

ENVIRONMENTAL IMPACTS IN COMMUNITIES ADJACENT TO PVC PRODUCTION FACILITIES

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Vinyl products are made of polyvinyl chloride. The production of polyvinyl chloride begins with chlorine reacting with ethylene to form 1,2-Dichloroethane(EDC). EDC is a possible human cancer causing agent. EDC is reacted to form vinyl chloride, a know human cancer causing agent. A specific cancer of the liver, angiosarcoma, has been linked to vinyl chloride exposure. Vinyl chloride is polymerized to form polyvinyl chloride, the major component in vinyl products.

During the production of vinyl chloride and polyvinyl chloride, vinyl chloride is emitted and released into the air by the industrial facilities. A total of 48 industrial facilities report releasing 732,219 pounds of vinyl chloride into the air on an annual basis. Human exposure to vinyl chloride results from occupational exposure during vinyl chloride production , storage, handling and processing of polyvinyl chloride, and living and working in close proximity to vinyl chloride and polyvinyl chloride production facilities. The use of vinyl materials, encourages the production of vinyl chloride and polyvinyl chloride and results in exposure of workers and community members to vinyl chloride, a toxic human cancer causing agent.

Vinyl Chloride Air Releases

The 48 industrial facilities that produce vinyl chloride and polyvinyl chloride in the United States are located in 17 states. The Gulf of Mexico industrial area of Texas and Louisiana is home to almost half (23) of the industrial facilities. Texas has 12 facilities and Louisiana has 11. Kentucky ranks third with 6 facilities. The largest

quantity of vinyl chloride air releases are associated with the vinyl chloride facilities in Texas (206,820 pounds), Delaware (129,823 pounds), and Louisiana (107,921 pounds). The vinyl chloride air releases in these three states are responsible for 60% of the vinyl chloride air releases reported for the entire United States.

The largest vinyl chloride emitting facilities are OxyVinyls Pasadena, TX PVC plant, 107,009 pounds; Formosa Plastics, Delaware City, DE, 97,717 pounds; and Occidental Chemical, Pottstown, PA, 89,200 pounds. These three facilities are responsible for 40% of the vinyl chloride releases reported in the United States on an annual basis. The fugitive vinyl chloride emissions from the OxyVinyls Pasadena facility consist of half of the total facility vinyl chloride releases 52,669 pounds fugitive versus 107,009 pounds total emissions. Fugitive emissions are released from valves, flanges and connectors. The stack vinyl chloride releases, 54,340 pounds, are from permitted sources. The other two largest vinyl chloride emitting facilities report less than 3% fugitive releases of vinyl chloride.

1,2-Dichloroethane (EDC) Air Releases

The vinyl chloride manufacturing facilities in Louisiana release large quantities of 1,2-Dichloroethane (EDC) into the air. The Formosa Plastics Corp. facility in Baton Rouge, near the state capital, releases 38,000 pounds of EDC on an annual basis (63% released from fugitive sources). The Borden Chemicals and Plastics facility in Geismar releases 24,747 pounds of EDC annually (49% released from fugitive sources). The Vulcan Materials Co. also in Geismar releases 5799 pounds of EDC (92% from fugitive sources). The PPG Industries facility in Lake Charles releases 18,600 pounds of EDC (54% from fugitive sources) annually.

Dioxin Air Releases

The manufacture of vinyl chloride results in the formation of dioxin and dioxin like compounds. A number of the vinyl chloride manufacturing facilities report air releases of dioxin and dioxin like compounds to the Environmental Protection Agency Toxic Release Inventory. The facilities reporting dioxin releases are primarily located in Texas and Louisiana and

are the same facilities reporting releases of EDC. The largest release of dioxin into the air is reported by the DOW Chemical Co. in Freeport, Texas, 124.93 grams per year. The second largest dioxin releasing facility is the Formosa Plastics Co. in Baton Rouge, LA, 58 grams per year. The Dow Plaquemine, LA, Vulcan Wichita, KS, and Geismar, LA, Borden, Geismar, LA and PPG, Lake Charles LA, facilities also reported releases of dioxin into the air. All reported dioxin releases from stack sources.

Calcasieu Industrial Area, Louisiana

The Calcasieu Industrial Area in southwest Louisiana consist of 55 industrial facilities located around the Calcasieu Estuary. The facilities consist of petroleum refineries, synthetic rubber manufacturers, petrochemical complexes and vinyl chloride monomer and polymer manufacturing facilities. The vinyl chloride monomer and polymer facilities consist of Certainteed Corp., PPG Industries and the Georgia Gulf/Condea Vista complex. Certainteed and PPG are located south of I-10 and Georgia Gulf is located north of I-10 and the Conoco Refinery , adjacent to the African American community of Mossville. PPG is the largest air emitter of vinyl chloride 13,410 pounds with 97% released into the air from fugitive sources. The PPG facility also released 18,600 pounds of EDC with 54% released from fugitive sources. The Certainteed Corp. facility released 2200 pounds of vinyl chloride into the air with 55% being released from fugitive sources. The Georgia Gulf facility released 1068 pounds of vinyl chloride into the

air with 91% from fugitive sources and 6900 pounds of EDC, 84% from fugitive sources.

