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Presumptive MACT for Amino and Phenolic Resin Production

Presumptive MACT Determination Document
Guidance Document - not a Rule

Table of Contents

Introduction

P-MACT Definition

In 1994, EPA had to postpone work on several of the MACT standards due in November 1997 and November 2000 (the 7-year and 10-year MACT standards) as a result of resource constraints. If the EPA fails to set MACT standards on time, Section 112(j) of the Clean Air Act (Act) requires the States to establish emission limitations using a case-by-case determination of what the Federal standard would have been. Case-by-case MACT determinations under 112(j) will require substantial information and resources from State and local agencies, industry, and environmental groups, and there appears to be a strong incentive for all parties involved to gather information for 112(j) determinations and to promulgate standards on time. The amount of work needed to complete all of the 7-year and 10-year standards on time is difficult to predict; however, the EPA believes that new approaches are needed to reduce the amount of work and time associated with standards development. To achieve this goal, the EPA has initiated a new standard setting process called MACT Partnerships, that involves a partnership with States, industry, and environmental organizations. This process is described in the March 29, 1995 Federal Register.

The MACT Partnerships program involves two phases. The first phase involves the development of a "presumptive MACT." A presumptive MACT is not an emission standard; it serves as a statement of current knowledge of maximum achievable control technologies and a basis for a decision on how to develop the emission standard for the source category involved. The second phase is the formal standard development process. For the second phase, the EPA envisions the use of one of three basic regulatory development paths: adopt-a-MACT, share-a-MACT, or a streamlined-traditional approach. In all cases, EPA would eventually propose and then promulgate the MACT standard.

The adopt-a-MACT and share-a-MACT paths involve agreements with States and industry to take primary or shared responsibility for developing the underlying data and analysis from which EPA would determine MACT. When no suitable partners can be found or a standard appears suitable for development by the traditional process, the EPA would go through a "streamlined-traditional" process of rule development.

Statutory Requirements

Section 112(d) of the CAA requires the promulgation of emissions standards (MACT standards) for listed source categories of the 189 HAPs identified in 112(b). If no MACT standard is promulgated within 18 months of the statutory deadline, Section 112(j)(2) of the CAA requires major sources to apply for a permit and comply with emission limitations equivalent to MACT. Section 112(g) of the CAA requires compliance with MACT on a case-by-case basis for major source modifications when no MACT standard has been promulgated by EPA. It is important to emphasize that "major source" means any stationary source or group of stationary sources located within a contiguous area under common control that emits or has the potential to emit considering controls, in the aggregate, 10 tons per year of any HAP or 25 tons per year of any combination of HAP.

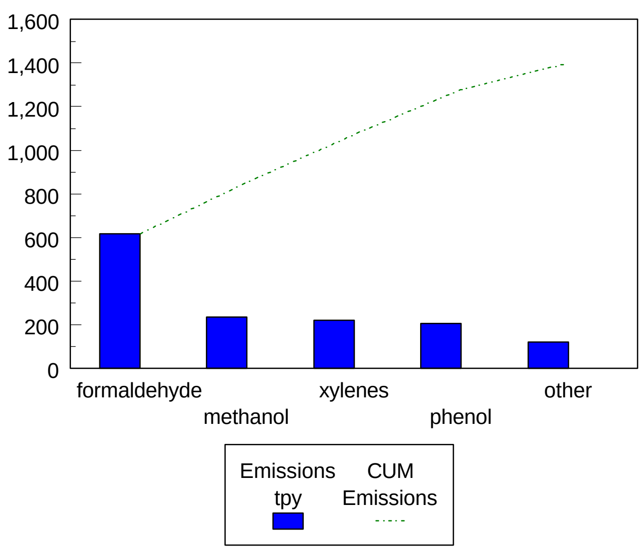
This standard is intended to regulate facilities that produce phenol-formaldehyde (phenolic resins), melamine-formaldehyde and urea-formaldehyde resins (amino resins). It will likely be expanded to regulate a small number of other specialty resins that are also based on formaldehyde polymers and produced in a similar manner to the listed source categories. In other words, applicability will be based on product verses feedstocks or process. These two source categories are part of a broader project to develop a MACT standard for all facilities that produce formaldehyde based resins. This project includes the acetal resin source category. This P-MACT document only addresses the amino and phenolic resin sources categories. The acetal resin source category is being analyzed under a separate P-MACT project. All of these resins will be addressed in the MACT standard for formaldehyde based resins, also referred to as Polymers and Resins Group III. The EPA is required to develop a MACT standard for each of these source categories before November 15, 1997.

