0*	*0*	*100*	NMEC	**0.9**	*7*	*0*
TCl	INC	711C2	170,321.7	*0*	*0*	*100*	MEC-EU	**0.9**	*0*	*15*
TCl	INC	706C2	17,331,118.8	*0*	*0*	*100*	MEC-EU	**1.0**	*33*	*13*
TCl	INC	708C3	55,155,746.1	*0*	*0*	*100*	NMEC	**1.0**	*0*	*17*
TCl	INC	214C3	50,478,083.6	*0*	*0*	*100*	NMEC	**1.0**	*0*	*15*
TCl	INC	344C2	NA	*NA*	*NA*	*NA*	NC	**1.1**	*100*	*12*
TCl	INC	711C3	777,612.5	*0*	*0*	*100*	MEC-EU	**1.1**	*0*	*15*
TCl	INC	701C2	NA	*NA*	*NA*	*NA*	NC	**1.1**	*0*	*16*
TCl	INC	344C1	NA	*NA*	*NA*	*NA*	NC	**1.3**	*100*	*15*
TCl	INC	354C4	NA	*NA*	*NA*	*NA*	NC	**1.3**	*0*	*0*
TCl	INC	708C2	62,228,319.6	*0*	*0*	*100*	NMEC	**1.4**	*0*	*16*
TCl	INC	500C4	15,362,888.1	*0*	*0*	*100*	MEC-EU	**1.4**	*0*	*14*
TCl	INC	325C4	11,923,572.6	*0*	*0*	*100*	MEC-EU	**1.4**	*0*	*15*
TCl	INC	708C1	87,164,119.5	*0*	*0*	*100*	NMEC	**1.4**	*0*	*13*
TCl	INC	807C1	3,293,720.2	*0*	*50*	*50*	NMEC	**1.6**	*0*	*0*
TCl	INC	327C3	NA	*NA*	*NA*	*NA*	NC	**1.7**	*16*	*0*
TCl	INC	707C1	NA	*NA*	*NA*	*NA*	NC	**1.7**	*0*	*13*
TCl	INC	347C3	NA	*NA*	*NA*	*NA*	NC	**1.8**	*50*	*10*
TCl	INC	359C2	22,364,553.3	*0*	*0*	*100*	NMEC	**1.8**	*0*	*14*
TCl	INC	341C2	2,615,611.0	*0*	*0*	*100*	NMEC	**1.8**	*0*	*14*
TCl	INC	600C2	49,075,983.5	*0*	*0*	*100*	NMEC	**1.8**	*0*	*14*
TCl	INC	325C8	NA	*NA*	*NA*	*NA*	NC	**1.8**	*0*	*12*
TCl	INC	222C6	28,393,411.3	*0*	*8*	*92*	NMEC	**1.9**	*6*	*0*
TCl	INC	222C3	NA	*NA*	*NA*	*NA*	NC	**1.9**	*2*	*0*

TABLE 2-1. CONTRIBUTION OF SPIKING, FULL DETECTION LIMIT FOR ND DATA, AND SUBSTITUTION TO MTECs AND EMISSIONS

Substance	System Type	Condition ID	Avg MTEC (ug/dscm 7%O_2)	Avg % ND MTEC	Avg % Spike	Avg % Waste	MACT Status	Avg Emission*,**	Avg % ND Emission	Avg % Substitution
TCl	INC	214C1	24,175,528.8	*0*	*32*	*68*	NMEC	**1.9**	*100*	*14*
TCl	INC	500C3	18,514,615.4	*0*	*0*	*100*	NMEC	**2.2**	*0*	*0*
TCl	INC	359C3	16,029,222.6	*0*	*0*	*100*	MEC-EU	**2.3**	*0*	*12*
TCl	INC	214C2	28,215,744.7	*0*	*0*	*100*	NMEC	**2.3**	*0*	*13*
TCl	INC	354C2	31,068,928.3	*0*	*0*	*11*	MEC-EU	**2.4**	*0*	*0*
TCl	INC	824C1	4,913,814.1	*0*	*0*	*100*	MEC-EU	**2.4**	*0*	*13*
TCl	INC	209C4	11,315,783.9	*0*	*0*	*100*	MEC-EU	**2.8**	*67*	*12*
TCl	INC	707A2	7,753,464.2	*0*	*0*	*100*	MEC-EU	**2.9**	*0*	*12*
TCl	INC	807C2	4,269,177.4	*0*	*57*	*43*	NMEC	**3.2**	*0*	*0*
TCl	INC	325C5	1,707,069.5	*0*	*0*	*100*	MEC-EU	**3.4**	*0*	*11*
TCl	INC	807C3	4,213,072.9	*0*	*57*	*43*	NMEC	**3.5**	*0*	*0*
TCl	INC	359C1	22,538,919.7	*0*	*0*	*100*	NMEC	**3.5**	*0*	*12*
TCl	INC	222C2	NA	*NA*	*NA*	*NA*	NC	**4.0**	*0*	*0*
TCl	INC	825C1	34,472,305.6	*0*	*0*	*100*	NMEC	**4.0**	*0*	*12*
TCl	INC	700C2	1,742,179.7	*0*	*99*	*1*	MEC-EU	**4.2**	*2*	*0*
TCl	INC	359C4	7,185,540.1	*0*	*0*	*100*	MEC-EU	**4.3**	*0*	*10*
TCl	INC	358C1	46,794,611.7	*0*	*0*	*100*	NMEC	**4.3**	*25*	*12*
TCl	INC	209C7	33,641,223.7	*0*	*47*	*53*	NMEC	**4.3**	*0*	*10*
TCl	INC	209C8	48,143,128.8	*0*	*35*	*65*	NMEC	**4.4**	*0*	*11*
TCl	INC	707C8	NA	*NA*	*NA*	*NA*	NC	**4.6**	*0*	*11*
TCl	INC	902C1	39,190,185.7	*0*	*1*	*99*	NMEC	**4.6**	*0*	*10*
TCl	INC	209C5	27,181,752.5	*0*	*47*	*53*	NMEC	**4.7**	*0*	*10*
TCl	INC	347C4	NA	*NA*	*NA*	*NA*	NC	**4.9**	*0*	*9*
TCl	INC	504C1	69,833.5	*22*	*0*	*56*	MEC-EU	**5.1**	*20*	*9*
TCl	INC	229C3	193,037,453.4	*0*	*0*	*100*	NMEC	**5.5**	*0*	*9*
TCl	INC	359C5	7,315,821.2	*0*	*0*	*100*	MEC-EU	**5.6**	*0*	*9*
TCl	INC	209C6	36,491,648.0	*0*	*63*	*37*	NMEC	**5.8**	*0*	*9*
TCl	INC	714C4	4,646,659.8	*0*	*0*	*100*	MEC-EU	**6.2**	*0*	*9*
TCl	INC	325C6	3,274,320.7	*0*	*0*	*100*	MEC-EU	**6.4**	*0*	*11*
TCl	INC	341C1	892,336.7	*0*	*0*	*100*	NMEC	**6.8**	*0*	*11*
TCl	INC	707A1	NA	*NA*	*NA*	*NA*	NC	**7.2**	*0*	*8*
TCl	INC	701C3	NA	*NA*	*NA*	*NA*	NC	**7.2**	*0*	*8*
TCl	INC	357C1	10,464,373.6	*0*	*0*	*100*	MEC-EU	**7.5**	*33*	*8*
TCl	INC	707C9	8,170,922.6	*0*	*17*	*83*	MEC-EU	**7.6**	*0*	*8*
TCl	INC	354C1	40,177,202.8	*0*	*0*	*9*	MEC-EU	**7.7**	*0*	*0*
TCl	INC	707C2	6,481,359.2	*0*	*18*	*82*	MEC-EU	**7.9**	*0*	*8*
TCl	INC	329C1	19,977,309.6	*0*	*32*	*68*	NMEC	**8.3**	*11*	*0*
TCl	INC	358C4	43,931,296.8	*0*	*0*	*100*	NMEC	**9.1**	*0*	*7*
TCl	INC	705C2	NA	*NA*	*NA*	*NA*	NC	**9.2**	*0*	*7*
TCl	INC	327C1	NA	*NA*	*NA*	*NA*	NC	**9.7**	*0*	*0*
TCl	INC	216C7	NA	*NA*	*NA*	*NA*	NC	**9.7**	*0*	*7*
TCl	INC	216C2	NA	*NA*	*NA*	*NA*	NC	**10.4**	*0*	*7*
TCl	INC	221C3	NA	*NA*	*NA*	*NA*	NC	**11.4**	*33*	*0*
TCl	INC	339C1	35,605,365.5	*0*	*0*	*100*	NMEC	**11.5**	*0*	*48*
TCl	INC	707C4	9,026,493.2	*0*	*5*	*95*	MEC-EU	**11.8**	*0*	*6*
TCl	INC	705C1	NA	*NA*	*NA*	*NA*	NC	**12.3**	*0*	*7*
TCl	INC	334C1	4,175,240.1	*0*	*0*	*100*	MEC-EU	**13.0**	*0*	*6*
TCl	INC	707C3	10,850,269.1	*0*	*17*	*83*	MEC-EU	**13.0**	*0*	*7*
TCl	INC	340C1	4,449,624.4	*0*	*0*	*100*	MEC-EU	**14.0**	*0*	*6*
TCl	INC	221C2	NA	*NA*	*NA*	*NA*	NC	**14.7**	*50*	*0*
TCl	INC	210C1	19,891,897.3	*0*	*0*	*100*	NMEC	**15.7**	*2*	*0*
TCl	INC	221C1	NA	*NA*	*NA*	*NA*	NC	**16.5**	*50*	*0*
TCl	INC	209C1	38,599,501.3	*0*	*0*	*100*	NMEC	**16.6**	*0*	*0*
TCl	INC	502C1	9,622,636.2	*0*	*0*	*100*	MEC-EU	**19.7**	*0*	*9*

