

DRAFT – DO NOT CITE OR QUOTE. THIS DRAFT INFORMATION IS DISTRIBUTED SOLELY FOR THE PURPOSE OF FACILITATING THE REVIEW OF EMISSION INVENTORY DATA FOR THE RISK AND TECHNOLOGY REVIEW PROGRAM. IT HAS NOT BEEN FORMALLY DISSEMINATED BY THE AGENCY. IT DOES NOT REPRESENT AND SHOULD NOT BE CONSTRUED TO REPRESENT ANY AGENCY DETERMINATION OR POLICY.

**Risk and Technology Review – Phase II
Advanced Notice of Proposed Rulemaking
Source Category Data Summary**

POLYSTYRENE PRODUCTION

March 2007

1.0 INTRODUCTION

Section 112(f)(2) of the Clean Air Act (CAA) directs EPA to assess the risk remaining (residual risk) after the application of control technology standards under section 112(d) (MACT). EPA is to promulgate more stringent standards for a category or subcategory of sources subject to MACT standards under section 112(d) if promulgation of such standards is necessary to protect public health with an ample margin of safety or to prevent (taking into consideration various factors) adverse environmental effects.

In an effort to streamline the process of making residual risk decisions for the large number of MACT source categories for which residual risk rules have not yet been developed, EPA plans to address residual risk and perform a technology review for several source categories in one combined effort. The first part of this approach is to compile and review (and update with facility-specific data collected by EPA in some cases) readily available source category emissions data from the 2002 NEI, and to identify hazardous air pollutants (HAP) expected to contribute the most to risks from each source category as well as to identify apparent anomalies in the data sets. This information will then be made available for public comment through an Advanced Notice of Proposed Rulemaking (ANPRM).

This document provides a summary of the available data for the Polystyrene Production source category. Section 2 of this document provides an introduction to this source category and a brief summary of the available emissions data. Section 3 identifies key HAP that may impact risk, as well as aspects of the data that may impact risk estimates. Section 4 includes a bulleted list of data anomalies, included to facilitate public comment.

A separate file available for download contains the detailed emissions and emissions release characteristic data for this source category. EPA is requesting comment on these data, which include emission rates, stack parameters, and source location information. Additions, deletions, and corrections to the data will be made based on feedback and comments from stakeholders and the public. Specific instructions on how to download and submit corrections to these data can be found in the text of the ANPRM, as well as within a “readme” file available on the website from which you obtained this summary report.

2.0 SOURCE CATEGORY AND EMISSIONS DATA

Group IV polymers and resins includes seven source categories of thermoplastics: acrylonitrile butadiene styrene resin, styrene acrylonitrile resin, methyl methacrylate acrylonitrile butadiene styrene resin, methyl methacrylate butadiene styrene resin, polystyrene resin, polyethylene terephthalate resin, and nitrile resin. The thermoplastics produced by these seven source categories are used in the manufacture of a variety of goods, including packaging materials and containers, polyester fibers, electrical insulation, automotive components, furniture, radio and television components, housewares, appliances, wall tiles, and x-ray film. Although one MACT

rule was developed for the polymers and resins group IV as a whole, each of these seven source categories has been assessed separately for the analyses conducted for the ANPRM. This summary describes the polystyrene resin production source category.

Polystyrene resins are those produced by the polymerization of styrene monomer. This type of resin can be produced by three methods: (1) suspension polymerization (operated in batch mode); (2) mass (operated in a continuous mode); and (3) emulsion process (operated in a continuous mode). The mass and suspension methods are the most commercially significant, whereas use of the emulsion process has decreased significantly since the mid-1940s. The suspension process is a batch process that can be used to produce crystal, impact, or expandable polystyrene beads. In this process, polymerization is carried out in an aqueous medium that permits the removal of heat resulting from the reaction. The polystyrene is formed in small beads which are separated from the aqueous phase. The mass process uses no water or organic solvents and is the simplest process for producing polystyrene. There are four major stages in the process: prepolymerization, polymerization, devolatilization, and extrusion.