Industry Profile

There are over 100 facilities that produce amino or phenolic resins in the United States. Thirty two of these facilitites produce amino (melamine or urea) resin while thirty three facilities produce phenolic resins. In addition, there are thirty five facilities that produce both amino and phenolic resins. There are at least twenty three facilities that also produce one of the primary feedstocks, formaldehyde, on-site.

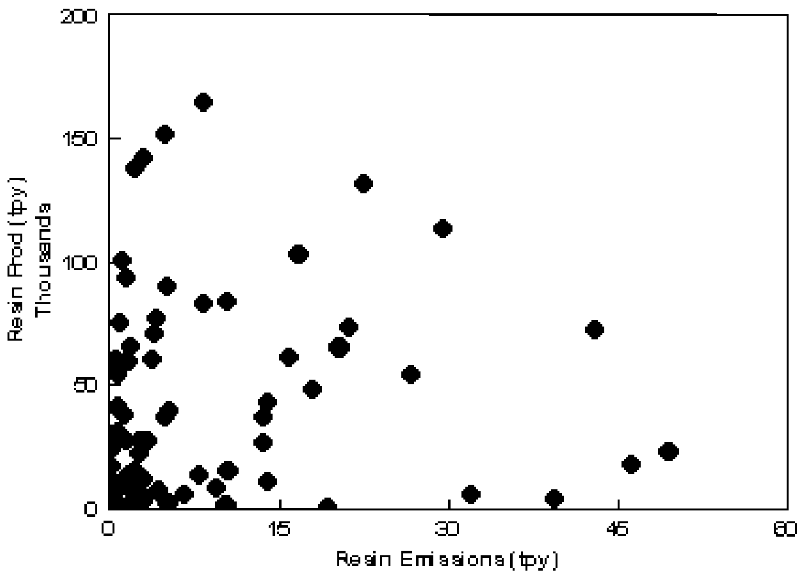
The following is a sample of the information that the EPA collected from the industry during the fall of 1992 using a generic Information Collection Request (ICR) and the authority of section 114 of the CAA.

Total HAP Emissions



As illustrated in the following chart, almost 1400 tons per year of HAPs are emitted by amino and phenolic resin production facilities. The types of HAPs emitted include: formaldehyde, methanol, xylenes, phenol, o-cresols, toluene, 26 other HAPs.

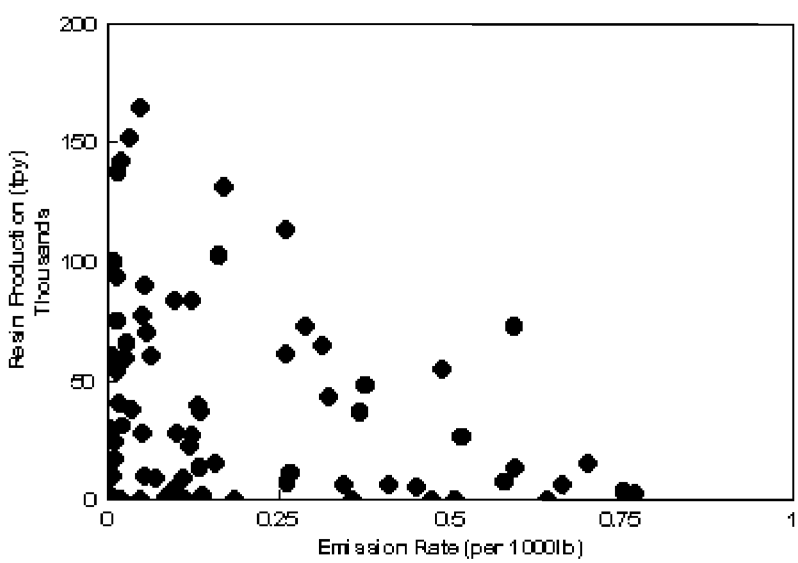
Resin Production vs Emissions



As illustrated in the following graphs, the facilities in these two source categories range from very large to very small manufacturers with all levels in-between. In addition, there is no clear correlation between the size of a facility and the effectiveness of its existing pollution controls.

