

APPENDIX A

RELEASES OF CARBONYL SULFIDE

Appendix A. Releases of Carbonyl Sulfide

This appendix presents an analysis of the characteristics of facilities identified as releasing carbonyl sulfide in EPA's Toxics Release Inventory (TRI) and AIRS¹ Facility Subsystem (AFS) database. The first section of the appendix describes facilities identified via TRI, while the second section describes facilities identified in AFS. Because some facilities appear in both TRI and AFS, the third section characterizes the union of the two sets of facilities. Finally, the firm or parent company (hereafter, ultimate corporate entity (UCE)) level data obtained from the Dun and Bradstreet (D&B) database for the identified facilities is described.

A.I. Carbonyl Sulfide Facilities in TRI

The TRI database contains toxic chemical release and transfer information from manufacturing facilities throughout the United States. Manufacturing facilities that have the equivalent of 10 or more full-time employees and meet the established threshold for manufacturing, processing, or otherwise using listed chemicals must report their releases and transfers. Thresholds for manufacturing and processing are currently 25,000 pounds for each listed chemical, while the threshold for otherwise use is 10,000 pounds.

Based on 1995 TRI reports, 58 facilities reported on carbonyl sulfide. These facilities manufacture carbonyl sulfide as a byproduct or impurity, and they release carbonyl sulfide as fugitive or non-point source emissions or as stack or point source air emissions totaling about 17.6 million pounds. One of the 58 facilities also ships 16,000 pounds of carbonyl sulfide off-site for treatment. None of the facilities release carbonyl sulfide to any other media (e.g., land disposal, water releases, transfers to publicly owned treatment works, or underground injection). Table A.1 summarizes the TRI releases of carbonyl sulfide for 1995, the latest year for which data are available.

Facilities were classified into those releasing or transferring at least 1,100 pounds per year of carbonyl sulfide, and those releasing or transferring less than that amount. Forty-four facilities (75.9%) released or transferred at least 1,100 pounds in 1995, while 14 (24.1%) released or transferred less than that amount. These 14 facilities accounted for only 0.062 percent of all reported releases and transfers of carbonyl sulfide in 1995.

Facilities can report up to six Standard Industrial Classification (SIC) codes on a TRI form. These codes indicate the particular industrial activities undertaken at a facility that emits carbonyl sulfide. The first SIC code of the most recent form submitted by a facility is considered its primary SIC code. Ten unique primary SIC codes were reported by the facilities. Table A.2 lists these primary SIC codes and their frequency of occurrence.

¹ Aerometric Information Retrieval System

Table A.1 1995 TRI Releases of Carbonyl Sulfide (58 facilities)			
	Air Releases (pounds)	Off-Site Transfers (pounds)	Total Releases and Transfers (pounds)
Minimum	0	0	0
Mean	303,150	276	303,430
Median	99,045	0	99,045
Maximum	2,900,000	16,000	2,900,000
Total	17,583,000	16,000	17,599,000
Notes: Three facilities filed a 1995 data collection form for carbonyl sulfide, but reported zero releases and transfers. Only one facility reported a non-zero off-site transfer amount.			

Table A.2 Primary SIC Codes Reported by Facilities Releasing or Transferring Carbonyl Sulfide			
SIC Code	Description	Number of Facilities	Frequency
2895	Carbon black	19	33 %
3334	Primary aluminum	11	19 %
2816	Inorganic pigments	10	17 %
2911	Petroleum refining	6	10 %
2821	Plastic materials and resins	4	7 %
3296	Mineral wool	3	5 %
2812	Alkalines and chlorines	2	3 %
2819	Industrial inorganic chemicals, n.e.c. ²	1	2 %
3339	Primary non-ferrous metals, n.e.c.	1	2 %
3341	Secondary non-ferrous metals	1	2 %
Total	----	58	100 %

² not elsewhere classified

A total of eighteen unique SIC codes were reported by the 58 facilities in the 1995 TRI report, when all SIC codes are considered. Table A.3 provides the listing of all SIC codes reported.

The list of total SIC categories and the list of primary SIC categories present very similar pictures of industry activities. The first six SIC codes on Table A.3 are also on Table A.2. In several cases, the secondary SIC codes are closely related to SIC codes on the primary list. For example, the total list includes aluminum sheet, plate and foil (SIC 3353), aluminum rolling and drawing, not elsewhere classified (SIC 3355) and aluminum extruded products (SIC 3354), in addition to primary aluminum (SIC 3334), which is on the primary SIC code list.

