

Introduction

If there is one thing we all have in common, it is waste. Every industry, business and household produces it. How we deal with waste varies from person to person, city to city and country to country, but it is an issue that cannot be ignored.

For many years, with cheap energy and disposal sites easy to locate, it was easier and cheaper to dispose of wastes than to do anything else with them. Many landfills, where most of our wastes end up, are quickly reaching their capacity. The **NIMBY** syndrome, concerns about local environmental conditions and steadily rising costs make replacing landfills very difficult.

In Alberta, many of the 'dumps' of the past have been replaced with engineered landfills to minimize their impact on the environment. Alberta is fortunate to have the Swan Hills Treatment Centre to manage hazardous and special wastes. If wastes are not disposed of properly, they can be a source of pollution to groundwater when buried or to the air when burned. Soil can be harmed directly when toxic or hazardous waste is disposed improperly.

There will always be a need for disposal in some form. Still, we can minimize the need for disposal by reducing the amount of waste generated in the first place. We can reuse materials again and again and separate out no longer usable materials for recycling. This is known as the hierarchy of the 4Rs – **Reduce, Reuse, Recycle** and **Recover**. Recover, the fourth "R", is largely out of the control of the average consumer. It involves recovering heat energy from burning waste to power another process. Burning wood waste from a sawmill to generate electricity is an example of a recovery process.

A common belief is that garbage buried in landfills is **biodegrading** or **decomposing**. For the first 15 years in the life of a landfill, about 25% of **organic** materials, such as food and yard waste, does decompose. Other trash, however, retains its original weight, volume and form for at least 40 years. Some materials can remain almost unchanged for hundreds of years. Decomposition occurs only

NIMBY - Not In My Back Yard. This is a common attitude that people have towards finding a site for landfills, waste incinerators or similar facilities.

Reduce - to diminish in size, amount, extent, or number

Reuse - the use of a product more than once in its same form for the same purpose; to use again.

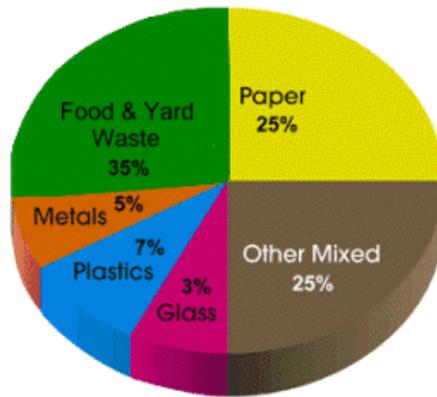
Recycle - to separate a given material from waste and process it so that it can be used again in a form similar to its original use.

Recover - to reclaim a resource embedded in waste.

Alberta

when there is the right combination of moisture, pH, nutrients, bacteria and temperature. Landfills have only 25-35% moisture content instead of the 65% needed to trigger adequate decomposition. Landfills are designed to minimize moisture to curb **leachate** that can contaminate groundwater if left unchecked. In addition, conditions in a landfill are **anaerobic** (very little available oxygen) and the micro-organisms that thrive in this kind of environment can take three times longer to decompose material than those under **aerobic** (oxygen rich) conditions. Excavations of landfills have found 25-year old newspapers that are still readable! Our wastes do not simply go away once they are out of sight in a landfill.

Average Residential Waste Composition (% by weight)



What is in the Solid Waste Stream?

The chart above shows the estimated types and proportions of residential waste, by weight, going into Alberta’s municipal landfills.

Paints, solvents, car batteries, used oil and many other toxic or hazardous materials can end up in our landfill even though there are more appropriate methods for disposing of household hazardous materials. Household hazardous waste round-ups or stations are the proper place for these materials.

Biodegrading - a process in which a substance or material can be broken down into simpler compounds by microorganisms and other decomposers such as fungi.

Decomposing - a process which separates materials into constituent parts of elements or into simpler compounds; to undergo chemical breakdown; decay or rot as a result of microbial / fungal action.

Organic - composed of living or once-living matter; composed of compounds mainly based on carbon, excluding carbon dioxide.

Leachate - liquid that has percolated through solid waste or another medium and has extracted, dissolved, or suspended materials from it, which may include potentially harmful materials. Leachate is of primary concern at municipal waste landfills.

Municipal Solid Waste - includes non-hazardous waste generated by households, commercial establishments and institutions; excludes industrial process wastes, demolition wastes, agricultural wastes, mining wastes, abandoned automobiles, ashes, street sweepings, and sewage sludge.

