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National Priority Chemicals Trends Report (2000-2004)

Section 4
Chemical Specific Trends Analyses for Priority Chemicals (2000−2004): Dibenzofuran

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Dibenzofuran

Chemical Information:

CAS Number − 132−64−9

Alternate Names − diphenylene oxide

General Uses − This chemical is used as an insecticide and to make other chemicals. It is made from coal tar and has been found in coke dust, grate ash, fly ash, and flame soot.

Potential Hazards − This chemical can cause skin, eye, nose, and throat irritation.

Summary Analysis:

- NATIONAL − Compared to the quantity of dibenzofuran reported in 2000, there was a 73 percent decrease in 2004.
- REGIONAL − In 2004, facilities in Regions 3 and 5 reported most of the dibenzofuran.
- STATES − Facilities in four states (Michigan, Illinois, West Virginia, Pennsylvania) reported approximately 98 percent of the total quantity of dibenzofuran.
- MANAGEMENT − In 2004, approximately 55 percent of the dibenzofuran was land disposed. Approximately 25 percent of the dibenzofuran was sent to offsite energy recovery – all from one facility, located in Illinois. Approximately 19 percent was treated.
- FACILITIES − Eleven facilities reported approximately 25,000 pounds of dibenzofuran in 2004. Of these, four facilities accounted for approximately 97 percent of the total quantity of this chemical.
- INDUSTRY SECTORS − Eleven facilities in six industry sectors reported dibenzofuran in 2004; 87 percent of the total quantity was reported by three facilities in SIC 2865 (Cyclic crudes and intermediates).

National Trends:

Exhibit 4.59 shows the number of facilities that reported dibenzofuran in 2000 to 2004 and the quantities of this PC that were managed via disposal, treatment, energy recovery, and recycling. The number of facilities that reported dibenzofuran since 2000 has been relatively constant with 11 to 12 facilities reporting each year. Compared to the quantity of dibenzofuran reported in 2000, there was a 73 percent decrease in 2004. Furthermore, since 2002, there have been significant decreases of approximately 70 percent in 2003 and again in 2004. The decreased quantities in 2003 and 2004 were mostly attributed to the shutdown of facilities in Michigan and Ohio, beginning in May 2003.

Since 2000, there have been significant yearly changes regarding the usage of management methods for dibenzofuran. Use of disposal, energy recovery, and treatment methods have varied considerably with no obvious trend. In 2004, approximately 55 percent of the dibenzofuran was land disposed. Recycling of dibenzofuran reached a peak in 2002 when 271,000 pounds were recycled; in 2004, approximately 11,000 pounds of dibenzofuran were recycled.

Exhibit 4.59. National Management Methods for Dibenzofuran, 2000−2004

Management Methods for Dibenzofuran and Number of Facilities	2000	2001	2002	2003	2004	Percent Change (2000−2004)	Management Method − Percent of Quantity of This PC (2004)
Number of Facilities	12	11	11	12	11	−8.3%	-
Disposal Quantity (pounds)	11,200	39,885	17,464	66,104	13,827	23.5%	55.4%
Energy Recovery Quantity (pounds)	23,873	22,580	266,235	1,340	6,277	−73.7%	25.2%
Treatment Quantity (pounds)	57,775	4,261	5,228	8,161	4,839	−91.6%	19.4%
Priority Chemical Quantity (pounds)	92,848	66,726	288,926	75,605	24,942	−73.1%	100%
Recycling Quantity (pounds)*	81,648	26,841	271,463	9,501	11,116	−86.4%	-

*Note: Waste minimization is the emphasis of this Report. As such, we primarily focus on quantities of PCs that are managed via onsite/offsite disposal, treatment, or energy recovery because we believe these PC quantities offer the greatest opportunities for waste minimization. Because recycled quantities of PCs are already directed to their best uses, they are considered separate and distinct from the quantities of PCs not recycled. Throughout this section, the recycled quantity is presented to provide some perspective regarding the quantity of this PC already recycled compared to the quantities that are managed via disposal, treatment, and energy recovery and thus potentially available for waste minimization.