TABLE 2-1. CONTRIBUTION OF SPIKING, FULL DETECTION LIMIT FOR ND DATA, AND SUBSTITUTION TO MTECs AND EMISSIONS

Substance	System Type	Condition ID	Avg MTEC (ug/dscm 7%O_2)	Avg % ND MTEC	Avg % Spike	Avg % Waste	MACT Status	Avg Emission*,**	Avg % ND Emission	Avg % Substitution
TCl	INC	334C2	9,386,817.8	*0*	*50*	*50*	MEC-EU	**21.7**	*0*	*5*
TCl	INC	340C2	2,369,008.7	*0*	*0*	*100*	MEC-EU	**22.4**	*0*	*5*
TCl	INC	701C1	NA	*NA*	*NA*	*NA*	NC	**26.1**	*0*	*6*
TCl	INC	713C1	122,090.6	*33*	*0*	*67*	MEC-EU	**26.9**	*0*	*6*
TCl	INC	500C1	2,705,629.5	*0*	*0*	*100*	MEC-EU	**28.9**	*0*	*0*
TCl	INC	700C1	3,191,282.5	*0*	*0*	*100*	MEC-EU	**29.6**	*0*	*0*
TCl	INC	714C3	6,375,485.3	*0*	*0*	*100*	MEC-EU	**32.0**	*0*	*6*
TCl	INC	359C6	6,266,641.5	*0*	*0*	*100*	MEC-EU	**32.6**	*0*	*6*
TCl	INC	221C4	NA	*NA*	*NA*	*NA*	NC	**34.2**	*0*	*0*
TCl	INC	209C3	10,366,609.0	*0*	*0*	*100*	MEC-EU	**35.3**	*0*	*6*
TCl	INC	211C1	25,495,956.0	*0*	*0*	*100*	NMEC	**37.7**	*0*	*0*
TCl	INC	325C7	8,710,859.1	*0*	*0*	*100*	MEC-EU	**39.3**	*0*	*9*
TCl	INC	221C5	NA	*NA*	*NA*	*NA*	NC	**39.7**	*0*	*0*
TCl	INC	906C2	4,816,362.1	*0*	*0*	*100*	MEC-EU	**44.1**	*0*	*7*
TCl	INC	806C1	NA	*NA*	*NA*	*NA*	NC	**45.3**	*0*	*8*
TCl	INC	333C1	8,571,833.3	*0*	*95*	*5*	NMEC	**48.6**	*0*	*0*
TCl	INC	806C2	1,403.4	*0*	*0*	*19*	MEC-EU	**52.2**	*0*	*8*
TCl	INC	210C2	18,072,742.0	*0*	*0*	*100*	NMEC	**54.1**	*0*	*0*
TCl	INC	229C6	217,450,435.4	*0*	*0*	*100*	NMEC	**54.4**	*0*	*8*
TCl	INC	330C1	26,461,321.0	*0*	*0*	*0*	NMEC	**55.8**	*2*	*6*
TCl	INC	333C2	13,116,961.7	*0*	*93*	*7*	NMEC	**59.0**	*0*	*0*
TCl	INC	332C1	38,443,972.6	*0*	*0*	*100*	NMEC	**64.8**	*0*	*0*
TCl	INC	714C2	7,340,293.1	*0*	*0*	*100*	MEC-EU	**70.3**	*0*	*10*
TCl	INC	714C1	10,384,011.5	*0*	*0*	*100*	MEC-EU	**70.4**	*0*	*10*
TCl	INC	725C1	NA	*NA*	*NA*	*NA*	NC	**75.2**	*0*	*0*
TCl	INC	229C5	257,945,460.5	*0*	*0*	*100*	NMEC	**96.8**	*0*	*11*
TCl	INC	337C1	NA	*NA*	*NA*	*NA*	NC	**99.3**	*0*	*89*
TCl	INC	229C1	154,205,029.7	*0*	*0*	*100*	NMEC	**102.0**	*0*	*11*
TCl	INC	805C1	3,469,660.1	*0*	*0*	*100*	MEC-EU	**106.5**	*100*	*89*
TCl	INC	209C2	40,448,982.5	*0*	*0*	*100*	NMEC	**106.5**	*0*	*0*
TCl	INC	212C1	33,089,898.4	*0*	*0*	*100*	NMEC	**133.9**	*0*	*0*
TCl	INC	906C1	62,174,232.2	*0*	*0*	*100*	NMEC	**134.3**	*0*	*13*
TCl	INC	714C5	12,664,653.2	*0*	*0*	*100*	NMEC	**135.6**	*0*	*12*
TCl	INC	500C2	12,563,190.2	*0*	*0*	*100*	NMEC	**139.3**	*0*	*0*
TCl	INC	906C3	52,669,224.0	*0*	*0*	*100*	NMEC	**159.4**	*0*	*12*
TCl	INC	229C4	185,712,877.3	*0*	*0*	*100*	NMEC	**159.8**	*0*	*13*
TCl	INC	324C4	273,973.5	*0*	*0*	*100*	NMEC	**163.2**	*0*	*10*
TCl	INC	704C1	94,465,585.0	*0*	*0*	*100*	NMEC	**163.7**	*0*	*12*
TCl	INC	725C2	NA	*NA*	*NA*	*NA*	NC	**164.7**	*0*	*0*
TCl	INC	906C5	79,390,184.4	*0*	*0*	*100*	NMEC	**188.3**	*0*	*14*
TCl	INC	324C3	231,127.5	*0*	*0*	*100*	NMEC	**192.6**	*0*	*12*
TCl	INC	324C1	297,188.1	*0*	*0*	*100*	NMEC	**200.9**	*0*	*13*
TCl	INC	704C2	114,017,434.8	*0*	*0*	*100*	NMEC	**214.3**	*0*	*15*
TCl	INC	324C2	168,886.2	*0*	*0*	*100*	NMEC	**215.1**	*0*	*13*
TCl	INC	229C2	196,384,497.5	*0*	*0*	*100*	NMEC	**218.1**	*0*	*15*
TCl	INC	914C1	17,715,965.7	*0*	*13*	*87*	NMEC	**227.1**	*0*	*84*
TCl	INC	906C4	65,669,151.4	*0*	*0*	*100*	NMEC	**252.7**	*0*	*15*
TCl	INC	703C1	541,312.9	*0*	*71*	*29*	NMEC	**325.5**	*0*	*17*
TCl	INC	710C3	45,181,479.0	*0*	*0*	*100*	NMEC	**346.8**	*0*	*0*
TCl	INC	710C1	65,244,148.6	*0*	*0*	*100*	NMEC	**355.5**	*0*	*0*
TCl	INC	703C2	487,048.9	*0*	*67*	*33*	NMEC	**378.1**	*0*	*17*
TCl	INC	710C2	49,100,826.8	*0*	*0*	*100*	NMEC	**439.6**	*0*	*0*
TCl	INC	784C1	NA	*NA*	*NA*	*NA*	NC	**1,012.3**	*0*	*14*
TCl	INC	784C2	NA	*NA*	*NA*	*NA*	NC	**1,067.9**	*0*	*15*

TABLE 2-1. CONTRIBUTION OF SPIKING, FULL DETECTION LIMIT FOR ND DATA, AND SUBSTITUTION TO MTECs AND EMISSIONS

Substance	System Type	Condition ID	Avg MTEC (ug/dscm 7%O_2)	Avg % ND MTEC	Avg % Spike	Avg % Waste	MACT Status	Avg Emission*,**	Avg % ND Emission	Avg % Substitution
TCl	LWAK	307C3	7,699,495.9	*0*	*25*	*75*	MEC-P	**13.3**	*0*	*0*
TCl	LWAK	307C2	13,945,545.4	*0*	*47*	*53*	MEC-P	**26.0**	*0*	*0*
TCl	LWAK	224C1	858,424.6	*0*	*0*	*99*	NMEC	**28.8**	*0*	*0*
TCl	LWAK	307C4	12,158,726.1	*0*	*39*	*61*	MEC-P	**30.9**	*0*	*0*
TCl	LWAK	307C1	3,309,745.9	*0*	*0*	*100*	MEC-P	**41.7**	*0*	*0*
TCl	LWAK	225C1	844,132.9	*0*	*0*	*99*	MEC-P	**641.1**	*0*	*0*
TCl	LWAK	314C1	1,874,347.1	*18*	*0*	*82*	MEC-P	**853.2**	*0*	*0*
TCl	LWAK	310C1	1,038,724.2	*27*	*0*	*73*	MEC-EU	**1,199.1**	*0*	*0*
TCl	LWAK	312C1	2,219,364.7	*14*	*0*	*86*	NMEC	**1,241.2**	*0*	*0*
TCl	LWAK	311C1	1,244,108.4	*29*	*0*	*71*	MEC-EU	**1,258.4**	*0*	*0*
TCl	LWAK	227C1	1,142,440.9	*0*	*0*	*47*	MEC-EU	**1,347.1**	*0*	*0*
TCl	LWAK	313C1	2,382,537.9	*12*	*0*	*88*	NMEC	**1,509.0**	*0*	*0*
TCl	LWAK	223C1	2,407,090.7	*0*	*0*	*100*	NMEC	**2,079.5**	*0*	*0*

Acronyms:

(*): Sorted by emission

(**): ug/dscm @ 7% O_2 for LVM, SVM, and Mercury; ppmv @ 7% O_2 for TCl

Avg: Average

MTEC: Maximum Theoretical Emission Concentration

NA: Not Available

NC: Not Considered (because it has no MTEC)

NS: No Substitution

MEC-P: MACT Emission Control Technology Pool

MEC-EU: MACT Emission Control Technology Expanded Universe

NMEC: non-MACT Emission Control Technology

TABLE 2-2. AVERAGE AND MEDIAN CONTRIBUTIONS OF FULL DETECTION LIMIT ND DATA AND SUBSTITUTION TO EMISSIONS OF HAPS

Substance	System Type	Emission Units	Emissions			ND Emissions (%)			Substituted Emissions (%)		
			Average	Median	Count	Average	Median	Count	Average	Median	Count
LVM	CK	ug/dscm7%O2	64.09	23.47	45	47.4	37.3	45	8.0	0.0	45
LVM	INC	ug/dscm7%O2	1853.71	57.73	88	24.6	4.6	88	9.0	0.0	88
LVM	LWAK	ug/dscm7%O2	98.95	59.61	13	12.4	1.7	13	0.0	0.0	13
Mercury	CK	ug/dscm7%O2	173.89	39.00	47	39.1	23.2	47	0.0	0.0	0
Mercury	INC	ug/dscm7%O2	295.30	12.74	79	25.5	0.0	79	0.0	0.0	0
Mercury	LWAK	ug/dscm7%O2	464.67	47.78	28	22.8	0.0	28	0.0	0.0	0
SVM	CK	ug/dscm7%O2	575.78	150.83	45	34.1	0.0	45	0.0	0.0	45
SVM	INC	ug/dscm7%O2	1464.26	89.34	85	18.1	0.0	85	10.7	0.0	85
SVM	LWAK	ug/dscm7%O2	293.22	10.23	13	4.7	0.0	13	0.0	0.0	13
TCl	CK	ppmv7%O2	33.27	21.77	52	4.3	0.0	52	0.2	0.0	52
TCl	INC	ppmv7%O2	59.46	7.36	152	11.4	0.0	152	9.8	9.1	152
TCl	LWAK	ppmv7%O2	789.95	853.21	13	0.0	0.0	13	0.0	0.0	13

TABLE 2-3. AVERAGE AND MEDIAN CONTRIBUTIONS OF SPIKING AND FULL DETECTION LIMIT ND NATA TO MTECs OF HAP's

Substance	System Type	MTEC (ug/dscm 7%O2)		% Spike		% ND MTEC		% ND Fuel		% ND Raw Material		% ND Spike		% ND Waste	
		Average	Median	Average	Median	Average	Median	Average	Median	Average	Median	Average	Median	Average	Median
Hg	CK	7499.04	134.21	5.68	0.00	43.19	29.14	28.85	0.00	74.36	100.00	0.00	0.00	11.89	0.00
Hg	INC	2921.63	52.13	11.61	0.00	33.52	12.61	13.51	0.00	0.00	0.00	2.70	0.00	28.45	4.81
Hg	LWAK	727.22	58.01	29.39	0.00	26.07	0.00	0.00	0.00	35.90	0.00	0.00	0.00	7.69	0.00
LVM	CK	137981.17	93974.42	56.86	62.37	8.52	3.18	15.14	2.80	27.21	12.80	0.19	0.00	9.04	0.02
LVM	INC	121202.71	6237.85	15.64	0.00	16.84	2.83	8.58	0.00	0.00	0.00	7.02	0.00	18.30	1.32
LVM	LWAK	102521.82	106283.40	28.12	32.61	0.91	0.00	0.00	0.00	1.00	0.00	0.59	0.00	5.23	0.00
SVM	CK	117527.48	90579.44	59.40	73.06	1.36	0.24	12.00	0.57	17.29	4.75	0.01	0.00	0.76	0.00
SVM	INC	108887.52	4665.96	9.05	0.00	14.23	0.02	4.03	0.00	0.00	0.00	0.00	0.00	15.85	0.00
SVM	LWAK	353307.63	277211.18	52.60	72.92	0.65	0.00	0.00	0.00	13.58	0.00	5.41	0.00	0.00	0.00
TCl	CK	1623683.67	1342500.98	8.45	0.00	5.98	0.00	13.35	0.00	29.08	0.00	0.30	0.00	0.01	0.00
TCl	INC	32014712.72	15805411.68	8.71	0.00	0.51	0.00	1.13	0.00	0.00	0.00	0.00	0.00	0.02	0.00
TCl	LWAK	3932668.05	2219364.75	8.60	0.00	7.69	0.00	0.00	0.00	38.46	0.00	0.00	0.00	0.00	0.00

TABLE 2-4. 50th AND 90th EMISSION PERCENTILES ASSUMING ND DATA AT FULL AND AT 1/2 DETECTION LIMITS (USING AVERAGE RANK BASED EMISSION SUBSTITUTION)

Substance	System Type	Units	Emiss Conc (ND @ Full Det Limit)		Emiss Conc (ND @ 1/2 Det Limit)	
			50th Percentile	90th Percentile	50th Percentile	90th Percentile
Hg	CK	ug/dscm 7%O_2	30.30	282.27	24.54	252.52
Hg	INC	ug/dscm 7%O_2	9.94	186.54	8.64	182.49
Hg	LWAK	ug/dscm 7%O_2	37.09	663.44	31.97	717.67
LVM	CK	ug/dscm 7%O_2	28.91	152.91	21.17	98.28
LVM	INC	ug/dscm 7%O_2	63.72	659.97	54.39	599.52
LVM	LWAK	ug/dscm 7%O_2	54.51	218.35	50.84	209.21
SVM	CK	ug/dscm 7%O_2	138.63	1607.98	108.90	1398.50
SVM	INC	ug/dscm 7%O_2	104.48	2036.09	93.56	2032.06
SVM	LWAK	ug/dscm 7%O_2	27.95	621.83	27.24	613.18
TCl	CK	ppmv 7%O_2	11.16	103.12	10.87	106.96
TCl	INC	ppmv 7%O_2	8.06	139.10	7.42	145.07
TCl	LWAK	ppmv 7%O_2	203.06	3369.76	203.06	3369.76

SECTION 3

SUBSTITUTION METHODOLOGY FOR LVM, SVM, AND TCl

Toxic metals of interest for EPA/OSW were divided into three major groups based on the volatility of metals. Selection of and justification for the metals volatility groupings are discussed in detail in the last section of this report. The three volatility groups are: low-volatility metals (LVM) including Sb, As, Be, and Cr; semi-volatility metals (SVM) including Cd and Pb; and high-volatility metals represented by Hg. Chlorine and HCl emissions were also grouped to represent total chlorine (TCl) emissions. The emission of LVM or SVM for a given run is defined as the sum of emissions for all metals in the LVM or SVM group. TCl emission, however, is the sum of HCl concentration and twice the reported Cl_2 concentration corresponding to total chloride (Cl) emission concentration.

Substitution of data became necessary in calculating emissions for the above metals and chlorine groups when a facility did not measure all of the elements in a particular group during a given run in a trial burn. For example, a facility may have measured only Sb, As, and Cr during a trial burn run but not Be. In such a case, before the LVM is calculated, an estimate of the Be emission was obtained based on the ranking of emissions of the other measured metals in the LVM group on a run basis. This procedure was performed by considering available LVM data from all source categories and ranking each metal according to its emissions. Then, the average rank of the LVM metals for the condition where Be data was not available was calculated and assumed to be the rank of the Be missing data. The Be concentration which corresponds to this average rank was then identified and substituted for the missing Be measurement. Therefore, as long as at least one element in any group was measured for a given run, the emissions of other missing elements were substituted for based on the average rank of the measured elements in the same group. More details on the substitution methodology and procedure are presented in the *Technical Support Document for HWC MACT Standards, Volume III: Selection of MACT Standards and Technologies*.

It is important to note here that the average rank based substitution was performed only for elements with missing emissions data in a particular group.

However, this substitution methodology was not performed for missing feed rate data when calculating feed rates (or MTEC concentrations) for the above groups. Therefore, a missing feed rate for any element in a group was assumed to be zero, and if all feed rates for all elements within a group were missing, the feed rate of the group for that run was considered not reported and there was no MTEC for that run. Furthermore, the emission results from such runs were not included in the MACT analysis.

Substitution of data became essential because in many facilities only a few of the elements in a given group were measured, and if the analyses were to be conducted only on groups with measured data for all elements, there would have been insufficient data in some cases to perform the various tasks of the program. An example of this is TCl emissions from INCs where most facilities measured only HCl emissions because they were not required to measure Cl_2 emissions. Table 2-1 shows that most TCl conditions have substitution due to missing Cl_2 measurements. However, because Cl_2 concentrations are typically much lower than HCl concentrations, Table 2-2 shows that less than 10% of the TCl emissions from INCs is attributable to substitution.

The main concern regarding data substitution is the impact of the methodology on the results from the various tasks in the program. Tables 2-1 and 2-2 provide information on the percentages of data attributable to emission data substitution for all HAPs and combustion sources. Table 2-1 provides these percentages on a condition basis while Table 2-2 provides averages and medians for the three HAP groups and source categories. The impact of the substitution methodology on the various tasks of the program is discussed below.

