Resource for Greening Food and Beverage Manufacturing
Pollution Prevention Information

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Greening Food and Beverage Manufacturing

Toronto's ChemTRAC program includes an Environmental Reporting and Disclosure Bylaw (Municipal Code Chapter 423) that requires local businesses to track and report their use and release of 25 priority substances. The ChemTRAC program provides an opportunity for you to identify strategies for improving your environmental performance. Strategies include those that reduce the use and release of the 25 priority substances. Strategies may also reduce the use and release of other chemicals that may have a health and/or an environmental impact. This Greening Resource for **Food and Beverage Manufacturing Sector** will help you understand the chemicals that you are using and find ways to reduce or eliminate their use. For additional resources, including a Guide to Reporting visit http://www.toronto.ca/chemtrac/.

Food and Beverage Manufacturing Sector

In the City of Toronto, food and beverage manufacturing includes many different activities and types of processes. Generally, food processing includes receiving, refrigerating, and preparing raw ingredient materials; processing and packaging those materials; refrigerating or storing final products; and cleaning equipment and facilities. Different subsectors engage in different processing activities such as peeling, mashing, fermenting, baking, frying, cooking, canning, and preserving. Examples of specific subsectors are listed below.

Some Food Manufacturing Subsectors:

- Meat processing
- Baking
- Fruit and vegetable canning
- Frozen food manufacturing
- Dairy product manufacturing
- Coffee and tea manufacturing

Some Beverage Manufacturing Subsectors:

- Soft drink and ice manufacturing
- Bottled water manufacturing
- Beer brewing
- Wine making
- Distilling

Priority Substances and Other Chemicals of Concern

Toronto Public Health has identified 25 substances of priority health concern that are commonly used and released by businesses in the City of Toronto. As part of ChemTRAC, the Environmental Reporting and

Disclosure Bylaw requires businesses and facilities to track and report on any of the listed priority substances that a facility manufactures, uses or releases to the environment if the amounts are equal to or above the reporting limits. In addition to the priority substances, industrial processes commonly use and release other chemicals of concern that may have a health and/or an environmental impact that are not subject to the by-law.

The food and beverage manufacturing sector may use and produce some of these priority substances and other chemicals of concern. Each of these chemicals may have an impact on human health and/or the environment. Below are the priority substances and other chemicals of concern that may be used or produced by your facility and its operation. This is not an exhaustive list.

Substances that may be used or produced by your Food and Beverage Manufacturing Sector

Cooking, fermenting, and baking processes may lead to the release of:	Cleaning products may contain:
• Volatile Organic Compounds[1] (VOCs) • Particulate Matter[2] ($PM_{2.5}$) • Nitrogen Oxides (NO_x) • Formaldehyde	• VOCs[1]

1 VOCs are emitted as gases from certain solids or liquids. When combined with nitrous oxides (NOx) in sunlight, smog forms. Ethanol and formaldehyde are common VOCs released by the food and beverage manufacturing sector.

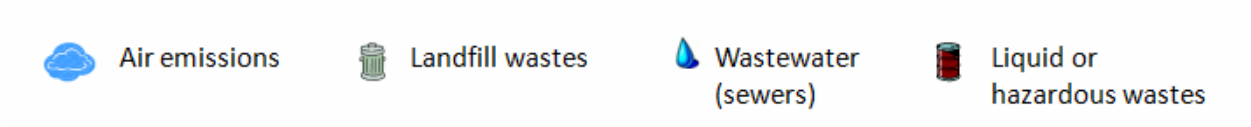
2 Particulate matter (PM) consists of airborne particles in solid or liquid form (e.g., smoke). $PM_{2.5}$ is airborne particulate matter with a mass median diameter less than 2.5 µm.

