MEMORANDUM

Date: January 14, 1997

Subject: MACT Floor For Continuous Processes

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To: Miscellaneous Organic NESHAP Project File

According to the Clean Air Act, the MACT floor is defined as "the average emission limitation achieved by the best performing 12 percent of the existing sources (for which the Administrator has emissions information),..." The EPA has interpreted the word "average" in 59 FR 29196 as a measure of the "central tendency of a data set." The central tendency may be represented by the arithmetic mean, median, or some other measure that is reasonable. The purpose of this memorandum is to identify the central tendency of the best performing 12 percent of continuous miscellaneous organic sources using available emissions data.

Emissions data available for processes covered by the Miscellaneous Organic NESHAP (MON) are included in the MON database. The MON database includes detailed emissions data for miscellaneous organic processes in the following seven states: California, Illinois, Louisiana, New Jersey, North Carolina, Missouri, and Texas. Information for these states was obtained primarily through electronic emission databases maintained by the individual states.

Alpha-Gamma has completed MACT floor analyses for continuous processes covered by the Miscellaneous Organic NESHAP (MON). The MACT floors were determined for the following emission types: process vents, storage tanks, equipment leaks, and wastewater. The following paragraphs describe the methodology used in determining the MACT floors and discuss the results obtained. Datasheets supporting the results described below are included as attachments to this memorandum.

Continuous Process Vents

The MON database includes a total of 598 continuous process vents emitting organic HAP's. For continuous process vents, the total resource effectiveness (TRE) approach used in the Hazardous Organic NESHAP (HON) was adopted for determining the MACT floor. The equation used in these calculations is shown below.

$$TRE = \frac{(a + bQ_s + cH_t + dE_{TOC})}{E_{HAP}}$$

where,

a,b,c,d = regression coefficients;
TRE = Total Resource Effectiveness;
Q_s = vent stream flow rate at a standard temperature of 20°C (scmm);
H_t = vent stream net heating value (MJ/scm);
E_{TOC} = hourly emission rate of TOC minus methane and ethane (kg/hr); and
E_{HAP} = hourly emission rate of total organic HAP (kg/hr).

The values of factors a, b, c, and d used in TRE calculations were obtained from a memorandum included in the HON docket and are presented in Table 1. This memorandum is dated January 11, 1994 and titled "TRE Coefficients in the Final Rule."

Table 1. TRE Coefficients

Stream Type	Control	a	b	c	d
Nonhalogenated	Flare	1.935	3.66e-01	-7.69e-03	-7.33e-04
	Incin. (0% recovery)	1.492	6.27e-02	3.18e-02	-1.16e-03
	Incin. (70% recovery)	2.519	1.18e-02	1.30e-02	4.79e-02
Halogenated	Incin. with scrubber	3.995	5.20e-02	-1.77e-03	9.70e-04

The MON database is not complete with respect to the parameters required to calculate TRE. The following methods were used to fill critical data gaps:

Heating value (H_t): Heating value was not available for any vent. Vent stream net heating value was calculated by assuming an average heating value of 20,000 Btu/lb of VOC. This average value was obtained by examining heating values for several VOC's as given in the Chemical Engineer's Handbook by Perry and Chilton. Vent stream net heating value was calculated by multiplying the assumed heating value (20,000 Btu/lb) by total annual VOC emissions and dividing the result by annual vent stream flow volume.

Flow rate (Q_s): Flow rate data were not available for 272 vents. For these

vents, an average flow rate of 610 scmm was assumed. This flow rate was obtained by taking the average of flow rates for all vents (#326) for which flow rate data were available.

VOC data (E_{TOC}): VOC emissions data were not available for 181 vents. For these vents it was assumed that VOC emissions are equal to HAP emissions.

Vent stream flow rates at standard conditions were calculated using reported flow rates (acfm) and exhaust stack temperatures. Hourly emissions rates were calculated by dividing total annual uncontrolled emissions by annual hours of operation. Annual hours of operation were assumed to be 8,736 (24 hrs/day * 7 days/week * 52 weeks/yr) where operational data were not available.

In some cases, reported flow rates were suspect because they were unusually low. Alpha-Gamma verified the validity of these flow rates by calculating HAP and VOC concentrations. Flow rates were refined assuming 100 percent saturation in cases where VOC and HAP concentrations were in excess of 100 percent. A VOC molecular weight of 50 lb/lb-mole was assumed in VOC concentration calculations. This value represents an average molecular weight for HAP's in the MON database.

The MACT control for continuous process vents was considered to be a combustion device, e.g. flare, incinerator, thermal oxidizer, boiler, or afterburner. Of the 598 vents emitting organic HAP's, 74 (12.40 percent) are controlled by a combustion device. All vents controlled by a combustion device were designated as MACT-controlled vents.