The uses for polystyrene resin include packaging and one-time use, expandable polystyrene beads, electronics, resellers and compounding, consumer and institutional products, and furniture, building, or construction uses. A wide variety of consumer and construction products are made from polystyrene resins, including disposable dinnerware, shower doors, light diffusers, soap dishes, insulation board, food containers, drain pipes, audio and video tape, picnic coolers, loose fill packaging, and tubing. The major HAP expected to be emitted by the polystyrene source category is styrene.

From information gathered during the MACT development and from more recent contacts with the industry, it is estimated that there are 28 facilities with processes belonging in the Polystyrene Production source category. EPA identified 23 of these facilities in Version 1.0 of the 2002 NEI (February 2006). For each facility, EPA assigned the polystyrene MACT code to all process units that emitted styrene, and included these units in the ANPRM data set for the category. In instances where the polystyrene MACT code was assigned to processes at other plant sites, the polystyrene MACT code was removed. The emissions and facility data in the 2002 NEI for the 23 facilities comprise the data set that will be used for the risk characterization effort (after consideration of public comments as a result of the ANPRM). While the NEI identifies 9 of these 23 facilities as area sources of HAP (and 14 as major sources), the uncertainty associated with these major/area classifications is significant. Without verification of the area source status of individual facilities, EPA will likely consider all facilities in the NEI to be major sources in future risk assessments.

Several HAP are emitted from this source category. Styrene is the HAP emitted in the largest total quantity from these facilities, accounting for over 65 percent of the total HAP emissions, and it is reported as an emission from all but one of the facilities in the data set. Ethyl chloride and toluene are also released in large quantities and collectively account for another 25 percent

DRAFT – DO NOT CITE OR QUOTE. THIS DRAFT INFORMATION IS DISTRIBUTED SOLELY FOR THE PURPOSE OF FACILITATING THE REVIEW OF EMISSION INVENTORY DATA FOR THE RISK AND TECHNOLOGY REVIEW PROGRAM. IT HAS NOT BEEN FORMALLY DISSEMINATED BY THE AGENCY. IT DOES NOT REPRESENT AND SHOULD NOT BE CONSTRUED TO REPRESENT ANY AGENCY DETERMINATION OR POLICY.

of the total mass emissions; however, these two HAP are reported as emissions for just one and six facilities, respectively. A range of other HAP, including volatile and non-volatile organic compounds, various metals, and non-metal inorganic compounds, are also reported as emissions (though generally from just a few facilities). Two persistent or bioaccumulative HAP (PB HAP), cadmium and lead, were each reported by one facility in the ANPRM data set. Table 2-1 summarizes the emissions for the Polystyrene Production source category ANPRM data set.

Table 2-1. Summary of Emissions from the Polystyrene Production Source Category

HAP ^a	Emissions (tpy)	Number of Facilities Reporting HAP (23 facilities in ANPRM data set)	Prioritized Inhalation Dose-Response Value Identified by OAQPS ^b			PB-HAP?
			Unit Risk Estimate for Cancer?	Reference Concentration for Noncancer?	Health Benchmark Values for Acute Noncancer?	
Styrene	123	22		U	U	
Ethyl Chloride	38	1		U		
Toluene	10	6		U	U	
Methylene Chloride	5	2		U	U	
Ethyl Benzene	4	12	U	U		
Xylenes (Mixture of o, m, and p Isomers)	2	5		U	U	
N,N-Dimethylformamide	2	1		U	U	
Methanol	1	2		U	U	
Tetrachloroethylene	1	1		U	U	
Acrylic Acid	0.5	1	U	U	U	
Cumene	0.3	6		U		
Hydrochloric Acid	0.3	1		U	U	
Acrylonitrile	0.1	3		U	U	
Hexane	0.1	1	U	U		
4,4'-Methylenediphenyl Diisocyanate	0.1	1		U	U	
Methyl Methacrylate	0.1	2		U	U	
Phenol	0.1	1		U	U	
Naphthalene	0.1	1		U		
o-Cresol	0.1	1	U	U		
Benzene	0.02	2			U	
Ethylene Dichloride	0.02	1	U	U	U	
1,3-Butadiene	0.01	1	U	U	U	
Antimony	0.01	1	U	U		
Nickel	0.003	1		U	U	
Acetaldehyde	0.003	1	U	U	U	
Chloroform	0.002	1	U	U	U	
1,4-Dichlorobenzene	0.001	1		U		