Understanding Your Company's Impacts: Food and Beverage Manufacturing Sector

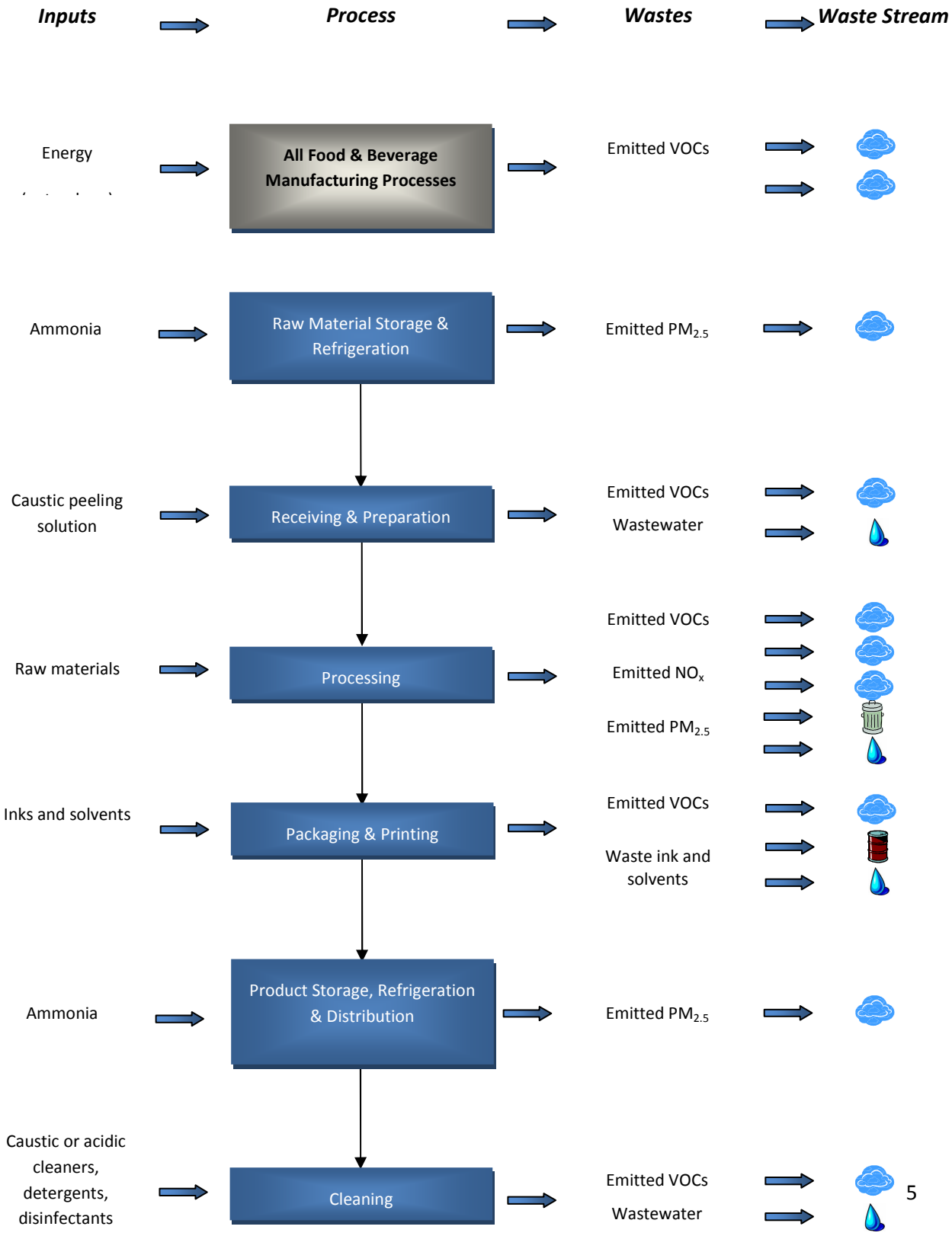
This section provides an overview of the wide-ranging activities that take place at many food and beverage manufacturing facilities. For each activity, the guide shows the raw materials that go into the process and the pollution (waste) that comes out of the process. Symbols show whether the wastes typically go to air, landfill, sewer systems and/or treatment facilities (liquid wastes).

The following diagrams show the raw materials that may go into **Food and Beverage Manufacturing** processes and the pollution that may come out of each process. This guide outlines the *general processes* **Food and Beverage Manufacturing Sector**. Your facility may have more specialized processes or only engage in a subset of these processes; however, it is possible that these priority substances and chemicals of concern may still be present. Symbols show whether the wastes typically go to air, landfill, sewer systems and/or treatment facilities (as liquid or hazardous wastes).