The Louisiana Statewide Ambient Air Monitoring Network has a station located in Westlake, just east of the Georgia Gulf facility. The Westlake monitoring site recorded the highest annual ambient air concentrations of EDC and vinyl chloride of any monitoring station in the state of Louisiana. The concentration of EDC exceeded the Louisiana Ambient Air Annual Standard Criteria of 0.95 ppb in 1996 (1.16 ppb) and 1998 (0.96 ppb). The vinyl chloride ambient air concentrations were approximately half of

the Louisiana Ambient Air Criteria of 0.47 ppb. The two chemicals are released into the air by Georgia Gulf/Condea, PPG and Certainteed.

In June 1999, the EPA conducted ambient air monitoring in the Calcasieu Industrial Complex using the Trace Atmospheric Gas Analyzer (TAGA) mobil monitor. The monitoring was conducted outside the fence line, along roads, highways and interstate highways surrounding the industrial facilities and in residential areas. The monitor detected vinyl chloride in the Mossville community ambient air at a concentration of 10 ppb down wind from the Georgia Gulf/Condea facility. The monitor detected vinyl chloride at a concentration of 58 ppb in Westlake when the wind was calm. Vinyl chloride was detected in the ambient air along a service road adjacent to I-10 in concentrations of 21 to 48 ppb when the wind was blowing from the PPG and Certainteed facilities and in concentrations of 15 to 18 ppb when the wind was blowing from the Georgia Gulf/Condea facility. The concentrations correlate with the distance from the industrial facilities. EDC was also detected in the ambient air at 23 ppb when the wind was blowing from the PPG facility. All of the vinyl chloride and EDC concentrations in the ambient air exceeded the Louisiana Ambient Air Criteria. The values were as much as 102 times the vinyl chloride standard and 24 times the EDC standard.

The vinyl chloride and EDC are released into the air from not only stack sources and fugitive sources but also as a result of accidental releases and upset conditions. Chemicals are released into the air during unauthorized accidental releases and upset conditions from the Georgia Gulf facility adjacent to the Mossville community. During 2000 and 2001, the Georgia Gulf facility reported 27 unauthorized release events. Of the 27 events, 17 events released 491 pounds of EDC, 16 events released 1825 pounds of vinyl chloride and 11 events released 2960 pounds of ethylene. The largest single event released 603 pounds of ethylene, 1391 pounds of vinyl chloride and 912 pounds of ethyl chloride. Nineteen of the unauthorized events exceeded the Mass Emissions limit, 12 exceeded the air toxics discharge reporting requirements, and one resulted in a shelter in place for Georgia Gulf and a portion of the Condea Vista facility.

As a result of community concerns and involvement in evaluating data from ambient monitoring, accidental releases and permit exceedences, the Louisiana Department of Environmental Quality, US EPA and the Lake Area Industry Alliance established a three-year air monitoring study. Five toxic air monitoring stations were established to sample volatile organic compounds. The sampling stations consist of the existing Westlake station (near Mossville) and four new sampling stations: Mossville, Lighthouse Lane, Bayou D'Inde and Vinton (control station to the west of the industrial complex). The stations were sampled once every six days for a 24 hour period (midnight to midnight).

A total of 267 air samples were collected and analyzed for 107 organic pollutants during 2001. The Lighthouse Lane site failed to meet the Louisiana Ambient Air Criteria for vinyl chloride. Vinyl chloride is released into the air by PPG, Georgia Gulf/Condea Vista and Certainteed. The PPG and Certainteed facilities are located near the Lighthouse Lane station. The source of excess vinyl chloride detected by the air monitor was traced to a cooling

tower on the PPG site, which contained vinyl chloride. The facility was required to address the problem by the regulatory agencies.

The Louisiana Department of Environmental Quality established an episodic sampling procedure at the Westlake and Lighthouse Lane locations. A continuous monitor for total hydrocarbons was placed online. When the total hydrocarbon concentration exceeded the fixed threshold, a canister sample for volatile organic compounds was initiated. The canister samples cover a 30 minute period. The system had 6 canisters available for sampling and an automatic notification system to alert technicians that canister samples are being collected and there was a need to service the station location. The episodic procedures have identified facility operational activities that result in elevated air toxics concentrations. These events include equipment malfunctions, tank and vessel cleaning activities, marine loading and off loading activities, control unit shut downs, flaring events and electrical outage unit shut downs.