Table A.3			
All SIC Codes Reported by TRI Facilities Releasing or Transferring Carbonyl Sulfide			
SIC Code	Description	Number of Mentions	Frequency of Mention
2895	Carbon black	19	25 %
3334	Primary aluminum	11	14 %
2816	Inorganic pigments	10	13 %
2821	Plastic materials and resins	6	8 %
2911	Petroleum refining	6	8 %
2819	Industrial inorganic chemicals, n.e.c.	4	5 %
2869	Industrial organic chemicals, n.e.c.	4	5 %
2812	Alkalines and chlorines	3	4 %
3296	Mineral wool	3	4 %
3353	Aluminum sheet, plate and foil	2	3 %
3355	Aluminum rolling and drawing, n.e.c.	2	3 %
2813	Industrial gases	1	1 %
2822	Synthetic rubber	1	1 %
2865	Cyclic crude and intermediates	1	1 %
2873	Nitrogenous fertilizers	1	1 %
3339	Primary non-ferrous metals, n.e.c.	1	1 %
3341	Secondary non-ferrous metals	1	1 %
3354	Aluminum extruded products	1	1 %
Total	----	77	100 %*
* Does not equal 100% due to rounding.			

A.II. Carbonyl Sulfide Facilities in AFS

The AIRS Facility Subsystem (AFS) is a facility-level database component of EPA's Aerometric Information Retrieval System. AFS is maintained by EPA's Office of Air Quality Planning and Standards. AFS includes general facility information as well as data on the facilities' air permits, compliance history, and estimated emissions of "criteria" pollutants and hazardous air pollutants.

Facilities report their emissions to their State agencies, who in turn file the data in AFS, although some States update data more often than others. States are required to report to EPA on annual emissions estimates for point sources emitting greater than or equal to 100 tons per year of volatile organic compounds (VOCs), nitrogen dioxide (NO₂), sulfur dioxide (SO₂), particulate matter less than 10 microns in size (PM-10); 1000 tons per year of carbon monoxide (CO); or 5 tons per year of lead (Pb). States are also required by the Clean Air Act Amendments to report emissions data for point sources in areas where air pollution exceeds federal standards. Facilities are generally required to report emissions every five years, on a rolling basis.

Facilities with carbonyl sulfide emissions were identified in two ways. First, facilities reporting carbonyl sulfide to the AFS were identified by the CAS number for carbonyl sulfide. Four AFS facilities report emissions of carbonyl sulfide.

Additional facilities were identified using a second method. Carbonyl sulfide is a component of some volatile organic compound (VOC) emissions. EPA has developed a "speciate" program, which classifies VOCs by their constituent chemicals and specific physical processes, called source category classifications (SCCs). This "speciate" program was used to identify the four SCCs that are associated with the release of carbonyl sulfide. These four SCCs are all part of carbon black manufacturing, and each process is estimated to release carbonyl sulfide as 8.9 percent of the total VOC-related emission from the SCC. Therefore, facilities were retrieved from AFS that reported VOC emissions from any one of these four SCCs. The estimated carbonyl sulfide emissions are then calculated to be 0.089 times the estimated VOC releases. Sixteen facilities were identified using this approach, none of which were identified in the direct AFS query for the CAS number associated with carbonyl sulfide. While each of these 16 facilities report using one or more of these 4 "carbon black" processes, the facilities may classify themselves in a non-carbon black SIC code depending on the majority of their production.

AFS data for facilities is not available for every year. In this analysis, the most recent available report is used. Of the 20 carbonyl sulfide-producing facilities located, one reported for 1996, five for 1995, two each for 1994 and 1993, one for 1992, six for 1990, and three for 1985. The 20 facilities report aggregate estimated carbonyl sulfide emissions of about 3 million pounds per year. Table A.4 provides descriptive statistics on the emissions.

Table A.5 presents the SIC codes associated with the facilities found in AFS. As was true with the facilities identified from TRI, most facilities that emit carbonyl sulfide are classified in SIC code 2895, carbon black. Fifteen percent of the facilities are in SIC code 4953, refuse systems, which is not a TRI reportable SIC code. These facilities are indicated in AFS as being landfills.

The AFS data include secondary and tertiary SIC code fields. The only secondary SIC code not previously reported as a primary is SIC code 1221, bituminous coal and lignite, surface. This is also not an industry that is currently reportable to TRI. No tertiary SIC codes were included that are not also primary SIC codes of these facilities.

In comparison to the SIC code information from TRI, no AFS facilities indicated an SIC code

corresponding to primary aluminum or inorganic pigments. These two industries were among the top three reported as both the primary SIC code and as among any SIC codes in TRI.

Table A.4 AFS Emissions of Carbonyl Sulfide (20 facilities, various years)	
	Emissions (pounds per year)
Minimum	0
Mean	150,600
Median	15,740
Maximum	1,057,000
Total	3,013,000
Notes: Three facilities estimated emissions as zero.	

