GREAT LAKES REGIONAL POLLUTION PREVENTION ROUNDTABLE

GLRPPR

Spotlight on Illinois' 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 paper summarizes findings for Illinois' manufacturing sector (NAICS 311-337).

Economy and TRI Emissions

The fabricated metal products sector had the most establishments in Illinois in 2014 (U.S. Bureau of the Census, 2014). The chemical manufacturing sector had the highest payroll.

According to Toxics Release Inventory data, the primary metals industry sector was the highest emitter, followed by the food manufacturing industry. The food manufacturing industry had the fourth highest payroll among manufacturing sectors. The primary metals sector ranked ninth. Food manufacturing ranked second in number of employees, while the primary metals sector ranked ninth. Finally, food manufacturers ranked fourth in number of establishments while primary metals ranked thirteenth. From these data, it appears that both the food manufacturing and primary metals sectors are comprised of larger facilities than some other sectors.

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

2014 Data Summary

Number of TRI Entries: 3,299
Number of TRI Facilities: 984 (based on TRI ID)
Number of GHG Facilities: 104
Number of P2 entries (TRI): 257
Number of P2 entries reporting reductions: 96
Total CO_{2e} Releases: 31,556,777 metric tons
Total On and Off-Site Releases: 57,055,533 lbs.
Chemical emissions rank: 3rd of 6 Great Lakes states

Releases

	Total	Highest Emitter
Air	23,865,241 lbs.	Food
Land	3,248,804 lbs.	Primary metals
Water	5,046,462 lbs.	Food
Off-site	24,895,006 lbs.	Primary metals
CO_{2e}	31,556,777 metric tons	Petroleum

Top Five Industry Sector Emitters

TRI	GHG
1. Primary metals	1. Petroleum
2. Food	2. Chemicals
3. Chemicals	3. Food
4. Plastics & Rubber	4. Primary metals
5. Fabricated metals	5. Nonmetallic minerals

Top Five Chemical Releases

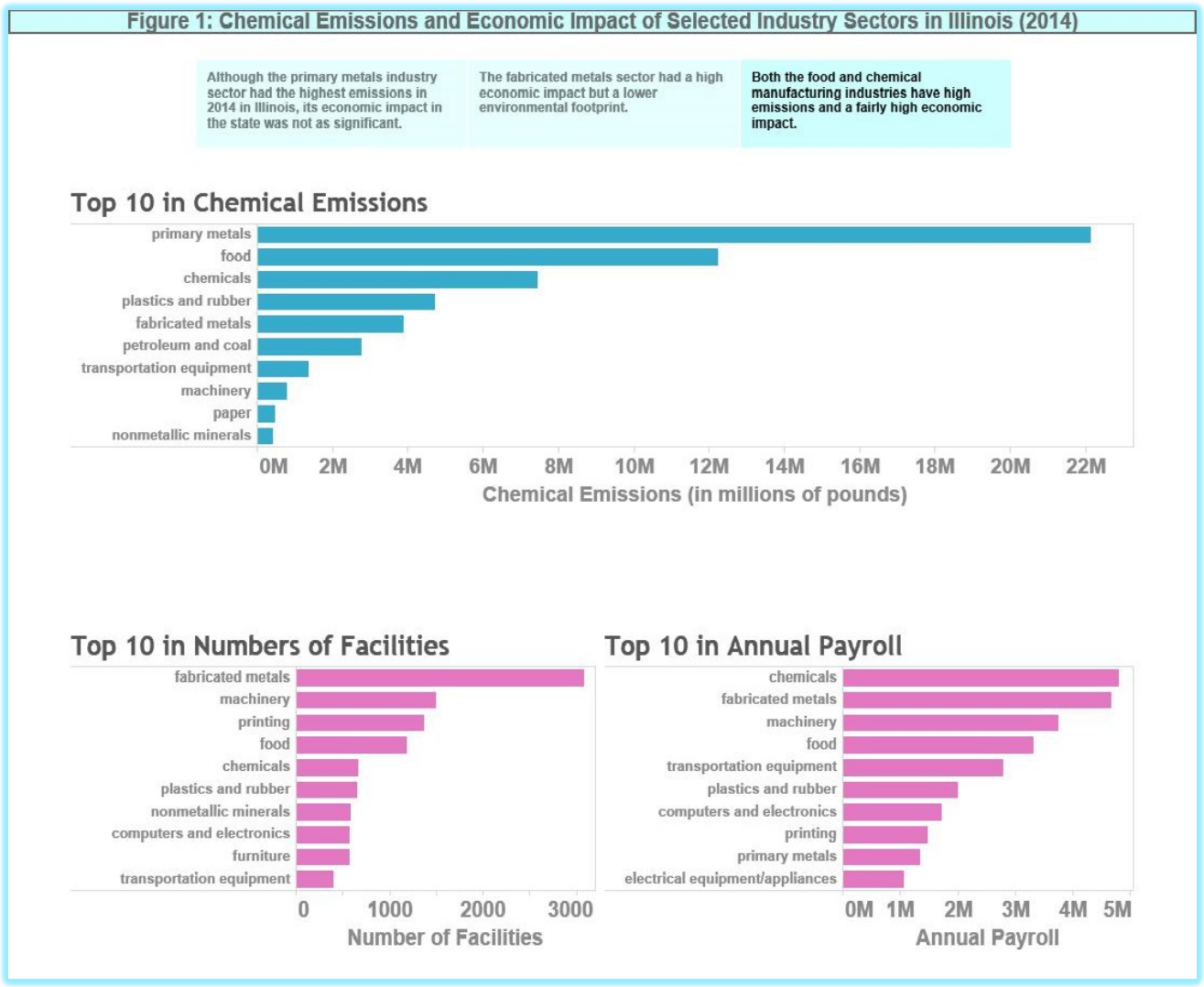
1. Zinc compounds
2. Manganese compounds
3. Nitrate compounds
4. Carbon disulfide
5. N-hexane