Exhibit 4.60 shows the number of facilities that reported dibenzofuran within various quantity ranges. Of the 11 facilities that reported dibenzofuran in 2004, four facilities accounted for approximately 97 percent of the total quantity of this chemical.

Exhibit 4.60. Distribution of Quantities by Facilities Reporting Dibenzofuran, 2004

Dibenzofuran (24,942 pounds)		
Quantity Reported	Number of Facilities Reporting This Quantity (2004)	Percent of Total Quantity of This PC (2004)
Up to 10 pounds	3	0.1%
11 − 100 pounds	0	0.0%
101 − 1,000 pounds	4	3.3%
1,001 − 10,000 pounds	4	96.7%
10,001 − 100,000 pounds	0	0.0%
100,001 − 1 million pounds	0	0.0%
> 1 million pounds	0	0.0%

EPA Regional Trends:

Exhibits 4.61 and 4.62 show the quantity of dibenzofuran in the four EPA regions where facilities reported this chemical between 2000 and 2004. In 2004, facilities in only 3 regions reported dibenzofuran; nearly all of the quantity was reported by facilities in Regions 3 and 5. Since 2000, facilities in Region 5 have reported most of the dibenzofuran. However, the Region 5 quantities decreased dramatically in both 2003 and 2004. These decreased quantities are attributed to the shutdown of facilities in Michigan and Ohio, beginning in May 2003. The decommissioning of a facility, located in Ohio, is believed to be the reason for the significant increase of dibenzofuran in 2002. Decommissioning activities such as the cleaning of tanks and process equipment and cleanups, generated additional quantities of wastes containing dibenzofuran. Compared to quantities reported in 2003, facilities in both Regions 3 and 4 also reported significant decreases.

Exhibit 4.61. Quantity of Dibenzofuran, by EPA Region, 2000−2004

EPA Region	2000 (pounds)	2001 (pounds)	2002 (pounds)	2003 (pounds)	2004 (pounds)	Percent Change in Quantity (2000−2004)	Percent of Total Quantity of This PC (2004)
3	3,226	3,600	5,570	15,011	8,217	154.7%	32.9%
4	2,978	377	69	1,889	116	−96.1%	0.5%
5	85,167	62,749	283,287	58,705	16,610	−80.5%	66.6%
10	1,477	0	0	0	0	−100.0%	0.0%
Total	**92,848**	**66,726**	**288,926**	**75,605**	**24,942**	**−73.1%**	**100.0%**

Exhibit 4.62. Distribution of Facilities Reporting Dibenzofuran in 2004 and the Quantities of Dibenzofuran Reported in 2004 by Region

