Spotlight on U.S. EPA Region 5's Food Manufacturing and Processing Industry

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Introduction

In 2015, the Great Lakes Regional Pollution Prevention Roundtable (GLRPPR) began a project to analyze public data sets to determine the impact of manufacturing on the economy and environment of the six states in U.S. EPA Region 5. The goal of this project was to use the analyzed results to assist pollution prevention technical assistance programs (P2 TAPs) with targeting their assistance efforts. This white paper summarizes preliminary findings related to the food manufacturing and processing industry (NAICS code 311).

Economic Impact

The Census Bureau's County Business Patterns database (2013) indicated that the food industry is the fourth (out of 20) most prevalent type of manufacturing facility in the region. **Figure 1** shows the distribution of the top 10 most prevalent manufacturing sectors in the region in 2013 based on County Business Patterns data.

Figure 1: Top 10 Manufacturing Sectors (2013)
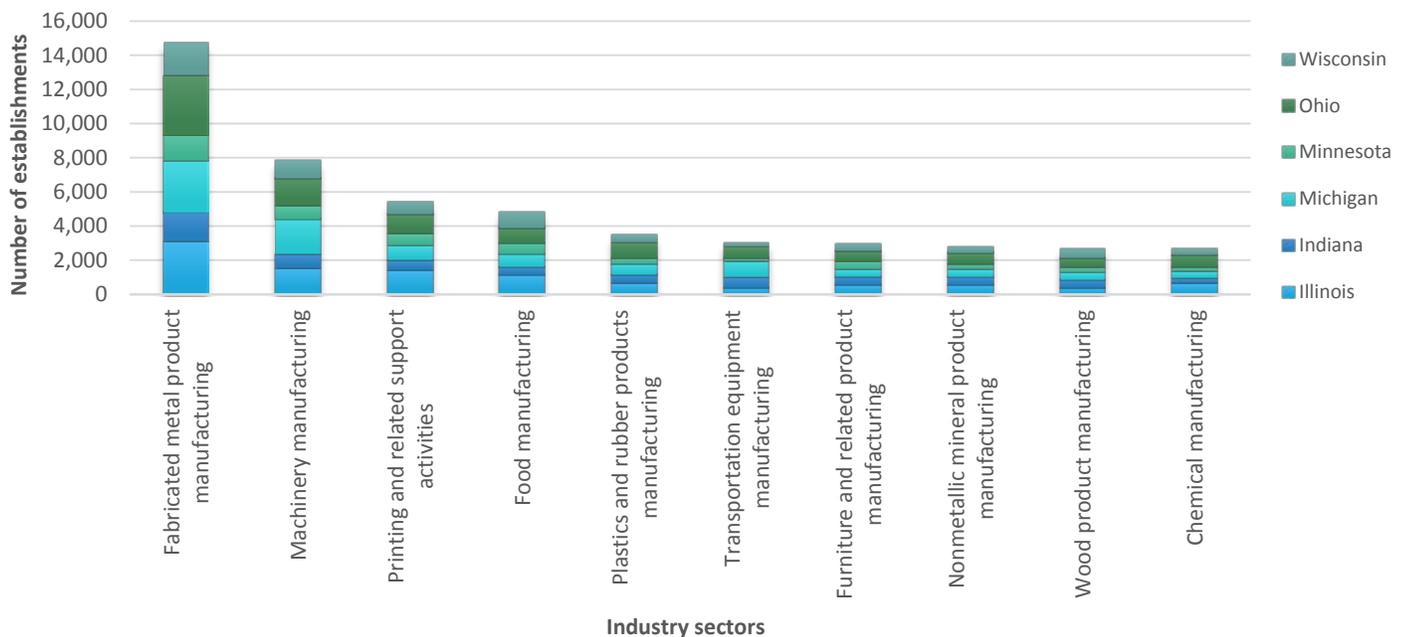
Food manufacturers represent a significant portion of the annual payroll of manufacturing industries in the region. In 2013, the 20 manufacturing sectors analyzed for this report employed over 2.5 million people and accounted for close to $150 million dollars in annual payroll. Of that total, companies in the food manufacturing sector spent more than $12.5 million to employ close to 300,000 food industry workers (County Business Patterns, 2013). **Figure 2** shows the number of food processing establishments per state in 2013.