Illinois is the Top Emitter in:

TRI	GHG
1. Food	1. Petroleum
2. Petroleum	2. Chemicals
3. Plastics & Rubber	3. Food
	4. Plastics & Rubber
	5. Machinery

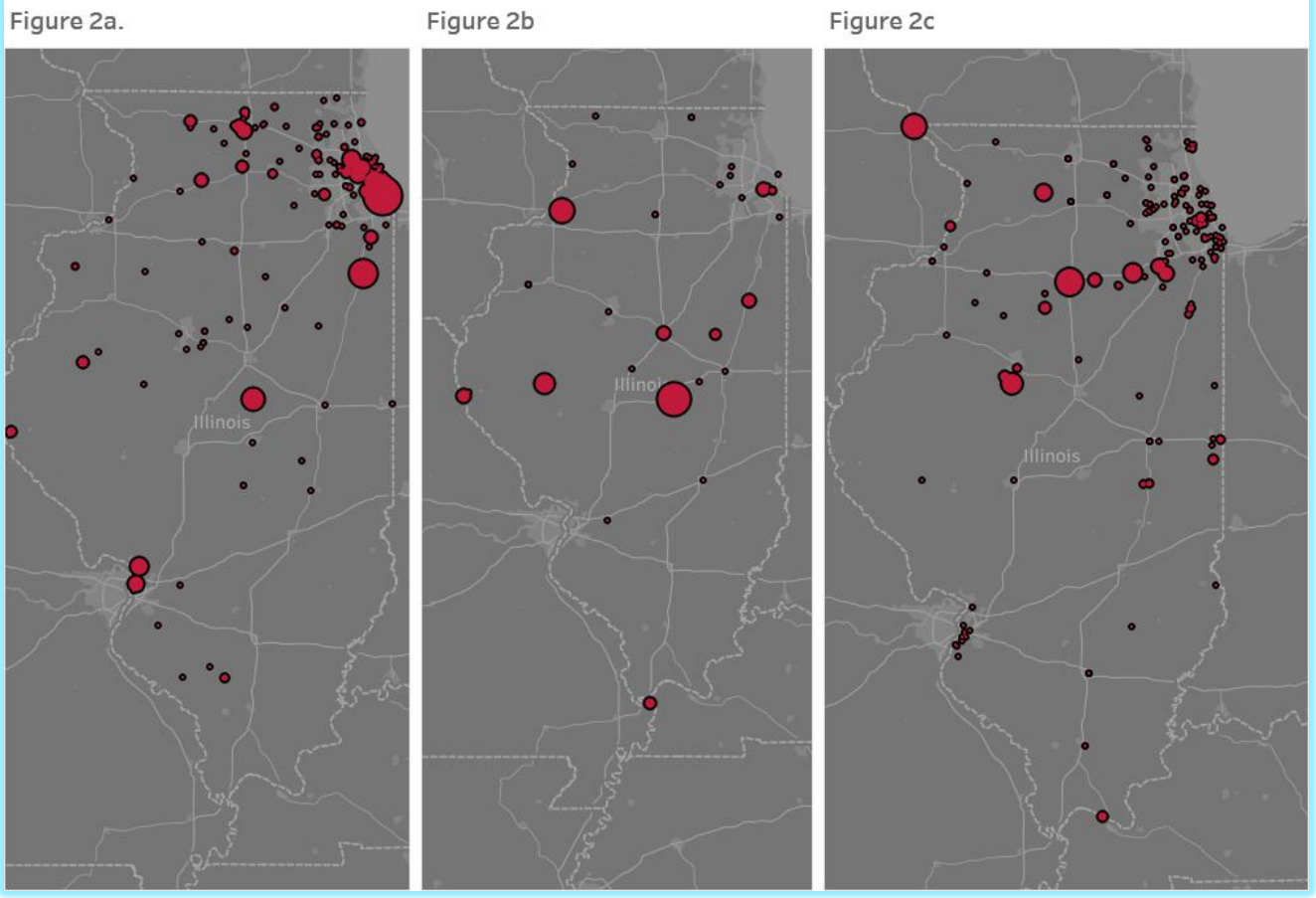
Sectors with Greatest Emissions Reductions (in pounds)

1. Food
2. Chemicals
3. Paper
4. Machinery
5. Primary metals



Figures 2a, 2b, and 2c show the distribution of cities and towns containing fabricated metal facilities (a), food manufacturing facilities (b), and chemical manufacturing facilities (c) with TRI chemical releases (greater than 0 pounds) in Illinois in 2014. Sizes of the circles indicate the relative amount of the releases in pounds for the corresponding sector. Each circle can represent more than one facility in that geographic location, which makes it easier to identify patterns in the data. For instance, there are relatively large clusters of fabricated metal and chemical facilities located in the Chicago Metropolitan area, while larger clusters of food processing facilities are found in central and western Illinois.

Figure 2: Distribution of Illinois Facilities in the Fabricated Metals sector (2a), the Food Processing sector (2b) and the Chemical Manufacturing sector (2c) (TRI, 2014).