Ambient and mobile monitoring have demonstrated off site impacts due to chemicals released by industrial facilities. The monitoring has documented the movement of chemicals into the surrounding residential areas in concentrations that exceed criteria levels.

Baton Rouge, Louisiana

The industrial complex in downtown Baton Rouge, Louisiana adjacent to the state capital consist of the second largest oil refinery in the United States, a number of large petrochemical facilities and large chemical plants. Formosa Plastics Corp. is also located in the industrial complex and releases 8,290 pounds of vinyl chloride into the air on an annual basis. Of the 8,290 pounds of vinyl chloride, 8,000 pounds (97%) are released into the air from fugitive sources at the facility. A number of toxic ambient air monitoring stations are located around the industrial complex. In 2002, the annual ambient air concentration exceeded the annual criteria for vinyl chloride at the monitoring station known as Rhodia. The maximum vinyl chloride concentrations also exceed the ambient air criteria at the southern Baton Rouge station and the Capital site (on the grounds of the State Capital Building). The source of the vinyl chloride in the ambient air was the Formosa Plastics Corp. The ambient air at the monitoring station also exceeded the annual criteria for 1,3-Butadiene. The 1,3-Butadiene was attributed to DSM Copolymer located adjacent to the Formosa facility.

The Bayou Plaquemine and Dutch Town toxic air monitors along the Mississippi River Corridor Industrial Complex, also detected vinyl chloride in elevated levels. The sources of the vinyl chloride are the Dow Chemical Co. Plaquemine facility, Shintech Inc. and the Borden Chemicals and Plastics facility in Addis, all in the area of the Bayou Plaquemine monitor. The Borden Chemicals and Plastics and Vulcan Materials vinyl facilities in Geismar are the sources of vinyl chloride detected in the Dutch Town air monitor.

The VCM and PVC facilities in Louisiana are impacting the ambient air quality by releasing vinyl chloride into the air. The toxic ambient air monitors in the general area of the VCM and PVC facilities detect the vinyl chloride in the ambient air.

Louisville, Kentucky

The Rubbertown area of West Louisville is home to industrial facilities focused on the production of synthetic rubber and vinyl resins. Two of the industrial facilities OxyVinyls, L. P. and Noveon, Inc. release vinyl chloride into the air. OxyVinyls releases 2,429 pounds of vinyl chloride, 49% of which is from fugitive sources. Noveon, Inc. releases 1,920 pounds of vinyl chloride, 78% of which is from fugitive sources. The two facilities also report the release of vinyl chloride as the most frequent released chemical into the air from accidental releases. The vinyl chloride released by the two industrial facilities located next to each other on Bells Lane is dispersed into the air and is detected by all five of the toxic ambient monitoring stations in the Rubbertown area in excess of established criteria (0.47 ppb). The vinyl chloride plume extends out to a radius of 1.5 miles surrounding the two facilities and exceeds the criteria value at that distance. The toxic air monitoring station with the highest detectable concentrations of vinyl chlorides is the Cane Run Elementary School. It is located approximately 0.75 miles from the vinyl chloride emitting facilities. The highest detected concentration at that distance from the sources of emissions was 1.11 ppb, 2.4 times the ambient air criteria (0.47 ppb). The 1.11 ppb concentration was detected November 23, 2003. The other ambient monitoring stations that exceeded the criteria for vinyl chloride were the Firearms Training Center (0.55 ppb), and Chickasaw Park (0.51 ppb) stations located 0.5 and 1.5 miles north of the vinyl chloride facilities, and the Ralph Avenue (1.0 ppb) and Farnsley Middle School (0.53 ppb) stations located 0.75 and 1.5 miles south of the vinyl chloride facilities. The presence of vinyl chloride in air over a large residential area (1.5 mile radius of the facilities), and at the school locations has been the focus of community evaluation and petitions to EPA in order to reduce the concentrations of vinyl chloride in the air.

The Rubbertown area of Louisville has been documented to have an excess incidence of angiosarcoma of the liver in the polymer plant workers in Louisville. Recent studies have documented an excess incidents of brain cancer in the polymer plant workers in Louisville.

