Fact Sheet: Eco-Efficiency in Dental Practices

Introduction
Dental care professionals diagnose, treat and prevent diseases of the teeth and gums. A general dental practice can provide a variety of services - examinations, x-rays (radiographs), cleaning, extractions, restorations (fillings), tooth whitening (bleaching), crowns, bridges, dentures, and gum treatments. Nova Scotia has approximately 200-225 dental practices (along with other specialized denture clinics and dental laboratories).

The most common sources of hazardous waste at dental clinics are silver/mercury amalgam, x-ray fixer and film, which contain silver, and lead foil from packaging. However, dental practices can produce a variety of other hazardous and non-hazardous wastes including cleaners, chemical sterilizing solutions, disinfectants, and typical office generated wastes like paper, packaging, electronics, and printer cartridges.

While a small dental office/clinic may not individually discharge a substantial amount of wastes, the main problem is the combined impact of wastes and chemical discharges from many small practices. This fact sheet has been developed to assist dental care professionals in Nova Scotia become more eco-efficient in their day-to-day operations. Suggestions for changes in workplace practices, behaviours, and technologies are provided that can be implemented to improve an organization's environmental and economic performance.

Did you know?
Dental amalgam (silver fillings) has been in widespread use for over 150 years, and is one of the oldest materials used in oral health care. It is made of approximately 40-50% mercury, 25% silver, and 25-35% a mixture of copper, zinc and tin. It is durable and low-cost.

General Tips for Using Chemicals
For any organization using chemicals, there are basic practices to follow with regards to handling, storing and disposal of chemical products.

- Understand all environmental legislation (federal, provincial, and municipal) relevant to your organization.
- Check Materials Safety Data Sheets (MSDS) to learn more about the products being used, and what precautions may be necessary (gloves, aprons, glasses and masks).
- Provide chemical management/spill prevention training for staff. Any employees using chemicals must be trained to use the products appropriately. This is the law in Nova Scotia.
- Inspect any chemicals in storage on a frequent basis for leaks. Don't allow containers to rust, leak, or deteriorate.

Eco-Efficiency
What is Eco-Efficiency?
Eco-efficiency is a practical and systematic approach that businesses can adopt in setting and achieving environmental and business performance objectives. It is very closely associated with and complementary to other concepts such as Occupational, Health and Safety (OHS), Total Quality Management (TQM), and Pollution Prevention (also known as source reduction). It involves changing processes, finding alternatives, and reducing or eliminating the generation of toxic wastes instead of dealing with problems of cleanup or disposal after the fact. It also includes extending product liability, enhancing material recyclability and maximizing the use of renewable resources. Eco-efficiency means doing more with less, creating and providing quality products and services while reducing resource use, waste and pollution along the entire value chain. It is not only about managing waste after it is created, but strives towards preventing and minimizing waste in the first place.

Mercury in Dentistry
One of the most hazardous waste products from dental offices is mercury. Mercury is a persistent, bio-accumulative chemical, and is listed as a toxic substance under CEPA (Canadian Environmental Protection Act). It can enter the environment from a dental office by vaporization into office air during mixing of mercury amalgam, and by rinsing amalgam mixing material and
old fillings down the drain or disposing of the material in the regular trash.

A Canada-wide survey of dentists estimated that in 2003, 5352 kgs of mercury was used in the preparation of amalgam restorations. Dentists removed amalgam restorations containing approximately 2472 kg of mercury. From these two sources, over 1000 kgs mercury entered the wastewater stream. If all dentists had ISO-approved separators installed, this would have been reduced to approximately 16 kg! Approximately 25% of NS dentists reported having amalgam separators in 2003.

The Canada Wide Standard on Mercury for Dental Amalgam Waste calls for dentists to voluntarily adopt Best Management Practices (BMPs) by the end of 2005. Dentists were also asked to consider using substitutes for mercury: non-mercury restorative fillings and crowns, including composite, glass ionomer, gold foil, cast gold alloy and metal-ceramic crowns. Talk to patients about the benefits and risks associated with alternative restorative materials.