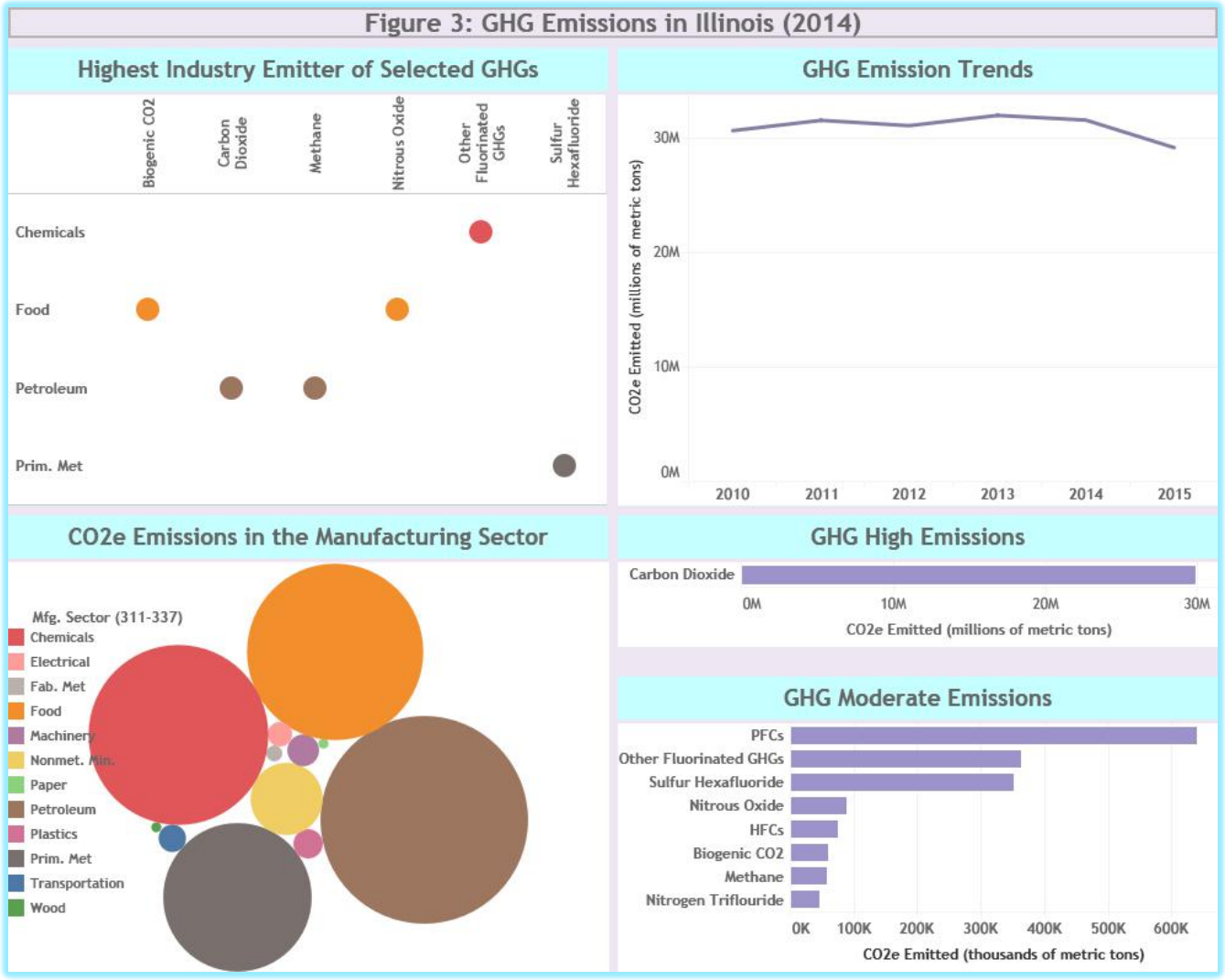


Greenhouse Gas (GHG) Emissions

Illinois ranked third of the six Region 5 states in GHG emissions in 2014, following Indiana and Ohio. Although GHG emissions increased from 2013 to 2014 in Region 5 as a whole, they decreased by approximately 408,000 metric tons in Illinois during the same period.

The top five emitters in Illinois' manufacturing sector in 2014 were the petroleum, chemicals, food processing, primary metals, and nonmetallic mineral industries. Illinois was the highest GHG emitter of all Region 5 states in the petroleum, chemical, food processing, machinery, and plastics and rubber industries.

The petroleum industry (NAICS 324) emitted the most carbon dioxide and methane (carbon dioxide comprises the bulk of all GHG emissions in the state). The food manufacturing industry (NAICS 311) was the highest emitter of both biogenic CO_2 and nitrous oxide. The primary metals industry (NAICS 331) was the highest emitter of sulfur hexafluoride, while the chemical industry (NAICS 325) led emissions in nitrogen trifluoride and all other fluorinated GHGs (including perfluorinated chemicals). **Figure 3** shows several different visualizations of Illinois' greenhouse gas emissions data.