Port Arthur, Texas

The Port Arthur industrial area consist of a residential area (West Port Arthur) surrounded on three sides with two petroleum refineries, two petrochemical facilities and marine loading facilities for ocean going ships and barges. The EPA TAGA mobil monitoring unit conducted toxic air monitoring in the West Port Arthur residential area and roads and highways surrounding the industrial facilities in January 2003. An examination of the EPA Toxic Release Inventory data base failed to identify any industrial facilities in the area releasing vinyl chloride into the air. However, an examination of the TAGA data identified vinyl chloride in the air sampled in concentrations from 6.5 to 125 ppb. The Texas commission on Environmental Quality (TCEQ) established Effects Screening Levels for vinyl chloride as well as other chemicals. The vinyl chloride levels are 5 ppb annual, 20 ppb 24- hour and 50 ppb 1- hour exposure concentrations. The vinyl chloride values exceeded the annual standard and the air concentrations along the highway west of the industrial facilities exceeded the 24-hour and 1-hour standard. The highest concentration 125 ppb was 2.5 times the 1-hour standard. The elevated vinyl chloride concentrations which could not be attributed to an industrial source were associated with wind directions in all directions around a wind rose. The basic assumption is the source or sources may be from marine loading activities and/or chemical storage locations on or associated with the industrial facilities. The EPA and TCEQ are currently attempting to identify the sources of the vinyl chloride in the air of West Port Arthur and take appropriate action to remedy the situation.

Summary

The production of vinyl chloride monomer and polyvinyl chloride results in the release of vinyl chloride and 1,2-Dichloroethane (EDC) into the air. The chemicals are known or possible human cancer causing chemicals. The chemicals are dispersed into the air off site of the industrial facilities and degrade the air quality in residential areas in proximity to the industrial facilities. The sources of the chemicals are normal facility operations as well as frequent accidental releases and upset conditions. The concentrations of those chemicals exceed established ambient air

concentrations in the offsite areas around and for quite some distances away from the industrial facilities.

Human exposure to vinyl chloride and EDC results from living and working in close proximity to vinyl chloride monomer and polymer production facilities. The production of the components that are used to produce vinyl products results in unacceptable exposure of community members to the toxic chemicals released during manufacturing and production.

VINYL CHLORIDE AIR RELEASES BY STATE

STATE	FACILITIES	VINYL CHLORIDE 2001 AIR RELEASES (pounds)
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TEXAS	12	206,820
DELAWARE	2	129,823
LOUISIANA	11	107,921
PENNSYLVANIA	1	89,200
ILLINOIS	2	73,462
KENTUCKY	6	44,428
NEW JERSEY	3	30,445
MISSISSIPPI	1	27,896
ARKANSAS	2	6,770
CALIFORNIA	1	9,485
ALABAMA	1	2,900
OKLAHOMA	1	1,760
MICHIGAN	1	969
OHIO	1	255
MISSOURI	1	75
UTAH	1	8
KANSAS	1	2
TOTAL	48	732,219

Source: EPA Toxic Release Inventory 2001

**INDUSTRIAL FACILITIES RANKED BY
VINYL CHLORIDE AIR RELEASES**

FACILITY	TOTAL (pounds)	FUGITIVE (pounds)	STACK (pounds)
OxyVinyls LP Pasadena, TX	107,009	52,669	54,340
Formosa Plastics Delaware City, DE	97,717	2,750	94,967
Occidental Chemical Pottstown, PA	89,200	2,200	87,000
Borden Chemicals Illioopolis, IL	41,762	11,379	30,383
Kaneka Delaware Delaware City, DE	32,106	3,730	28,376
Polyone Henry, IL	31,700	1,700	30,000
Shintech, TX Freeport, TX	28,173	5,251	22,922
Georgia Gulf Plaquemine, LA	28,000	17,000	11,000
Georgia Gulf Aberdeen, MS	27,896	4,807	23,089

Source: EPA 2001 Toxic Release Inventory

INDUSTRIAL FACILITIES RANKED BY 1,2-DICHLOROETHANE (EDC) AIR RELEASES

FACILITY	TOTAL (Pounds)	FUGITIVE (Pounds)	STACK (Pounds)
Formosa Plastics Baton Rouge, LA	38,000	24,000	14,000
Borden Chemicals Geismar, LA	24,747	12,075	12,672
PPG Industries Lake Charles, LA	18,600	10,000	8,600
Dow Chemical Freeport, TX	16,361	6,589	9,772
Dow Chemical Plaquemine, LA	13,067	6,976	6,091
Georgia Gulf Lake Charles, LA	6,900	5,770	1,130
Vulcan Materials Geismar, LA	5,799	5,320	479
Formosa Plastics Point Comfort, TX	5,114	3,404	1,130

Source: EPA 2001 Toxic Release Inventory

DIOXIN AND DIOXIN-LIKE COMPOUNDS RELEASED BY VINYL CHLORIDE FACILITIES

FACILITY	STACK AIR RELEASES (GRAMS)
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Dow Chemical Freeport, TX	124.93
Formosa Plastics Baton Rouge, LA	58
Vulcan Chemicals Wichita, KS	14.41
Borden Chemicals Geismar, LA	3.16
Dow Chemical Plaquemine, LA	1.84
Formosa Plastics Point Comfort, TX	1.47
PPG Industries Lake Charles, LA	1.33
Vulcan Chemicals Geismar, LA	0.05

Source: EPA 2001 Toxic Release Inventory

