Note: The attachments are not available

MEMORANDUM

DATE: June 7, 1999

SUBJECT: New Source MACT Floors for Batch and Continuous Chemical Manufacturing Processes Covered by the MON

FROM: Chuck Zukor and Reese Howle
Alpha-Gamma Technologies, Inc.

To: Miscellaneous Organic NESHAP Project File

The purpose of this memorandum is to summarize the maximum achievable control technology (MACT) floor determinations for batch and continuous chemical manufacturing processes at new sources which are covered by the Miscellaneous Organic NESHAP (MON). Material discussed in this memorandum includes:

1) Background information and the new source MACT definition;
2) Determination of the new source MACT floor for process vents;
3) Determination of the new source MACT floor for storage tanks;
4) Determination of the new source MACT floor for wastewater; and
5) Determination of the new source MACT floor for equipment components.

1.0 BACKGROUND

This section presents background information on development of MACT floors for the MON. Section 1.1 describes the available information used in the new source MACT floor determinations. While, Section 1.2 discusses the required guidelines for determining new source MACT floors and provides a summary of the resulting MON new source MACT floor determinations.

1.1 Available Information

The MACT floor determinations for new sources are based on the same information used for the MACT floor determinations for existing sources. In general, information on batch chemical processes was obtained from responses to Section 114 surveys. While, information on continuous chemical processes was obtained from permit and emissions inventory data maintained by state and local regulatory agencies. A more

detailed description of the type of data available for batch and continuous chemical processes is provided in the May 20, 1999 memorandum, “MACT Floors for Batch and Continuous Chemical Manufacturing Processes at Existing Sources Covered by the MON.”

1.2 New Source MACT Floor Determinations

The Clean Air Act as amended in 1990 requires EPA to promulgate emission standards to reflect the maximum degree of reduction in HAP emissions that EPA determines is achievable for new or existing sources. This control level is referred to as MACT. The Act also prescribes a method for determining the least stringent level allowed for a MACT standard, which is known as the "MACT floor."

For new sources, the standards for a source category or subcategory "shall not be less stringent than the emission control that is achieved in practice by the best controlled similar source, as determined by the Administrator" [section 112(d)(3)]. New source MACT floors for the MON are based on the best controlled similar source for each emission type, using the available data. Table 1 provides a summary of the new source MACT floor determinations for batch and continuous chemical processes. The new source MACT floors and the methodology used to determine these floors are described in the following sections.

2.0 PROCESS VENT NEW SOURCE MACT FLOOR DETERMINATION

As with existing process vents, a class distinction was established between new process vents associated with continuous and batch chemical processes. Therefore, separate new source MACT floors were determined for continuous and batch chemical processes:

- The new source MACT floor for continuous process vents is a control device with a HAP reduction efficiency of 98 percent or greater for an individual vent with a total resource effectiveness (TRE) value of 5.1 or less.

- The new source MACT floor for batch process vents is a control device capable of reducing product process HAP emissions by 98 percent or greater for batch product processes with total HAP emissions of 3,000 lb/yr or more.

The class distinction between continuous and batch vents is discussed in Section 2.1. In Section 2.2, the MACT floor level of performance is discussed. Section 2.3 describes the top performing process vent population used in the new source MACT floor determination.

Table 1. New Source MACT Floor Determinations for Chemical Processes

Source Type	Required Control	Performance Level	
Process Vents	98 percent reduction	Each continuous vent within a facility with a TRE $\leq$ 5.1	All batch vents within a product process with total product process HAP emissions $\geq$ 3,000 lb/yr
Storage Tanks	IFR/EFR or 95 percent reduction	Tank with capacity $\geq$ 10,000 gal and HAP partial pressure $\geq$ 0.1 psia	
Wastewater	Same reductions as required by the HON	Wastewater streams with total VOHAP[a] concentration $\geq$ 10,000 ppmw, or Wastewater streams with flow rate $\geq$ 10 lpm and total VOHAP concentration $\geq$ 1,000 ppmw, or Wastewater streams with flow rate $\geq$ 0.02 lpm and total VVHAP[b] concentration $\geq$ 10 ppmw.	
Equipment Components	HON equivalent LDAR program	All affected product processes.	

