GREAT LAKES REGIONAL POLLUTION PREVENTION ROUNDTABLE

GLRPPR

Spotlight on Ohio's Manufacturing Sector

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Introduction

In 2015, the Great Lakes Regional Pollution Prevention Roundtable (GLRPPR) began a project to analyze data from U.S. EPA's Toxics Release Inventory (TRI) and Greenhouse Gas databases and the Census Bureau's County Business Patterns Database to determine the impact of manufacturing on the economy and environment of the six states in U.S. EPA Region 5. This fact sheet summarizes findings for Ohio's manufacturing sector (NAICS 311-337) in 2015.

Economy and TRI Emissions

Ohio's fabricated metals products industry is the manufacturing sector with the most establishments (U.S. Bureau of the Census, 2015). The transportation equipment manufacturing sector had the highest payroll.

The chemical manufacturing sector had the highest TRI emissions. It ranked fifth in payroll, sixth in number of establishments, and seventh in number of employees. The primary metals industry had the second highest TRI emissions. They ranked sixth in number of employees and payroll size and twelfth in number of establishments. These data suggest that both of these manufacturing sectors consist of fewer, larger facilities that have a greater impact on emissions than sectors with a greater number of relatively smaller facilities. The state's fabricated metals sector has the third highest TRI emissions with the most establishments, the second-highest number of employees, and the second-highest annual payroll.

2015 Data Summary

Number of TRI Entries: 4,119
Number of TRI Facilities: 1,237 (based on TRI ID)
Number of GHG Facilities: 125
Number of P2 Entries (TRI): 545
Number of P2 Entries Reporting Reductions: 243
Total CO_{2e} Releases: 28,947,029 metric tons
Total On and Off-Site Releases: 72,252,425 lbs.
Chemical Emissions Rank: 2nd of 6 Great Lakes states

Releases

	Total	Highest Emitter
Air	23,008,852 lbs.	Chemicals
Land	9,540,693 lbs.	Primary metals
Water	7,363,078 lbs.	Primary metals
Off-site	24,769,088 lbs.	Primary metals
CO_{2e}	28,947,029 metric tons	Primary metals

Top Five Industry Sector Emitters

TRI	GHG
1. Chemicals	1. Primary metals
2. Primary metals	2. Chemicals
3. Fabricated metals	3. Petroleum
4. Nonmetallic min.	4. Nonmetallic min.
5. Transportation	5. Paper

Top Five Chemical Releases

1. Zinc compounds
2. Manganese compounds
3. Nitrate compounds
4. Ammonia
5. Manganese

Ohio is the top emitter in:

TRI	GHG
• Beverage & tobacco	• Nonmetallic minerals
• Textiles	• Fabricated metals
• Chemicals	
• Nonmetallic minerals	
• Electrical equipment	
• Fabricated metals	
• Machinery	
• Computers & electronics	

Sectors with the greatest emissions reductions (in pounds)

- Chemicals
- Primary metals
- Transportation
- Plastics & rubber
- Fabricated metals