3.1 MACT ANALYSIS

Details of the MACT procedure and analysis for all HAPs and source categories are presented and discussed in the *Technical Support Document for HWC MACT Standards, Volume III: Selection of MACT Standards and Technologies*. A brief description of the MACT analysis is also presented in Section 2.1 of this report. Similar to ND emission data consideration, the impact of emissions substitution on determining the MACT pool facilities (the lowest 6% condition emissions) was not considered. In most cases, however, Table 2-1 shows that the substitution percentages for MACT pool facilities are zero. Only a few cases (5 out of 33 conditions) have substitutions ranging from 10% to 16% and one condition (LVM from a cement kiln)

has a substitution of 33%. Moreover, conditions with high substitution percentages were excluded from the MACT EU. This was performed to guarantee that when the MACT floor limit is determined (based on the worst emitting facility in the MACT EU), a facility with a high percentage of data substitution will not be the determining MACT floor level facility. It is important to note here that substitution of data may impact only HAPs made of groups of elements including LVM, SVM, and TCl. Mercury data, on the other hand, had no substitution and, therefore, mercury MACT analysis is not impacted by substitution.

As indicated earlier, substitution for missing feed rate MTECs of individual elements within the LVM and SVM groups was not performed using the average rank based methodology used for emissions but by substituting zero for missing feed rate data. Substitution of zero for feed rate MTECs of LVM and SVM was not considered in the determination of the MACT-defining HW MTECs for these groups. This has the potential impact of decreasing the value of the MACT-defining HW MTEC and, consequently, decreasing the number of facilities in the MACT EU. There was no substitution necessary to obtain TCl feed rate MTECs since trial burns reported feed rates of total chlorine in various feed streams and not individual Cl_2 and HCl feed rates. Therefore, for TCl there is no impact of feed substitution on the TCl MACT analysis.

3.2 NATIONAL EMISSIONS AND COST ESTIMATES

The methodology and procedure for estimating national emissions of HAPs from combustion sources and national cost for meeting the proposed floor and beyond the floor limits are explained in the *Technical Support Document for HWC MACT Standards, Volume V: Engineering Costs*. The potential impact of emission data substitution on national emissions and cost estimates can be assessed from Table 2-2. This table shows that uncertainty attributable to data substitution may not be significant in general. For example, uncertainty due to substitution for LVM from CKs and INCs, and SVM and TCl from INCs may be up to approximately 10% (based on the average for emissions substitution shown in Table 2-2). Moreover, there is no significant substitution for LVM from LWAKs, and SVM and TCl from CKs and LWAKs.

3.3 50th AND 90th EMISSION PERCENTILES USED FOR RISK ANALYSIS

The 50th and 90th emission percentile results for metals and other HAPs are

provided in the *Technical Support Document for HWC MACT Standards, Volume V: Engineering Costs*. A brief description of this analysis is also provided in Section 2.3 of this report. The contribution of emission data substitution on the 50th and 90th emission percentiles may be qualitatively assessed from Table 2-1 (ranked according to emissions). This table shows that, in general, the conditions with substituted data occur over a wide range of emissions for most HAPs and, therefore, there is a potential substitution impact on 50th and 90th percentiles. To confirm this and to thoroughly explore the impact of the current average ranking substitution methodology on the 50th and 90th emission percentiles, a comprehensive quantitative assessment was performed using run data to determine 50th and 90th percentiles for all HAPs and source categories based on substituting zero for missing emissions data. This 50th and 90th percentile analysis was also performed assuming log-normal distribution for emissions. The results from this analysis are summarized in Table 3-1. This table shows the substance, combustion source, 50th and 90th percentiles for average ranking substitution, and 50th and 90th percentiles for zero substitution. Results in Table 3-1 indicate:

- The 50th and 90th percentiles either remained unchanged or decreased when zero was substituted for missing emission data for all HAPs and source categories.
- The most significant change occurred for LVM, SVM, and TCl from INCs where the 50th and 90th emission percentiles decreased by approximately 11% and 9%, 19% and 8%, and 12% and 14%, respectively, when the zero substitution methodology was used.
- There was no significant impact of emission data substitution on determining the 50th and 90th emission percentiles for LVM, SVM, and TCl from CKs and LWAKs.

3.4 EMISSION DISTRIBUTION BASED ON WASTE, FUEL, AND RAW MATERIAL FEED ("BAR CHARTS")

The methodology, procedure, and results for the "bar charts" are presented in the *Technical Support Document for HWC MACT Standards, Volume III: Selection of MACT Standards and Technologies*. A brief description of the "bar charts" analysis is also presented in Section 2.4 of this report. Since the distribution of HAP feed rates in various feed streams was the basis for determining emissions distribution of HAPs, the potential impact of the substitution methodology for feed rate MTECs on the bar

charts results have to be assessed. As indicated earlier in this report, zero was substituted for missing feed rate data when calculating LVM and SVM feed rate MTECs, but there was no substitution required to calculate TCl feed rate MTECs since total chlorine measurements were reported in trial burns. Therefore, the zero substitution methodology for missing feed rate data may potentially impact the bar chart results for LVM and SVM only, but not for TCl or mercury. Substituting zero for missing feed rate data may potentially decrease the true feed rate MTECs for LVM and SVM in any given feed stream where they were fed but not measured (or reported) and, consequently, may change the emissions distribution for LVM or SVM.

As an example of this potential impact, suppose that a facility has waste and raw material feed streams and that the four metals in the LVM group were fed and measured in the waste stream, while only two out of the four metals in the LVM group were measured in the raw material feed stream (although the four metals were present). Substitution of zero for the two missing metals feed rates, in this case, will underestimate the true value of the feed rate MTEC for LVM in the raw material feed stream and, consequently, increase the ratio of emissions due to LVM in the waste relative to LVM in the raw material shown in the bar charts (an example bar chart for LVM from CKs is shown in Figure 3-1). On the other hand, if only two metals were measured in the waste and raw material, and if the true feed rate of LVM and the two measured metals are similar for both feed streams, then zero substitution may not have an impact on the emissions distribution.

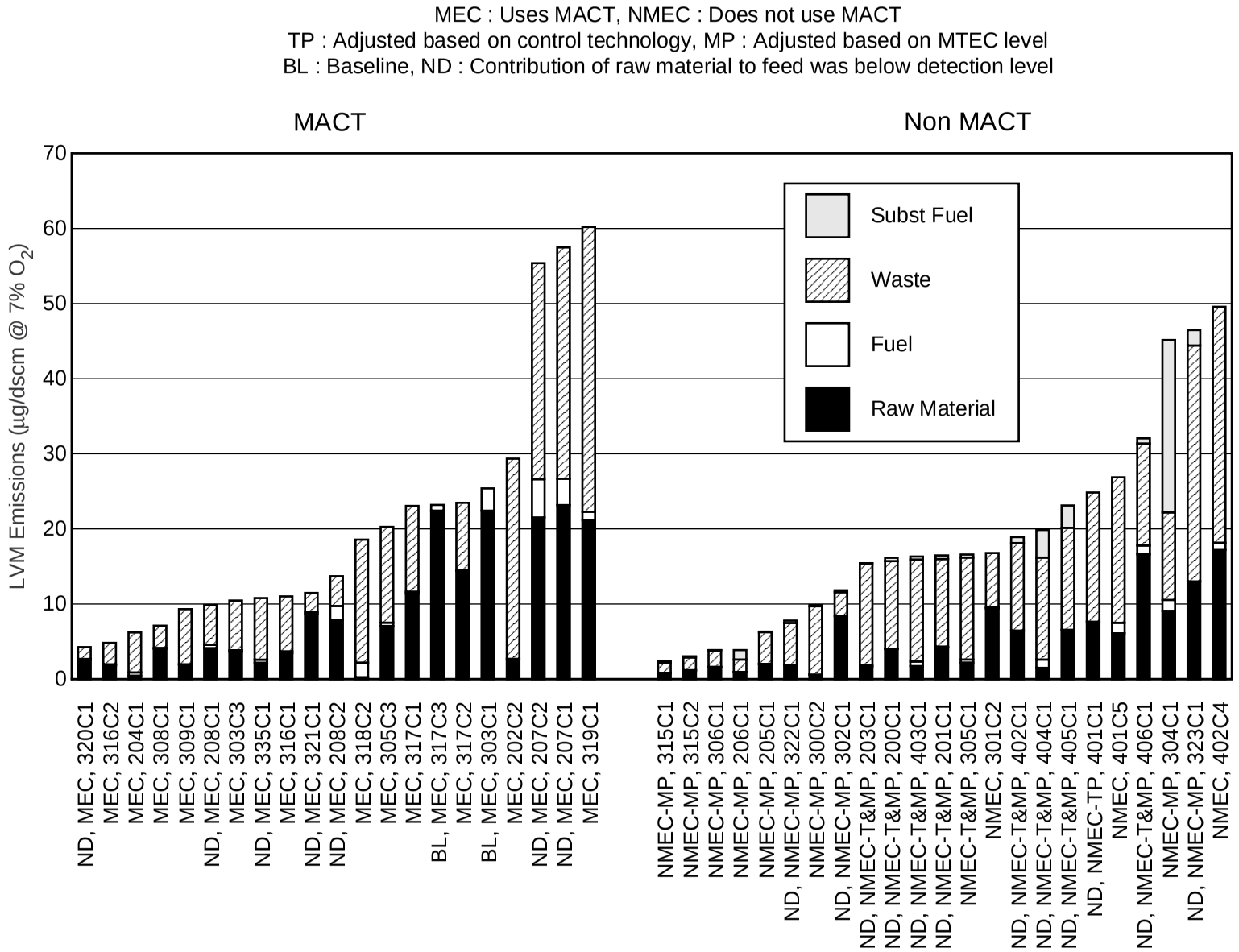

Figure 3-1. Contribution of feed streams to stack emissions of LVM for cement kilns.