[a] VOHAP is described in Table 9 of the HON rule (40 CFR 63, Appendix to Subpart G). Table 9 lists the volatile organic HAP (VOHAP) which volatilize readily from wastewater and are characterized by Henry's Law constants greater than or equal to 1.51×10^{-6} atm-m^3/mol.

[b] VVHAP is described in Table 8 of the HON rule (40 CFR 63, Appendix to Subpart G). Table 8 lists the very volatile HAP (VVHAP) which volatilize very easily from wastewater and are characterized by Henry's Law constants greater than or equal to 5.55×10^{-3} atm-m^3/mol (i.e., the Henry's Law constant for benzene). Table 8 compounds are a subset of Table 9 compounds.

2.1 Class Distinctions

As with the MACT floor for existing sources, a class distinction was established between vents associated with continuous and batch chemical processes. Factors considered in establishing the continuous-batch class distinction included the following:

- Hours of operation (hr/yr) for continuous vents are longer than batch vents (average of 8,100 vs 3,500 hr/yr),

- Volumetric flow rates (scfm) for continuous vents are higher than batch vents (average of 6,450 vs 415 scfm), and

- Annual emissions (lb/yr) for continuous vents are higher than batch vents.

The EPA already has several regulatory standards which have set a precedent for establishing a class distinction between continuous and batch chemical processes. Examples of these precedents include: the HON, Polymers & Resins (Group I & IV) NESHAP, and New Source Performance Standards for Distillation Units (Subpart NNN) and Reactor Processes (Subpart RRR).

2.2 New Source MACT Floor Level of Performance

The level of performance determined for the new source MACT floor is a control device achieving a HAP emission reduction efficiency of 98 percent or more, excluding scrubbers. Some continuous and batch process vents were reported as achieving HAP emission reductions in excess of 98 percent. These higher HAP emission reductions were typically obtained through the use of combustion control devices such as thermal oxidizers. However, source test data necessary to support and validate HAP emission reductions in excess of 98 percent were not available. In addition, diverse process vent characteristics such as varying flow rates, types of pollutants, and pollutant concentrations make it difficult to conclude an efficiency greater than 98 percent can be achieved for all process vents. Therefore, the best demonstrated performance level is a HAP emission reduction of 98 percent, which is consistent with the performance level determined for existing sources. The MACT floor level of performance established for new continuous and batch vents is also consistent with the HON and other chemical industry MACT standards.

2.3 Top Performing Process Vents

The new source MACT floors for both continuous and batch process vents are established with the same performance criteria used for determining the existing source MACT floors. Criteria used for continuous vents was the TRE value. While, criteria used for batch product process vents was uncontrolled organic HAP emissions.

2.3.1 Continuous Vents

The new source MACT floor for continuous vents was established by considering all vents located within each facility operating continuous product processes. The TRE “threshold” for each facility was selected as the measure of performance to rank order and determine the best performing facility. The TRE “threshold” is the value below which all continuous vents at a facility are controlled at a 98 percent MACT floor

performance level. This same approach was used for determining the existing source MACT floor for storage tanks.

The performance criteria corresponding to the best facility was a TRE "threshold" value of 5.1. The Mobil Chemical Company in Beaumont, TX is currently controlling all continuous vents with a TRE value of 5.1 or less at a level of 98 percent. Attachment A provides the top MACT floor rankings for continuous vents with corresponding TRE threshold values.

2.3.2 Batch Vents

Total uncontrolled HAP emissions from a batch product process was selected as the measure of performance to rank order batch vents which are collectively controlled at a 98 percent MACT floor level. This collective vent approach was selected because information in the MON database indicated that batch vents are commonly manifolded within a product process prior to control. All vents associated with a batch product process are considered.