Reduce

Studies have shown that 25% of wastes can be diverted from landfills through changes in consumer behaviour. This does not mean having to do without things you need, but it does mean taking the time to shop wisely. Ask yourself the following questions before purchasing an item:

- Can the item be rented instead of purchased?
- What about packaging? Can the same item be bought without excess packaging, or in bulk?
- Is the product in a refillable container?
- Is this a quality product that will last as long as it is needed?
- Can the material used in it be reused or recycled?
- Is there an **Environmental Choice** label on the product?
- Is the product or its container made of recycled materials?

If you take these things into consideration, it will help to reduce the amount of waste generated in the first place and is the most effective way you can make a difference.

Reuse

There are many ways to reuse items, cut costs and reduce the burden on the environment. From refillable containers to used clothing or furniture, the list is seemingly endless. The following are just a few examples of reuse and how individual actions can make a difference:

- Using cloth, nylon or durable plastic bags for groceries.
- Having a garage sale or donating unwanted items.
- Using both sides of paper and reusing envelopes.
- Using a reusable cup for coffee or other drinks.
- Using old sheets, towels, socks, etc. for cleaning and polishing.

Recycling

Recycling involves much more than sorting wastes and preparing them for collection. It is a complex process that in the end transforms materials into new and usable products. However, before this can be done, the materials need to be collected, processed, transported, sorted or separated for decontamination and then remanufactured. Processing, such as shredding or baling, can take place at various points along the recycling pathway to help reduce the volume and expense of transporting the material.

In order for recycling to be successful, there must be a steady supply of recyclable materials and industries that are willing to buy and remanufacture those materials. There must also be a market for the end products being made from the recyclable materials. Individuals and organizations can make a difference in completing the recycling loop by buying products that contain recycled materials.

Environmental Choice – The Environmental Choice Program was established in 1988 to encourage the demand for, and supply of, products and services that are more environmentally responsible. The program helps consumers make informed choices to products that are environmentally friendly. Today, the EcoLogo is the recognized seal of approval from the program. The logo is now found on a broad range of household, commercial and industrial products and services.

Recycling Activity in Alberta

Many communities in Alberta have some form of recycling program. Some communities collect just one or two types of materials while others collect a wide range. Some communities have curbside collection, others have drop-off bins at selected locations and still others have both. It all depends on the size of the community, the resources they have at hand, whether they can establish markets for their collected materials and how economical it is to collect and transport the material to market. Many communities are working together on a regional basis to reduce costs and to increase volumes of materials collected to improve (or even make viable) the market potential.

The Beverage Container Collection System, which operates under provincial government legislation, ensures the recycling of glass, plastic, polycoat and metal beverage containers. Containers holding most ready-to-serve drinks have a deposit that is refunded when these containers are brought back to a bottle depot. There are over 200 bottle depots located throughout Alberta. Only a few containers are exempt from the deposit system, such as milk containers. Originally designed as a litter management program, the focus of this system has changed to make sure that not only beverage containers are collected but the beverage manufacturers themselves have the responsibility to see they are recycled. So don't throw beverage containers in the garbage! Take them back to the depot where they will be collected for recycling (and you get your refund!).

As well as beverage containers, the following materials are recycled in Alberta:

Paper: Writing paper, newspaper, magazines, cardboard - all kinds of paper - make up the largest single part of our waste stream. There are many different grades of paper on the market, which means there are just as many different grades of scrap paper.

Scrap paper can be classified into main categories: old newsprint (ONP), computer paper (CPO) and other high grades, old corrugated containers (OCC), old magazines (OMP), boxboard, and numerous sub-categories. Reprocessing waste paper is not unlike the technology that is used for processing virgin pulp fibres into paper products. To recover fibre in the waste paper stream, the paper needs to be separated from other materials, then sorted by grade and cleaned or de-inked. Grading is fundamental to the process because the quality of the paper fibre going in will determine the quality of the paper product being produced. For this reason, virgin pulp is almost always added to maintain the necessary fibre content.

Old newspaper is used to make new newsprint and paperboard, but cannot be recycled to make tissue paper, which can be made from milk cartons and office paper. Specialty paper waste, such as facsimile and carbonless copy paper, are limited to being used in the manufacture of building products such as shingles and tarpaper.

Metals: Household garbage is approximately 5% metals and most is in the form of what we call tin cans. These cans are actually made of steel, a **ferrous** metal, with a thin layer of tin on the interior to resist corrosion and to help conserve food. Aluminum, a **non-ferrous** metal, is the other major metal component of household waste. The benefits of recycling metals were recognized long before today's increase in recycling activities.

