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Pollution Prevention and Opportunities by Industrial Sector


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Why Industrial Sectors?


- The NYSP2I has sorted through the sectors to find the top 8 waste sectors.
- We will cover the “hot spots” for each one and possible ways to improve each.

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Pollution Prevention in Industry

- Pollution Prevention is all about opportunities
- Reduced pollution usually means reduced waste and therefore reduced cost
- Ever changing technologies can provide pollution and waste reduction improvements where none were available before

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Overview of Top Sector Areas

1. Chemical manufacturing, NAICS* code 325
2. Computer and electronics production, code 334
3. Primary metal manufacturing, code 331
4. Fabricated metal product manufacturing, code 332
5. Miscellaneous manufacturing, code 339
6. Food manufacturing, code 311
7. Printing and related support activities, code 323
8. Nonmetallic mineral product manufacturing, 327

*NAICS = North American Industry Classification System

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Overview of Sectors (ranked by importance)



- Chemical
 - Petrochemical, dyes, chlorine, paints, soap, adhesives, ethanol, fertilizer, ink, pharmaceuticals, pesticides, plastic resins, carbon black
- Electronics
 - Computers, phones, radios, audio, video, printed circuit boards, electronic assembly
- Primary metal manufacturing
 - Steel mill, aluminum production, basic shapes (alum., steel, copper), foundries
- Fabricated metal
 - Stamping, forging, roll forming, heat treating, pipe, containers, metal buildings
- Misc. manufacturing
 - Dental/surgical/medical equipment, ophthalmic goods, jewelry, sporting goods, etc.
- Food manufacturing
 - Animal feed, dairy, meat, poultry processing, pasta, etc.
- Printing
 - All printing methods, pre-press operations
- Nonmetallic mineral product
 - China, ceramic tiles, porcelain products, brick, glass, cement, concrete, cut stone, abrasives


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#1, Chemical Manufacturing

- ***Hazardous Waste***
 - Heavy metals
 - Waste solvents
 - Toxic organics
- ***Wastewater***
- ***Air Emissions***
 - Fugitive VOC's
- ***Energy Use***
 - Heaters, chillers, mixers, distillation units





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Chemical Industry Opportunities

- Heat exchange recovery from heaters, chillers
- Are mixers on only as needed? Do they have high efficiency motors?
- Any need for the “waste” in another industry?


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#2, Computer and Electronics Production

The primary focus is on the processes associated with printed circuit board manufacturing.


- Circuit board plating operations
- Component mounting process (wave soldering, surface mount)

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Electronic Product Manufacturing


- **Solid Waste**
 - Sludge from plating waste treatment, scrap circuit boards
- **Hazardous Waste**
 - Treated plating waste is likely to be hazardous due to the metal content
 - If the solder dross contains lead then this will be hazardous
- **Wastewater**
 - If large quantities of water are being treated then water use may not be optimum (rinsing operations)

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Electronic Product Manufacturing

- **Air Emissions**
 - Depending on the solder fluxes used, there may be solvent-type cleaners used to remove the flux after soldering
- **Water Use**
 - Water use will tend to be high in any plating system due to the multiple rinsing operations

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Electronic Product Manufacturing Opportunities

- Rinse water reduction
- Acid life extension
- Solvent cleaning? Switch to water soluble flux?
- Designing for end-of-life by eliminating lead in the solder?




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#3, Primary Metal Mfg.

Includes both metal production, metal refining, and basic metal shape production (sheet, wire, plate, extrusions, castings, forgings, etc.)

- There are many precious metal refiners in NYS
- There are many metal shape producers in NYS
- There is only one major ore-to-metal producer in NYS- Alcoa




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Primary Metal Mfg.


- **Solid Waste**
 - Slag and tailings from metal refining
- **Hazardous Waste**
 - Tailings may contain leachable metals or sulfides
 - Precious metal refining waste liquid may require treatment for metals and pH adjustment
- **Air Emissions**
 - Metal vapors such as lead, mercury, selenium
- **Energy Use**
 - High energy use for metal refining, forging, casting, rolling mills (electricity for aluminum, natural gas and electricity for other industries)

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Primary Metal Mfg. Opportunities

- Is there any heat reclamation of exhaust heat from smelting furnaces?
- For precious metal refiners, are there other metals of lower value which can be reclaimed by another industry?
- Can acid life be extended in the refining process?
- Can equipment be stopped or idled to reduce energy use?

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#4, Fabricated Metal Products and Machinery Mfg.