TABLE 3-1. 50th AND 90th EMISSION PERCENTILES ASSUMING AVERAGE RANK BASED AND ZERO EMISSION SUBSTITUTIONS (USING ND DATA @ FULL DETECTION LIMIT)

Substance	System Type	Units	Emiss Conc (Avg Rank Substitution)		Emiss Conc (0-Substitution)	
			50th Percentile	90th Percentile	50th Percentile	90th Percentile
LVM	CK	ug/dscm 7%O_2	28.91	152.91	26.50	149.67
LVM	INC	ug/dscm 7%O_2	63.72	659.97	56.12	598.98
LVM	LWAK	ug/dscm 7%O_2	54.51	218.35	54.51	218.35
SVM	CK	ug/dscm 7%O_2	138.63	1607.98	138.63	1607.98
SVM	INC	ug/dscm 7%O_2	104.48	2036.09	85.23	1877.00
SVM	LWAK	ug/dscm 7%O_2	27.95	621.83	27.95	621.83
TCl	CK	ppmv 7%O_2	11.16	103.12	11.15	103.00
TCl	INC	ppmv 7%O_2	8.06	139.10	7.02	120.92
TCl	LWAK	ppmv 7%O_2	203.06	3369.76	203.06	3369.76

SECTION 4

METAL AND CHLORINE SPIKING

According to the boiler and industrial furnace (BIF) Rule and the EPA's Metals Guidance, metals emissions from BIFs and incinerators burning hazardous wastes are required to be tested in trial burns according to three tiers. Tier I assumes all of the metal fed to the incinerator or the BIF is emitted to the atmosphere and does not provide credit for the amount of metal captured in the system (in bottom ash and collected air pollution control equipment ash). For Tier I, a facility can set its feed rate limit for each metal according to the safe emission limits established by the BIF rule or the Metals Guidance which are based on general conservative EPA risk analysis. A facility can also conduct site specific risk assessment and modify the EPA risk limits according to their site. A facility can then choose to comply with adjusted Tier I (or Tier IA) limits to set maximum feed rates.

For metals with desired feed rates higher than EPA's Tier I or Tier IA limits, a facility has to comply with either Tier II or Tier III. Both of these tiers require a facility to demonstrate that emissions of metals are below established EPA limits by conducting a trial burn and measuring metals emissions at the stack. Additionally, the trial burn must be conducted at maximum desired metals feed rates (which in most cases requires metal spiking) and the system must operate at conditions which maximize metals emissions. Tier II emission limits are based on general conservative EPA risk limits, while Tier III limits are based on site specific risk assessment. Both Tier II and III allow credit for the portion of metals captured in the system.

As indicated above, Tier II and III metals are tested at maximum desired feed rates which are typically achieved by spiking the metals during a trial burn. Under normal operating conditions, however, the feed rates of metals are generally below the spiked feed rates and are often much below them. The analyses performed in this program are based on trial burn data where, particularly for CKs and LWAKs, facilities spiked Tier II and III metals. Thus, the spiking practice may have an impact on the results from the various analyses performed. The average percentage attributable to spiking of HAPs per condition for all source categories is shown in Table 2-1. This

table also shows the percentage of each HAP attributable to waste feed. The percentage of spiking for HAPs was obtained from the reports by identifying feed streams where HAPs were spiked and relating that to the total feed rate of each HAP for a given run. This section explores the possible impacts of HAPs spiking on the results from the various analyses performed in this program.

4.1 MACT ANALYSIS

Details of the MACT procedure and analysis for all HAPs and source categories are presented and discussed in the *Technical Support Document for HWC MACT Standards, Volume III: Selection of MACT Standards and Technologies*. A brief description of the MACT analysis is also presented in Section 2.1 of this report. The percentage attributable to spiking of HAPs per condition for each source category, shown in Table 2-1, was not considered in the selection of MACT pool facilities nor in the selection of the MACT EU. As Table 2-1 shows, spiking percentages dominate most of the conditions for LVM and SVM from CKs and LWAKs. The information available from reports appear to indicate that LVM and SVM spiking in incinerators was not as significant as for CKs and LWAKs. Additionally, spiking information shows that most of the facilities for all three source categories did not spike Hg or chlorine. For chlorine, since many wastes, particularly liquid wastes, have high chlorine concentrations, there is no reason to spike chlorine.

It is difficult to make a conclusive statement on how spiking may have impacted the MACT results. However, in general, if facilities did not spike metals and chlorine during trial burns, there is a possibility that the MACT pool facilities and corresponding MACT-defining HW MTECs may be different, which consequently may change the definition of MACT, MACT EU facilities, and correspondingly MACT floor levels. Although at first glance one may conclude that the use of data from spiked conditions may result in inflated floor levels (i.e., the use of non-spiked data resulting in lower MACT floor levels), it is difficult to generalize whether the MACT floor level will be higher or lower if non-spiked data were used. This is illustrated in the discussion below where spiking impact on specific HAPs and source category is discussed based on Table 2-1 results.

4.1.1 LVM

Table 2-1 indicates that 54% and 81% of the feed rates in two out of the three MACT pool facilities for LVM from CKs are attributable to spiking, and that most MACT EU and non-MACT facilities also have high spiking percentages. The non-spiked facilities are not generally the lowest emitting facilities even if their feed rates

were low (e.g., the low feed rate baseline 303C1 for LVM from CKs has a higher than median emission level). This uniform distribution of spiking across all stack gas emission levels makes it difficult to conclude how the MACT results would change if facilities did not spike LVM metals. For example, if the MACT analysis were performed with the LVM percentage attributable to spiking removed from both the feed rates and the emissions, both the MACT pool defining facilities and the MACT EU may change. MACT definition may change in two ways: removing spiking from feed rates may reduce the MACT-defining HW MTEC, and removing spiking from emissions may put another technology in the MACT pool. The MACT EU may change similarly: although removing spiking from emissions can only lower emissions from an individual facility, removing spiking from feed rates may include new (possibly higher emitting) facilities, as may include new technologies in the MACT definition.

It is interesting to note that the current highest emitting MACT EU facility for LVM from CKs (319C1, which sets the floor limit) has 0% spiking, which makes it tempting to conclude that spiking does not impact the floor. However, if the MACT analysis were performed again using non-spiked data, there is no guarantee that the same facility (319C1) would remain the determining MACT floor facility. This discussion for LVM from CKs can be generalized to also include LVM from INCs and LWAKs.

4.1.2 SVM

The above discussion for LVM from CKs can be generalized to also include SVM from CKs, INCs, and LWAKs.

4.1.3 Mercury

For CKs, the spiking of Hg occurs significantly (>6% of the total) in only two facilities. These two facilities are not MACT pool facilities (i.e., the MACT pool facilities did not spike Hg) and, thus, the current MACT EU for Hg is based on facilities that did not spike Hg. Therefore, unless the emissions from these two facilities decrease sufficiently to become part of the lowest 6% emitting facilities if the MACT analysis were performed without spiking, the MACT standards for Hg from CKs are not likely to change. A similar conclusion can be drawn for the Hg standards for INCs and LWAKs.

4.1.4 TCl

Although, relative to LVM and SVM, not many CK and INC facilities spiked chlorine, the spiked facilities are distributed across all emission levels. Therefore, the possible impacts of considering only non-spiked data on the MACT standards for TCl from CKs and LWAKs are similar to those discussed earlier for LVM and SVM for all source categories. For LWAKs, some of the TCl MACT pool facilities have contributions from spiking while all of the MACT EU and the non-MACT facilities did not spike chlorine. Thus, if only non-spiked feed rates and emissions are to be considered, the technologies will remain the same and the MACT-defining HW MTEC may become lower. The consequence of this scenario is to possibly include fewer MACT EU facilities and, thus, potentially decrease the MACT floor level.

4.2 NATIONAL EMISSIONS AND COST ESTIMATES

The methodology and procedure for estimating national emissions of HAPs from combustion sources and national cost for meeting the proposed floor and beyond the floor limits are explained in the *Technical Support Document for HWC MACT Standards, Volume V: Engineering Costs*. The potential impact of metals and chlorine spiking on national emissions and cost estimates can be assessed from Table 2-3. This table shows that approximately over 50% of the national emissions estimate for LVM from CKs and SVM from CKs and LWAKs, and approximately 29% for Hg from LWAKs may be attributable to the fact that metals in these groups were spiked during trial burns. Since national emissions are roughly proportional to average emissions, this means that the national emissions estimate for these cases may be an overestimate of emissions under normal operating conditions. Other average spiking percentages in Table 2-3 are lower and range between approximately 5% to 15% for Hg from CKs and INCs, and for LVM and SVM from INCs; and are on the order of 8% for TCl from all source categories.

Since national emissions estimates for HAPs and source categories were used to calculate emission reduction requirements and subsequently to estimate national costs for meeting the proposed standards, similar qualitative conclusions to the above can be drawn regarding the impact of spiking on national cost estimates.

4.3 50th AND 90th EMISSION PERCENTILES USED FOR RISK ANALYSIS

The 50th and 90th emission percentile results for metals and other HAPs are provided in the *Technical Support Document for HWC MACT Standards, Volume V: Engineering Costs*. A brief description of this analysis is also provided in Section 2.3

of this report. Based on the distribution of spiking percentages and their magnitudes, as shown in Table 2-1, for Hg and TCl from all source categories, and possibly for LVM and SVM from INCs, the changes in the 50th and 90th emission percentiles due to considering only non-spiked feed rates and emissions is likely to be insignificant. However, it is very likely that the 50th / 90th emission percentiles for LVM and SVM from CKs and LWAKs may be different if only non-spiked feed rates and emissions were considered in the analysis.

