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National Priority Chemicals Trends Report (2004-2006)

Section 4 Trends Analyses for Specific Priority Chemicals (2004-2006): Polycyclic Aromatic Compounds (PACs)

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Polycyclic Aromatic Compounds (PACs)

Chemical Information

PACs, also known as polycyclic aromatic hydrocarbons (PAHs), are a group of more than 100 different chemicals that are characterized by hydrogen and carbon arranged in two or more fused benzene rings. As pure chemicals, PACs generally exist as colorless, white, or pale yellow-green solids. The polycyclic aromatic compounds category (TRI Category N590) consists of 21 specific chemicals reportable to TRI.

Polycyclic Aromatic Compounds in TRI Category N590	
1-Nitropyrene	Benzo(k)fluoranthene
3-Methylcholanthrene	Benzo(r,s,t)pentaphene
5-Methylchrysene	Dibenz(a,h)acridine
7,12-Dimethylbenz(a)anthracene	Dibenz(a,j)acridine
7H-Dibenzo(c,g)carbazole	Dibenzo(a,e)fluoranthene
Benzo(a)anthracene	Dibenzo(a,e)pyrene
Benzo(a)phenanthrene (chrysene)	Dibenzo(a,h)anthracene
Benzo(a)pyrene	Dibenzo(a,h)pyrene
Benzo(b)fluoranthene	Dibenzo(a,l)pyrene
Benzo(j)fluoranthene	Indeno(1,2,3-cd)pyrene
Benzo(j,k)fluorene (fluoranthene)	

General Uses: Most, if not all, PACs are byproducts of combustion or impurities. They are produced or emitted during thermal processes, such as the incomplete combustion of organic compounds, pyrolysis, or the processing of fossil fuels, bitumens, or nonfossil fuels. There are presently no known commercial uses for PACs.

How Much Polycyclic Aromatic Compounds Were Generated?

For 2006, 693 facilities reported approximately 8 million pounds of PACs being generated; one facility accounted for approximately 27 percent of the national total quantity of this PC, while 12 facilities accounted for approximately 87 percent (please refer to Exhibit 3.4 to see the number of facilities that reported this PC within various quantity ranges). Compared to the total quantities of PACs reported for 2004 and 2005, the quantity decreased by approximately 646,000 pounds and 1.1 million pounds, respectively (Exhibit 4.58).

Exhibit 4.58. National Generation of Polycyclic aromatic compounds (2004–2006)

TRI Reporting Year	2004	2005	2006
Total Quantity of Polycyclic aromatic compounds (pounds)	8,614,112	9,073,001	7,968,088
Number of TRI Facilities Reporting Polycyclic aromatic compounds	687	700	693

Where Were Polycyclic Aromatic Compounds Generated?

Since 2004, facilities in 54 states and territories reported generating PACs. Exhibit 4.59 shows the counties in which facilities reported approximately 90 percent of the total quantity of PACs. Some observations concerning the quantity of PACs reported by facilities in these counties are:

- A primary aluminum production facility in Hancock County, Kentucky (EPA Region 4) reported an increase of approximately 958,000 pounds for 2006. This facility uses coal tar pitch and coke to produce carbon rods (anodes) for aluminum smelting. PACs are contained in the coal tar pitch bought from an offsite source. In 2006, the facility changed its coal tar pitch vendor, resulting in a change in composition of the coal tar pitch. The quantities of PACs generated also correlate with the production of carbon rods.
- A carbon and graphite product manufacturing facility in Pope County, Arkansas (EPA Region 6) reported an increase of approximately 242,000 pounds for 2006 due to changes in feedstock and production rate.
- A carbon and graphite product manufacturing facility in Maury County, Tennessee (EPA Region 4) reported a decrease of approximately 967,000 pounds for 2006. This facility uses coal tar pitch for producing carbon electrodes and changed its coal tar pitch vendor, resulting in a change in composition of the coal tar pitch. The quantities of PACs generated also correlate with the production of carbon rods.
- A cyclic crude and intermediate manufacturing facility in Harris County, Texas (EPA Region 6) reported an increase of approximately 745,000 pounds for 2005 due to demolition and tank/releases cleanup efforts.
- A chemical product and preparation manufacturing facility in Mayes County, Oklahoma (EPA Region 6) reported approximately 551,000 pounds for 2006. This was the first time this facility reported polycyclic aromatic compounds.
- A carbon and graphite product manufacturing facility in Burke County, North Carolina (EPA Region 4) reported an increase of approximately 512,000 pounds for 2005 followed by a decrease of approximately 690,000 pounds for 2006. This facility uses coal tar pitch for producing carbon electrodes. The quantities of PACs generated correlate with the production of carbon rods; the facility also noted the composition of the coal tar pitch changed, as supplied by its vendor.