Table A.5 Primary SIC Codes Reported by AFS Facilities Emitting Carbonyl Sulfide			
SIC Code	Description	Number of Facilities	Frequency
2895	Carbon black	12	60 %
4953	Refuse systems	3	15 %
3624	Carbon and graphite products	2	10 %
2819	Industrial inorganic chemicals, n.e.c.	1	5 %
2911	Petroleum refining	1	5 %
3297	Non-clay refractories	1	5 %
Total	----	20	100 %

A.III. Combining TRI and AFS data

Seven facilities were identified in both the TRI data and AFS data, based on facility identifiers and address/geographic information. In addition, three facilities have similar address information but different facility names; these three are believed to have been acquired or otherwise changed ownership. For the facilities in common to both databases, the estimated emissions in AFS can be quite different from the TRI releases. This can be true because, in cases where carbonyl sulfide is not directly reported, AFS uses representative plant data to estimate the percentage of VOC emissions that are carbonyl sulfide. In other words, any facility releasing VOCs estimates its particular VOC emissions rate. Using the representative percentage of 8.9 percent for these processes, EPA estimates facility-specific carbonyl sulfide emissions were estimated. The particular facilities may have actual carbonyl sulfide emission percentages above or below the representative plant percentage. Because of the uncertainty involved in AFS emissions data and the age of the AFS submissions, the TRI data is considered to be more accurate for those facilities in common.

Discarding the AFS emissions data in common (the seven facilities in common plus the three believed to be in common) yields 10 facilities with emissions totaling about 670,000 pounds per year. When combined with the TRI release data, there are 68 facilities emitting or releasing about 17.9 million pounds per year of carbonyl sulfide.

A.IV. UCE Revenues

Data from the Dun and Bradstreet (D&B) registry database were used to determine the size of UCEs owning carbonyl sulfide facilities, based on UCE revenues.³ The TRI database contains fields for facility D&B number (DUNS) and UCE DUNS, while the AFS database contains a field for facility DUNS. These fields were linked to D&B data to retrieve the UCE revenue data.

Forty-nine of the 58 TRI facilities have DUNS data; 38 of these were found in the current D&B database. Thirteen of the 20 AFS facilities have DUNS data; nine of these were found in the D&B database. An automated search was performed in the D&B database to retrieve data for those DUNS that were in the database. The 31 facilities that either have no DUNS data or have DUNS data that are not in the D&B database were manually linked to D&B UCEs via address information.

All told, there are 68 unique facilities: 58 from TRI plus 20 from AFS less ten facilities in common. These 68 facilities are associated with 37 UCEs. It was possible to link every facility to a UCE, and all UCEs have revenue data. Table A.6 summarizes descriptive statistics on revenues and carbonyl sulfide releases and emissions of the 37 UCEs.

³*Dun's Marketing Information Services*, April 1997 version, accessed through EPA "Finds" system located on the Agency's mainframe computer.

**Table A.6
UCE Revenues of Facilities Emitting, Releasing or Transferring
Carbonyl Sulfide (37 UCEs)**

Revenues		Releases and Emissions (lb. / yr)	
Minimum	< \$4 million	Minimum	0
Mean	\$ 6.9 billion	Mean	485,000
Median	\$ 940 million	Median	70,700
Maximum	>\$50.0 billion	Maximum	5.20 million
Number < \$40 million	5 (13.5 %)	Number < 1,100 lb. / yr.	13 (35.1%)

Of the 37 UCEs, 13 release or emit fewer than 1,100 lb per year and would not be initially burdened by the HAPs test rule. Of the 24 UCEs that are initially burdened, only two have sales below \$40 million. In each case, they generate more than 100,000 pounds of the chemical and therefore are not considered to be small businesses under the TSCA definition (40 CFR 704.3). Thus, there are no initially burdened small UCEs that generate carbonyl sulfide.

Table A.7 lists the UCEs and their emissions of carbonyl sulfide.

**Table A.7
Emissions of Carbonyl Sulfide**

UCE Name	Emissions (lbs)
American Carbide Co.	0
Ucar Carbon Co.	0
Uno-ven	0
Owens Corning	0
Talley Industries	4
Lion Oil Co.	30
Ashland Petroleum Co.	33
Montana Sulphur and Chemical	250
NAC Carbon	338
Elf Aquitaine	356
Morganite North America	475
General Electric Co.	752
WMX Technologies, Inc.	1,020
Dow Chemical Co.	1,100
USA Waste Services	4,920
Titanium Metals Corp.	5,300
Louisiana Pigment Co., LLP	18,700
Kerr-McGee	64,000
3M Company	70,700
Chevron Chemical Corp.	71,430
Citgo Petroleum	75,000
Witco	91,786
GVC Holdings Inc.	93,649
Goldendale Aluminum	97,090
Rock Wool Mfg. Co.	122,658
Vanalco	250,000
Sid Richardson Carbon Co.	251,790
Refined Metals Corp.	256,320
Walter Industries, Inc	260,505
Kemira Holdings Inc.	300,000
Degussa Corp.	655,233
Columbian Chemicals Co.	919,546
Cabot Corp.	1,335,307
Alumax Inc.	1,434,598
Alcoa Inc.	3,163,243
E I du Pont de Nemours	3,190,400
SCM Chemical	5,200,016
Sources: Emissions from 1995 TRI and various years of AFS.	