DRAFT – DO NOT CITE OR QUOTE. THIS DRAFT INFORMATION IS DISTRIBUTED SOLELY FOR THE PURPOSE OF FACILITATING THE REVIEW OF EMISSION INVENTORY DATA FOR THE RISK AND TECHNOLOGY REVIEW PROGRAM. IT HAS NOT BEEN FORMALLY DISSEMINATED BY THE AGENCY. IT DOES NOT REPRESENT AND SHOULD NOT BE CONSTRUED TO REPRESENT ANY AGENCY DETERMINATION OR POLICY.

HAP ^a	Emissions (tpy)	Number of Facilities Reporting HAP (23 facilities in ANPRM data set)	Prioritized Inhalation Dose-Response Value Identified by OAQPS ^b			PB-HAP?
			Unit Risk Estimate for Cancer?	Reference Concentration for Noncancer?	Health Benchmark Values for Acute Noncancer?	
Lead	0.001	1	U	U		U
Selenium	0.001	1		U		
Chromium	0.001	1		U		
Cobalt	0.001	1	U	U		
Cadmium	0.001	1		U		U

^a Notes for how HAP will be speciated in future risk assessments in the absence of additional information:

- For most metals, emissions reported as the elemental metal will be combined with metal compound emissions (e.g., “cadmium” emissions modeled as “cadmium & compounds”).
- For emissions reported generically as “chromium” or “chromium & compounds,” emissions will be speciated for this category as 66 percent “chromium (III) compounds” and 34 percent “chromium (VI) compounds.” Chromium speciation profiles can be found on EPA’s Technology Transfer Network website for emissions inventories at: <http://www.epa.gov/ttn/chief/net/2002inventory.html>

^b Specific dose-response values for each chemical are identified on EPA’s Technology Transfer Network website for air toxics at: <http://www.epa.gov/ttn/atw/toxsource/summary.html>.

3.0 KEY HAP AND DATA SET ANOMALIES

This section identifies key HAP for this source category and uncertainties or anomalies associated with the data based on a preliminary review of the NEI. To help focus efforts to review inventory data, Table 3-1 lists key carcinogenic HAP and key non-carcinogenic HAP emitted by this source category in order of their most likely importance for this source category. HAP may be listed as both carcinogenic and non-carcinogenic if it causes both cancer and adverse health effects other than cancer. Table 3-2 summarizes the data anomalies and uncertainties.

Table 3-1. Key HAP

Carcinogenic HAP	tetrachloroethene
Non-carcinogenic HAP	acrylic acid

DRAFT – DO NOT CITE OR QUOTE. THIS DRAFT INFORMATION IS DISTRIBUTED SOLELY FOR THE PURPOSE OF FACILITATING THE REVIEW OF EMISSION INVENTORY DATA FOR THE RISK AND TECHNOLOGY REVIEW PROGRAM. IT HAS NOT BEEN FORMALLY DISSEMINATED BY THE AGENCY. IT DOES NOT REPRESENT AND SHOULD NOT BE CONSTRUED TO REPRESENT ANY AGENCY DETERMINATION OR POLICY.

