

Environmental Best Management Practices for Small Businesses

Introduction

An environmental best management practice (BMP) is an action or combination of actions implemented to reduce the environmental impacts of business operations. There are two types of pollution prevention: source reduction and recycling. Source reduction reduces or eliminates the generation of waste. Recycling takes used materials, modifies their form, and makes them available for future reuse. The BMPs provided in the fact sheets listed below are a combination of source reduction and recycling strategies, which provide economic as well as environmental and safety benefits.

Each BMP fact sheet focuses on a particular sector, and draws information from several sources, which are listed in the endnotes section of each fact sheet. The BMPs listed in each fact sheet may be used as a guide for your business. Depending on your business' individual needs and technical and financial capacities, the BMPs may require modification. When adapting a BMP to your business, it may be necessary to contact your local regulatory agency to determine permit requirements. It is important to note that the BMPs listed in these fact sheets are intended as a starting point for your business' environmental management plan, and are not all-inclusive. Further information is available through links at the end of each fact sheet. For additional information about regional specific BMPs, or BMPs not covered in these fact sheets, contact your local authorities and regulating agencies. It is not expected that each BMP will work in all situations; each small business must factor in their own needs, resources, and capacities to find the ones that work best for them.

The fact sheets are intended to work in conjunction with the Environmental Protection Agency's *Practical Guide to Environmental Management for Small Business* and its companion book, *Documenting Your Environmental Management Plan*. For copies of these guides, please refer to the links provided on this website.

Each fact sheet is divided into five sections:

- 1) **Sector Introduction:** Provides basic background information on environmental impacts associated with the sector.
- 2) **Best Management Practices:** Divided into two or more subsections. Each subsection consists of a paragraph describing a particular environmental impact, followed by a list of BMPs which address the problem.
- 3) **Investments in Technology:** Supplies additional information on technologies mentioned in the BMPs or provides information on new technologies to consider when making your choice of BMPs to use. Information about returns on investment is provided where possible, but the true payback period will vary greatly, dependent upon your situation. To determine if a particular technology is right for your operations contact a local vendor for more information.
- 4) **Case Study:** Demonstrates the effectiveness of a BMP used in a business.
- 5) **Other Sources:** Provides links to BMP information listed in the fact sheet. Also provides additional resources available to small businesses.



Best Management Practice

Bakery

Sector Introduction

The baking industry faces environmental challenges related to water use, wastewater, air, and solid waste issues. Companies in this industry, depending on location, may soon be subject to increased regulatory requirements related to wastewater discharge. Publicly Owned Treatment Works (POTWs) are working to solve issues resulting from oil and grease discharges. These issues will result in stricter requirements “upstream.” They also face limits on the amount of Biochemical Oxygen Demand (BOD) allowed in their treatment plant effluent. Bakeries must also be concerned about air emissions of Volatile Organic Compounds (VOC), which contribute to smog and other environmental issues.

This fact sheet will help you prepare for potential regulatory changes and identify opportunities for environmental excellence. These efforts may increase competitiveness by increasing efficiency and promoting positive public relations. The BMPs listed in this fact sheet are a starting point for your business. Additional suggestions for a wider range of activities can be found using the links in the “Other Sources” section.

Best Management Practices

Water Use

Water use and discharge, from baking and cleaning, is a major concern for bakeries. Bakeries traditionally use 1 to 1.5 gallons of water to produce 1 pound of muffins, cakes, or danishes, or 0.2 gallon of water per loaf of bread. On average this amounts to between 10,000 and 30,000 gallons of water each day for a small bakery. Only a portion of this water is incorporated into the actual product; approximately 70% of this water is discharged as wastewater. You pay for the water you use and discharge, therefore working to reduce your usage may be beneficial both economically and environmentally.

- Sweep or dust off floors and machines instead of hosing them down with water.³
- Equip water sprayers with automatic shut-off nozzles, so that employees do not accidentally leave the water running.⁵
- Shut off water completely when not in use. For example, make sure pan washer is off during breaks and down time.⁵
- Install pressure regulators on supply lines for hoses and pan washers.⁵
- Use high pressure, low volume cleaning equipment.⁵
- Encourage employees to use less water by posting signs near high use areas, prohibiting use of water hoses as brooms, monitoring water use for each shift, and setting goals in your company for water conservation.⁵

Air Pollution

Equipment in your business may contribute to poor air quality. Some commercial refrigerators contain chlorofluorocarbons (CFCs) or ammonia as a refrigerant. Refrigerant leaks may have a negative effect on air quality. In addition to these refrigerants, yeast-leavened bakery products emit several air pollutants during the baking process. Ethanol, a VOC, is a by-product formed from yeast fermenting and is an air pollutant of significant concern due to its contribution to smog.