No apparent correlation between size of facility and overall emissions from resin production.

Resin Production vs Emission Rate



No apparent correlation between the size of the facility and the emission rate for resin production.

Roundtable Team Members

The following tables summarize the people and organizations who participated in the amino and phenolic resin P-MACT. All of these people provided comments on draft documents, participated in roundtable discussions or otherwise provided expertise and insight into the production of amino and phenolic resins.

EPA Participants

OAQPS, RTP, NC	Title	Phone Number
Pete Hofmann	Project Engineer	919-541-3713/F-3470
John Schaefer	Environmental Engineer	919-541-0296/F-3470
Bob Rosensteel	Senior Engineer	919-541-5608/F-3470
Susan Wyatt	Group Leader	919-541-5674/F-3470
Larry Sorrels	Economist	919-541-5041/F-0839
Jan King	Economist	919-541-5665/F-0839

State and Local Agencies

State or Local Agency	Participant Name	Phone Number
New York DEC	Jack Lauber	518-457-7688/F-0794
New York DEC - Region 4	Rick Leone	
New York DEC - Region 9	Larry Stiller	
APCD of Jefferson City, Kentucky	Dick Everhart	502-574-6000/F-5306
Div of Env Services, Toledo, OH	Karen Granata	419-697-5129/F-936-3016

Industry/Other

Company/Trade Group/Organization	Participant Name	Phone Number
UF Resins Mfg Ass'n (*)	c/o Brock Landry, Jenner & Block	202-639-6070/F-6066
*Southeastern Adhesives	Larry Wasfaret	704-754-3493/F-0052
*Borden, Inc.	Mark Gruenwald	614-225-3459/F-7638
*Borden, Inc.	Diane Strayer	206-462-5453/F-5487
*Georgia-Pacific Resins, Inc.	Terry Liles	404-593-6832/F-6801
*Georgia-Pacific Resins, Inc.	Rodney Canada	404-652-8037/F-230-1676
*Neste Resins Corp.	Larry Lowenkron	503-687-8840/F-484-6825
*Spurlock Adhesives	Norman Spurlock	804-834-3113/F-2860
*D.B. Western, Inc.	Dan Matthews	503-756-0533/F-5911
*BTL Specialty Resins	Andy Fairchild	419-244-5856/F-9206
*Tailored Chemical Products	Jack Temple, III	704-322-6512/F-7688
Schenectady International Inc.	Tom Windish	518-370-4200/F-887-2386
Schenectady Int. Inc. (Radian)	John Stelling	919-461-1279/F-1417
3M	Camillya Bryant	612-778-4344/F-7203
Monsanto	Norman Phillibert	413-730-2082/F-3299
Monsanto	Dave Krawczyk	314-694-3666/F-6262
Dexter Packaging	Andrew Miles	205-854-5121/F-520-0206
Simpson Timber	David Berg	503-978-2817/F-2607
P.D. George Company	Jeannine Kelly	314-621-5700/F-436-1030
Occidental Chemical Corp	Frank Collis	716-286-3589/F-3141
National Paints and Coatings Assn	Jim Sell	202-462-6272/F-8549
Cytec Industries	Steve Byrne	908-862-6000/F-8023
Ashland Chemical	Tara Lanier	614-790-3214/F-6080
Clean Air Network	John Tallmadge	202-624-9388/F-783-5917

MACT Floor Determination
Storage Tanks

Analysis
Little or no information was available on the sizes or typical contents of storage tanks at the 100 facilities in the amino and phenolic resin source category. Some limited assumptions were possible based on the calculations submitted by some companies in the ICR data, but no specific information related to tank size, contents or controls at each facility was collected. In addition, the primary stored reactants in these source categories are heavy liquids, i.e., liquids with vapor pressures < 0.04 psi. Facilities that use volatile solvents to create specialty resins typically use either very small quantities or use controls consistent with the HON and the majority of state regulations. The existing state regulations for storage tanks are very similar to the HON except for minor differences in vapor pressure cut-offs. The types of controls required are the same.