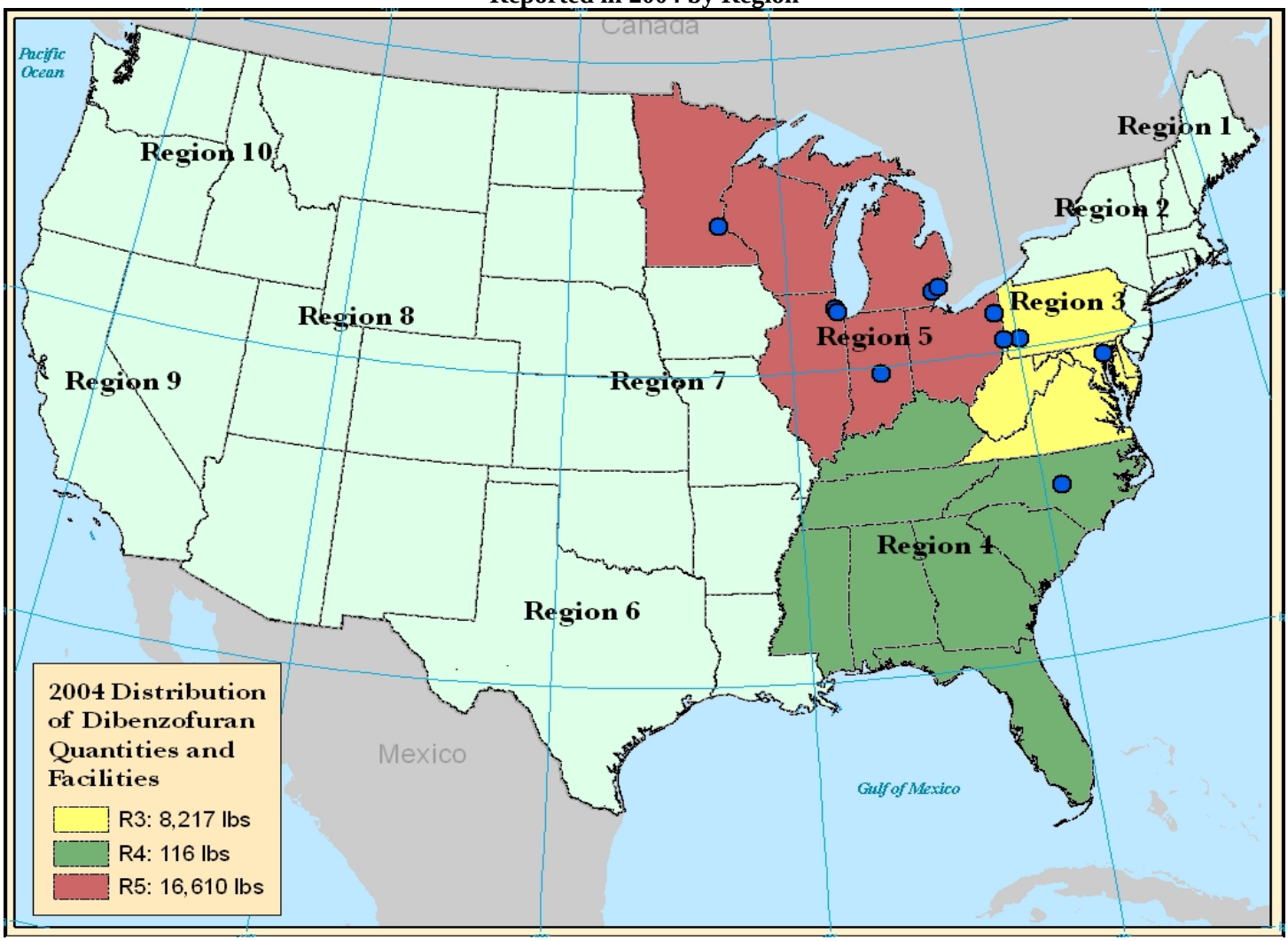


Exhibit 4.63 shows how dibenzofuran was managed by facilities within each of the three EPA regions where facilities reported this chemical in 2004. Overall, approximately 55 percent of the dibenzofuran was land disposed offsite. Region 5 facilities reported most of the dibenzofuran sent to offsite land disposal; a facility in Michigan, undergoing shutdown operations, accounted for approximately 8,100 pounds or 82 percent of the total quantity sent to land disposal by facilities in Region 5. Approximately 25 percent of the dibenzofuran was sent to offsite energy recovery – all from one facility, located in Illinois. Of the 30,000 pounds of dibenzofuran recycled by these facilities in 2004, a facility in Region 5 accounted for 99 percent of the total recycled quantity.