In order to account for the methods used to fill the data gaps indicated above, the relative impacts of flow rate, heat content, and VOC emission rate on TRE were evaluated. Data used in these analyses were the same as those used to develop the coefficients shown in Table 1. Results obtained from these analyses are shown in Table 2. The results indicate that flow rate is the most critical parameter in TRE calculations. Heat content and VOC emission rates are not critical in accurate prediction of TRE. Hence, TRE calculations are not critically affected by assumptions regarding heat content and VOC emission rate. However, it is expected that any assumption with regards to flow rate critically affect TRE calculations. Note that flow rate data are available for only 55 percent of the vents. Therefore, while MACT floor results obtained from these vents can be treated with a high level of confidence, they may not be representative of all the vents in the database. In order to achieve better representation, MACT floor analysis was also performed for all the vents in the database by assuming an average flow rate for vents with no flow rate data.

Table 2. Regression Coefficients (R^2) For TRE

Stream Type	Control	Flow Rate	VOC Emissions	Heat Value
Nonhalogenated	Flare	0.99	0.45	0.04
	Incin. (0% recovery)	0.92	0.23	0.03
	Incin. (70% recovery)	0.93	0.43	0.03
Halogenated	Incin. with scrubber	0.68	0.00	0.05

The MACT floor was determined from the central tendency of calculated TRE values for the top 12 percent of process vents. The median was determined to be the best measure of central tendency because outliers led to unreasonable values for the mean, another measure of central tendency. A median TRE value of 0.8 was the central tendency of the data set covering only the vents with flow rate data. Additionally, a median TRE value of 1.2 was the central tendency of the data set covering all vents. Therefore, the MACT floor for continuous process vents can be represented by a TRE value between 0.8 and 1.2. For the purpose of arriving at a discrete number, the numbers 0.8 and 1.2 were averaged, and a TRE value of 1.0 was selected as the MACT floor for process vents.

Storage Tanks

The MON database includes emissions data for more than 1,000 storage tanks. The MACT floor for storage tanks was determined by categorizing tanks into three classes based on tank capacity: (10,000 - 20,000) gal, (20,000 - 40,000) gal, and $\geq$ 40,000 gal. These three tank capacity classes are consistent with the HON rule. Tank capacity data in the MON database are limited. Moreover, vapor pressure data for tanks located in New Jersey are not available due to lack of HAP-specific emissions data. The MACT floor for storage tanks may change based on additional data being gathered and pending review of the MON database by interested stakeholders.

The MACT control for storage tanks was considered to be an internal floating roof tank or a control device with an efficiency of 95 percent or greater. Based on this definition of MACT control, all tanks with an internal floating roof or with a control device having an efficiency of 95 percent or greater were designated as MACT-controlled tanks. Based on additional data being gathered, tanks controlled at levels less than 95 percent may also be designated as MACT-controlled.

The MACT floor for storage tanks is based on vapor pressure values of

MACT-controlled tanks. Vapor pressures were assigned based on the HAP emitted and not based on the material stored. The median was chosen as the measure of central tendency for vapor pressure values because outliers led to unreasonable values for the mean, another measure of central tendency. The MACT floor for storage tanks is shown in Table 3.

Table 3. MACT Floor for Storage Tanks

Class	Vapor Pressure Cutoff
(10,000 - 20,000) gallons	1.9 psia
(20,000 - 40,000) gallons	1.7 psia
>= 40,000 gallons	1.9 psia

Equipment Leaks

The MACT floor for equipment leaks is the Louisiana MACT determination for non-HON sources. The MACT floor is based on an estimate of total number of facilities nationwide that employ continuous processes. The MON database includes 20 facilities in Louisiana with continuous processes. These facilities are expected to comply with the Louisiana non-HON equipment leak requirements. Additionally, the MON database includes 42 facilities in California, Illinois, Missouri, New Jersey, North Carolina, and Texas that employ continuous processes. The 1993 TRIS database includes 565 facilities nationwide within the SIC codes covering MON processes. Out of these 565 facilities, 196 are located in California, Illinois, Missouri, New Jersey, North Carolina, and Texas. Therefore, the expected number of MON facilities nationwide that employ continuous processes is 120 (42×565÷196). The assumption made in this calculation is that the ratio of continuous processes to total processes is the same for the entire nation and California, Illinois, Missouri, New Jersey, North Carolina, and Texas combined. Assuming that facilities outside of Louisiana do not control equipment leaks, the top 12 percent (i.e., MACT Floor) of facilities nationwide is represented by the Louisiana facilities since Louisiana accounts for 17 percent (20÷120×100) of the facilities nationwide. Therefore, the MACT floor is the Louisiana MACT determination for non-HON sources.

Wastewater

The MON database includes emissions data for 26 facilities with wastewater sources. Consistent with the HON, the MACT control for wastewater sources was considered to be a steam stripper. All facilities with a steam stripper were designated as MACT-controlled. Based on data for wastewater sources (Attachment C), less than

12 percent of all wastewater sources in the MON database are MACT-controlled. Out of the 26 facilities with wastewater sources, only two facilities are controlled using a steam stripper. Therefore, there is no MACT floor for wastewater sources.

ATTACHMENTS