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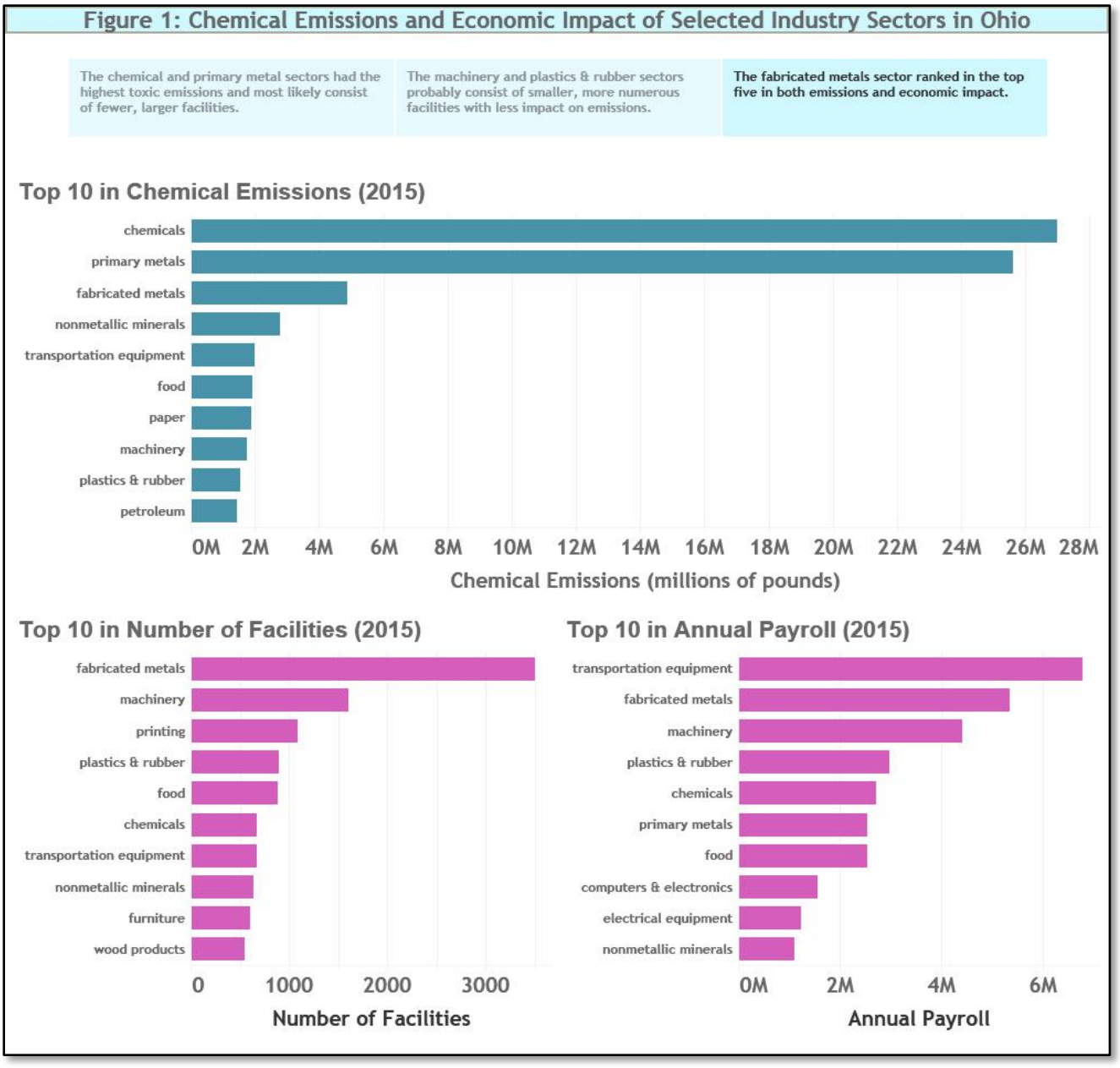
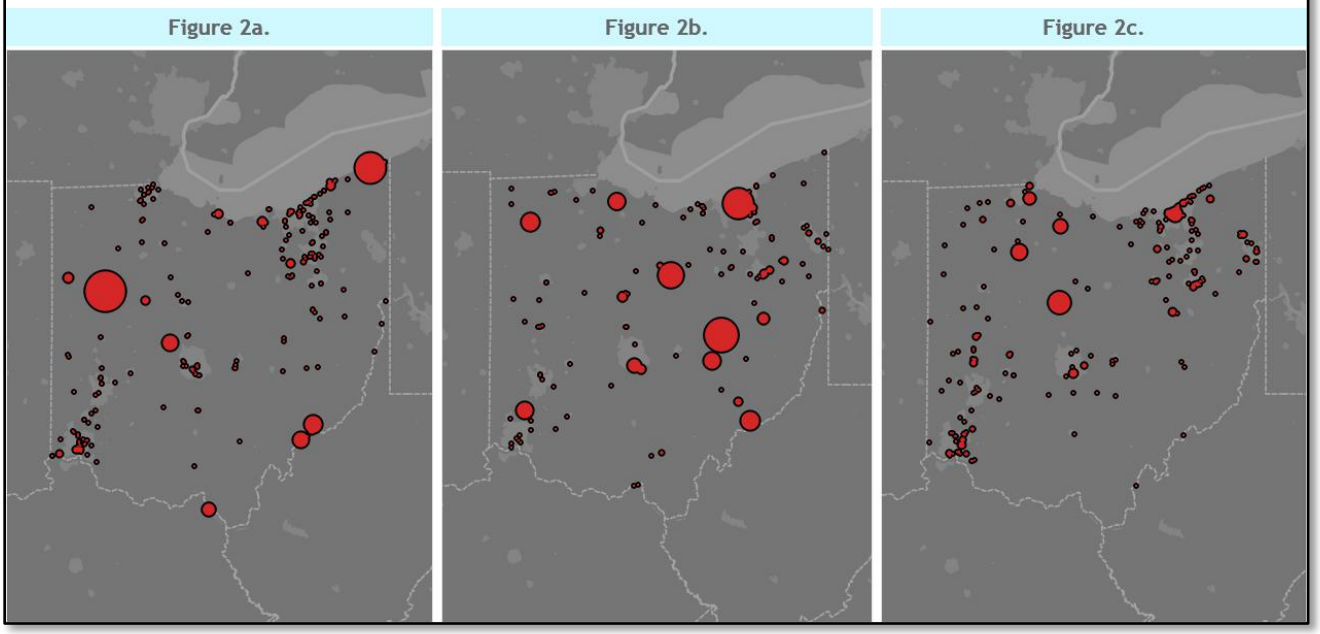
Figure 1 compares the significance of chemical emissions and economic impact of specific industry sectors.