- Replace yeast with baking powder, when possible, because baking powder does not produce VOCs.¹³
- Clean your work areas. Clean work areas almost always equate to reduced emissions.¹⁴
- Keep ovens and boilers in good operating condition to help prevent pollution.¹⁴
- Maintain refrigeration units to ensure there are no leaks. If leaks are found, repair them, follow up the repairs with leak checks, maintain complete service records and retrofit or replace the leaky systems.¹¹
- Consider hiring technicians to tour your facility and look for ways to prevent pollution, minimize waste and improve energy efficiency. There may be free and confidential services available to your business.¹²

Wastewater

Wastewater expenses arise from the surcharges imposed when wastewater exceeds certain pollution levels. It is more difficult to treat wastewater that contains more



pollutants, and the cost is passed on to the business discharging the pollutants. The primary concern of bakeries is BOD. BOD is a measure of the amount of oxygen needed to break down organics in the wastewater. Ingredients used in a bakery are a source of organics and thus increase BOD. Flour, sugar, yeast, and shortening are the major problem. Your business is paying for wastewater treatment and for wasted ingredients. Other wastewater issues include chemical oxygen demand (COD), total suspended solids, and oil and grease.

- Install spill collection trays to collect solids at appropriate places in the production line.⁶
- Store dry materials off of the floor and away from liquids by placing catch pans under them. Build curbs around storage areas to keep spills in and water out.⁹
- Establish waste reduction goals for your plant. Train employees in the concept of waste reduction and how to perform their jobs to maximize pollution prevention in your plant.³
- Drain tanks, kettles, troughs, and mixers thoroughly

before cleaning.³

- Cover floor drains in places where product and ingredient residue is likely to fall on the floor and wash down the drain during cleaning. Areas around conveyor belts may be a good place to focus.²
- Install drain screens, settling basins, berms, or systems to separate waste products out of wastewater before it is discharged.⁶
- Seek other uses for waste oil and shortening, such as filtering shortening to extend its usefulness. Do not discharge vegetable shortening and oil waste from the deep fryer into the drain.²
- Create a routine maintenance schedule for machines, to prevent leaks of product.³
- Investigate the potential for bulk containers to store and mix large use ingredients such as icing, to reduce the number of smaller containers washed each day. Also consider dedicating containers for specific ingredients to eliminate washing the container unless switching products.²

Investments in Technology

- Businesses that have moved to temperature controlled holding tanks for storage of ingredients have seen a payback time of about one year on their purchase. They have also seen reduced water use, reduced product waste, time savings from reduced time spent cleaning, and a more consistent product quality.²
- Consider installing an emission control system to treat VOCs and other hazardous air pollutants. Some environmental companies will provide conversions at no cost to the end user and are only paid when predicted operating savings become a reality.¹⁵
- High pressure washers cost about \$200 and use half the amount of water of traditional hoses. The high pressure washers have the added benefit of cleaning equipment more quickly and thoroughly. A business using water on the low end of the average range can expect to see a savings of over \$1,000 per year with this change.⁵
- Consider the use of a dissolved air flotation system (DAF) to pre-treat wastewater before it is discharged. A DAF is a gravity separation system that uses air bubbles in a wastewater holding tank to help float

insoluble materials to the surface so they can be removed. A dissolved air flotation system can remove fat, grease, and oil from wastewater before it is sent to the POTW. With further assistance from chemical flocculants, some dissolved materials that are heavier than water can also be removed.⁴

- If your bakery has a conveyor belt for donuts or similar products, several steps can be taken to reduce the amount of icing or product residue that falls from the equipment and must be disposed. These steps include installing a rotating brush under the conveyor system to sweep or airbrush sugar glaze or residue off the conveyor belt and into hanging catch pans. Also, sheets of vinyl or other impermeable material can be hung under conveyors to catch fallen icing or product. The conveyor belts can cycle through a wash bin to remove excess product residue. Install automatic brushes alongside the conveyor to wipe additional sugar residue off the belt and into the wash bin.²
- If carbon buildup on baking containers and conveyor belts in ovens is a problem, consider the use of a spray-on anti-carbon agent. This agent can be applied using an automatic spray system. Systems used by



other bakeries have been small enough to be stationed on a moveable cart and take up minimal floor space. Use of an anti-carbon agent reduced cleaning of containers and belts from every two weeks to every six weeks at one bakery utilizing the system. A side benefit of the system is reduced sticking of dough, improved product quality, and reduced waste.¹⁰

- Look for ways to utilize the heated exhaust from ovens. A heat exchanger system is one option to recycle wasted oven heat. This system uses the exhaust gases to heat pipes containing a fluid, such as water. The liquid boils initially, and then condenses in cooler parts of the pipe, thus transferring energy as latent heat. This heat can then be used for another application. Companies have found success

with using the exhaust gases from their main baking ovens to generate the heat needed for their lower temperature proofing ovens.⁷