Floor Determination
Since we did not have enough information available to make an attempt to estimate the floor for storage tanks, the reg team decided that the HON is at least as stringent as the floor and therefore, assume the HON to be the floor. The industry members on the roundtable commented that this would aid in obtaining regulatory consistency where possible and practical. In addition, most of the storage tanks at the facilities in these source categories would not meet either the size or the vapor pressure cutoffs of the HON. Control will be directed at those facilities using large quantities of volatile materials. Per the HON, the applicability cutoffs for control are as follows:

capacity >40,000 gal	and	vapor pressure >0.75 psi
20,000<capacity<40,000	and	vapor pressure >1.9 psi

Open Issues
none

MACT Floor Determination
Batch Process Vents

Analysis
In an effort to ensure consistency in the analysis of batch process vent emissions, the roundtable agreed to consider the primary condenser on the reactor to be an integral part of the process and not a pollution control device. In addition, batch emissions from process reactors were the primary source of data for determining the floor. Batch emissions from other process equipment were assumed to be small compared to the reactor emissions. Therefore, only control devices used after the primary condenser on the process reactors were considered in determining the floor.

The MACT floor was determined using the average emissions reductions for the best performing twelve percent of existing facilities. Since we had data on 100 facilities, we analyzed the best performing twelve facilities. The floor included two facilities that use thermal incinerators, seven that use catalytic incinerators and the remaining three facilities used wet scrubbers. The reported efficiencies for these devices ranged up to 99.6%. To determine the MACT floor, we assumed control device effectiveness based on existing EPA documentation. Therefore, 98% was used for thermal incineration, 95% for catalytic incineration and 50% for wet scrubbing. Further analysis of actual flow characteristics in these source categories could modify these control device efficiencies.

Floor Determination

Based on the ICR data, the floor is 84% control of batch emissions from process vents (numerical average). Alternatively, the floor could possibly be defined by some other measure (e.g., max ppmv) or an equivalent control technology.

Open Issues

The EPA agreed to determine actual efficiencies of control devices using technical input from industry. The industry participants agreed to determine the proportion of incinerated streams that are from resin production at facilities who incinerate process vent emissions as well as obtain data on flow characteristics to aid the EPA's control device efficiency analysis.

MACT Floor Determination

Continuous Process Vents

Analysis

In addition to the batch emissions present at most all of the facilities in this source category, some facilities have a significant number of continuous process vent emissions. These emissions are primarily located at larger facilities who continuously operate spray dryers, flaker belts and other equipment for drying finished resins. In general, these emission sources can be characterized as either high volume, low concentration flows (e.g., spray dryers) and low volume, low concentration flows (e.g., flaker belts).

Floor Determination

Due to these flow characteristics, no spray dryers and very few other continuous process vents in these source categories are controlled. There are some controls on isolated pieces of continuously operating process equipment. Based on the data available, the floor for continuous process vents is no control.

Open Issues

None

MACT Floor Determination
Wastewater

Analysis
There are five facilities that use wastewater controls. These controls include thermal incineration, air stripping, steam stripping and carbon absorption to meet effluent guidelines. The HAPs controlled per the ICR are mostly non-volatile and don't require control per Table 8 in the wastewater provisions in the HON. These controls appear to exist primarily to minimize water discharges. The actual control device efficiencies for reducing air emissions are difficult to determine due to the low volatility of primary HAPs in liquid emission streams. In addition, no state regulations require control of air emissions from wastewater at facilities in these source categories.

In addition to formal pollution controls on air emissions from wastewater streams, several facilities in these source categories are "zero discharge" and recycle or resale all of their process wastewater. It is not clear at this point how this practice should best be used to determine a floor level of control for air emissions.