Figures 2a, 2b, and 2c show the general distribution of communities that have chemical manufacturing facilities (a), primary metals facilities (b), and fabricated metal facilities (c) with TRI chemical releases (greater than 0 pounds) in 2015. Circle sizes indicate the relative amount of the releases in pounds for the corresponding sector. Circles may represent more than one facility and more than one type of chemical release in that geographic location, which makes patterns easier to identify. For example, chemical manufacturing facilities are located throughout the state with concentrated clusters of lower emitters surrounding Cleveland and Cincinnati. Primary metals facilities with higher emissions are centered in a north-south band through the east-central section of Ohio, with smaller emitters

scattered throughout the rest of the area. Finally, fabricated metal facilities are distributed primarily in the northern and western parts of the state, with clusters of facilities near large metropolitan hubs.

Figure 2: Distribution of Ohio Facilities in the Chemical Manufacturing sector (2a), the Primary Metals sector (2b), and the Fabricated Metals sector (2c) (TRI, 2015).

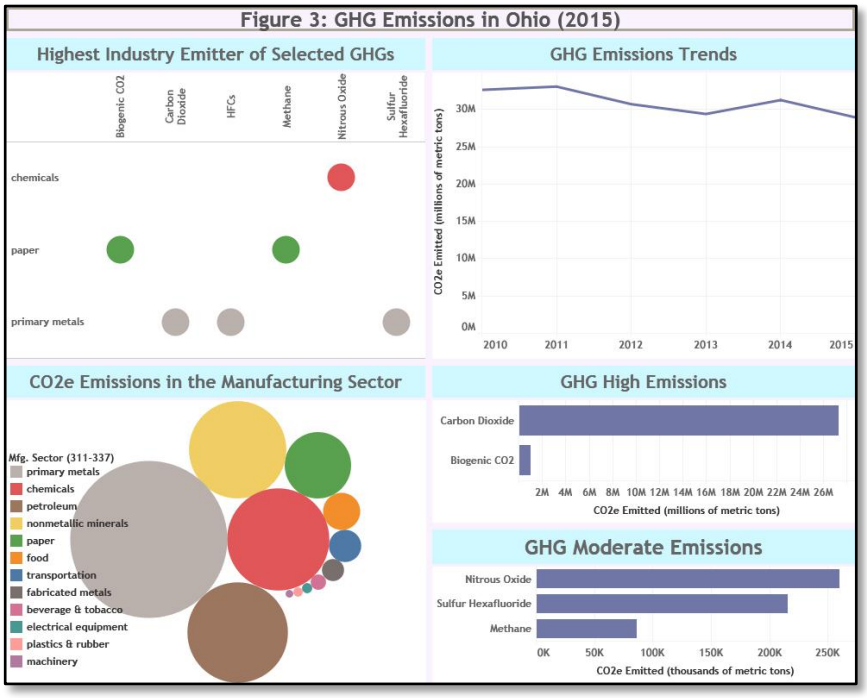


Greenhouse Gas (GHG) Emissions

Ohio's manufacturing sector ranked third of the region's six states in overall GHG emissions. All Region 5 states reported decreased GHG emissions from 2014 to 2015. Ohio's share of that decrease was approximately 2,319,347 metric tons of CO_2e.

The top five GHG emitters were the primary metal, chemical, petroleum, nonmetallic minerals, and paper industries. Ohio was the highest GHG emitter of all Region 5 states in the nonmetallic minerals and fabricated metal industries.

Figure 3: GHG Emissions in Ohio (2015)



The primary metals industry was the highest emitter of carbon dioxide (carbon dioxide accounts for nearly all GHG emissions in the state), sulfur hexafluoride, and hydrofluorocarbons (HFCs). The chemical industry was the highest emitter of nitrous oxide. The paper industry was the highest emitter of biogenic CO_2 and methane. **Figure 3** shows several different visualizations of Ohio's greenhouse gas emissions data.