Some of the best performing MON batch sources have common control systems capable of achieving 98 percent reductions in emissions. Many of these sources with common control systems also have extensive waste gas header systems which collect and route compatible process emissions to the common control system. Sources with this type of header and control system are capable and likely to control most if not all process emissions regardless of emission potential. Since the average volumetric flow rate for a batch process vent is 415 scfm, existing 98 percent control devices typically have available capacity to add vent streams of this magnitude to the header system.

Many MON facilities already have a 98 percent control device or will be required to install a 98 percent control device for the existing sources through implementation of this rule. The remaining MON facilities are those that would not otherwise be required by this rule to install a 98 percent control. Therefore, the best performing MON batch source, that is representative of all batch processes, will meet the following criteria:

- Located at a facility that would not otherwise be required to install a 98 percent control device to meet the existing source MACT floor (i.e., no continuous vents with a TRE value of 2.8 or less and no batch product processes with uncontrolled organic HAP emissions of 10,000 lb/yr or more);
- Already equipped with a 98 percent control device; and
- The sole MON product process with the lowest uncontrolled HAP emissions.

Applying the above criteria, the best performing batch source is a product process located at the CCP facility in Marshall, TX which has total uncontrolled HAP emissions of approximately 3,000 lb/yr (actual value is 2,880 lb/yr) and is controlled by thermal incineration. This particular product process located at CCP is the sole MON product process and would not otherwise be required to install a 98 percent control, but yet, is controlled to a MACT floor level. Attachment B provides the top MACT floor rankings for batch vents with corresponding total product process HAP emissions.

3.0 STORAGE TANK NEW SOURCE MACT FLOOR DETERMINATION

The new source MACT floor for storage tanks was determined to be an internal or external floating roof (IFR or EFR), or a control device with a HAP reduction efficiency of 95 percent or greater for all tanks with a capacity of 10,000 gallons or greater and storing a material with a HAP partial pressure of 0.10 psia or greater.

The performance level for the new source MACT floor is discussed in Section 3.1. While, Section 3.2 describes the top performing storage tank population used in the new source MACT floor determination.

3.1 New Source Performance Level

The level of performance determined for the new source MACT floor is a tank equipped with an internal or external floating roof (IFR or EFR), or another control device with a HAP emission reduction efficiency of 95 percent or more, excluding scrubbers. The top facility, Ashland Chemical Company in Philadelphia, PA, reported storage tank control efficiencies of 95 percent. Thus, the best demonstrated performance level is a HAP emission reduction of 95 percent, which is consistent with the performance level determined for MON existing sources. The 95 percent performance level is also consistent with the HON and other chemical industry MACT standards.

3.2 Top Performing Storage Tanks

The new source MACT floor for storage tanks was established by considering all tanks located in each facility operating continuous and/or batch product processes as the affected source. The HAP partial pressure “threshold” for each facility was selected as the measure of performance to rank order and determine the best performing facility. The HAP partial pressure “threshold” is the value above which all tanks at a facility are controlled at a MACT floor level of performance. This same approach was used for determining the existing source MACT floor for storage tanks.

The performance criteria corresponding to the best facility was a HAP partial pressure “threshold” value of 0.1 psia. The top facility has applied controls with the MACT floor

level of performance to all tanks storing materials with a HAP partial pressure at or above 0.10 psia. The HAP partial pressure "threshold" for the top facility is actually 0.087 psia, but the value was rounded up to the first significant digit (i.e., 0.1 psia). The most predominate HAP stored in the top performing tanks is styrene. However, one of the top performing tanks also stored methyl methacrylate. Attachment C provides the top MACT floor rankings for storage tanks with corresponding HAP partial pressure threshold values.