Steel made from recycled scrap uses only one-quarter of the energy it takes to make it from its **primary resource**, iron ore. Aluminum can be recycled at a savings of 95% of the energy used to manufacture it from aluminum ore. This does not include the energy that went into mining the ore. Close to 75% of ferrous scrap and 45% of non-ferrous scrap metals are recycled in Alberta.

Whether ferrous or non-ferrous, all metals follow the same reprocessing pattern of separation, decontamination, shredding, melting and moulding. Alberta's only steel reprocessing plant processes ferrous scrap metal into structural steel and reinforcing bars for construction. Aluminum is collected, shredded, baled and exported out of the province. Silver, another non-ferrous metal, is recovered in Alberta from X-ray films and photographic processing solutions.

Plastics: They are everywhere, telephones, pens, dishes, even shoes, you name it! Plastics give us low-cost, sanitary packaging that is lightweight and shatterproof. By weight, plastics comprise about 7% of the waste stream, but since they are often used to make food containers, boxes and other bulky items, they can account for up to 20% of waste by volume.

Over 40 different kinds of plastics are used in Canada. These can be broken down into two major groups of plastic **resins**: thermoplastic and thermoset. **Thermoset** resins make up 10% of the plastics in use. These are plastics that, once solidified, cannot be melted and resolidified and so are not suitable for recycling. **Thermoplastic** resins, on the other hand, have a molecular structure that allows them to be repeatedly melted and remoulded without major changes in quality. Recycling plastic requires sorting and separating by resin type. The physical and chemical properties of the various resins mean they will melt and behave differently at different temperatures. Separation by colour is also important for visual purposes, as a different mix of colours will result in an olive-to black-coloured resin.

The Society of the Plastics Industry has developed a voluntary coding system for the major thermoplastic resin types to assist in their recyclability.

Ferrous - pertaining to, or derived from, iron. (In resource recovery, often used to refer to materials that can be removed from the waste

Non-Ferrous - any metal scraps that are derived from metals other than iron and its alloys in steel, such as aluminum, copper, brass, bronze, lead, zinc, and other metals to which a magnet will not adhere.

Primary Resource - a resource which is extracted from its natural source, for example, iron ore, petroleum, trees.

Resin - an inert varnish-like organic substance.

Thermosets - plastic material set to permanent shapes when heat and pressure are applied during forming and which cannot be softened again when reheated.

Thermoplastics - plastic material that can be melted to a liquid or semi fluid state, which then rehardens when cooled.

<u>CODE</u>	<u>MATERIAL</u>
 PETE	Poly-Ethylene Terephthalate (PET) - soft drink bottles
 HDPE	High Density Polyethylene - milk jugs, margarine tubs
 V	Vinyl/Polyvinyl Chloride (PVC) - cosmetics containers
 LDPE	Low Density Polyethylene - plastic bags/wrap
 PP	Polypropylene - food tubs, yogurt cups
 PS	Polystyrene - egg cartons, plastic plates/cups
 OTHER	All Other Resins and Layered Multi-Material

Plastics recycling activity in Alberta has focused largely on HDPE (#2), LDPE (#4) and PET (#1). Generally, once the plastic is sorted and separated from contaminants (paper labels, metal rings, etc.) it is shredded, washed and dried. For HDPE and LDPE, the shredded plastic is melted and moulded into spaghetti-like strands and then cut to form pellets. The pellets can be melted and moulded into new plastic products. In the case of PET, the shredded flakes are melted into plastic sheets to be used for items like packaging bubbles, binder covers, rulers and plant trays. Mixed plastics have been collected in the past and remanufactured into plastic building materials for items such as picnic tables, fence posts, and parking curb stops. Recent focus, however, has been on collecting and remanufacturing separated plastic materials.

Glass: The majority of glass recovered in Alberta is recovered through the beverage container system. A large percentage of beverage containers, such as juice bottles, are returned to the manufacturer for reuse. Non-refillable beverage containers are being recycled for a variety of uses, including remanufacture into beverage containers. Other glass containers, such as jars, are collected through some blue box programs and drop-off recycling facilities. Some flat glass, like window and mirror glass, can be recycled, but glass that is used in windshields or ceramics is *not* recyclable. The contaminants in these products are not easily separated out and can virtually destroy the furnaces that reprocess glass.