Exhibit 4.59. Quantity of Polycyclic Aromatic Compounds, for Facilities Reporting 90 Percent of Total Quantity, by County (2006)

EPA Region	State	County	Quantity (pounds) of PACs			Percent of Total Quantity (2006)
			2004	2005	2006	
4	KY	Hancock	1,389,221	1,171,896	2,129,500	26.7%
6	AR	Pope	674,556	628,392	870,098	10.9%
4	TN	Maury	1,775,195	1,728,070	760,744	9.5%
6	TX	Harris	13,308	756,633	612,121	7.7%
6	OK	Mayes	0	0	551,117	6.9%
5	IN	Lake	428,671	462,774	482,521	6.1%
6	AR	Franklin	364,642	371,159	447,882	5.6%
4	KY	Fulton	299,761	327,672	339,742	4.3%
4	NC	Burke	498,756	1,010,636	320,713	4.0%
6	TX	Nueces	168,061	177,787	153,664	1.9%
3	WV	Brooke	299,080	305,310	140,494	1.8%
4	SC	Berkeley	132,318	135,408	134,248	1.7%
6	LA	Calcasieu	93,146	112,638	79,540	1.0%
4	TN	Lawrence	33,126	57,012	72,444	0.9%
2	NY	St Lawrence	75,221	80,615	67,188	0.8%
Total			6,247,068	7,328,006	7,164,022	89.9%

Which Industries Generated Polycyclic Aromatic Compounds?

For 2006, facilities in 76 different NAICS codes reported generating PACs. Facilities in two NAICS codes: NAICS code 335991 (Carbon and Graphite Product Manufacturing) and NAICS code 331312 (Primary Aluminum Production) accounted for approximately 65 percent of the total PACs quantity generated (Exhibit 4.60).

Exhibit 4.60. Industry Sectors Quantities of Polycyclic Aromatic Compounds, for Facilities Reporting 95 Percent of Total Quantity (2006)

Primary NAICS Code	NAICS Code Description	Facilities Reporting (2006)	Quantity (pounds) of PACs			Percent of Total Quantity (2006)
			2004	2005	2006	
335991	Carbon and Graphite Product Manufacturing	18	3,709,574	4,220,588	2,899,886	36.4%
331312	Primary Aluminum Production	12	1,559,987	1,341,676	2,264,506	28.4%
325192	Cyclic Crude and Intermediate Manufacturing	5	104,092	811,619	668,368	8.4%
325998	All Other Miscellaneous Chemical Product and Preparation Manufacturing	5	19,206	15,483	572,424	7.2%
324191	Petroleum Lubricating Oil and Grease Manufacturing	2	445,100	481,117	501,738	6.3%
324110	Petroleum Refineries	83	353,755	341,553	264,400	3.3%
325110	Petrochemical Manufacturing	14	611,808	721,140	226,270	2.8%
325211	Plastics Material and Resin Manufacturing	6	207,352	203,925	140,419	1.8%
Total		145	7,010,874	8,137,101	7,538,011	94.6%

How Did Facilities Manage Polycyclic Aromatic Compounds?

Exhibit 4.61 shows how facilities, by industry, managed PACs in 2006.

Land Disposal: Facilities disposed of approximately 5 percent of the PACs generated, primarily offsite. The facility in NAICS code 325110 (Petrochemical Manufacturing) disposed of approximately 62 percent of its PACs.

Energy Recovery: Facilities used energy recovery to manage approximately 2.3 million or 30 percent of the PACs generated.

Treatment: Facilities treated approximately 4.9 million pounds or 65 percent of the PACs generated. Facilities in 5 of the 8 industries used treatment as their primary method for managing this PC.

Recycling: Facilities recycled approximately 939,000 pounds of PACs in 2006. Facilities in 4 of the 8 industries accounted for approximately 75 percent of the total recycled quantity of PACs generated; facilities in three industries reported no recycling of this PC.

Many facilities reported they only used recycling to manage their PACs. For 2006, 35 facilities, in 12 different industries, reported only recycling approximately 69,000 pounds of PACs. Exhibits 4.62 and 4.63 show the industries and the quantities for those facilities that accounted for more than 96 percent of the PACs that were managed only by recycling.

Exhibit 4.61. Management Methods for Polycyclic Aromatic Compounds, by Industry (NAICS Code) in 2006

Primary NAICS Code	NAICS Code Description	Total PC Quantity* Reported	Quantity (pounds) of PACs							
			Disposal		Energy Recovery		Treatment		Recycling	
			Onsite	Offsite	Onsite	Offsite	Onsite	Offsite	Onsite	Offsite
335991	Carbon and Graphite Product Manufacturing	2,899,886	12,841	34,402	1,091,272	281	1,749,774	11,316	203,597	885
331312	Primary Aluminum Production	2,264,506	2,781	52,666	0	0	2,207,018	2,040	158,889	0
325192	Cyclic Crude and Intermediate Manufacturing	668,368	0	53,073	34	615,221	35	5	269,328	74,320
325998	All Other Miscellaneous Chemical Product and Preparation Manufacturing	572,424	0	17,907	551,117	0	3,400	0	0	0
324191	Petroleum Lubricating Oil and Grease Manufacturing	501,738	0	19,294	0	0	482,444	0	0	0
324110	Petroleum Refineries	264,400	2,817	18,846	2,269	2,692	229,832	7,943	163,438	22,953
325110	Petrochemical Manufacturing	226,270	1	141,035	354	1,127	34,769	48,984	23,821	21,494
325211	Plastics Material and Resin Manufacturing	140,419	63	198	13,598	3,351	123,208	1	0	0
Total		7,538,011	18,503	337,422	1,658,644	622,673	4,830,480	70,290	819,073	119,652