Exhibit 4.63. Regional Management Methods for Dibenzofuran, 2004

EPA Region	Quantity of Dibenzofuran (2004)	Percent of Dibenzofuran (2004)	Disposal		Energy Recovery		Treatment		Recycling	
			Onsite Disposal (pounds)	Offsite Disposal (pounds)	Onsite Energy Recovery (pounds)	Offsite Energy Recovery (pounds)	Onsite Treatment (pounds)	Offsite Treatment (pounds)	Onsite Recycling (pounds)	Offsite Recycling (pounds)
3	8,217	27.4%	0	3,809	0	0	2,055	2,353	250	0
4	116	0.4%	0	116	0	0	0	0	0	0
5	16,610	55.5%	0	9,902	0	6,277	177	254	29,566	0

State Trends:

Although facilities in nine states reported dibenzofuran in 2004, facilities in four of these states accounted for approximately 98 percent of the total quantity of dibenzofuran. Exhibit 4.64 shows the quantity of dibenzofuran that was reported by facilities in 11 states for 2000−2004. Highlights concerning trends for the reported quantities of dibenzofuran in states include:

- One facility, in Michigan, which only began reporting dibenzofuran in 2003, accounted for almost 68 percent of the total quantity of this chemical in 2003 and 33 percent of the total quantity in 2004. This facility is being shutdown.
- Facilities in Ohio have significantly reduced dibenzofuran since 2000. The decommissioning of a facility, located in Ohio, is believed to be the reason for the significant increase in 2002 and subsequent decrease of dibenzofuran thereafter. Initial decommissioning activities, such as the cleaning of tanks and process equipment and cleanups, generated additional quantities of wastes containing dibenzofuran.
- One facility in West Virginia had more than 350 percent increase in 2003, compared to 2002, and then a 52 percent decrease in 2004. These year−to−year changes were attributed to shifts in production rates.

Exhibit 4.64. State Quantity Trends for Dibenzofuran, Based on Largest States 2004 Quantity, 2000−2004

State	Total Quantity (pounds) of Dibenzofuran					Change in Quantity (2000−2004)	Percent Change in Quantity (2000−2004)	Percent of Total Quantity of This PC (2004)
	2000	2001	2002	2003	2004			
MI	0	0	1,248	52,202	8,115	8,115	NA	32.5%
IL	9,967	392	6,429	6,113	8,000	−1,967	−19.7%	32.1%
WV	1,300	2,000	3,400	12,022	5,819	4,519	347.6%	23.3%
PA	1,926	1,600	2,170	2,706	2,395	469	24.4%	9.6%
IN	52	1,251	28	260	261	209	401.9%	1.0%
OH	75,148	61,106	275,582	128	229	−74,919	−99.7%	0.9%
NC	33	111	50	165	116	83	250.0%	0.5%
MN	0	0	0	2	5	5	NA	0.0%
MD	0	0	0	283	3	3	NA	0.0%
AL	2,945	266	19	1,724	0	−2,945	−100.0%	0.0%
WA	1,477	0	0	0	0	−1,477	−100.0%	0.0%
Total	**92,848**	**66,726**	**288,926**	**75,605**	**24,942**	**−67,906**	**−73.1%**	**100.0%**

Exhibits 4.65 and 4.66 show the trends for the quantities of dibenzofuran in the top five states where facilities reported this PC in 2004.

