MEMORANDUM

Date: October 7, 1996

Subject: Preliminary MACT Floor Analyses

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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 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. Additional details regarding the MON database are documented in a memorandum titled "Description of MON Database" dated July 11, 1996. This memorandum is included in the MON docket (Docket No. A-96-04).

Alpha-Gamma has completed preliminary MACT floor analyses for emission sources covered by the Miscellaneous Organic NESHAP (MON). The MACT floors were determined for the following emission types: continuous process vents, batch process vents, storage tanks, wastewater, equipment leaks, and formulation operations. The following paragraphs describe the methodology used in determining the preliminary 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 597 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 preliminary 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 Table ($3,000/ Mg HAP)

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 346 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 (#251) 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 597 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. These vents were arranged in descending order of cost effectiveness. Cost effectiveness values were calculated by multiplying TRE values obtained from the equation shown above by 3,000.

Results for the top 12 percent of continuous process vents are shown in Table 2. Due to the data gaps discussed above, the following three levels of analyses were performed for continuous process vents: (a) included only the vents with reported flow rates and VOC emissions; (b) included all vents with reported flow rates - VOC emissions assumed to be equal to HAP emissions where not available; and (c) included

all vents - assumed average flow rate and VOC emissions equal to HAP emissions where not available.

Table 2. Continuous Process Vents

Approach	Mean ($/Mg)	Median ($/Mg)
Only vents with flow & VOC data	5,681	1,088
Only vents with flow data and VOC as HAP where no VOC data	30,034	2,121
All vents with average flow and VOC as HAP where no flow and VOC data	19,223,955	3,678

Batch Process Vents

The MON database includes 741 batch process vents. These vents are distributed over 49 batch processes. For batch process vents, MACT floor analyses were performed at the process unit level. Lack of flow rate data was the main data gap in determining the MACT floor for batch process vents.

At the process unit level, the preliminary MACT floor was determined by subcategorizing processes into the following two classes: (a) processes with uncontrolled emissions less than 10 tons/yr; and (b) processes with uncontrolled emissions greater than or equal to 10 tons/yr. For each of these two classes, processes were arranged in descending order of efficiency. Efficiencies greater than 98 percent were assumed to be equal to 98 percent. There were only 14 processes with uncontrolled emissions less than 10 tons/yr. Since the total number of processes was less than 30, the MACT floor for this class was determined using the best performing 5 processes as required by the Clean Air Act.

The preliminary MACT floor for batch vents at the process unit level is shown in Table 3.

Table 3. Batch Process Vents

Class	Mean Efficiency (%)	Median Efficiency (%)
Processes (0 - 10) tons/yr	95	95
Processes >= 10 tons/yr	98	98

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 ≥ 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 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. These tanks were arranged in ascending order of vapor pressure. Vapor pressures were assigned based on the HAP emitted and not based on the material stored. The preliminary MACT floor for storage tanks is based on vapor pressure values of MACT-controlled tanks.

Results for the top 12 percent of all storage tanks are shown in Table 5.

Table 4. Storage Tanks

Class	Mean VP[1] (psia)	Median VP (psia)
(10,000 - 20,000) gallons	3.55	1.93
(20,000 - 40,000) gallons	1.84	1.68
>= 40,000 gallons	1.7	1.93

[1] VP = vapor pressure

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 D), 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.

Equipment Leaks

The MON database does not include information regarding leak detection and repair programs being employed by individual facilities. The MACT floor for equipment leaks is based on a review of existing Federal and State regulations governing equipment leaks. Regulations that were reviewed include: HON, Polymers and Resins I, II, and IV rules, Petroleum Refinery NESHAP, NSPS requirements, and California, Louisiana, and Texas State requirements. This review was performed to determine the most stringent set of requirements affecting equipment leaks.

Based on review of existing State and Federal regulations governing equipment leaks, it was determined that the HON equipment leak provisions are most stringent. The Polymers and Resins I, II, and IV rules and the Petroleum Refinery NESHAP adopted the HON equipment leak provisions. The State of Louisiana also adopted the HON for equipment leaks associated with non-HON sources. Therefore, the preliminary MACT floor for equipment leaks is at or below the HON equipment leak provisions.

Formulation Processes

Mixing tanks used in formulation processes were considered under a separate plank in the preliminary MACT floor determination. Other emission sources in formulation processes such as storage tanks and equipment leaks were included under their respective planks as discussed earlier in this memorandum.

The MACT floor for formulation processes is based on existing State regulations. A compilation of existing State regulations on formulation processes such as paint manufacturing, ink manufacturing, and others is shown in Table 5. Note that there are no existing Federal regulations on formulation processes. Regulations governing formulation processes exist in the following three States: Illinois, Michigan, and Missouri. Most of the requirements are common among these States. Common requirements include tank covers, submerged filling, and minimization of VOC emissions from tank cleaning.

The 1993 TRIS database includes 151 major facilities in SIC codes 2851 (paint manufacturing) and 2893 (ink manufacturing). Twenty-nine facilities out of the 155 major facilities are located in Illinois, Michigan, or Missouri. This represents 19 percent of the 155 major facilities. Therefore, based on the fact that only Illinois, Michigan, and Missouri have regulations for formulations processes, it can be assumed that the top 12 percent of all formulation processes are located in these three States. The number of major facilities was estimated from actual reported HAP emissions included in the 1993 TRIS database by using a threshold of 5 tpy for a single HAP or an aggregate of 12.5 tpy for all HAP's emitted. This threshold was based on the assumption that potential emissions may be twice the actual emissions.

The preliminary MACT floor for formulation processes is as follows: tank covers on all tanks, with an opening no larger than that necessary to allow for safe clearance of the mixer shaft; submerged filling of all tanks greater than 250 gal; and minimization of VOC and HAP emissions from tank cleaning operations.

ATTACHMENTS

Table 5. State Regulations On Paint And Other Formulation Processes

State	Applicability	Source	Control Requirement
Illinois	Paint and Ink Formulation Processes: >100 tpy potential-to-emit >2,000,000 gal/yr production <10 percent by weight water	Tanks	• Covers on all tanks > 12 gal • Submerged filling or bottom filling for all tanks > 250 gal • Conservation vents on all tanks storing VOC with vapor pressure > 1.5 psi
		Equipment Leaks	• Visual inspection of pump seals on a weekly basis
		Cleaning	• No organic solvents unless equipment is completely enclosed; store organic solvents in closed containers
Illinois	Miscellaneous Formulation Processes: > 100 tpy potential-to-emit Units < 2.5 tpy are exempt, if total emissions from such units is < 5 tpy	Process Unit	• Overall reduction >= 81 percent for each emission unit
Michigan	Existing Paint Manufacturing Processes	Tanks	• Covers on all tanks
		Cleaning	• Minimize VOC emissions • Store VOC solvents in closed containers
Missouri	Paints, Varnishes, Enamels, and Allied Surface Coating Processes: > 100 tpy or 250 kg/day potential-to-emit	Tanks	• Covers on all tanks • Submerged filling or bottom filling for all tanks > 250 gal • Conservation vents on all tanks storing VOC with vapor pressure > 1.5 psi
		Varnish Cooking	• Control device >= 85 percent efficient
		Polymerization	• Surface condensers or similar control

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