Floor Determination
Since there are only five facilities that have any controls for air emissions from wastewater streams in place, the remaining seven facilities that are considered when determining the floor have no controls in place. Therefore, the key measure of central tendency for this sub-category would be the most frequently occurring data point or mode. Since the mode for this sub-category is no control, then the floor could be defined as no control. However, since it is not clear how to integrate "zero discharge" facilities in the floor analysis, the floor for wastewater is unclear at this time.

Open Issues
The EPA will obtain detailed information on VOHAP reductions at facilities with wastewater controls in place to help identify the "best controlled source" for defining the new source performance standard. EPA will also determine which HAPs are actually controlled at these facilities and the criteria for control. Finally, the EPA will need to determine if "zero discharge" facilities need to be accounted for in the floor determination for wastewater.

MACT Floor Determination
Equipment Leaks

Analysis
Twenty three facilities reported some form of LDAR program was in place for reducing fugitive emissions in the ICR. Further investigation by the roundtable team members identified at least sixteen of those facilities did not have formal LDAR programs for their resin facilities. They either performed routine maintenance and visual checks or had formal LDAR programs elsewhere in their facilities. The facilities that had LDAR programs in place claimed reductions that 61-90% control. The specific reductions appear to correspond to prior EPA estimates for monthly, 10,000 ppmv leak detection programs outlined in 40 CFR 60 Subpart VV.

Floor Determination
The NSPS LDAR requirement defines the floor (40 CFR 60 Subpart VV) based on the information collected.

Open Issues
none

Presumptive MACT

Storage Tanks

Analysis
The following options beyond the floor were considered during the development of the HON and were reconsidered for this P-MACT:

small tanks (10,000<capacity<20,000 gal) - control all tanks
medium tanks (20,000<cap<40,000 gal) - control all tanks
large tanks (>40,000 gal capacity) - control all tanks, control tanks with VP > 1.9 psi

Since these options were determined to not be cost effective for the HON as well as the stored materials in these source categories being predominately less volatile than those in the HON, the HON is a sound choice for presumptive MACT. This also keeps with the desire for regulatory consistency from both the regulator and regulated communities.

Presumptive MACT Determination
HON storage tanks rule
small (<20,000 gallon) - no control
medium (20,000<capacity<40,000 gallon) - control if stored liquid has VP >1.9 psi
large (>40,000 gallon) - control if stored liquid has VP > 0.75 psi

HON control requirements

Open Issues
none

Presumptive MACT
Batch Process Vents

Analysis
Based on the limited amount of emissions data available, the primary batch vent streams in these source categories have very low flow rates (<200 scfm) with low concentrations (<50 ppmv). Given that the floor is 84% control of emissions (emissions after primary condenser for reactor vents), the primary challenge was to determine an effective regulatory approach for defining controls and applicability requirements for batch process emissions.

The Batch ACT (EPA-450/R-94-020) has 90, 95 and 98% control options as well as a series of calculations to determine applicability for control that consider the unique qualities of batch emissions. In general, control is required for high concentration, low flowrate streams. In addition, manifolding of emissions from adjacent reactor lines is also considered during applicability determination calculations. While all three levels of control were considered to be cost effective during the development of the Batch ACT, the 90% level was chosen for these source categories due to the pre-dominance of low flow/ low concentration emissions.

Presumptive MACT Determination
Batch ACT at 90% control level.
(Note: The control cutoff for low volatility streams in the Batch ACT is defined at 13 tpy of HAP emissions. This will be modified for these source categories to ensure all major sources have to comply with the MACT standard. For example, the control cutoff may be redefined as 10 tpy of a single HAP/ 13 tpy of combined HAP emissions.)
Federally enforceable limits on production shall be used to ensure compliance with cutoff requirements.

