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National Priority Chemicals Trends Report (2005-2007)

Section 4 Trends Analyses for Specific Priority Chemicals (2005-2007): Cadmium and Cadmium Compounds (Cadmium)

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Cadmium and Cadmium Compounds (Cadmium)

Chemical Information

General Uses: Cadmium is used in metal plating and to make pigments, batteries and plastics. It is obtained as a byproduct from melting zinc, lead, or copper ores.

How Much Cadmium Was Generated?

For 2007, 53 facilities reported generating approximately 816,000 pounds of cadmium. Two facilities reported approximately 68 percent of the national total quantity of this PC; eight facilities reported approximately 90 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 cadmium reported for 2005 and 2006, the quantity increased by approximately 256,000 pounds and decreased 52,000 pounds, respectively (Exhibit 4.1).

Exhibit 4.1. National Generation of Cadmium (2005–2007)

TRI Reporting Year	2005	2006	2007
Total Quantity of Cadmium (pounds)	611,375	867,700	815,688
Number of TRI Facilities Reporting Cadmium	65	62	53

Where Was Cadmium Generated?

For 2007, two facilities reported a total of approximately 558,000 pounds of cadmium, representing approximately 68 percent of the total quantity generated (Exhibit 4.2). One facility, an inorganic chemical manufacturing facility, located in Caribou County, Idaho (EPA Region 10), reported an increase of approximately 238,000 pounds for 2006. This facility's cadmium is an impurity in phosphate ores from which nodules are made for use in electric arc furnaces for the production of 99 percent pure phosphorous. The quantity of this facility's reported cadmium is determined by the concentration of cadmium in the ore and the production rate. The second facility, a secondary smelting and refining facility, located in Washington County, Oklahoma (EPA Region 6), extracts lead and zinc from electric arc furnace dusts. This facility's quantity of cadmium correlates to the variability of the electric arc furnace dusts processed.

Exhibit 4.2. Quantity of Cadmium, for Facilities Reporting 95 Percent of Total Quantity, by County (2007)

EPA Region	State	County	Quantity (pounds) of Cadmium			Percent of Total Quantity (2007)
			2005	2006	2007	
10	ID	Caribou	68,005	306,044	322,494	39.5%
6	OK	Washington	287,766	293,666	235,437	28.9%
4	AL	Pike	39,608	39,514	42,277	5.2%
4	SC	Berkeley	6,883	0	31,924	3.9%
4	TN	Madison	15,114	16,549	29,619	3.6%
7	NE	Jefferson	22,400	30,000	26,000	3.2%
4	AL	Morgan	40,789	9,141	25,208	3.1%
1	MA	Bristol	6,355	20,063	18,253	2.2%
4	AL	Tuscaloosa	128	10,802	13,152	1.6%
5	WI	Milwaukee	9,768	7,680	10,322	1.3%
6	AR	Mississippi	7,444	12,288	9,599	1.2%
6	TX	Mclennan	3,452	6,661	8,606	1.1%
Total			507,712	752,408	772,891	94.8%

Which Industries Generated Cadmium?

For 2007, nine facilities in two NAICS codes reported approximately 78 percent of the cadmium generated (Exhibit 4.3). Two of these facilities, one each in NAICS code 325188 (All other basic inorganic chemical manufacturing) and in NAICS code 331492 (Secondary smelting, refining, and alloying of nonferrous metal (except copper and aluminum)) reported approximately 68 percent of the national total quantity of cadmium generated for 2007.

Exhibit 4.3. Industry Sector Quantities of Cadmium, for Facilities Reporting 99 Percent of Total Quantity (2007)

Primary NAICS code	NAICS Code Description	Facilities Reporting (2007)	Quantity (pounds) of Cadmium			Percent of Total Quantity (2007)
			2005	2006	2007	
325188	All Other Basic Inorganic Chemical Manufacturing	4	109,966	336,053	348,628	42.7%
331492	Secondary Smelting, Refining, and Alloying of Nonferrous Metal (except Copper and Aluminum)	5	364,161	344,408	287,378	35.2%
331111	Iron and Steel Mills	9	36,941	46,076	91,423	11.2%
325199	All Other Basic Organic Chemical Manufacturing	3	45,570	9,838	25,889	3.2%
335931	Current-Carrying Wiring Device Manufacturing	1	6,355	20,063	18,253	2.2%
332813	Electroplating, Plating, Polishing, Anodizing, and Coloring	4	12,379	17,361	13,073	1.6%
332510	Hardware Manufacturing	1	9,768	7,680	10,322	1.3%
335911	Storage Battery Manufacturing	4	3,937	7,089	9,138	1.1%
332722	Bolt, Nut, Screw, Rivet, and Washer Manufacturing	1	0	9,326	4,395	0.5%
Total		32	589,077	797,894	808,498	99.1%

How Did Facilities Manage Cadmium?