4.4 EMISSION DISTRIBUTION BASED ON WASTE, FUEL, AND RAW MATERIAL FEED ("BAR CHARTS")

The methodology, procedure, and results for the "bar charts" are presented in the *Technical Support Document for HWC MACT Standards, Volume III: Selection of MACT Standards and Technologies*. Additionally, the "bar charts" procedure was summarized and examples were shown in Section 2.4 and 3.4 of this report. The contribution of hazardous waste feed for these bar charts included the contribution of both the HAP feed in the waste and in the spike streams. Therefore, the obvious conclusion is that the ratio of emissions due to hazardous waste feed relative to emissions attributable to other feed streams for conditions with considerable contribution of spiking may be an overestimate of the ratio under normal operating conditions. As shown in Table 2-1, results for LVM and SVM from CKs and LWAKs will be impacted the most, while the impact on the results for Hg and TCl from all source categories, and possibly for LVM and SVM from INCs, may be minor.

SECTION 5

SUPPORT FOR SELECTION OF METALS VOLATILITY GROUPS

Analyses of metals data for the various tasks of the program were performed for three major groups of metals which represent the toxic metals of concern. These are the low-volatility metals (LVM) group including Sb, As, Be, and Cr; the semi-volatility metals (SVM) group encompassing Cd and Pb; and the high-volatility metals group represented by Hg. These groups were segregated by volatility behavior such that metals within each group have similar volatilities. These metals volatility groupings chosen for the proposed rule were primarily based on metals partitioning and enrichment data from cement kilns as well as on metals penetration ranking from all combustion systems as will be discussed later in this section.

The list of hazardous constituents under the Resource Conservation and Recovery Act (RCRA), Appendix VIII of §261, includes 12 metals of concern (Sb, As, Be, Cd, Cr, Pb, Hg, Ni, Se, Ag, Tl, and Ba) while the list in Section 112(b) of the Clean Air Act Amendment of 1990 (CAAA) includes 11 metals of concern (Sb, As, Be, Cd, Cr, Pb, Hg, Ni, Se, Co, and Mn). Between these two hazardous constituents lists, there are a total of 14 toxic metals that are classified to potentially pose a hazard to human health. The rationale for choosing only 7 out of 14 metals for the proposed rule (Sb, As, Be, Cd, Cr, Pb, and Hg) is based upon two points: first, these metals are common to both RCRA and CAAA lists and, second, they have sufficient data from trial burns for MACT and other analyses to be performed. Therefore, the reasons for not including the other 7 metals are:

- Ba, Ag, and Tl are RCRA metals but are not on the CAAA HAPs list,
- Co and Mn are CAAA metals but are not RCRA metals, and
- although Se and Ni are common to both RCRA and CAAA HAPs lists, they do not have enough data from trial burns to perform the various analyses of this

program.

Factors associated with not including some of the above metals in either the RCRA or CAAA lists include lack of health and toxicity data, lack of risk data, or lack of emissions data.

Choosing the number of volatility groups and the metals to include in each group may depend on the availability of metals measured data, the type of combustion systems tested, and the judgment of the researcher. For example, the European Union has established three groupings to control metals emissions from hazardous waste incineration units. One group includes only Hg, a second group consists of Cd and Tl, and the third group includes Sb, As, Cr, Co, Cu, Pb, Mn, Ni, Sn, and V. Comparing the European metals groupings to the 7 metals groupings for the proposed rule indicates that including Pb with low volatility metals in the European groupings is different from including Pb in the LVM group in the proposed rule. Additionally, Be is not grouped at all in the European rules while it is included in the LVM group in the proposed rule.

If the other 7 non-grouped metals (Se, Tl, Ag, Ba, Ni, Mn, and Co) were to be included in the three volatility groupings of the proposed rule, these metals (based on the data presented in Sections 5.1 and 5.2 below) would most likely fit in the three groups as follows:

- Se would be grouped with Hg in the high volatility metals group,
- Tl would be grouped with Cd and Pb in the SVM group, and
- Ag, Ba, Ni, Mn, and Co would be grouped with Sb, As, Be, and Cr in the LVM group.

Note that including Mn and Co in the LVM group was not based on information from trial burns since these metals were not measured during these tests, but was based on theoretical predicted volatility. Also note that the above locations of the non-grouped metals are similar to their locations in the European groupings; i.e., the European groupings include Tl with the semi-volatile metals and include Co, Mn, and Ni in the low-volatility metals group.

The remainder of this section contains three subsections. The first two present support for selection of the proposed rule volatility groupings based on metals partitioning and enrichment analyses performed on CKs trial burn data as well as on metals penetration ranking analysis performed on data from all combustion devices. The third and last subsection presents average and median contributions of elements

to emissions and feed rates of LVM, SVM, and TCl based on the analysis performed on data from all source categories.

5.1 METALS PARTITIONING AND ENRICHMENT

Metals cannot be destroyed in a combustion system. Thus, they must exit the system by any of several pathways including the bottom ash (or clinker), collected air pollution control device (APCD) particulate matter, or stack emissions. In the combustion process, metals are subjected to high temperatures where, depending on the thermodynamic properties of the metals and on the local conditions, a portion of the metals may react and/or vaporize. They may also partition to the gas phase by solid particulate entrainment. Metals which partition to the gas by entrainment are typically relatively large (above 1 μm in diameter) and are effectively removed in most particulate control devices. Metals which vaporize are swept away with the combustion gas and, as the gas cools, they tend to condense and/or nucleate to form very fine (below 1 μm in diameter) particles which are in the size range that is least effectively removed in most particulate control devices. Thus, metals with similar volatility should behave similarly in an air pollution control system.

Based on the above discussion, partitioning of metals within a combustion system can be a primary indicator of metals volatility. The metals volatility groupings chosen for the proposed rule were primarily based on partitioning data from cement kilns as shown in Figure 5-1. They include:

- Highly-volatile metals including mercury (Hg) which partition substantially to the stack and require adsorption or absorption flue gas cleaning devices,
- Semi-volatile metals including cadmium (Cd) and lead (Pb) which partition primarily to particulate matter (PM) captured in a PM control device which can effectively remove fine particulate matter, and
- Low-volatile metals including antimony (Sb), arsenic (As), beryllium (Be), and chromium (Cr) which partition primarily to the clinker (or bottom ash in an incinerator) and are controllable by a wide variety of PM control devices.

The partitioning analysis was limited to cement kilns because trial burn concentration measurements of metals from various feed and exit streams were not sufficiently available from other combustion systems (such as incinerators and LWAKs) to perform similar metals partitioning analysis. For the partitioning analysis, data which were reported below detection limits in CK trial burns were considered at full detection limit in all feed and exit streams.

Metals enrichment in a combustion system is another primary indicator of metals volatility during combustion of hazardous wastes. Metals enrichment is defined here as the ratio of metals concentration in the collected APCD ash (or dust in cement kilns) to the concentration of the same metals in the clinker (or the bottom ash for incinerators). Therefore, the calculation of metals enrichment requires measurements of metals in both the collected ash and the clinker (or bottom ash). Such information was only available from cement kilns and, therefore, the enrichment analysis of metals was also limited to cement kilns. This enrichment analysis was performed only using detected data (i.e., ND reported data were eliminated from the enrichment analysis).

Table 5-1 shows the average, maximum, and minimum metals enrichment results for each condition for cement kilns ranked from low to high according to average enrichments. Additionally, Table 5-2 summarizes the average and median enrichment of all measured conditions for each metal. The metals enrichment results in Table 5-2 are ranked by median enrichment and show that the median enrichments for Cr, Be, Sb, and As are on the order of one, while for Cd and Pb are on the order of 100. It is expected that low-volatile metals do not vaporize significantly during combustion and that their emissions and collected APCD ash/dust are primarily due to entrainment of particulate matter and, therefore, their concentrations in the clinker and the APCD dust should be similar. Consequently, their enrichment should be on the order of one. This is clearly illustrated in Table 5-2 supporting the selection of these four metals in the LVM group. In contrast, when a metal completely vaporizes in the combustion zone, it is expected that its concentration in the clinker would be depleted and its concentration in the collected ash would be enriched. This is also clearly illustrated in Table 5-2 for Cd and Pb which have enrichment factors on the order of 100, thus supporting their classification as semi-volatile metals (metals which vaporize during combustion but condense/nucleate entirely prior to the APCD).

Highly volatile metals are expected to vaporize completely in the combustion zone and remain mainly in the vapor phase even at the inlet to the particulate APCD. Therefore, in the absence of a vapor phase metal scrubbing APCD, highly volatile metals are emitted primarily as vapors; and the enrichment (as defined in this report) of these metals will not be high since the collected ash will not have significant concentration of these metals. This is the case for Hg which shows a median enrichment of 5 because it is mainly in the vapor phase as it passes the APCD and is emitted primarily in the vapor phase (see partitioning of Hg in Figure 5-1).

5.2 METALS PENETRATION RANKING

Although the selection of metals volatility groupings was based primarily on

partitioning and enrichment data from cement kilns, the above metals volatility groupings are justified for use on other hazardous waste combustors (HWCs) based on the analysis presented in Table 5-3 where emissions from each run from all types of devices were ranked according to penetration (1 - system removal efficiency -- SRE) and the rankings were averaged to develop a composite ranking of the relative penetrations (or inverse SREs) of metals. Note that this ranking corresponds exactly with the metals volatility groupings in that:

- Hg, the high volatility metal, has the highest penetration; followed by
- Cd, (Tl - not grouped), and Pb, the semi-volatile metals; followed by
- Sb, (Ag and Ba - not grouped), Cr, As and Be, the low volatility metals.