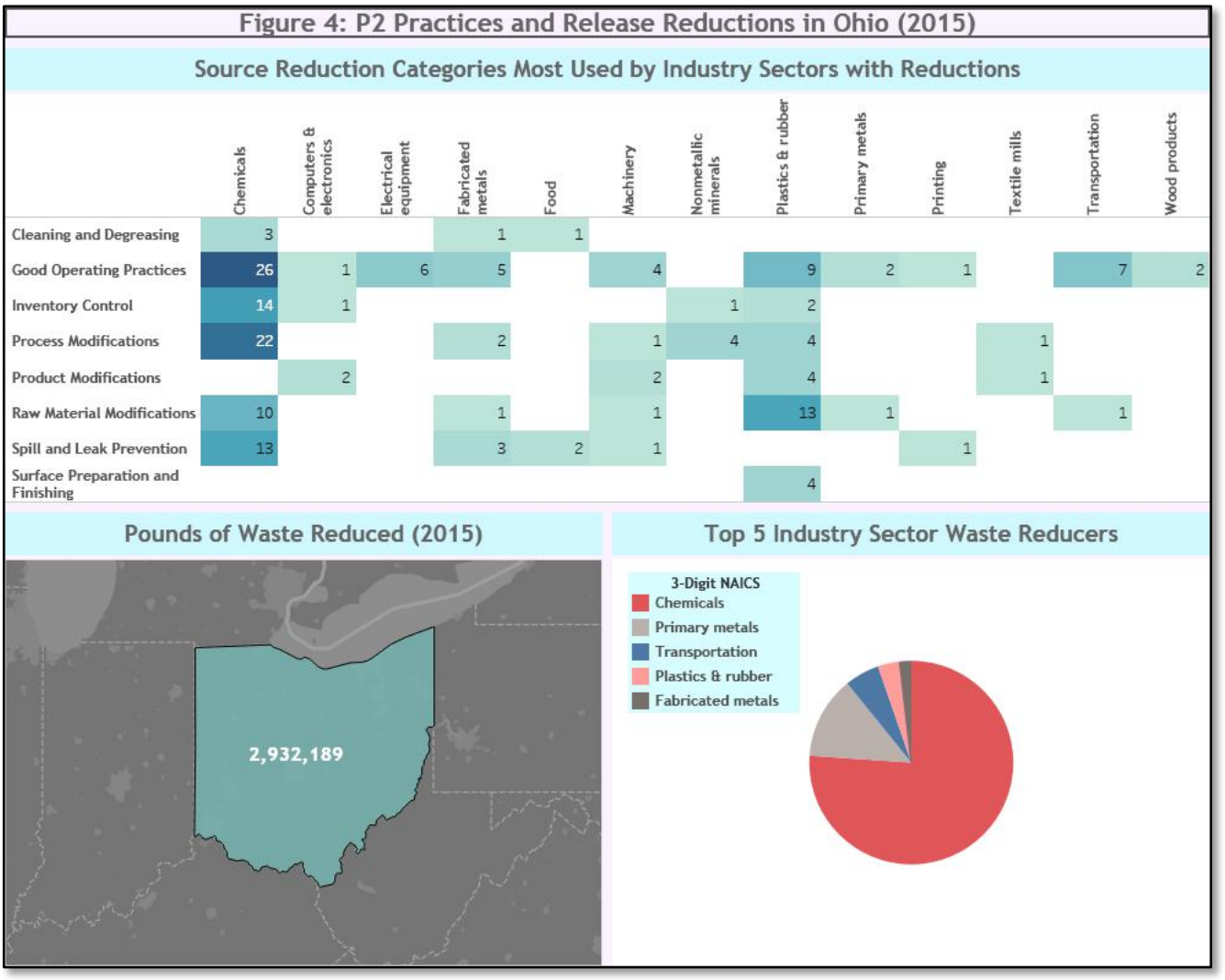
Pollution Prevention (P2) Practices

The TRI reporting program includes an optional section where companies can detail the pollution prevention practices their facility used to reduce specific chemicals. Facilities indicate the activity implemented and the method by which this P2 opportunity was identified using designated codes (W and T codes). Facilities can also choose to describe these activities or other measures taken to reduce toxic chemical releases using a free-text data entry field on the TRI reporting form. Under the Pollution Prevention Act, TRI facilities report a production or activity ratio that typically compares production in the current year with that of the prior year. For a chemical used in the generation of electricity, for example, the production ratio for that chemical reflects the annual change in number of kilowatt hours produced. Using this ratio, year-to-year changes in waste management quantities can be viewed within the context of production, which can help gauge whether reductions were the result of reported source reduction activities (EPA, 2016).

Based on the TRI P2 data entries with only reported reductions, good operating practices (W13 through W19) and process modifications (W50 through W58) were the most effective P2 practices or practice combinations for Ohio companies reporting in 2015. Raw material modifications (W41 through W49) and spill and leak prevention (W31 through W39) were the third and fourth most commonly reported practices by companies with reductions, respectively. According to Ranson et al. (2015), the pollution prevention technique that most effectively reduces emissions is raw material modifications.

The most common good operating practices reported by Ohio companies were "improved maintenance scheduling, recordkeeping, or procedures" (W13), followed by "changed production schedule to minimize equipment and feedstock changeovers" (W14) and "other changes in operating practices" (W19). Facilities also reported process modifications such as "other process modifications" (W58) and "modified equipment layout or piping" (W52). Facilities that reported raw material modifications mentioned "substitution of raw materials" (W42) as the most prevalent source reduction technique. Several companies also reported using spill and leak prevention techniques, such as "installed overflow alarms or automatic shut-off valves" (W33) and "implemented inspection or monitoring program of potential spill or leak sources" (W36).

Of the six Region 5 states, Ohio was second in the number of pounds of toxic emissions reduced (about 2,932,189 pounds). As shown in **Figure 4**, the top five manufacturing industry sectors in reductions of toxic emissions (in order) were chemicals, primary metals, transportation, plastics and rubber, and fabricated metals. Four of these sectors (chemicals, primary metals, fabricated metals, and transportation) also ranked in the top five waste emitters. The plastics and rubber sector was the ninth highest emitter of toxic emissions.



The top five chemicals reduced (highest numbers of pounds) were ammonia, manganese compounds, phenol, zinc compounds, and hydrochloric acid. Reductions of ammonia added up to 1,248,012 pounds. Almost all of this reduction was reported by one nitrogenous fertilizer manufacturer (chemicals sector). The next highest reduction was of manganese compounds at 564,017 pounds. TRI P2 data showed that six industry sectors contributed to this number. The majority of the pounds of phenol reduced were reported by one plastics material and resins manufacturer, which is a subsector of the chemical manufacturing industry.