Handling a Mercury Spill

Be prepared. Materials Safety Data Sheets (MSDS) will tell you how to properly handle a mercury spill. Have a mercury spill kit on hand, and ensure staff is trained in clean-up procedures. Consider these additional practices:

- Ventilate the area.
- Wear nitrile gloves (not latex).
- Clean up immediately.
- Do not use a vacuum cleaner.
- Remove all jewellery from your hands as mercury will bond with the metal.
- Use a flashlight to locate the mercury. The light will reflect off the mercury beads and make them easier to find.
- Use an eyedropper to suction the beads of mercury.

Dental Cements

Some dental cement’s contain the compound “zinc phosphate”. Zinc is a toxic water pollutant, and dentists should consider substitutes for zinc cements. As well, tools that have been used in cement should be cleaned over a trash can instead of over a sink.

X-Ray Material Waste

Dental x-rays are an essential tool in a dental clinic. However, there are a number of chemical products used, and chemical wastes produced in taking patient x-rays. Used fixer contains silver - approximately 4000 mg per litre. X-ray film contains silver and comes packaged in lead foil. As well, there is an issue of appropriate disposal of lead aprons and collars that patients wear to minimize exposure to radiation.

- Use a digital X-ray unit to minimize the need for fixer solutions, and minimize purchase of film.
- Don’t pour fixer down the drain. Use an on-site silver recovery unit to recapture the silver - for small volume users, using metallic replacement is recommended. These canisters are filled with another metal, usually steel wool that reacts with the silver in the fixer. They are simple to use and maintain. Recovered silver can be sold to a metal reclaimer/recycler. Silver-containing solutions could also be collected and shipped to an off-site recovery facility.
- It may be possible to dispose of completely spent X-ray developer through the sewer system. However, you should contact local municipal authorities to confirm this. Unused developer, or developer mixed with fixer should still be treated as hazardous waste, and never poured down the
Digital X-rays

Dentists may want to consider changing their oral imaging process to digital radiography. These devices use enhanced computer technology to provide real-time images with crisper detail than conventional x-ray film. This increased sensitivity leads to a reduction of up to 90% of radiation exposure, no chemical or film usage and records that can be stored or transmitted by computer, reducing bulky paper records. The main downfall with digital x-rays is the cost. This cost should decrease as units become more common.  


### Sterilizing Agents, Cleaners & Disinfectants

Dental offices use other chemicals for sterilizing instruments, and cleaning and disinfecting surfaces and equipment. Try and incorporate these practices into day-to-day operations:

- Avoid the use of chemical sterilizing agents whenever possible.
- Use steam or dry heat to sterilize your dental instruments.
- Use the minimum amount of sterilant necessary.
- Neutralize sterilant, if appropriate, with glycine.
- Use a sterilant containing less-hazardous active ingredients, such as quaternary ammonium compounds.
- Minimize the use of disinfectants whenever possible by disinfecting only when and where required. Refer to the NSDA Infection Control Manual for guidance on usage.
- Use non-bleach line cleaners.
- Flammable materials, such as alcohol, ether, acetone, and other solvents should never be poured down the drain. These substances can cause explosions in the sewer system, injure workers, and damage pipes. These substances should be disposed of properly.
- Establish written procedures for cleaning and disinfecting to reduce errors.

### General Purpose Cleaning Products

General cleaning products create hazardous waste threatening human health and the natural environment. There are many “green products” available that are as effective as traditional ones. Look for Eco-Logo or Green Seal certified products.

The following are points you should take into account when purchasing a cleaner for your business:

- Is it non-toxic to both humans and aquatic life?
- Is it biodegradable?
- Does it have a low corrosivity factor?
- Does it have acceptable Volatile Organic Carbon (VOC) levels?
- Is it sold in concentrated form?
- Can it work for multiple cleaning purposes?
- Is it effective when diluted with water at room temperature?

*From Green Seal’s “Chose Green Report” on General Purpose Cleaners - [www.greenseal.org](http://www.greenseal.org)*

Other tips for purchasing cleaners:

- Try citric or terpene cleaners for cleaning, degreasing, or parts washing. Terpenes are oils isolated from plants through gentle heating or steam distillation. They are less toxic and more biodegradable than most solvents. Limonene cleaners are terpenes made of lemon or orange oils.
- Choose products with a neutral pH.
- Avoid petroleum-derived ingredients. Instead choose surfactants derived from vegetable oil. Look for d-limonene and pine oil solvents.
- Avoid phosphates. Choose products with a phosphate concentration of 0.5% or less by weight.
- Avoid products containing chlorine bleach or sodium hypochlorite.
- Use entryway systems such as mats and grates to reduce the need for cleaning supply usage.