Symbols used in the flow diagram



Food and Beverage Manufacturing: Chemical Inputs and Associated Wastes



Specific processing steps associated with three sample subsectors include:

Fruit and Vegetable Processing	Meat Processing	Beer Brewing
• Storage; Refrigeration • Sorting; Washing • Peeling; Cutting; Pulverizing • Cooking; Frying; Freezing; Flavouring; Concentrating; Preserving; Freeze-drying	• Holding livestock • Stunning; Slaughtering • Hide removal; Dehairing; Defeathering • Evisceration • Trimming; Carcass washing • Deboning • Curing; Smoking; Freezing	• Grain storage • Mashing • Lautering (i.e., separating) • Boiling • Fermenting; Conditioning • Filtering • Filling; Packaging

Food and beverage manufacturers may or may not print their own product labels; consequently, they may or may not use inks and solvents and produce wastes associated with printing. Pollution prevention initiatives associated with printing processes are not discussed in this document. For a detailed discussion of printing and publishing processes and associated pollution prevention measures, please refer to Toronto Public Health's Resource for Greening Printing and Publishing at www.toronto.ca/chemtrac.

Pollution Prevention Steps You Can Take

This resource identifies steps you can take to reduce or eliminate your use of the priority substances and other chemicals that may have a health and/or an environmental impact, and to prevent pollution in the **Food and Beverage Manufacturing Sector.**

The pollution prevention measures identified in this information sheet can reduce costs and/or increase profits.

Pollution Prevention Assessments – A Good First Step

Before you go too far with any given measure, you may want to do a Pollution Prevention Assessment of your business. You may need an outside expert to help. A typical Pollution Prevention Assessment will include mapping process flows, reviewing equipment uses, evaluating the way you use and store chemicals, evaluating the way you use energy, as well as reviewing waste handling practices and discharges. This assessment helps you to identify many pollution prevention opportunities (and any regulatory compliance issues) and decide which steps to take first.

Pollution Prevention - A Key to Good Management

Good management of your chemical purchases, chemical use and waste disposal is very important. You can improve your environmental performance through Pollution Prevention by:

- identifying how you are using the priority substances and other chemicals of concern that may have a health and/or an environmental impact
- figuring out how much you are using of each chemical and estimating the related emissions (see the earlier description for more information on how to estimate chemical use and emissions)
- discussing the options to reduce or to eliminate these chemicals and, where feasible, taking action. Actions could include:
    - using a different product
    - changing how you apply or clean up the chemical product/waste
    - training staff on how best to apply and clean up the chemical product/waste, or
    - installing new technology
    - maintaining equipment to ensure that leaks and general efficiencies are managed
- tracking the amount of chemicals you use and see if it goes down over time, and
- reviewing progress and identifying whether or not you need to make changes to the company's practices and procedures.

Changes you could make in your medical laboratory

The following table lists many options to help you reduce or stop using the priority substances and other chemicals of concern in your facility. Some measures will cost more than others, and some will be easier

to implement than others. Employees can implement certain measures by making minor changes in their day-to-day approaches; while others will require management to invest in new technologies.

The table provides a quick and simple way to take stock of what measures your business has already put into place and those measures that your business could apply. In completing the table, you are encouraged to prioritize the actions you would take. While it is not exhaustive, the table identifies many pollution prevention opportunities for **the Food and Beverage Manufacturing Sector**. When assessing the options, please consider your facility-specific conditions and how each option might affect pollution releases to the air, land and water.

The table identifies three general types of options and distinguishes each with a symbol:

Low-cost, good operating procedures – These measures involve operational and managerial changes that can reduce chemical use. They include simple changes to normal practices, process improvements, as well as training and good housekeeping opportunities. This measure does not need new technology purchases.

Choosing an alternative chemical – These measures involve replacing traditional products (such as solvents and cleaning products) with products that have less harmful properties. The ease and cost of these measures depends on the product and the process used.