Category includes sheet metal forming, machining, grinding, welding, heat treating, wire EDM (electric discharge machining), shot blasting, etc.




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Fabricated Metal Products and Machinery Mfg.


- **Solid Waste**
 - Metal chips and scrap typically have high recycling value if kept separated
- **Energy Use**
 - Heat treating and large equipment are big energy users

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Fabricated Metal Products and Machinery Mfg. Opportunities

- Is there any heat reclamation of exhaust heat from heat treating ovens?
- Is equipment running when it doesn't need to be?
- Are motors high efficiency?


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#5, Miscellaneous Manufacturing*

- **Solid Waste**
 - Sludge from plating
- **Hazardous Waste**
 - Heavy metals in some plating operations (cyanides in silver and gold plating operations)
- **Wastewater**
 - Acids, alkali, dissolved metals in rinse water
- **Water Use**
 - High volumes in cleaning and rinsing operations

*Since this is like a sub-sector of fabricated metal products there will be many similarities


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#6, Food Manufacturing

This category primarily concerns food processing and packaging (not retailers or restaurants)

- Meats
- Cheese and other dairy products
- Canned goods
- Beverages



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Food Manufacturing

- **Solid Waste**
 - Rework/scrap rates (damaged packaging)
 - Food scrap, floor waste
- **Wastewater**
 - Solids entering the wastewater
 - Dissolved solids
- **Energy Use**
 - Refrigeration, heating, product movement (conveyors)
- **Water Use**
 - can be high in some food industries

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Food Manufacturing Opportunities

- Heat exchangers for pasteurization heat recovery with the added advantage of reduced chiller loads
- Reverse Osmosis (RO) for water reclamation and solids concentration
- Zero-discharge facilities
 - Re-use or recycling water within the process wherever possible
- **Cogeneration with anaerobic digesters that produce methane**




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#7, Printing

“Printing is a process that transfers an inked image to paper or another substrate”¹

- 5 Modern Printing Methods:
 1. Letterpress (material removal from substrate of non-printing area)
 2. Flexography (material removal from substrate of non-printing area)
 3. Gravure (image area set below plate surface)
 4. Lithography (planographic, offset)
 5. Screen Printing (ink mechanically forced through image area of a screen, sometimes called silk screen printing)



¹ – Guyer, Howard H., *Industrial Processes and Waste Stream Management*. 1998. Chapter 20, Page 388.

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Printing

- **Solid Waste**
 - High volume waste ink and paper, large numbers of empty containers
- **Hazardous Waste**
 - Acid/alkaline, solvent wastes, photographic processing, heavy metals in inks
- **Air Emissions**
 - VOCs from solvent based inks/adhesives, equipment cleaners


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Printing Opportunities

- Switch to digital photography during pre-press operations (image proofing)
- UV curing inks (100% solids, no solvent)
- Water-based inks




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#8, Nonmetallic Mineral Product Manufacturing


- **Solid Waste**
 - Fired ceramic scrap
- **Energy Use**
 - Electric motors for mixing clay
 - Natural gas for kiln heating

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Nonmetallic Mineral Sector Opportunities


- Waste heat recovery opportunities?
- Uses for the fired ceramic scrap?
- Are the kiln burners and kiln insulation state-of-the-art?
- Are there scrap reduction opportunities?
- Are mixing motors efficient and in operation as-needed?


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Sector Summary


Sector	Solid Waste	Hazardous Waste	Water Use/Waste Water	Air Emissions	Energy Use (total energy)	Energy (BTU/\$ of product)
Chemical Manufacturing		YES	YES	YES	YES	YES
Computer/ Electronics	YES	YES	YES	YES		
Primary Metal Manufacturing	YES	YES		YES	YES	YES
Fabricated Metal and Machines	YES				YES	YES
Miscellaneous Manufacturing	YES	YES	YES		YES	YES
Food Manufacturing	YES		YES		YES	YES
Printing/ Support Activities	YES	YES		YES		
Nonmetallic Mineral Products	YES				YES	YES


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- ## What you can do
- Make a checklist before the site visit
 - If the company is a high quantity generator, find out what is the heavy hitter area(s). Review the permits and look for “hot spots”.
 - Think: water, air, solids. Is there one which is “excessive” compared to the others?
 - In a walk-through, look for:
 - Fume hoods
 - Use of safety equipment (masks)
 - Wastewater treatment size
 - Plating area
 - Paint booths
 - Gaylords of scrap or other waste
 - **If they have areas of need, let us know.**
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Questions?



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