### Water Usage

Water use in a dental office may be reduced in numerous ways. The following are some easy water conservation practices:

- Use water only as necessary. Check for and repair any leaks in the piping. Remind employees to turn off faucets and report leaks.
• Install flow restrictors, aerators, toilet dams, urinal flushing controls, or other low-flow devices. Install automatic shutoffs on faucets and fountains.
• Use appropriate settings on equipment and appliances to maximize water efficiency.
• Use cold water instead of hot water wherever possible.

Solid Waste
Reducing solid waste sent to the landfill may be one of the easiest ways to make a dental office more environmentally friendly. Here are some straightforward ways to accomplish this:
• Ask your suppliers to provide their products in refillable or recyclable containers, or alternative packaging that uses less packing material.
• Don’t forget to inspect material upon delivery and return any that are unacceptable to suppliers.
• Buy only what you need, and organize shelves so that old materials are used first.
• Recovering office paper for recycling
• Always printing double-sided sheets

Additionally, recycling bins and compost collection containers should be installed in every business. This can facilitate recycling of paper and many plastics, as well as separation of organic materials like coffee grinds and food materials. Make it easy for staff to participate in these programs (signage on bins, convenient placement of bins). Talk to your waste hauler or landlord to ensure that separated materials are reaching the appropriate destination, and not being recombined after hauling.

Landfill Bans
Nova Scotia has some of the strictest landfill bans in the country, and this allowed us to reach 50% diversion in 2000. Bans are in place for many items including: corrugated cardboard, newsprint, beverage, steel/tin and glass food containers, automotive batteries and antifreeze, used tires, waste paint, compostable organic material and several types of plastics, including shrink wrap. Speak to local waste haulers, recyclers and organizations like the Eco-Efficiency Centre about options available to your business.

References and Resources
We have used and referred to publications, fact sheets and web sites from a number of sources to compile this fact sheet. We would like to acknowledge these organizations and agencies, and refer you to them for additional information:

• Best Management Practices for Hazardous Dental Waste Disposal (NS Dental Association)
  http://www.nsidental.org/
• Canada Wide Standard on Mercury for Dental Amalgam Waste
  http://www.ccme.ca/ assets/pdf/cws_merc_amalgam_e.pdf
  CCME: Canada Wide Standards on Mercury: A Report on Progress
  http://www.ccme.ca/assets/pdf/joint_hg_progress_rpt_e.pdf
• Dentistry and the Environment
  "http://mntap.umn.edu/health/73-DisinfectionBMP.htm"
http://www.mwra.state.ma.us/03sewer/html/dental.pdf
• Environment Canada - Mercury and the Environment: Dental Amalgam Waste
• Environmentally Responsible Dentistry Program
• Green Seal - Choose Green Reports on General Purpose Cleaners and Industrial and Institutional Cleaners www.greenseal.org/
• Hazardous Dental Waste
Mercury Management in the Health Care Environment
  http://www.maine.gov/dep/m ercury/mercurymedical.htm#spill
• NEWMOA – Mercury Dental Hub
  http://www.newmoa.org/prevention/mercury/
• SF Environment: Environmentally Responsible Dentistry Program
  http://www.sfenvironment.org/index.html
• The Environmentally Responsible Dental Office
  http://delta-institute.org/

Telephone and Website Guide
Eco-Efficiency Centre
Tel - 902-461-6704
Website - www.dal.ca/eco-burnside
Atlantic Canada Opportunities Agency (ACOA)
Tel - 902-426-6743
Website - www.acoa-apec.ca/e/index.shtml
Atlantic Region, Environment Canada, P2
Tel - 902-426-7231
Website - www.atl.ec.gc.ca/epb/pollprev/
NS Dept of Environment and Labour
Tel - 902-424-5300
Website - www.gov.ns.ca/enla
NS Materials Exchange
Website - www.nsmaterials.com
RRFB Nova Scotia
Tel - 1-877-313-7732 (toll-free)
Website - www.rrfb.com
Directory of Solid Waste, Reuse, Recycling and Composting
Contacts in Nova Scotia
http://www.gov.ns.ca/enla/emc/wasteman/contents.htm
For more information, contact:
Eco-Efficiency Centre 902-461-6704 (tel)
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