In conclusion, based on metals partitioning and enrichment results from cement kilns as well as on metals penetration ranking from all combustion sources, it is clear that the choice of metals selection for the three metals volatility groupings presented in this report is reasonable, particularly for cement kilns. For low combustion temperature INCs and LWAKs, however, the line between SVM and LVM may be drawn differently than for higher temperature CKs. For example, the European rules for incinerators, discussed earlier, consider Pb a low-volatile metal instead of a semi-volatile metal. This may be due to reduced Pb volatility during lower incineration temperatures.

5.3 CONTRIBUTION OF ELEMENTS TO EMISSIONS AND FEED RATES OF LVM, SVM, AND TCl GROUPS

Once the metals and chlorine groupings were established, the emissions and feed rates for the LVM, SVM, and TCl groups were calculated for each run based on emissions and feed rates of the various elements in each group. As discussed in earlier sections, LVM and SVM emissions were calculated by simply adding the contributions of the elements within each group. When emissions data were not available for any element within a group, average ranking based substitution was performed (as discussed in Section 3 of this report). LVM and SVM feed rates for each run were also calculated by adding the contributions of elements within each group, but when feed rate data were missing, zero was substituted. For TCl emissions, the same ranking based substitution methodology was used, but the TCl emission per run was calculated as the sum of HCl emission and twice the reported Cl_2 emission to obtain an emission concentration corresponding to total chloride (Cl) concentration. Feed rate substitution was not necessary to obtain TCl feed rates since total chlorine feed rates were reported in trial burns.

Based on the above groupings, the contribution of each element to emissions and feed rates of LVM, SVM, and TCl was calculated for each run and then averaged per condition for all source categories. The average and median contributions to emissions and feed rates based on all conditions were then calculated for all groups and source categories and are summarized in Tables 5-4 and 5-5, respectively. For each group and source category, Table 5-4 shows the average and median emissions of the group and also the average and median percentage contributions of the various elements to the emission of the group. Similarly, Table 5-5 shows the average and median feed rates of each group and the average and median percentage contributions of the various elements to the feed rate of the group. Table 5-4 indicates that:

- Cr dominates the contribution to the LVM group emissions for all source categories (above 50% on average); Pb dominates the contribution to the SVM group (on average, above 80% for CKs and INCs, and 64% for LWAKs); and HCl dominates the contribution to the TCl group for all source categories (above 80% on average).
- Sb has a significant contribution to the LVM group emissions for all source categories (approximately 30% on average).
- Cd has a significant contribution to the SVM group emissions for LWAKs (36% on average).

Table 5-5 indicates that Cr also dominates the contribution to the LVM group feed rates for all source categories (above 50% on average), but the contribution of Sb to feed rates of the LVM group is not as significant (ranges between 8 % to 22% for all source categories) as its 30% average contribution to the LVM group emissions for all source categories. Similarly Table 5-5 shows that Pb is the dominant contributor to the SVM group feed rates (above 70% on average for all source categories), but Cd is not a significant contributor to the SVM group feed rates for LWAKs (only 9% on average) in comparison to its 36% average contribution to the SVM group emissions.

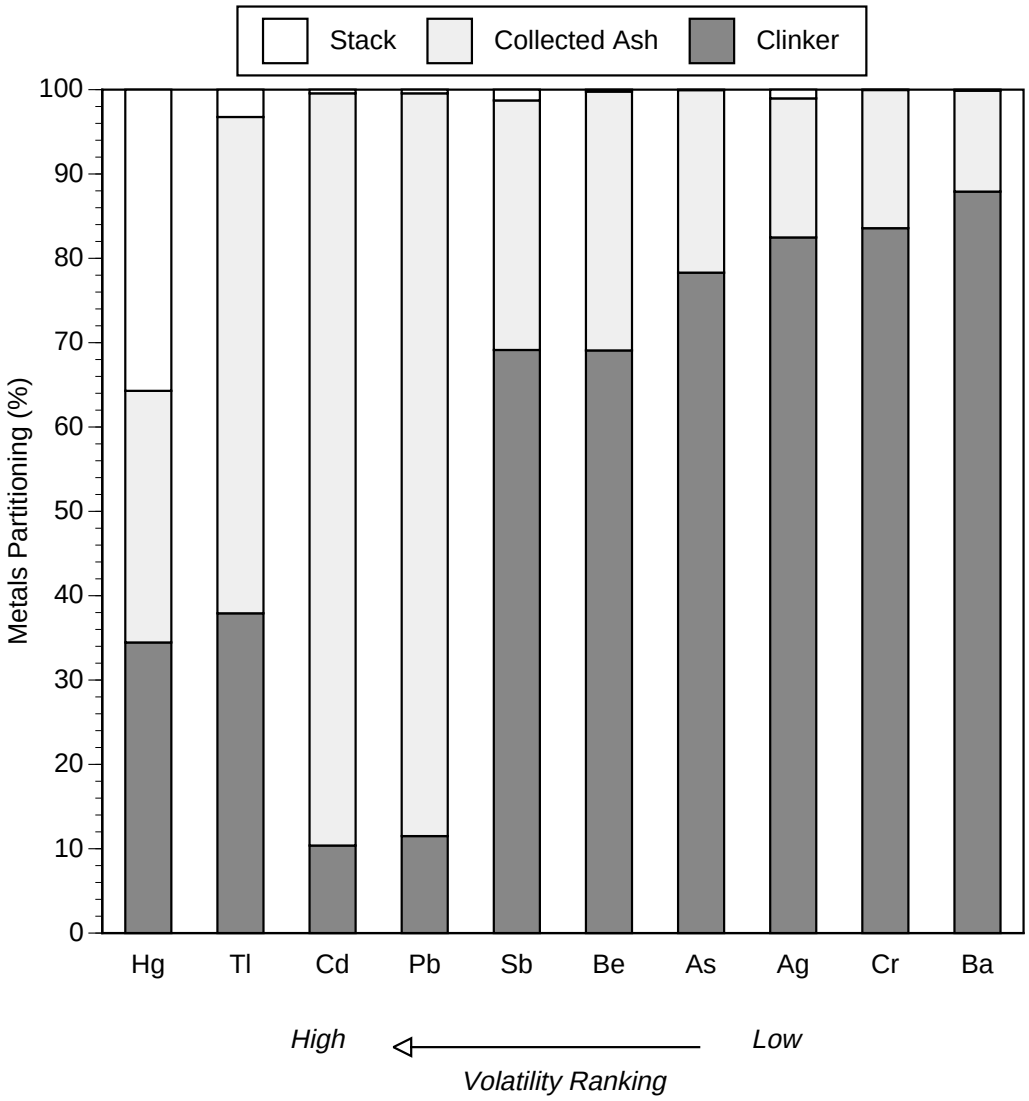

Figure 5-1. Metals partitioning in cement kilns burning hazardous wastes.

TABLE 5-1. ENRICHMENT (CONCENTRATION RATIO OF FF/ESP ASH TO CLINKER) OF METALS IN CEMENT KILNS (DETECTED DATA ONLY)

Substance	Cond ID	**Avg Enrichment**	Max Enrichment	Min Enrichment
Antimony	402C4	**0.73**	1.00	0.40
Antimony	315C1	**0.78**	0.81	0.73
Antimony	315C2	**0.83**	0.98	0.54
Antimony	319C1	**0.91**	0.91	0.91
Antimony	315C3	**0.93**	1.03	0.85
Antimony	205C1	**1.00**	1.06	0.97
Antimony	304C1	**1.05**	1.05	1.05
Antimony	206C1	**1.10**	1.34	0.84
Antimony	303C3	**1.50**	1.96	1.20
Antimony	403C1	**1.50**	1.50	1.50
Antimony	401C1	**2.09**	2.09	2.09
Antimony	300C2	**8.23**	16.34	3.81
Arsenic	300C2	**0.44**	0.62	0.28
Arsenic	303C3	**0.61**	0.66	0.58
Arsenic	304C1	**0.81**	0.81	0.81
Arsenic	402C1	**0.83**	1.00	0.64
Arsenic	303C1	**0.88**	1.08	0.60
Arsenic	205C1	**0.93**	1.01	0.86
Arsenic	402C4	**1.00**	1.14	0.85
Arsenic	315C3	**1.10**	1.14	1.03
Arsenic	315C1	**1.15**	1.23	1.09
Arsenic	401C5	**1.19**	1.53	0.99
Arsenic	315C2	**1.21**	1.49	0.96
Arsenic	319C1	**1.21**	1.21	1.21
Arsenic	306C1	**1.23**	1.67	0.94
Arsenic	206C1	**1.40**	1.50	1.31
Arsenic	403C1	**1.49**	1.60	1.25
Arsenic	405C1	**1.69**	2.45	1.43
Arsenic	404C1	**1.78**	2.11	1.25
Arsenic	406C1	**3.26**	3.26	3.26
Barium	401C1	**0.51**	0.66	0.36
Barium	304C1	**0.56**	0.56	0.56
Barium	401C5	**0.60**	0.72	0.53
Barium	303C1	**0.67**	0.77	0.62
Barium	402C1	**0.68**	0.86	0.59
Barium	319C1	**0.68**	0.68	0.68
Barium	402C4	**0.73**	0.82	0.67
Barium	303C3	**0.73**	0.80	0.62
Barium	406C1	**0.74**	0.89	0.65
Barium	300C2	**0.79**	1.04	0.41
Barium	315C1	**0.80**	0.82	0.76
Barium	315C2	**0.81**	0.85	0.79
Barium	315C3	**0.82**	0.83	0.81
Barium	206C1	**0.96**	1.09	0.74
Barium	306C1	**1.10**	1.19	1.00