Exhibit 4.65. Michigan, Illinois, and Indiana Trends for Dibenzofuran, 2000−2004

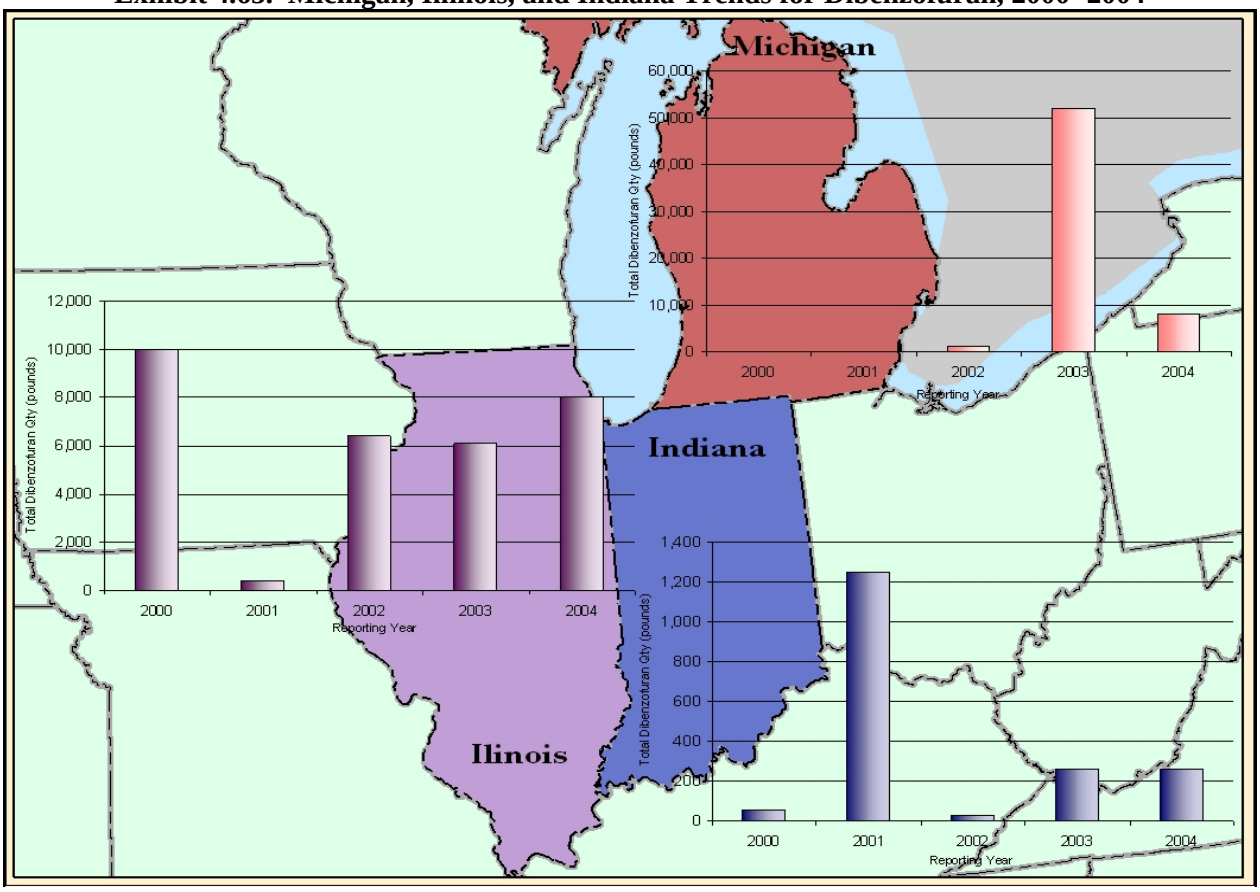
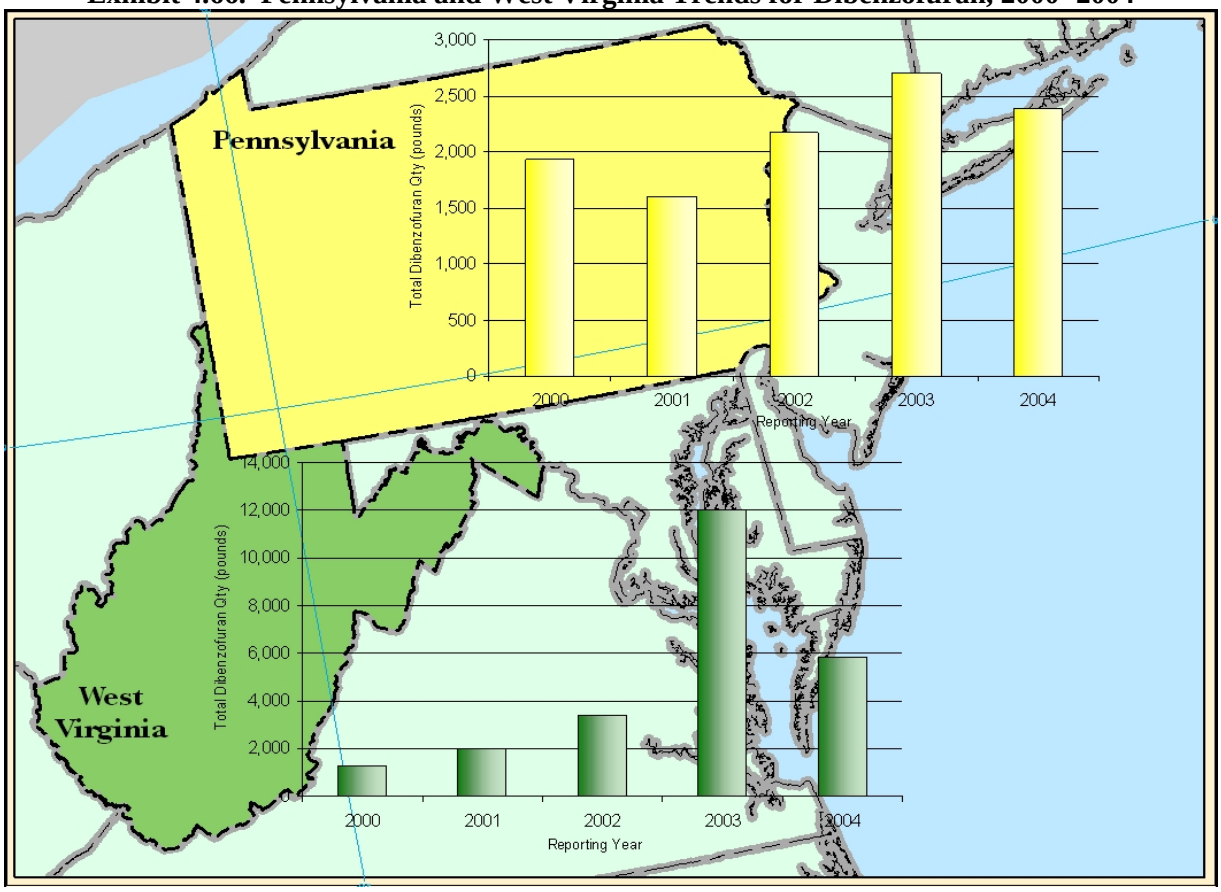