Open Issues
process vent floor issues

Presumptive MACT
Continuous Process Vents

Analysis
The most prevalent continuous process vents in these source categories are associated with spray drying operations and other drying equipment (e.g., flaker belts). Spray drying operations typically have very high flow rates (>30,000 scfm) with low concentrations (<30 ppmv) of HAP. The MACT floor is no control for spray dryer emissions. To ensure that continuous vents are objectively analyzed for control potential, a TRE will be calculated for each continuous vent as outlined in the HON. Control will be required for all vents with TRE less than or equal to 1. This control option above the floor was also selected in the HON and determined to be cost effective.

Presumptive MACT Determination
Calculate TRE per HON

TRE <= 1 - control per HON
TRE > 1 - no control

Open Issues
none

Presumptive MACT
Wastewater

Analysis
The predominate HAPs in these source categories have very low volatility as well as high water solubility. Some facilities control wastewater, but information in ICRs is inconclusive as to why low volatility HAPs are controlled and if air emissions are controlled. Additional information was provided to EPA by roundtable members and confirmed that there are some facilities in these source categories that will meet the applicability thresholds for the HON wastewater provisions. These applicability determinations were made using an average flowrate calculated using the guidance in the HON (total annual wastewater volume divided by 525,600 minutes). This calculation method averages wastewater discharges over all batch process steps and simulates the effect of a continuous process stream.

The HON wastewater provisions (identified compounds only) were considered and selected as an option for control beyond the floor. In addition, requiring a level of control comparable to the level acheived by "zero discharge" facilities will still be analyzed, depending how the final floor determination is made.

Presumptive MACT Determination
HON wastewater applicability
    VOHAPs identified in Table 9 of Subpart G
    1000 ppm concentration and 10 lpm flow
        or
    10,000 ppm concentration

HON control requirements
    recycle to a process
    reduce total HAP mass or concentration
    reduce HAP content to specific target values
    treat with design steam stripper

Open Issues
wastewater floor issues

Presumptive MACT
Equipment Leaks

Analysis
There is a floor requirement for an LDAR program corresponding to a monthly monitoring program similar to the requirements of Subpart VV. The predominate reactants in these source categories are heavy liquids, however, there are a number of facilities that use large quantities of solvents during the production of their resins. These solvents are predominately light liquids.

As an option beyond the floor, the HON negotiated regulation for equipment leaks was considered. Since heavy liquids are the primary reactants in these source categories, there didn't appear to be any tangible benefit to requiring the HON equipment leak provisions. Each facility will have the option to use the HON provisions in place of Subpart VV if this will reduce regulatory burdens.

Presumptive MACT Determination
LDAR program consistent with NSPS LDAR requirements
40 CFR 60 Subpart VV

Open Issues
The EPA will verify that the NSPS LDAR program is consistent with LDAR programs in floor facilities.

Presumptive MACT
Reporting, Recordkeeping and Monitoring

Reporting Requirements
Semi-annual compliance reports will be required in either hardcopy or electronic formats. The focus of all reporting requirements will be on certifying compliance and not the submission of large quantities of data.

Recordkeeping Requirements
Facilities will be required to keep hardcopy records for key monitors for a five year period. Production records and other analyses to document compliance with federally enforceable limits for cutoffs and synthetic area determinations will also be required to be maintained for a five year period. The owner/operators will also be required to develop startup, shutdown and malfunction provisions similar to those in the General Provisions outlined in 40 CFR Part 63, Subpart A.

Monitoring Requirements
The primary monitoring requirements will be for key control device parameters. The operating limits for these control devices will be determined by the owner/operator. The key parameters will be averaged, most likely on an hourly basis, and used to ensure compliance with the standard.

Open Issue
EPA will identify a reliable/acceptable method to determine initial compliance with the 90% emission reduction for process vents.