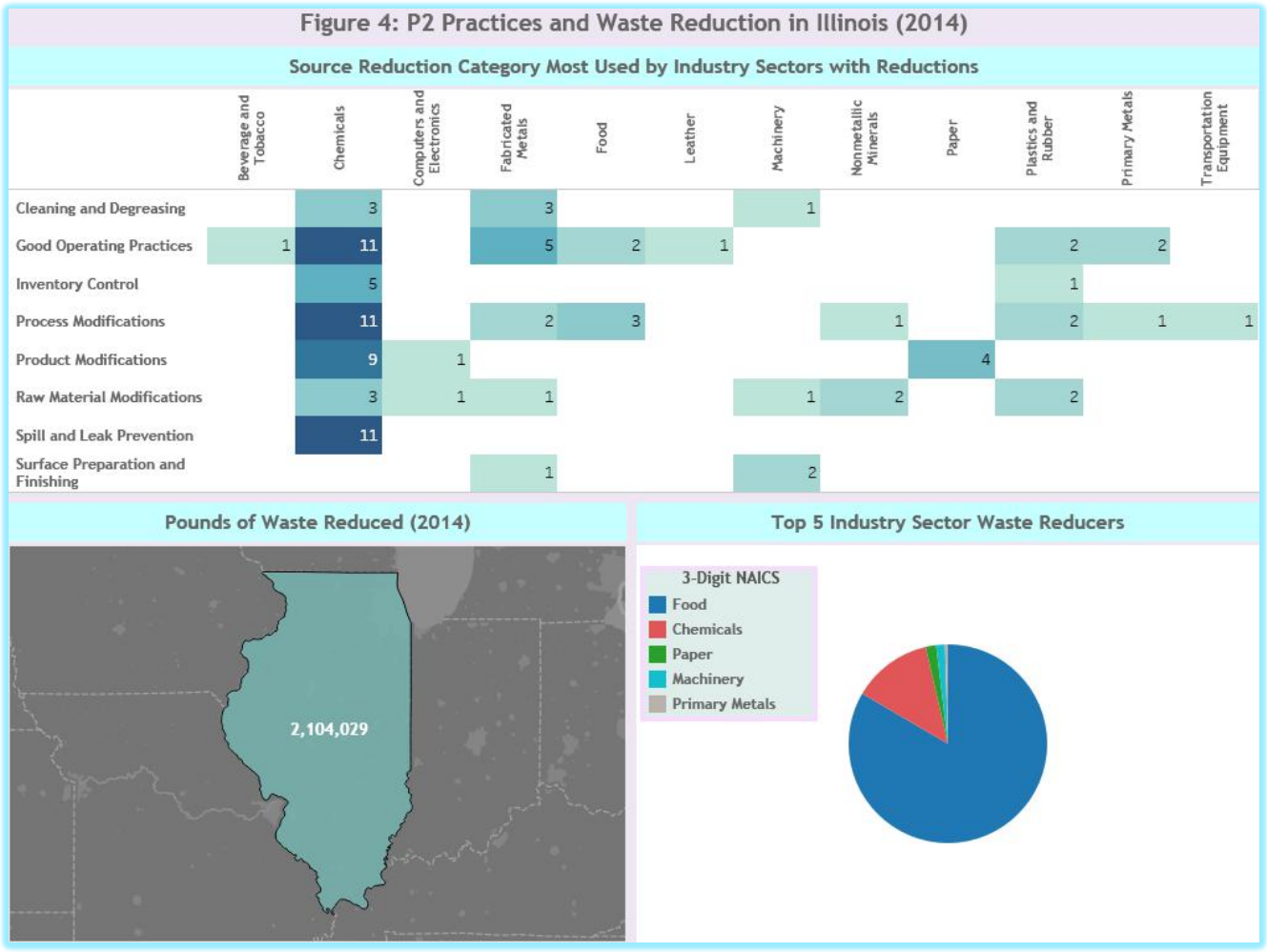
Pollution Prevention (P2) Practices

The TRI reporting program includes an optional reporting section where companies can report which pollution prevention practices they used to achieve reductions of specific chemicals. Based on the TRI P2 data entries with only reported reductions, process modifications and good operating practices were the most effective P2 practices or combinations of practices for Illinois companies reporting in 2014. P2 practices in these source reduction categories tend to be easiest and least expensive to implement and are therefore usually the most popular practices for companies to adopt.