The most notable trend in Ohio's 2015 P2 data is the gap between the numbers of pounds of waste reduced by chemical manufacturing facilities compared to the other industry sectors (see pie chart in Figure 4). Chemical manufacturing facilities reduced 2,202,022 pounds of emissions, which is about 75% of the total reductions reported statewide. The chemical industry also achieved the greatest toxics reductions in 2014, reporting similar numbers. The primary metals industry reduced emissions by 379,093 pounds, which accounted for 13% of all manufacturing sector reductions. In 2014, the primary metals industry reduced only 2,846 pounds of toxic emissions, which ranked them eleventh in pollution reductions among the state's manufacturing sectors.

The chemicals industry subsector with the most pounds reduced in 2015 (1,442,369 pounds) was Nitrogenous Fertilizer manufacturing (NAICS 325311).

One Ohio nitrogenous fertilizer manufacturer accounted for about 66% of the chemical sector's total reductions, primarily by decreasing their emissions of ammonia. The facility reported using "improved maintenance scheduling, recordkeeping, or procedures" (W13) and "other process modifications" (W58) as P2 practices. They provided no further details. When ammonia emissions were normalized relative to production for the facility, the number of pounds reduced was lower, but still fairly significant.

A plastics material and resin manufacturer reduced emissions by 404,923 pounds, primarily by decreasing their phenol emissions. The facility reported that they reduced waste generation by process control, which reduced the quantity of waste shipped off-site for disposal. They did not provide a specific P2 technique code. When phenol emissions were normalized relative to production for the facility, the number of pounds reduced was less than half of the previous total, indicating that a portion of reduced emissions was due to production-related events.

A basic inorganic chemical manufacturer reduced emissions of manganese compounds by about 11% by "modifying equipment, layout, or piping" (W52). They modified piping in their leach process to improve manganese recovery. When manganese compound emissions were normalized relative to production for the facility, the number of pounds reduced was slightly lower, but still significant.

One synthetic rubber manufacturer reduced 98,000 pounds of hydrochloric acid emissions by "substituting a feedstock or reagent chemical with a different chemical" (W43). Specifically, the facility replaced their coal-fired boilers with natural gas/oil fired boilers. However, when the waste quantities were normalized relative to production for hydrochloric acid, they no longer showed emissions reductions.

The primary metals manufacturing industry reduced the second highest amount of emissions in 2015. The sector reduced overall emissions by 379,093 pounds. One iron and steel mill/ferroalloy manufacturer accounted for almost all (99.5%) of the total emissions reductions in this sector, primarily through reduced releases of manganese compounds. This facility did not provide any information regarding P2 practices used to reduce these chemicals, other than a standard statement on environmental policy. When manganese compound emissions were normalized relative to production for the facility, the number of pounds reduced was slightly lower, but still significant.

A steel foundry reduced emissions of chromium compounds by about 43% by "substituting raw materials" (W42). They stated that the brand of chromite sand they had been using in their process was no longer available and that they planned to use ceramic material as a replacement. When chromium emissions were normalized relative to production for the facility, they no longer showed emissions reductions.

The fabricated metals industry was the third highest emitter and the fifth highest reducer of toxic emissions in Ohio in 2015. One electroplating, plating, polishing, anodizing, and coloring facility reduced emissions of trichloroethylene by 62% by using "modified stripping/cleaning equipment"

(W59). The facility stated that they discontinued use of their vapor degreaser in 2015. When trichloroethylene emissions were normalized relative to production for the facility, the number of pounds reduced was slightly lower, but still significant.

The food industry was the sixth highest emitter and achieved the seventh highest reductions in toxic emissions during the period. A frozen specialty food manufacturer decreased emissions of ammonia by 98%. They reported that they "implemented an inspection or monitoring program of potential spill or leak sources" (W36). When ammonia emissions were normalized relative to production for the facility, the number of pounds reduced was quite similar. However, the company also reported in 2015 that they recycled almost all of the ammonia waste that they generated. In 2014, most of this waste was released. Thus, reported emissions reductions may be a result of a change in waste management practices rather than the use of P2 techniques.

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For More Information

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