Exhibit 4.4 shows how facilities, by industry, managed cadmium in 2007.

Disposal: Facilities disposed of 100 percent of the cadmium generated with approximately an equal amount disposed of on site and off site.

Energy Recovery: Energy recovery is not applicable to this PC.

Treatment: No facilities reported treating this PC.

In 2007, facilities also recycled approximately 597,000 pounds of cadmium. See Exhibit C.3 in Appendix C for additional information about the recycling of cadmium. Facilities also released 5,300 pounds of cadmium as air emissions and surface water discharges in 2007. See Appendix D for additional information about releases of cadmium.

Exhibit 4.4. Management Methods for Cadmium in Industry Sectors (2007)

Primary NAICS Code	NAICS Code Description	Total PC Quantity Reported	Quantity (pounds) of Cadmium					
			Disposal		Energy Recovery		Treatment	
			On-site	Off-site	On-site	Off-site	On-site	Off-site
325188	All Other Basic Inorganic Chemical Manufacturing	348,628	322,494	26,134	0	0	0	0
331492	Secondary Smelting, Refining, and Alloying of Nonferrous Metal (except Copper and Aluminum)	287,378	42,308	245,070	0	0	0	0
331111	Iron and Steel Mills	91,423	29,003	62,420	0	0	0	0
325199	All Other Basic Organic Chemical Manufacturing	25,889	0	25,889	0	0	0	0
335931	Current-Carrying Wiring Device Manufacturing	18,253	0	18,253	0	0	0	0
332813	Electroplating, Plating, Polishing, Anodizing, and Coloring	13,073	0	13,073	0	0	0	0
332510	Hardware Manufacturing	10,322	0	10,322	0	0	0	0
335911	Storage Battery Manufacturing	9,138	0	9,138	0	0	0	0
332722	Bolt, Nut, Screw, Rivet, and Washer Manufacturing	4,395	0	4,395	0	0	0	0
Total		808,498	393,805	414,693	0	0	0	0

Data Derived From Hazardous Waste Biennial Reports for Cadmium

In this section, we present data about cadmium contained in hazardous wastes, derived from information submitted by facilities in Biennial Reports under RCRA. We derived these data by applying a methodology to estimate the quantity of cadmium contained in BR waste streams. The estimates of cadmium contained in hazardous wastes supplement the data reported to TRI, providing a broader perspective regarding the industries that generate and manage wastes that contain cadmium. Based on applying our methodology to the 2007 BR data, we estimate that 4,379 facilities in 472 NAICS codes reported hazardous wastes containing approximately 2.2 million pounds of cadmium. Waste streams classified as non-wastewaters contained approximately 99 percent of the cadmium. Facilities in NAICS code 331110 (Iron and Steel Mills and Ferroalloy Manufacturing) accounted for approximately 83 percent of the total estimated quantity of cadmium in the hazardous waste streams (Exhibit 4.5).

Exhibit 4.5. Estimated Quantity of Cadmium in Primary Generation Hazardous Waste for Facilities Reporting 95 Percent of the Total Estimated Quantity of Cadmium in Wastes, by NAICS Code (2007)

Primary NAICS Code	NAICS Code Description	Number of Facilities	Quantity (pounds) of Cadmium			Percent of Total Quantity
			Wastewaters	Non-Wastewaters	Total Quantity	
331110	Iron and Steel Mills and Ferroalloy Manufacturing	101	801	1,779,123	1,779,924	82.7%
331210	Iron and Steel Pipe and Tube Manufacturing from Purchased Steel	33	46	125,406	125,452	5.8%
928110	National Security	222	26	28,937	28,963	1.3%
235930	Excavation Contractors	1	0	21,970	21,970	1.0%
331221	Rolled Steel Shape Manufacturing	22	434	19,533	19,967	0.9%
331492	Secondary Smelting, Refining, and Alloying of Nonferrous Metal (except Copper and Aluminum)	24	24	19,787	19,811	0.9%
325992	Photographic Film, Paper, Plate, and Chemical Manufacturing	8	<1	17,862	17,862	0.8%
332813	Electroplating, Plating, Polishing, Anodizing, and Coloring	682	154	16,005	16,158	0.8%
325199	All Other Basic Organic Chemical Manufacturing	49	6	14,358	14,364	0.7%
Total		1,142	1,491	2,042,981	2,044,471	95.0%