New technology or system – These measures involve the installation of a new system, machine or process. The cost varies depending on the technology / system.

See ***More Resources*** for a list of additional resources related to pollution prevention in the **Food and Beverage Manufacturing Sector.**

Process	Pollution Prevention Opportunities	Type of activity	In place?			What level of priority do we put on implementing this measure? (High, Medium or Low)
			Yes	No	N/A	
Cleaning	Use dry (waterless) cleaning methods such as sweeping prior to water clean-up to reduce water and cleaning product usage.		☐	☐	☐	H M L
	Clean equipment immediately after use to prevent food from hardening on equipment and to reduce the amount of water and cleaning product needed.		☐	☐	☐	H M L
	Pre-soak soiled surfaces prior to cleaning to loosen dirt or food residues and to minimize water and cleaning product usage.		☐	☐	☐	H M L
	Neutralize caustic wastewaters with a mild acid (such as vinegar) and acidic wastewaters with a weak base (such as baking soda) before discharging.		☐	☐	☐	H M L
	Place catch pans or other containment devices near hydraulic lifts, liquid drum storage or dry product storage to contain overflows and leaks and to reduce water and cleaning product usage.		☐	☐	☐	H M L
	Use low-pressure foam cleaning (foam soak, followed by low pressure rinse) to minimize detergent, water and energy use.		☐	☐	☐	H M L
	Substitute less harmful cleaning products such as water-based biodegradable cleaners.		☐	☐	☐	H M L
	Replace parts-bath solvents with non-hazardous substitutes to clean equipment.		☐	☐	☐	H M L

	Low-cost, good operating procedures		Choosing an alternative chemical		New technology or system

	Use clean-in-place systems and program systems to use only the amount of water and detergent required for particular cleaning tasks.		☐	☐	☐	H	M	L
	Use high pressure, low volume spray washes to reduce water usage and wastewater.		☐	☐	☐	H	M	L
	Use compressed air to clean equipment rather than water and cleaning products.		☐	☐	☐	H	M	L
	Clean equipment with steam to reduce water and cleaning product usage.		☐	☐	☐	H	M	L
	Collect, filter and reuse appropriate wastewaters for other cleaning processes, such as cleaning trucks and storage areas.		☐	☐	☐	H	M	L
	Use a computer controlled cleaning system to prevent cleaning product discharges that accompany equipment breakdowns.		☐	☐	☐	H	M	L
Food Processing	Use dry caustic peeling to peel fruits and vegetables and minimize caustic solution use and wastewater production.		☐	☐	☐	H	M	L
	Maintain deep-frying oil at the standard operating temperature (180℃) to increase the life of the oil being used and to reduce air emissions.		☐	☐	☐	H	M	L
	Use olive oil, rather than canola oil to deep-fry foods at the standard operating temperature (180℃) to reduce air emissions.		☐	☐	☐	H	M	L
Beverage Processing	Use spent grains to adsorb VOC emissions and organic material from effluent.		☐	☐	☐	H	M	L
	Collect fermentation gases at breweries and wineries to produce saleable carbon dioxide and reduce ethanol emissions.		☐	☐	☐	H	M	L

	Low-cost, good operating procedures		Choosing an alternative chemical		New technology or system

Food/Beverage Processing	Recover vapour condensate and use heat or water for various operational processes such as cleaning to reduce energy use, VOC emissions and water use.		☐	☐	☐	H	M	L
General **Operating**	Undergo an energy audit to identify opportunities for energy savings, emissions reductions and associated cost savings.		☐	☐	☐	H	M	L
	Use fluorescent lights or lower wattage lamps to light facilities and reduce energy use and air emissions.		☐	☐	☐	H	M	L
	Maintain equipment such as cooling systems to improve efficiency and avoid producing unnecessary air emissions.		☐	☐	☐	H	M	L
	Replace old equipment such as motors and heating units with more efficient equipment to reduce energy use and air emissions.		☐	☐	☐	H	M	L
	Install timers and thermostats to control heating and cooling to reduce energy use and air emissions.		☐	☐	☐	H	M	L
	Install computerized controllers to better regulate motor outputs to reduce energy use and air emissions.		☐	☐	☐	H	M	L
Purchasing and Inventory	Review suppliers' products regularly to find the most environmentally-responsible products.		☐	☐	☐	H	M	L
	Keep an accurate inventory of products used.		☐	☐	☐	H	M	L
Training	Train workers to follow best-practices operating procedures related to cleaning, good housekeeping, and energy and water usage.		☐	☐	☐	H	M	L
Other	Ask employees for P2 suggestions.		☐	☐	☐	H	M	L