Table 3-2. Uncertainties in the Summary of ANPRM Data Set for Polystyrene Production and Their Potential Impacts on Risk Estimates

Parameter	Assumption	Discussion of Uncertainties or Anomalies	Potential Impact on Risk Estimates
Source Category Representation			
Facilities included	Facilities in the ANPRM data set are representative of entire source category.	The ANPRM data set includes data for 23 of the 28, or approximately 82 percent of the facilities believed to be in the source category.	Could underestimate maximum risks, population exposure, and cancer incidence.
Emissions and Release Characterization			
HAP emitted	The ANPRM data set is complete and correct.	Two of the key HAP, tetrachloroethylene and naphthalene, are only reported to be emitted by one facility. It is possible that these emissions are correctly reported for that facility, that emissions of these chemicals should be included for other facilities, or are incorrectly reported for this one facility. We also would expect styrene emissions from every facility.	Could underestimate or overestimate risks.
Emission levels	The emission levels in the ANPRM data set are actual emission levels that represent normal operating conditions while in compliance with the applicable MACT standard.	The actual emission levels are likely lower than the “allowable” emission levels that are permissible by the standard.	Could underestimate potential risk levels.
Stack release characteristics	The ANPRM data set is either correct or has reasonable default parameters from the NEI where data were not provided by the State agencies.	The quality of stack release characteristics for individual facilities varies as some facilities have stack-specific parameters, while others have default parameters. For this source category, approximately one half of the values for stack diameter, exit gas temperature, and exit gas velocity were default values, and one third of the stack height values were defaults.	Could underestimate or overestimate risks.

DRAFT – DO NOT CITE OR QUOTE. THIS DRAFT INFORMATION IS DISTRIBUTED SOLELY FOR THE PURPOSE OF FACILITATING THE REVIEW OF EMISSION INVENTORY DATA FOR THE RISK AND TECHNOLOGY REVIEW PROGRAM. IT HAS NOT BEEN FORMALLY DISSEMINATED BY THE AGENCY. IT DOES NOT REPRESENT AND SHOULD NOT BE CONSTRUED TO REPRESENT ANY AGENCY DETERMINATION OR POLICY.

Table 3-2. Uncertainties in the Summary of ANPRM Data Set for Polystyrene Production and Their Potential Impacts on Risk Estimates

Parameter	Assumption	Discussion of Uncertainties or Anomalies	Potential Impact on Risk Estimates
Emission source coordinates	The ANPRM data set contains accurate coordinates for each emission point.	For this source category, none of the records have coordinates that were defaulted. However, there can still be errors in the coordinates that result in the emission sources not being properly located on plant property.	Could underestimate or overestimate risks.

4.0 DATA ANOMALIES FOR COMMENT

- The general method used to identify polystyrene production units at large, integrated chemical plants (i.e., all units that emit styrene) could have resulted in non-polystyrene production process units being assigned to this category. There were several HAP emitted that are not necessarily expected from polystyrene production. For example, tetrachloroethylene and naphthalene emissions were reported for one facility in this category. Ethyl chloride emissions were reported in large quantities from one facility and several metal HAP were also emitted from another facility in this category. Are these emissions really from this source category or are they actually from some other processes at the site? Should these emissions be reported for other facilities in the source category?
- Styrene is expected to be emitted by every facility in this source category. In the absence of comments on this issue, EPA will develop an emissions profile for application to this facility.
- EPA's estimated number of facilities indicates that there may be more facilities in this category than represented in the ANPRM data set. Are you aware of additional facilities that should be included in this source category?
- As noted in Section 2, there is uncertainty in the identification of sources as major or area in the NEI. We are specifically requesting that you review the area/major identification and submit corrections as necessary.
- Coordinates in the NEI are checked to ensure that they are generally correct (e.g., in the correct county). However, there can still be errors in the coordinates that result in the emission sources not being properly located on plant property. We are asking for public reviewers to carefully review the coordinates for all facilities in this data set and submit corrections where necessary.