The most common process modifications reported by Illinois companies were: “modifying equipment layout or piping” or “reducing or eliminating use of an organic solvent.” Companies also reported good operating practices, such as “improved maintenance scheduling, recordkeeping, or procedures” or “changing a production schedule to minimize equipment and feedstock changeovers.” Several companies also reported using product modifications and raw material modifications. Although spill

and leak prevention practices are the fourth most common source reduction category by Illinois companies in 2014, these practices tend not to be as effective at reducing emissions as other practices, such as process or product modifications and good operating practices (Ranson, 2015).

Of the six Region 5 states, Illinois was second in the most pounds of toxics emissions reduced (over two million pounds). As illustrated in **Figure 4**, the Illinois manufacturing industry sectors with the greatest reductions of toxic emissions (in order) were: food processing, chemicals, paper, machinery, and primary metals. Three of these sectors (food processing, chemicals, and primary metals) also ranked in the top five waste emitters in Illinois.



The top five chemicals reduced in Illinois in 2014 (highest numbers of pounds) were: nitrate compounds, ammonia, formaldehyde, phenol, and toluene. Reductions of nitrate compounds topped 1.5 million pounds compared to the next highest reduction (ammonia) at less than 200,000 pounds. Nitrate compounds and ammonia are the chemicals most often reported as TRI emissions by food manufacturers.

The most notable trend in Illinois' 2014 P2 data is the large gap between the numbers of pounds of waste reduced by food processors compared to the rest of the state's manufacturing sectors.

When looking only at companies reporting emissions reductions in 2014, food manufacturing facilities reduced 1,739,725 pounds of emissions, which is nearly 83% of the total reductions reported statewide. The next highest number of pounds reduced was 270,759 pounds in the chemical industry. All other industry sectors reported less than 50,000 pounds reduced. Most of those sectors reported reducing less than 10,000 pounds. One meat processor accounted for approximately 89% of the sector's total emissions reductions by dramatically decreasing their emissions of nitrate compounds. The facility reported using "other process modifications" (W58) as a P2 practice. They did not add additional comments to describe what those modifications were. However, a review of their reported P2 data in previous years shows that they implemented a nitrate reduction project in 2009. In addition, they continued to explore methods of reducing the load from their wastewater system in 2010, including using polymers for stripping out Total Kjeldahl Nitrogen (TKN). They also reported that their amount of production-related waste (nitrate compounds) decreased by about 34% from 2013 to 2014, so it is possible that decreased production also played a role in the reduction.

The food manufacturing sector is one of the most diverse in the Toxics Release Inventory. The industry segments that reduced their emissions the most from 2013 to 2014 were:

1. Meat processed from carcasses (NAICS 311612).
2. Wet corn milling (NAICS 311221)
3. Spice and extract manufacturing (NAICS 311942)
4. Dry pasta, dough, and flour mixes manufacturing (NAICS 311824).

The chemical manufacturing industry reduced the second highest amount of emissions in 2014. The sector reduced overall emissions by 270,769 pounds. As in the food manufacturing sector, one company accounted for 89% of total emission reductions in this sector, primarily through reductions of formaldehyde, phenol, and chromium compounds. They reported using "other process modifications" (W58) and "modifying the design or composition of product" (W82) as P2 practices. Their additional comments indicated that they increased the scrubber solution blow down rate to increase the removal efficiency for formaldehyde and phenol, then installed oxidizers on two of three production lines. For chromium compound emissions, they reported using "improved procedures for loading, unloading, and transfer operations" (W32), specifically installing a dust suppression hopper on truck loading stations to reduce fugitive emissions.

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For More Information

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