The first step in glass processing is to separate all glass into different grades. Grading at present involves hand-sorting by colour: clear (or flint), amber or green. It is then crushed into **cullet**, which is the term used for irregularly shaped pieces of glass. The production of glass beads involves the melting of finely

Cullet - broken or waste glass used in the manufacture of new glass.

crushed cullet. Bubbles formed in the molten material are captured, cooled and sorted by size and quality. Beads can be used to provide the reflective quality for road and road sign paint and in the manufacture of fibreglass insulation. Although the primary end products for recycled glass are food and beverage containers, crushed glass can also be used instead of sand as a road bed material and also as backfill in building construction.

Lubricating Oil, Containers and Filters: Over 50 Eco Centres have been created throughout Alberta for the collection of used oil, filters and containers. In addition to these centers, there are over 200 other collection facilities that provide Albertans with the opportunity to properly dispose of their used oil materials. The oil is re-refined, and with the appropriate additives reintroduced, it is as good as new. Oil filters are crushed and the excess oil is collected for recycling. The metal cases are sent to a metal recycler and made into rebar. The plastic oil containers are recycled into plastic pails, pallets and fence posts. For more information on the used oil recycling program visit the Alberta Used Oil Management Association website at www.usedoilrecycling.com.

Scrap Tires: Scrap tires can cause many environmental problems. They take up large amounts of storage space and can pose significant health and fire hazards. However, more scrap tires in Alberta are now being processed and recycled than are generated annually. Albertans discard over 2 million tires a year. With the growth of this rapidly expanding recycling industry, over 15 million tires have been recycled since the inception of the tire recycling program in 1992. This figure includes the stockpiles that had been accumulating in landfills. Alberta uses over 80% of the recycled rubber material. This includes rubber crumb moulded into matting products, non-slip landscaping bricks and industrial flooring. The shredded material provides stabilization for highways and road embankments. It is also used in landfills in leachate collection systems that provide protection from groundwater contamination. For more information on tire recycling, visit the Tire Recycling Management Association website at www.trma.com.

Batteries: There are two main types of batteries: consumer dry cell and automotive SLI (starting, lighting and ignition) lead-acid batteries. There are seven different types of consumer dry cell batteries, distinguished by their use and composition. They can contain zinc, manganese dioxide, mercury, chromium, nickel, cadmium, silver and lithium in different combinations and can come in different sizes and shapes. There is limited recycling of these types of batteries and most generally end up in the landfill.

Batteries can be dropped off at Hazardous Waste Roundups throughout the province. For nickel-cadmium batteries, there is the “Charge Up to Recycle” program of the Rechargeable Battery Recycling Corporation. Information on battery recycling can be found at www.rbrc.org.

Organics: Special mention should be made of organics, since recycling of organic materials is an enhanced version of the recycling process found in nature. Organics can comprise up to 50% of the waste stream. Leaves, grass clippings, food scraps and wood are all part of the natural carbon cycle and decompose far

more readily than other materials, given the right conditions. Paper is also considered an organic material, but it is often destined for a higher end use such as reuse or recycling.

When organic materials are buried in the landfill, they are not exposed to levels of oxygen, moisture and organisms that can help to break them down. Probably the most effective way of diverting organic materials from the waste stream is a process that gardeners have used for many years; backyard **composting**. Active composting is simply a way of speeding up the natural decomposition process. A mixture of leaves, grass, vegetable food scraps (meat and dairy products are not recommended), wood chips and twigs, can be contained in a pile or bin. Turning the pile to provide air and adding water to maintain moisture for the bacteria and organisms to do their work is generally all that is required. The better maintained the environment is for these microbial workers, the quicker the materials turn into a rich humus which can be mixed with soil to provide added nutrients and texture.

Many homeowners compost to help reduce waste and in turn reap the benefits for their gardens. Large scale composting operations, where compostable materials are collected community-wide, are becoming increasingly popular. In these cases, yard wastes are collected and piled into **windrows** which are watered and turned periodically to speed up the composting process. The finished product is then used on public lands, sold or given away to those who can use it.

Summary

In the past, we have harvested our resources and managed our wastes. In the future, it is hoped we will manage our resources and harvest our wastes. We all play a part in the production of waste, but we can control the impact of waste by actively reducing and reusing, recycling what we can, making use of bottle depots and participating in drug and household hazardous waste round-up programs in our community. Every action counts and can indeed make a difference.

Source for definitions: The McGraw-Hill Recycling Handbook, Herbert F. Lund, 1993.

Composting - the controlled biological decomposition of organic solid waste under aerobic conditions. Organic waste materials are transformed into soil amendments such as humus or mulch.

Windrow - a large, elongated pile of composting material.

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