Figure 2: Number of Food Processing Facilities (2013)

Number of establishments / Region 5 States

Illinois: 1142
Wisconsin: 929
Ohio: 893
Michigan: 765
Minnesota: 647
Indiana: 458

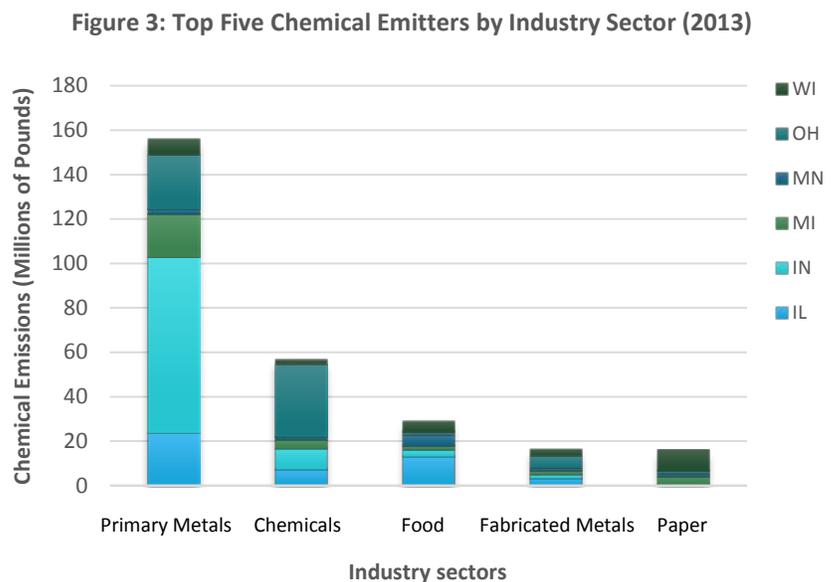P2 TAPs can have an impact on this important economic sector by targeting efforts to prevent or reduce pollution at its source. Companies can avoid expensive investments in waste management or clean-up efforts if they change their operations so that they do not produce waste. Although companies may balk at the initial investment that a change in technology or procedure requires, TAPs can help them to see how much money they will save if they view the situation from a long-term perspective. This cost savings in the production process and waste management can translate to increased research and development of new products, higher wages, and perhaps even more jobs.
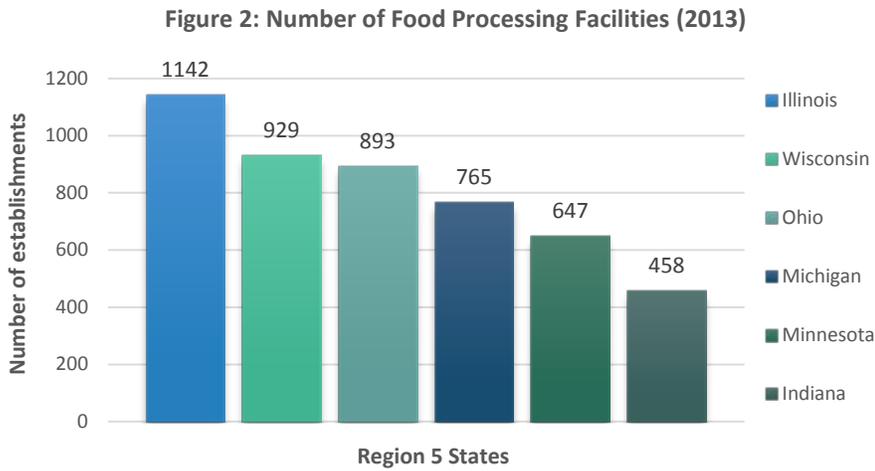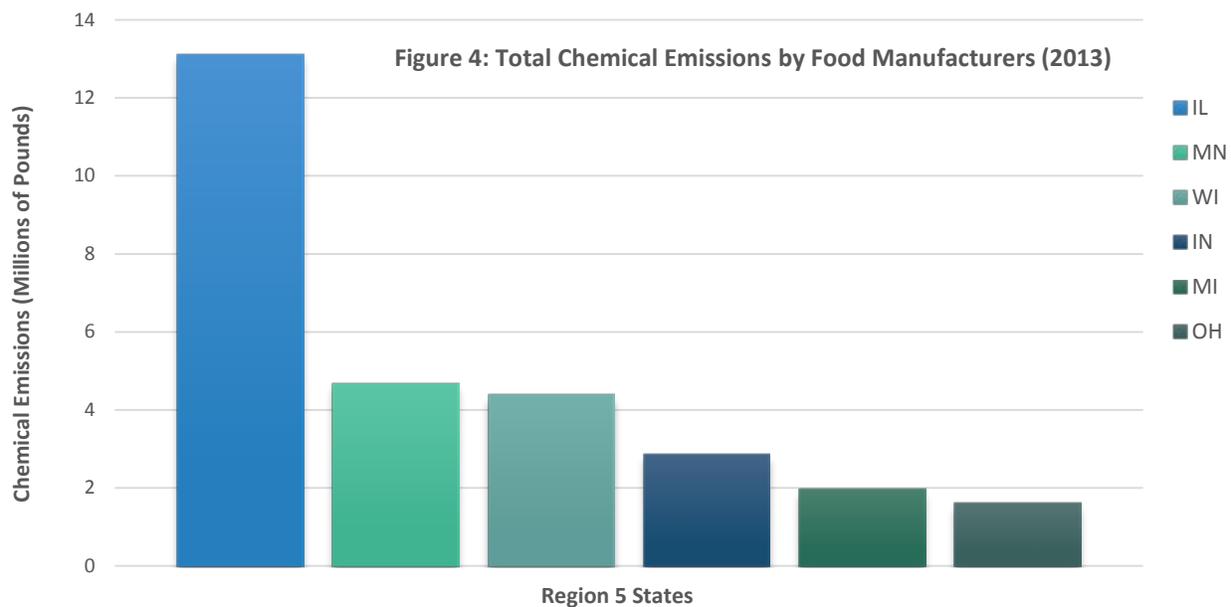
Emissions