TABLE 5-1. ENRICHMENT (CONCENTRATION RATIO OF FF/ESP ASH TO CLINKER) OF METALS IN CEMENT KILNS (DETECTED DATA ONLY)

Substance	Cond ID	**Avg Enrichment**	Max Enrichment	Min Enrichment
Barium	405C1	**1.12**	1.24	1.09
Barium	205C1	**1.29**	1.44	1.20
Barium	404C1	**1.46**	2.45	0.73
Barium	403C1	**1.67**	2.15	1.37
Beryllium	306C1	**0.22**	0.25	0.20
Beryllium	304C1	**0.45**	0.45	0.45
Beryllium	303C3	**0.45**	0.47	0.43
Beryllium	300C2	**0.49**	0.61	0.38
Beryllium	315C1	**0.64**	0.78	0.39
Beryllium	319C1	**0.71**	0.71	0.71
Beryllium	303C1	**0.73**	0.92	0.58
Beryllium	402C4	**0.79**	1.00	0.16
Beryllium	401C1	**0.85**	1.00	0.71
Beryllium	206C1	**0.91**	1.08	0.78
Beryllium	205C1	**0.94**	1.04	0.89
Beryllium	315C3	**1.01**	1.10	0.90
Beryllium	402C1	**1.05**	1.67	0.71
Beryllium	315C2	**1.12**	1.22	1.07
Beryllium	404C1	**1.81**	3.09	0.57
Beryllium	405C1	**2.13**	3.00	1.82
Beryllium	403C1	**2.76**	3.15	2.31
Beryllium	406C1	**14.00**	14.00	14.00
Cadmium	303C1	**1.39**	1.94	0.99
Cadmium	300C2	**29.79**	40.41	15.84
Cadmium	303C3	**55.85**	57.62	53.46
Cadmium	205C1	**98.03**	108.92	87.13
Cadmium	306C1	**102.00**	102.00	102.00
Cadmium	319C1	**133.72**	133.72	133.72
Cadmium	402C4	**916.13**	1222.22	342.31
Chromium	300C2	**0.28**	0.43	0.16
Chromium	303C1	**0.31**	0.38	0.25
Chromium	403C1	**0.36**	0.40	0.31
Chromium	401C1	**0.38**	0.52	0.30
Chromium	401C5	**0.39**	0.46	0.28
Chromium	306C1	**0.43**	0.50	0.36
Chromium	404C1	**0.47**	0.63	0.24
Chromium	402C1	**0.53**	0.53	0.51
Chromium	402C4	**0.53**	0.76	0.34
Chromium	304C1	**0.58**	0.58	0.58
Chromium	303C3	**0.62**	0.74	0.51
Chromium	206C1	**0.70**	0.85	0.55
Chromium	319C1	**0.74**	0.74	0.74
Chromium	406C1	**0.78**	1.38	0.56
Chromium	315C1	**0.84**	0.89	0.81
Chromium	315C3	**0.85**	0.98	0.74

TABLE 5-1. ENRICHMENT (CONCENTRATION RATIO OF FF/ESP ASH TO CLINKER) OF METALS IN CEMENT KILNS (DETECTED DATA ONLY)

Substance	Cond ID	**Avg Enrichment**	Max Enrichment	Min Enrichment
Chromium	205C1	**0.90**	1.02	0.80
Chromium	315C2	**0.91**	0.93	0.88
Chromium	405C1	**1.24**	1.47	1.07
Lead	303C1	**4.99**	6.69	3.63
Lead	315C3	**15.16**	17.21	12.10
Lead	401C1	**17.89**	29.29	7.74
Lead	303C3	**22.72**	36.27	14.80
Lead	315C2	**22.88**	24.31	20.77
Lead	315C1	**28.90**	37.87	24.29
Lead	406C1	**34.00**	34.00	34.00
Lead	402C1	**72.95**	129.41	39.29
Lead	405C1	**124.14**	165.00	100.00
Lead	319C1	**140.24**	140.24	140.24
Lead	304C1	**201.69**	201.69	201.69
Lead	206C1	**247.86**	313.84	192.47
Lead	402C4	**260.59**	425.00	91.18
Lead	306C1	**302.69**	362.96	242.42
Lead	205C1	**576.23**	756.88	436.92
Lead	300C2	**726.91**	1101.46	429.60
Lead	401C5	**1086.06**	1444.44	647.06
Mercury	402C1	**0.01**	0.01	0.01
Mercury	406C1	**5.00**	5.00	5.00
Mercury	303C3	**5.24**	6.28	4.07
Mercury	402C4	**8.63**	10.50	7.00
Mercury	401C1	**11.75**	11.75	11.75
Nickel	206C1	**0.57**	0.72	0.42
Nickel	205C1	**0.91**	0.96	0.87
Silver	401C1	**0.75**	0.75	0.75
Silver	402C1	**0.85**	1.33	0.36
Silver	315C1	**1.41**	1.70	0.98
Silver	315C2	**1.57**	1.97	1.24
Silver	205C1	**1.77**	1.77	1.77
Silver	315C3	**1.94**	3.09	0.95
Silver	406C1	**2.50**	2.50	2.50
Silver	319C1	**3.59**	3.59	3.59
Silver	303C3	**4.49**	5.44	2.67
Silver	402C4	**7.40**	14.71	0.33
Silver	303C1	**10.87**	10.87	10.87
Silver	300C2	**31.24**	42.53	20.72
Thallium	402C4	**1.11**	1.33	1.00
Thallium	206C1	**1.40**	1.40	1.40
Thallium	315C1	**1.42**	1.42	1.42
Thallium	315C2	**3.24**	3.24	3.24
Thallium	303C1	**129.30**	129.30	129.30
Thallium	303C3	**219.18**	315.54	142.15

TABLE 5-2. AVERAGE AND MEDIAN ENRICHMENT FACTORS BASED ON ALL CONDITIONS FOR EACH METAL IN CEMENT KILNS (DETECTED DATA ONLY)

Substance	Average Enrichment	Median Enrichment
Chromium	0.62	**0.58**
Nickel	0.74	**0.74**
Barium	0.88	**0.79**
Beryllium	1.72	**0.88**
Antimony	1.72	**1.03**
Arsenic	1.23	**1.17**
Silver	5.70	**2.22**
Thallium	59.28	**2.33**
Mercury	6.12	**5.24**
Cadmium	190.99	**98.03**
Lead	228.58	**124.14**

TABLE 5-3. PENETRATION RELATIVE RANKING OF METALS FOR ALL COMBUSTION SYSTEMS

	Hg	Cd	Tl	Pb	Sb	Ag	Ba	Cr	As	Be	Avg Rank	# Comparisons
Hg		78%	80%	80%	83%	90%	85%	79%	85%	90%	83%	1067
Cd	22%		52%	61%	61%	66%	68%	68%	75%	87%	62%	1402
Tl	20%	48%		59%	55%	47%	70%	66%	60%	78%	56%	540
Pb	20%	39%	41%		50%	61%	65%	63%	64%	84%	54%	1416
Sb	17%	39%	45%	50%		46%	61%	66%	57%	67%	50%	838
Ag	10%	34%	53%	39%	54%		56%	55%	54%	74%	48%	571
Ba	15%	32%	30%	35%	39%	44%		50%	62%	73%	42%	1006
Cr	21%	32%	34%	37%	34%	45%	50%		56%	54%	40%	1359
As	15%	25%	40%	36%	43%	46%	38%	44%		47%	37%	1027
Be	10%	13%	22%	16%	33%	26%	27%	46%	53%		27%	794

TABLE 5-4. AVERAGE AND MEDIAN CONTRIBUTIONS OF ELEMENTS TO EMISSIONS OF LVM, SVM, AND TCl

System Type >>	Cement Kilns		Incinerators		LWA Kilns	
Substance	**Average**	**Median**	**Average**	**Median**	**Average**	**Median**
LVM (ug/dscm @ 7%O_2)	*64.09*	*23.47*	*1853.71*	*57.73*	*98.95*	*59.61*
Sb (%)	29	20	31	21	30	18
As (%)	14	9	14	9	12	11
Be (%)	3	1	3	1	2	1
Cr (%)	54	57	51	54	56	64
SVM (ug/dscm @ 7%O_2)	*575.78*	*150.83*	*1464.26*	*89.34*	*293.22*	*10.23*
Cd (%)	18	12	17	13	36	31
Pb (%)	82	88	83	87	64	69
TCl (ppmv @ 7%O_2)	*33.27*	*21.77*	*59.46*	*7.36*	*789.95*	*853.21*
HCl (%)	89	96	80	88	93	98
Cl (%)	11	4	20	12	7	2

TABLE 5-5. AVERAGE AND MEDIAN CONTRIBUTIONS OF METALS TO FEED RATES OF LVM AND SVM

System Type >>	Cement Kilns		Incinerators		LWA Kilns	
Substance	**Average**	**Median**	**Average**	**Median**	**Average**	**Median**
LVM Feedrate (lb/hr)	*44.93*	*33.97*	*6.86*	*0.28*	*4.67*	*4.12*
Sb (%)	14	6	22	13	8	5
As (%)	16	14	20	14	26	24
Be (%)	1	1	4	1	3	2
Cr (%)	69	74	55	57	63	59
SVM Feedrate (lb/hr)	*38.20*	*27.15*	*11.66*	*0.28*	*14.63*	*12.50*
Cd (%)	13	8	30	11	9	8
Pb (%)	87	92	70	89	91	92