*Note: The recycled quantity is presented to provide some perspective regarding the quantity of this PC already recycled compared to the quantities that are not recycled. In this Report, we primarily focus on non-recycled quantities of PCs (PC quantity) that offer the greatest opportunities for waste minimization. The term "PC Quantity", as used in this Report, refers to quantities of PCs that are managed via disposal, treatment, and energy recovery and thus potentially available for waste minimization.

Exhibit 4.62. Industries in Which Facilities Only Recycled Polycyclic Aromatic Compounds, Reporting 99 Percent of the Polycyclic Aromatic Compounds Managed Only By Recycling (2006)

Primary NAICS Code	NAICS Code Description	Recycled Only Quantity (2006)	Percent of Recycled Only Quantity (2006)
325199	All Other Basic Organic Chemical Manufacturing	31,853	46.4%
324199	All Other Petroleum and Coal Products Manufacturing	15,672	22.8%
331111	Iron and Steel Mills	13,000	18.9%
324122	Asphalt Shingle and Coating Materials Manufacturing	4,442	6.5%
324121	Asphalt Paving Mixture and Block Manufacturing	3,212	4.7%

Exhibit 4.63. Facilities That Only Recycled Polycyclic Aromatic Compounds, Reporting 96 Percent of the Polycyclic aromatic compounds Managed Only By Recycling (2006)

Primary NAICS Code	NAICS Code Description	EPA Region	State	County	Recycling (pounds)		
					Onsite	Offsite	Total
325199	All Other Basic Organic Chemical Manufacturing	6	TX	Jefferson	0	31,853	31,853
324199	All Other Petroleum and Coal Products Manufacturing	2	NY	Erie	14,928	0	14,928
331111	Iron and Steel Mills	4	AL	Jefferson	13,000	0	13,000
324122	Asphalt Shingle and Coating Materials Manufacturing	5	OH	Erie	0	2,462	2,462
324122	Asphalt Shingle and Coating Materials Manufacturing	5	MN	Scott	0	1,922	1,922
324121	Asphalt Paving Mixture and Block Manufacturing	1	MA	Middlesex	1,715	0	1,715
Total					29,643	36,238	65,881

Data Derived From Hazardous Waste Biennial Reports for Polycyclic Aromatic Compounds

In this section, we present data on which facilities submitted information to the BR system. As discussed in Section 1, we caution readers against making casual one-to-one comparisons between the TRI and BR data. The differences between these two reporting systems can cause significant variation in the number of reporting facilities and quantities of chemicals reported.

Exhibit 4.64 shows the estimated quantity of PACs contained in hazardous wastes generated in 2005—derived from data reported by facilities on the BR. We estimate that hazardous wastes reported by facilities in these industries contained approximately 711,000 pounds of PACs. Waste streams classified as non-wastewaters contained approximately 98 percent of the PACs. Facilities in two industries: NAICS code 324110 (Petroleum Refineries) and NAICS code 325192 (Cyclic Crude and Intermediate Manufacturing) accounted for approximately 84 percent of the total estimated quantity of PACs in the hazardous waste streams.

Exhibit 4.64. Estimated Quantity of Polycyclic aromatic compounds in Primary Generation Hazardous Waste for Facilities Reporting 99.9 Percent of the Total Priority Chemical Quantity, by NAICS Code (2005)

Primary NAICS Code	NAICS Code Description	Number of Facilities	Quantity (pounds) of PACs			Percent of Total Quantity
			Non-wastewaters	Wastewaters	Total Quantity	
324110	Petroleum Refineries	140	432,499	14,908	447,407	62.8%
325192	Cyclic Crude and Intermediate Manufacturing	4	147,817	0	147,817	20.8%
331312	Primary Aluminum Production	13	44,281	0	44,281	6.2%
321114	Wood Preservation	52	15,143	1,434	16,577	2.3%
493110	General Warehousing and Storage	1	14,536	0	14,536	2.0%
331111	Iron and Steel Mills	4	12,196	0	12,196	1.7%
331210	Iron and Steel Pipe and Tube Manufacturing from Purchased Steel	1	12,173	0	12,173	1.7%
324199	All Other Petroleum and Coal Products Manufacturing	5	5,430	7	5,436	0.8%
331315	Aluminum Sheet, Plate, and Foil Manufacturing	1	5,435	0	5,435	0.8%
331311	Alumina Refining	1	3,575	0	3,575	0.5%
333298	All Other Industrial Machinery Manufacturing	1	687	0	687	0.1%
321113	Sawmills	1	420	0	420	0.1%
424710	Petroleum Bulk Stations and Terminals	4	406	0	406	0.1%
Total		228	694,598	16,349	710,946	99.9%