Chemical Emissions Overview

The food manufacturing and processing industry is a significant source of chemical emissions. Toxics Release Inventory (TRI) data analyzed from the years 2009-2013 from U.S. EPA Region 5 indicated that the food industry had a major impact on the environment in all five years. Only the primary metal and chemical manufacturing industries had higher chemical emission rates. **Figure 3** shows the highest emitting industries and illustrates how the states compare in each sector in 2013.

Figure 3: Top Five Chemical Emitters by Industry Sector (2013)

Chemical Emissions (Millions of Pounds) / Industry sectors

Legend: WI, OH, MN, MI, IN, IL

Industry sectors: Primary Metals, Chemicals, Food, Fabricated Metals, Paper

The food industry was the number one chemical emitter for Minnesota in 2009-2013 and for Illinois in 2009. Illinois led this industry sector in all five years. Approximately 13,128,225 pounds of chemicals were emitted by the food industry in Illinois in 2013. Minnesota followed with 4,681,450 pounds emitted (its highest emitting industry sector).

To get a better idea of the actual impact of the food industry in each state, we also looked at how large the industry sector is and how much it contributes to each state's total emissions. In Minnesota in 2013, food manufacturers comprised about 10% of all manufacturers, but about 35% of all chemical emissions. In Illinois and Indiana, food manufacturers comprised about 9% and 6% of all manufacturers respectively, while contributing close to 25% of all chemical emissions. Wisconsin lands somewhere in the middle, with food manufacturers comprising about 11% of all manufacturers, and about 15% of all chemical emissions. Michigan and Ohio have a lower percentage of their chemical emissions coming from the food industry (5% or less), although this industry sector comprises about 7% of all manufacturers in both states. **Figure 4** shows the chemical emissions data for all Region 5 states in the food processing industry in 2013.

Figure 4: Total Chemical Emissions by Food Manufacturers (2013)

Chemical Emissions By State

Analysis of specific chemicals emitted by the food manufacturing and processing industry in **Illinois** in 2013 showed that nitrate compounds topped the list with 5,521,506 pounds emitted primarily to water, followed by:

- N-hexane with 3,410,612 pounds emitted primarily to air;
- ammonia with 842,438 pounds emitted primarily to air;
- hydrochloric acid with 642,305 pounds emitted primarily to air; and
- barium compounds with 623,071 pounds emitted primarily through off-site releases.

Figure 5 illustrates the top 10 chemicals released by the food industry in Illinois in 2013.

The most prevalent chemicals emitted in the other five states in Region 5 in 2013 (TRI, 2013) are summarized below:

Figure 5: Top 10 Chemicals Emitted by Illinois Food Processors (2013)
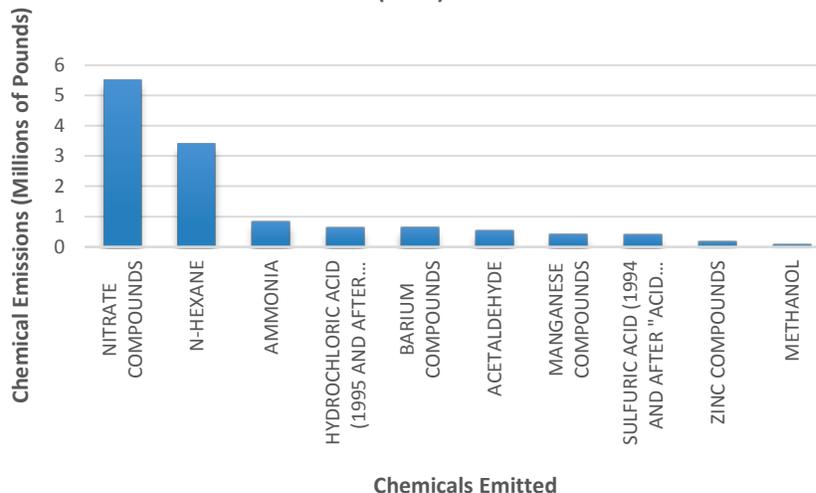

- **Wisconsin:** nitrate compounds primarily to water, followed by nitric acid to land, and ammonia to air.
- **Michigan:** nitrate compounds to water, followed by N-hexane, hydrochloric acid, and ammonia to air.
- **Indiana:** N-hexane to air, followed by acetaldehyde and hydrochloric acid to air, and nitrate compounds to water.
- **Ohio:** N-hexane to air, followed by hydrochloric acid and ammonia to air, and nitrate compounds to water.
- **Minnesota:** N-hexane to air, followed by ammonia to air, nitrate compounds to water, and hydrogen sulfide to air.

Based on this analysis, the most prevalent chemicals emitted in the food industry in the Great Lakes states are **N-hexane and ammonia to air** and **nitrate compounds to water**. Some states varied, but almost all states listed these three chemicals in their top four emissions. P2 TAPs may be able to use these findings to target technical assistance efforts to food processors. For example, in Illinois in 2013, the food manufacturing and processing industry released its most prevalent pollutant (nitrate compounds) to water. Therefore, Illinois' P2 TAPs might want to focus on nitrate reduction in food processing to reduce these emissions.

Greenhouse Gas Emissions

Another area of concern when discussing emissions data is that of greenhouse gas (GHG) emissions, which contribute to global climate change. U.S. EPA Envirofacts data from 2013 on greenhouse gas (GHG) emissions in Region 5 indicated that the food processing industry released the eighth most carbon dioxide equivalents (CO_2e) to the air out of 16 industries for which U.S. EPA reported data.

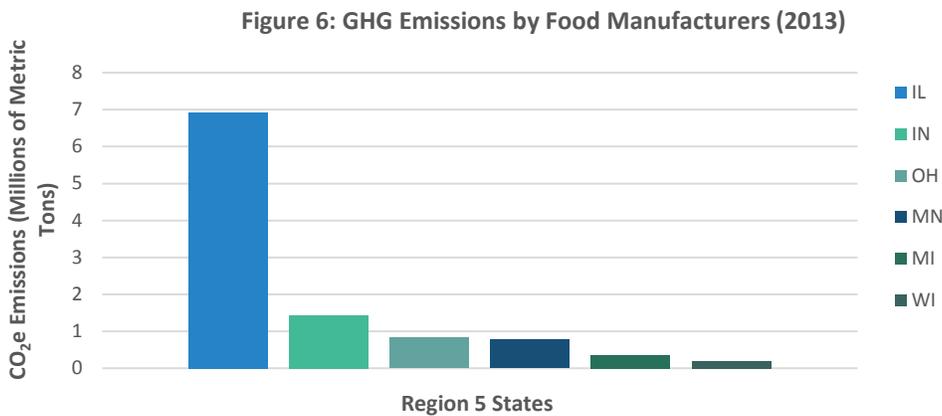Figure 6: GHG Emissions by Food Manufacturers (2013)

Figure 6 shows the GHG emissions for each of the six states in Region 5. These data indicate that food processing industries in Illinois released the highest amount of CO_2e in the region. This can be partially explained by the fact that there are more food manufacturing facilities in Illinois than in any other state in the region. The next highest state in number of facilities (Wisconsin) had over 200 fewer establishments in this category. However, Wisconsin reported emitting the lowest amount of CO_2e, according to U.S. EPA data. This may indicate an opportunity for P2 TAPs in Illinois to investigate specific P2 practices used by Wisconsin food manufacturers so that they can communicate that information to Illinois companies.

Managing Wastes

Waste Management Practices

Analysis of waste management methods in the food processing industry in U.S. EPA Region 5 shows that companies are most likely to recycle their waste on-site. Companies recycled 883,787,819 pounds of waste on-site in 2013. The next most frequent management technique was on-site treatment (56,096,139 pounds). **Figure 7** illustrates waste management methods used by the food industry (NAICS 311) in U. S. EPA Region 5 during 2013.