- An oil water separator can also be utilized to greatly reduce the amount of oil and grease ultimately discharged in the wastewater. This system operates by slowing down the flow of water as it passes through the system, allowing solids to fall to the bottom of the holding tank and oil water separation to begin. The oily water then flows through oil coalescing plates. These plates allow the oil to gather together into large droplets where they can float to the surface and be mechanically skimmed from the water. Depending on the system, the water can then be directed for reuse or sewer discharge.⁸

CASE STUDY Supermom's Bakery

Supermom's bakery, a medium sized bakery, made several upgrades to its facilities. One such improvement was to its icing storage procedures. Moving to bulk preparation and storage for icing eliminated the need to wash 65 to 100 icing mixing buckets a day. Icing is now stored in three large stainless steel mixing vats: one each for chocolate, caramel, and vanilla flavors. The vats had a total purchase cost of \$45,000. The two larger vats hold 1,200 pounds of icing, while the smaller one holds 750 pounds.

In each previously washed bucket, four to five ounces of icing would be washed down the drain. Eliminating this waste saves Supermom's \$2,000 a year. Eliminating the three hours a night spent washing buckets saves Supermom's around \$40,000 yearly, and reduces their overall water consumption. Now, icing is only mixed once in the morning, as opposed to multiple daily mixings on an as-needed basis. The temperature-controlled vats yield consistently higher quality icing than did individual bucket mixing. The vats had a payback time of about one year.

Source: Minnesota Technical Assistance Program, University of Minnesota,
<http://mntap.umn.edu/food/74-Supermom.htm>

Other Sources of Information

- ¹ Georgia's Small Business Assistance Program, *Bakery's Permit Guide*, http://www.smallbiz-enviroweb.org/html/pdf/bakry_ga.pdf
- ² Minnesota Technical Assistance Program, *Reducing Waste Saves Supermom's \$235,000 Yearly*, <http://www.p2pays.org/ref/05/04255.htm>
- ³ North Carolina Cooperative Extension Service, Water Quality and Waste Management, *Cut Waste To Reduce Your Wastewater Surcharges for your Bakery*, <http://www.p2pays.org/ref/01/00459.htm>
- ⁴ North Carolina Cooperative Extension Service, Water Quality and Waste Management, *Dissolved Air Flotation Systems (DAFs) for Bakeries*, <http://www.p2pays.org/ref/01/00881/>
- ⁵ North Carolina Cooperative Extension Service, Water Quality and Waste Management, *Liquid Assets for Your Bakery*, <http://www.p2pays.org/ref/01/00029.htm>



- ⁶ R.J. Philips & Associates, Inc., *Wastewater Reduction and Recycling in Food Processing Operations*, <http://foodsci.unl.edu/fmc/7wastewa.htm>
- ⁷ North Carolina Department of Environment and Natural Resources, Division of Environmental Assistance and Pollution Prevention: *Cleaner Production in Bread Making – Buttercup Bakeries, Australia*, <http://www.p2pays.org/ref/04/03323.htm>
- ⁸ Silas W. Givens and James K. Cable, CH2M Hill Southeast, Inc., Case Study - *A Tale of Two Industries Pretreatment of Confectionary and Bakery Wastewaters*, <http://www.p2pays.org/search/pdf/frame.asp?pdfurl=/ref/14/13658.pdf>
- ⁹ Cleaner Production, *The Food Processing Industry*, <http://www.cleanerproduction.com/sectors/subsectors/FoodProc.html>
- ¹⁰ Spraying Systems Company, *Bakery Decreases Cleaning and Service Frequency*, http://www.spray.com/applications/application_reference/fp_bakery.asp
- ¹¹ U.S. EPA, *EPA Announces Largest Settlement Under the Ozone Protection Program of the Clean Air Act*, <http://www.epa.gov/region4/oeapages/00press/000911a.htm>
- ¹² Minnesota Office of Environmental Assistance, *Minnesota Retired Engineer Technical Assistance Program (Minnesota ReTAP)*, <http://www.moea.state.mn.us/p2/retap.cfm>
- ¹³ U.S. EPA, *Area Source Category Method Abstract*, <http://www.epa.gov/ttn/chief/eiip/techreport/volume03/bakeries.pdf>
- ¹⁴ Louisiana Department of Environmental Quality, *Breweries, Wineries, Distilleries, & Bakeries*, <http://www.deq.state.la.us/assistance/sbap/regs/brew-win-dist-bak.htm>
- ¹⁵ Durr Environmental, *Global Environmental Solutions*, <http://www.durrenvironmental.com/about.asp>