Summary of Floor and Presumptive MACT

FLOOR	Applicability	Control Requirement
Storage Tanks	>40k gal & VP>0.75 psi	HON
	20k<gal<40k & VP>1.9 psi	HON
	<20k gal	none
Process Vents	Batch Process Vents	84% control
	Continuous Process Vents	none
Wastewater	unclear	unclear
Equipment Leaks	based on equipment type and volatility	LDAR per 40 CFR 60 part VV

P-MACT	Applicability	Control Requirement
Storage Tanks	>40k gal & VP>0.75 psi	HON
	20k<gal<40k & VP>1.9 psi	HON
	<20k gal	none
Process Vents	Batch ACT regression equations	90% control
	>50 ppm, TRE<=1.0	HON
Wastewater	10,000 ppmv or 1000 ppmv and 10 lpm	HON
Equipment Leaks	based on equipment type and volatility	LDAR per 40 CFR 60 part VV

Implementation Issues

During the final roundtable meeting in December 1995, several issues were identified that will need to be resolved before a standard can be promulgated for the amino and phenolic resin source categories. Any state or local regulators that use this P-MACT document for guidance on implementing a local standard need to consider the following issues and how they apply to the facilities under their jurisdiction.

The issues identified at the roundtable and the most current information are provided below. As more information is obtained, updates will be provided through the draft standard on the TTN.

ISSUE	**DISCUSSION**
Compliance dates for this standard	Even though this standard makes use of existing guidance from the HON and the Batch ACT, the compliance dates will be based on the proposal and promulgation dates of this standard.
Applicability to thinning tanks	It is unlikely that thinning tanks at painting and coating facilities will be covered by this standard. The primary challenge is to define the end point of resin production and the start point for paints and coatings.
Wastewater flowrates	Given the batch nature of these source categories, it is unclear what the most effective method for determining wastewater flowrates. The HON currently identifies an annual average (total discharge/525,600 minutes) as the preferred method.
Wastewater holding tanks	Wastewater holding tanks downstream of process lines will be covered by the storage wastewater provisions of the standard that is developed.
Equipment leak cutoffs	It is likely that there will be a cutoff limit for the equipment leak provisions of the standard similar to those in Subpart VV.
Source category definition	This standard is intended to regulate facilities that produce phenol-formaldehyde, melamine-formaldehyde and urea-formaldehyde resins. It will likely be expanded to regulate a small number of other specialty resins that are also based on formaldehyde polymers and produced in a similar manner to the listed source categories. In other words, applicability will be based on product verses feedstocks or process.
Research and development facilities	It is unlikely that research and development facilities will be regulated by this standard. As defined in the CAA (Sect 112 (c)(7)), these facilities will be regulated in a future standard.
Distillate	It is likely that distillate that is recycled will not be considered wastewater. However, distillate that is discharged will most likely be considered when evaluating wastewater control applicability.

Fugitives other than equipment leaks	Since the EPA has determined that the fugitive emissions other than equipment leaks (e.g. transfer operations) are negligible for these source categories, we don't plan to address them in this standard.
Non-contact cooling water	For this standard, wastewater will not include non-contact cooling water. EPA will still explore the possibility for an LDAR requirement if VOHAP contamination occurs.
Emissions averaging	It is likely that there will be emissions averaging provisions in this standard similar to those in the HON and other polymer and resin standards.
Aggregating batch process vents	While ducting costs are integrated into the regression cutoff equations of the Batch ACT, there are likely to be instances where the ducting costs will become excessive. This costs can escalate significantly due to a number of site specific factors. These factors include the physical distance between reactors as well as the potential need for flame arresters and other equipment to prevent explosions with certain resin formulations. EPA will investigate methods for evaluating these types of facilities.
Process equipment definition for process vents	In general, all process equipment involved in resin formulation and finishing will be considered when performing emission calculations for this standard. It is likely that the standard will identify certain specific types of process equipment that are very minor emission sources and need not be considered when performing process vent cutoff calculations using the Batch ACT methodology.
Applicability of more stringent requirement for new sources	Were more stringent controls are required for new or reconstructed sources such as storage tanks in the HON the Clean Air Act specifies 2 compliance deadlines. If the source begins construction after the rule is promulgated the source must show it will comply with the standard before it begins construction or reconstruction. If the source begins construction or reconstruction after proposal of a rule and before promulgation the source has three years after the date of promulgation to comply with the rule. CAA Section 112(i)(1) and (2)
Non-significant sources at major facilities	There are several phenolic resins facilities located at paints and coatings facilities that produce resins for very small periods during the year (5% for many of these facilities). Many of these facilities are major due to their paints and coatings operations. There is a concern about drawing these plants into the rule for equipment leaks and recordkeeping (other operations are minor enough to be exempted).