Figure 7: Waste Management Methods in the Food Industry (2013)
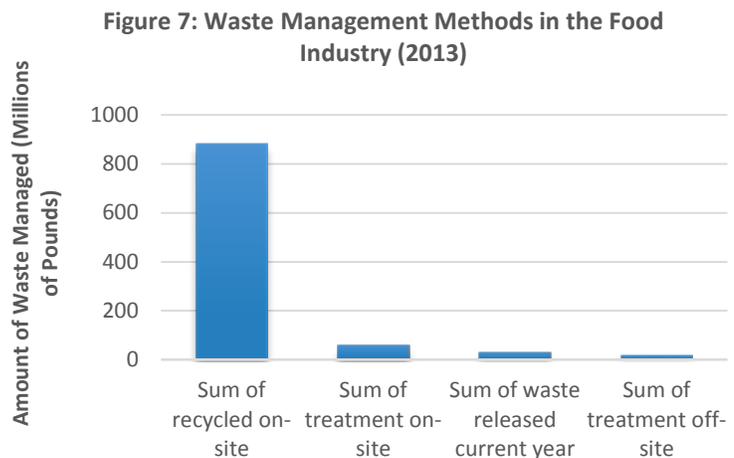
Pollution Prevention Practices

The TRI program asks companies to report what P2 processes they are using to reduce specific regulated chemicals. The three chemicals most commonly emitted by Region 5 food manufacturers in 2013 were nitrate compounds, N-hexane, and ammonia. We analyzed the TRI Pollution Prevention data to determine how food manufacturers are successfully reducing these emissions.

Specific industries that most often reported the release of ammonia were the wet corn milling industry, frozen specialty food manufacturing, and the rendering and meat processing industry. TRI data for Region 5 from 2009-2013 indicated that the P2 practice most commonly employed to reduce

emissions of ammonia was improving maintenance scheduling, recordkeeping, or procedures, specifically, starting a preventive maintenance program. The second most common P2 practice was modifying equipment, layout, or piping (such as valve replacement). Also important were implementing an inspection or monitoring program for potential spill or leak sources and improving procedures for loading, unloading, and transfer operations.

The soybean and other oilseed processing and the spice and extract manufacturing industries most often reported N-hexane releases. To reduce N-hexane emissions, companies most commonly employed process modifications, such as installing more efficient equipment (e.g., replacing condensers) and reducing vacuum pressure on extractors. The next most common P2 practices were changing the production schedule to minimize equipment and feedstock changeovers; focusing more heavily on spill or leak prevention; and modifications of equipment, layout, or piping (such as valve replacement).

Specific industries most often reporting the release of nitrate compounds were the animal slaughtering and meat processing industry; the cheese and milk manufacturing industry; and the specialty canning industry. The P2 practices most commonly employed to reduce emissions of nitrate compounds were process modifications, such as reducing the use of cleaning chemicals containing nitric acid. The next most common practices were improving maintenance scheduling, recordkeeping, or procedures and instituting modifications to cleaning and degreasing procedures.

Conclusion

The food manufacturing industry has a large impact on both the economy and the environmental quality of the Great Lakes States. Although manufacturers in this sector are already utilizing a variety of pollution prevention techniques, more can be accomplished to reduce emissions. Technical assistance programs can be a valuable resource to the food manufacturing industry as it continues to find new ways of incorporating pollution prevention techniques into its processes and reducing emissions. By studying these data and comparing them across states, P2 TAPs may be able to identify practices used by companies in another state that can be applied to food manufacturers in their own state. David Liebl of the University of Wisconsin's Solid and Hazardous Waste Education Center, has authored a strategy for P2 TAPs that are interested in leveraging this data. See the *Recommended Reading* section.

Recommended Reading

Food Processing Environmental Assistance Center (2010s?). "General Operations." West Lafayette, IN : Purdue University. Online at http://www.fpeac.org/generaloperations.htm. Accessed 4/22/2015.

Liebl, David S. (2015). "A Strategy for Using the U.S. EPA Toxics Release Inventory to Identify Opportunities for Diffusion of Innovative Methods for Hazardous Waste and Toxic Emission Reduction." Madison, WI: University of Wisconsin-Madison Solid and Hazardous Waste Education Center. Online at https://uwmadison.app.box.com/WI-TRI-Strategy-Files-10-2015/1/4717750437/40508754685/1.

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For More Information

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