Contact us to provide your feedback on this resource or to suggest any additional pollution prevention resources (email chemtrac@toronto.ca or call 416-338-7600).

	Low-cost, good operating procedures		Choosing an alternative chemical		New technology or system

More Resources

Australia Government. 2007. Emission Estimation Technique Manuals by Industry.
http://www.npi.gov.au/handbooks/approved_handbooks/sector-manuals.html

- *A description of industry-specific manufacturing processes and their associated emissions. The manuals outline the procedures and recommended approaches for estimating emissions from various food and beverage manufacturing facilities.*

Capital Regional District. Codes of Practice by Industry.
http://www.crd.bc.ca/wastewater/sourcecontrol/codespractice.htm

- *A description of food and beverage manufacturing processes and best management practices for dealing with wastes.*

Fraser River Action Plan. Technical Pollution Prevention Guides by Industry.
http://www.rem.sfu.ca/FRAP/PDF_list

- *A guide that provides a brief overview of pollution prevention, describes industry-specific manufacturing processes and best management practices, and outlines step-by-step procedures for developing a facility-specific pollution prevention program.*

University of California. 2007. Energy Efficiency Improvement and Cost Saving Opportunities for the Fruit and Vegetable Processing Industry. http://www.energystar.gov/ia/business/industry/Food-Guide.pdf

- *This energy guide discusses the trends, structure, and energy consumption characteristics of the U.S. fruit and vegetable processing industry, describes the major process technologies used within the industry, and identifies a variety of energy efficiency measures applicable to fruit and vegetable processing plants.*

University of Queensland Australia. Eco-Efficiency Toolkits and Fact Sheets.
http://www.gpa.uq.edu.au/CleanProd/toolkits/toolkits.htm

- *Toolkits outline environmental challenges in the food processing industry and describe eco-efficiency strategies that can help food processors use resources efficiently and reduce waste production. Self-assessment guides are included to assist food processors in identifying and implementing eco-efficiency opportunities.*

U.S. EPA. 1999. Multimedia Environmental Compliance Guide for Food Processors.
http://www.epa.gov/compliance/resources/publications/assistance/sectors/multifood.pdf

- *An overview of food production processes and pollution prevention measures, including instructions for completing waste analyses at food and beverage manufacturing facilities. The EPA's major environmental statutes are reviewed and instructions for complying with environmental regulations are discussed.*

Waste Reduction Resource Center. The Meat Processing Topic Hub.
http://wrrc.p2pays.org/p2rx/index.cfm?page=toc&hub_id=449&subsec_id=7

- *A topic hub that describes various meat processing activities, provides flow diagrams to illustrate these various activities, identifies pollution prevention opportunities, and presents case studies that illustrate waste reduction opportunities in meat processing.*

Additional relevant resources include:

General P2 Resources

Environment Canada. Pollution Prevention Planning Handbook.
http://www.ec.gc.ca/NOPP/DOCS/P2P/hbook/En/index.cfm

- *Detailed information about general pollution prevention planning processes and techniques.*

Do-it-Yourself P2 Tools

Canadian Centre for Pollution Prevention. Environmental Accounting Online Training Tool.
http://learning.c2p2online.com/

- *A training tool designed to familiarize participants with the steps and tools available for identifying and estimating the costs and benefits associated with pollution prevention options identified during the pollution prevention planning process.*

P2 Database and Resource Centres

Canadian Pollution Prevention Information Clearinghouse (CPPIC)
http://www.ec.gc.ca/cppic/en/index.cfm

- *An online database providing access to pollution prevention resources for specific sectors.*