Sample Calculations for Batch ACT

Medium Facility

- Entire facility is major due to collocation with a SOCMI process
- 6 Reactors are used to produce amino and phenolic resins
- Four resin products (A, B, C & D) are made in any of the six reactors
  - Product A - 100 batches in previous year
  - Product B - 300 batches in previous year
  - Product C - 700 batches in previous year
  - Product D - 275 batches in previous year
- Emission streams are all low volatility
- Actual annual HAP emissions from process vents during resin production was 28,300 lbs

Determine MACT Applicability

- Entire facility is a major source (>10/25 tpy)
- Entire facility can't qualify as a synthetic minor
- Comply with MACT standard

Compute average flowrate (FR) per batch using the following equation:

- Product A FR = 33.8 scfm
- Product B FR = 52.1 scfm
- Product C FR = 42.6 scfm
- Product D FR = 48.3 scfm

$$FR = \frac{\sum_{i=1}^{n} (FR_{event_i})(Duration_{event_i})}{\sum_{i=1}^{n} Duration_{event_i}}$$

$$\frac{00)(33.8) + (300)(52.1) + (700)(42}{1375}$$

- Since all six reactors can be used for resin production, the average FR for the facility is (6)(45.2) = 271.2
- Manifolding of vents for all twelve reactors and parallel processing is assumed

Determine if cutoffs are met

- AE from vents = 28,300lbs > 26,014lbs (cutoff for low volatility streams in Table 6-1) ====> NO
- From Table 6-1, for low volatility stream and 90% control, use the following:

$FR_{calc} = (0.07)(AE) - 1821$
$FR_{calc} = (0.07)(28,300) - 1821$
$FR_{calc} = 160$ scfm

- Since 160 < 271.2, no control is required for process vents
- Commit to enforceable limits on annual emissions as well as average FR for the facility

Large Facility

- Entire facility is major
- 12 Reactors are used to produce amino and phenolic resins
- Eight resin products (A, B, C, D, E, F, G & H) are made in any of the twelve reactors
  Previous year production:

Product A - 150 Batches	Product B - 220 Batches
Product C - 95 Batches	Product D - 900 Batches
Product E - 850 Batches	Product F - 640 Batches
Product G - 770 Batches	Product H - 1100 Batches

- Emission streams are all low volatility
- Actual annual HAP emissions from process vents during resin production was 52,600 lbs

Determine MACT Applicability

- Entire facility is a major source (>10/25 tpy)
- Entire facility can't qualify as a synthetic minor
- Comply with MACT standard

Compute average flowrate (FR) per batch using the following equation:

- Product A FR = 42.8 scfm
  Product B FR = 38.3 scfm
- Product C FR = 52.5 scfm
  Product D FR = 24.1 scfm
- Product E FR = 22.6 scfm
  Product F FR = 19.7 scfm
- Product G FR = 18.3 scfm
  Product H FR = 20.3 scfm

$$FR = \frac{\sum_{i=1}^{n} (FR_{event_i})(Duration_{event_i})}{\sum_{i=1}^{n} Duration_{event_i}}$$

$$\therefore\ Average\ FR\ per\ batch = \frac{(150)(42.8) + (220)(38.3) + ... + (1100)(20.3)}{4725} = 23.2\ scfm$$

- Since all 12 reactors can be used for resin production, the average FR for the facility is (12)(23.2) = 278.4
- Manifolding of vents for all twelve reactors and parallel processing is assumed

Determine if cutoffs are met

- AE from vents = 52,600lbs > 26,014lbs (cutoff for low volatility streams in Table 6-1) ====> NO
- From Table 6-1, for low volatility stream and 90% control, use the following:

FR_{calc} = (0.07)(AE) - 1821
FR_{calc} = (0.07)(52,600) - 1821
FR_{calc} = 1861 scfm

- Since 1861 > 278.4, control is required for process vents to 90 %