4.0 WASTEWATER NEW SOURCE MACT FLOOR DETERMINATION

The new source MACT floor for MON batch and continuous wastewater streams was determined to be the same as the HON new source MACT floor for wastewater. Control requirements to meet the HON new source floor includes several options. Floor control requirements can be met using a steam stripper meeting a minimum set of design specifications. Another option is to use a control device capable of meeting HAP-specific mass fraction removal (Fr) efficiency as specified in Table 9 of the HON rule (40 CFR 63, Supart G). Therefore, HON control requirements apply to each individual wastewater stream meeting any of the following characteristics:

1) Flow rate $\geq$ 0.02 lpm and total VVHAP concentration $\geq$ 10 ppmw,

2) Flow rate $\geq$ 10 lpm and total VOHAP concentration $\geq$ 1,000 ppmw, or

3) Total VOHAP concentration $\geq$ 10,000 ppmw.

Because information on the techniques used to control wastewater was not reported consistently by the surveyed facilities, it was necessary to consider applicable regulations at the best performing facilities to determine the MACT floor control level. A new source MACT floor can be derived from two applicable wastewater regulations: the Benzene Waste Operations NESHAP (BWON) and the HON. It has been determined that the Benzene Waste Operations NESHAP applies to wastewater streams generated by MON chemical processes. For example, a wastewater stream generated by Zeneca Specialties, Inc. in Mt Pleasant, TN contains a benzene concentration of approximately 360,000 ppmw prior to entering an air stripper which vents to a combustion device. The Zeneca wastewater stream has an approximate uncontrolled benzene loading of more than 2,300 tons/yr. Based on the stream characteristics, the Zeneca wastewater stream is subject to the BWON.

Wastewater streams at MON facilities containing benzene may also contain other VOHAP. Control measures used to reduce benzene under the BWON would also reduce VOHAP present in the wastewater, particularly those as volatile or more volatile than benzene. The HAP compounds that are at least as volatile as benzene are listed in Table 8 of Subpart G of the HON, and are referred to as VVHAP.

During the HON new source MACT floor determination, the EPA faced a similar situation and the HON new source MACT floor for wastewater was determined to be the BWON. The EPA reasoned that since compliance with the BWON also controlled VOHAP -- at least those as volatile or more volatile than benzene -- the HON new source MACT floor was control of benzene and other VVHAP. This rationale is described in the preamble of the proposed HON (57 FR 62608).

The HON new source MACT standard, in its final form, is applicable to other wastewater streams in addition to those containing Table 8 HAP, but the MACT floor for new sources included only the Table 8 component of what is now the HON new source MACT standard. The requirements of the Table 8 component of the HON wastewater provisions and the requirements of the BWON are very similar. In fact, the HON provisions for Table 8 HAP are the same as the BWON requirements with the exception that benzene concentration levels are replaced with Table 8 HAP concentration levels. However, an advantage of the HON is that it allows more flexibility by providing additional compliance methods while requiring the same level of control.

Using rationale similar to that used for the HON new source MACT floor, the MON new source MACT floor for wastewater can be expressed as the HON new source MACT floor. This requires HON equivalent HAP reductions for wastewater streams meeting any of the following characteristics:

1) Flow rate $\geq$ 0.02 lpm and total VVHAP concentration $\geq$ 10 ppmw,

2) Flow rate $\geq$ 10 lpm and total VOHAP concentration $\geq$ 1,000 ppmw, or

3) Total VOHAP concentration $\geq$ 10,000 ppmw.

5.0 EQUIPMENT COMPONENT NEW SOURCE FLOOR DETERMINATION

The new source MACT floor for equipment components was determined to be a HON equivalent leak detection and repair (LDAR) program for facilities with continuous and batch chemical operations.

The new source MACT floor for equipment components was established by considering LDAR programs implemented at each facility operating continuous and/or batch product processes. The overall effectiveness of an LDAR program in reducing HAP emissions from a facility was used as the measure of performance to rank order and determine the best performing facility. This same approach was used for determining the existing source MACT floor for equipment components.

The performance criteria corresponding to the best facility was a LDAR program equivalent to the HON. The HON LDAR program is the most effective overall program compared to other federal and state LDAR programs. Thus, there are no other LDAR programs with a higher level of effectiveness. The HON LDAR program was determined most effective through a comparative analysis of ten LDAR programs. The top 16 batch facilities and top 14 continuous facilities have implemented a HON equivalent LDAR program.