In 2007, facilities generated hazardous waste containing cadmium in more than 1,100 counties within 54 states and territories. Exhibit 4.6 shows the 16 states in which facilities generated an estimated 90 percent of the cadmium contained in hazardous wastes.

Exhibit 4.6. States in Which Facilities Generated 90 Percent of Cadmium Contained in Primary Generation Hazardous Waste (2007)

EPA Region	State	Estimated Quantity of Cadmium Contained in Hazardous Wastes (pounds)	Percent of Total Quantity of Cadmium Contained in Hazardous Wastes
5	IN	308,657	14.3%
5	OH	242,237	11.3%
6	AR	202,041	9.4%
4	SC	179,326	8.3%
6	TX	160,835	7.5%
3	PA	157,746	7.3%
4	AL	149,589	7.0%
5	IL	92,540	4.3%
5	MI	90,966	4.2%
4	KY	81,828	3.8%
4	NC	65,848	3.1%
7	IA	56,570	2.6%
7	NE	52,897	2.5%
2	NY	36,388	1.7%
10	OR	32,181	1.5%
8	UT	28,667	1.3%
Total		1,938,317	90.1%

Exhibit 4.7 shows how facilities reported managing hazardous wastes that contain cadmium. For example, facilities used metals recovery for hazardous wastes containing an estimated 744,000 pounds of cadmium; hazardous wastes containing an estimated 550,000 pounds of cadmium were disposed of in landfills or surface impoundments. See Appendix E for a full list of the BR management codes and their descriptions.

Exhibit 4.7. Methods Used to Manage Hazardous Wastes Containing Cadmium (2007)

Management Method Group	Management Method Code Description	Quantity (pounds) of Cadmium Managed (2007)	Percent of Total Estimated Quantity of Cadmium
Reclamation and Recovery	Metals recovery	743,603	35.3%
	Other recovery or reclamation for reuse	39,569	1.9%
	Energy recovery at this site	13,249	0.6%
	Fuel blending prior to energy recovery at another site	6,319	0.3%
	Solvents recovery	4,632	0.2%
Reclamation and Recovery Total		807,372	38.4%
Disposal	Landfill or surface impoundment that will be closed as landfill	550,316	26.1%
	Land treatment or application	24,948	1.2%
	Deepwell or underground injection	1,891	0.1%
	Discharge to sewer/POTW or NPDES	80	<0.1%
Disposal Total		577,155	27.4%
Destruction or Treatment Prior to Disposal at Another Site	Stabilization or chemical fixation prior to disposal at another site	383,953	18.2%
	Incineration	14,550	0.7%
	Macro-encapsulation prior to disposal at another site	11,915	0.6%
	Other treatment	4,046	0.2%
	Other chemical precipitation with or without pre-treatment	550	<0.1%
	Sludge treatment and/or dewatering	406	<0.1%
	Chemical reduction with or without precipitation	260	<0.1%
	Cyanide destruction with or without precipitation	40	<0.1%
	Evaporation	35	<0.1%
	Neutralization only	19	<0.1%
	Biological treatment with or without precipitation	14	<0.1%
	Adsorption	6	<0.1%
	Phase separation	5	<0.1%
	Chemical oxidation	4	<0.1%
	Settling or clarification	2	<0.1%
	Wet air oxidation	<1	<0.1%
	Air or steam stripping	<1	<0.1%
	Absorption	<1	<0.1%
Destruction or Treatment Prior to Disposal at Another Site Total		415,805	19.8%
Transfer Off Site	Storage, bulking, and/or transfer off site	195,077	9.3%
Transfer Off Site Total		195,077	9.3%
NA	NA	109,711	5.2%
NA Total		109,711	5.2%
Grand Total		2,105,126	100.0%