Exhibit 4.66. Pennsylvania and West Virginia Trends for Dibenzofuran, 2000−2004

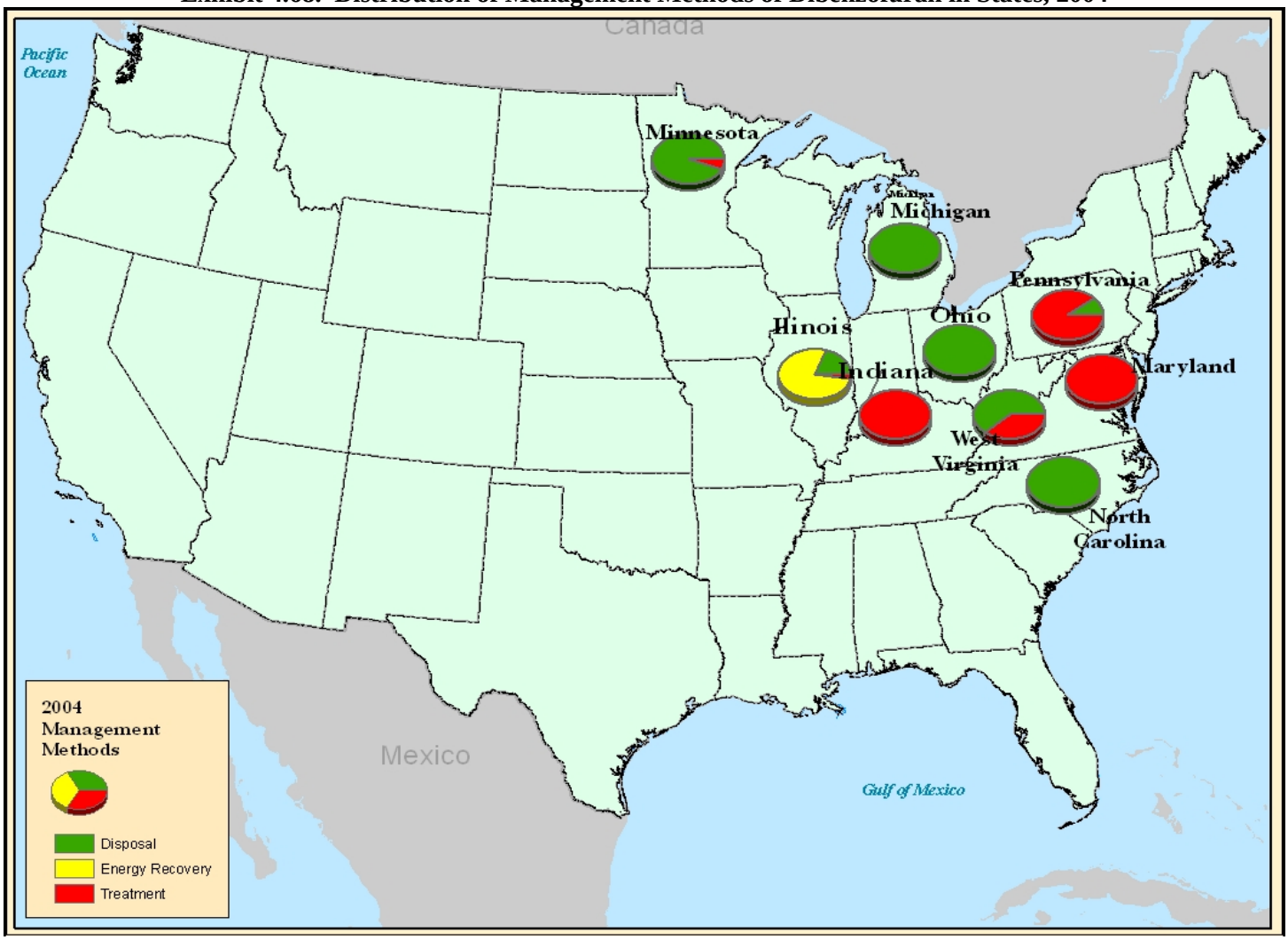


Exhibits 4.67 and 4.68 show how dibenzofuran was managed by facilities in the four states that accounted for 98 percent of the total quantity of this PC in 2004. Most of the dibenzofuran reported by facilities in Michigan, Illinois, and West Virginia was sent to offsite land disposal. A facility in Illinois reported all of the offsite energy recovery. Two facilities, one each in Pennsylvania and West Virginia, reported most of the treatment quantities. Relatively little recycling of dibenzofuran occurred in 2004.

Exhibit 4.67. Management Methods for Dibenzofuran, Facilities in States With 98 Percent of Total Quantity, 2004

State	Total Quantity of Dibenzofuran (2004)	Onsite Disposal (pounds)	Offsite Disposal (pounds)	Onsite Energy Recovery (pounds)	Offsite Energy Recovery (pounds)	Onsite Treatment (pounds)	Offsite Treatment (pounds)	Onsite Recycling (pounds)	Offsite Recycling (pounds)
MI	8,115	0	8,115	0	0	0	0	0	0
IL	8,000	0	1,554	0	6,277	170	0	148	0
WV	5,819	0	3,569	0	0	2,000	250	130	0
PA	2,395	0	240	0	0	55	2,100	120	0

Exhibit 4.68. Distribution of Management Methods of Dibenzofuran in States, 2004



Industry Sector (SIC) Trends:

Exhibit 4.69 shows the dibenzofuran quantity for the eight industry sectors reported by facilities in 2000−2004. Eleven facilities in six industry sectors reported dibenzofuran in 2004; 87 percent of the total quantity was reported by three facilities in SIC 2865 (Cyclic crudes and intermediates). Compared to the quantities reported in 2000, facilities in this industry sector reported a decrease of approximately 69,000 pounds of dibenzofuran in 2004. In 2002, there was a dramatic increase in the quantity of dibenzofuran. This increase was attributed to the decommissioning of an SIC 2865 facility, located in Ohio, at which initial decommissioning activities such as the cleaning of tanks and process equipment and cleanups, generating additional quantities of wastes containing dibenzofuran. Although there was an increase in the quantity of dibenzofuran reported by facilities in SIC 3312 (Blast furnaces and steel mills) beginning in 2003, this increase was due to the quantity reported by a facility that had reported as a SIC 2865 facility previous to 2003.

Exhibit 4.70 shows how facilities managed dibenzofuran in the two industry sectors that accounted for 98 percent of the total quantity of this PC in 2004. Most of the dibenzofuran was land disposed, primarily offsite, particularly within SIC 2865 (Cyclic crudes and intermediates). The majority of the dibenzofuran reported by facilities in SIC 3312 (Blast furnaces and steel mills) was sent to offsite treatment. Very little recycling of dibenzofuran was reported by facilities in these two industry sectors in 2004. However, one facility in SIC 4925 (Gas production and/or distribution), in addition to treating a relatively small quantity of dibenzofuran, recycled approximately 29,000 pounds of this chemical in 2004.

Exhibit 4.69. Industry Sectors Containing Dibenzofuran, 2000−2004

Primary SIC	SIC Description	Number of Facilities That Reported Dibenzofuran (2004)	2000 (pounds)	2001 (pounds)	2002 (pounds)	2003 (pounds)	2004 (pounds)	Change in Quantity (2000−2004)	Percent of Total Quantity of This PC (2004)
2865	Cyclic crudes and intermediates	3	90,878	65,082	286,288	70,243	21,715	−69,163	87.1%
3312*	Blast furnaces and steel mills	2	158	32	212	2,834	2,624	2,466	10.5%
4925	Gas production and/or distribution	1	6	1,245	14	260	261	255	1.0%
3272	Concrete products, nec	3	0	0	2,348	2,101	222	222	0.9%
2491	Wood preserving	1	79	117	64	165	116	37	0.5%
2911	Petroleum refining	1	0	0	0	2	5	5	0.0%
2952	Asphalt felts and coatings	0	250	250	0	0	0	−250	0.0%
3334	Primary aluminum	0	1,477	0	0	0	0	−1,477	0.0%

* Note: Most of the quantity shown for SIC 3312 in 2003 and 2004 was reported by a facility that, prior to 2003, had used SIC 2865 as its primary SIC code.

Exhibit 4.70. Management Methods for Dibenzofuran in Industry Sectors With 98 Percent of Total Quantity, 2004

Primary SIC	SIC Description	Total Quantity of Dibenzofuran (2004)	Percent of Total Quantity (2004)	Disposal		Energy Recovery		Treatment		Recycling	
				Onsite Disposal (pounds)	Offsite Disposal (pounds)	Onsite Energy Recovery (pounds)	Offsite Energy Recovery (pounds)	Onsite Treatment (pounds)	Offsite Treatment (pounds)	Onsite Recycling (pounds)	Offsite Recycling (pounds)
2865	Cyclic crudes and intermediates	21,715	87.1%	0	13,019	0	6,277	2,170	250	278	0
3312	Blast furnaces and steel mills	2,624	10.5%	0	469	0	0	55	2,100	120	0