

## Municipal Solid Waste

- I. Municipal solid waste is everyone's problem because we all use resources and produce waste. The **waste stream** is a term that describes the steady flow of varied wastes that we all produce.
  - A. This includes domestic garbage and yard waste as well as industrial, commercial, and construction waste. This is not even to mention the huge amount of agricultural and mining waste. The amount has been increasing over time because of increased population and our changing lifestyle.
  - B. Many of the materials we throw out are valuable but they are usually lost because our common practice mixes and crushes valuable components together with the other garbage, increasing the cost of separation and recovery. Another problem is that hazardous material (such as spray paint cans, pesticides, batteries and household cleaners) gets mixed with thousands of tons of miscellaneous garbage, making burning or disposal difficult. People, in general, pay little attention to what they throw away in the trash.
  - C. The general components of MSW are fairly constant but the relative amounts change in response to several factors including time of year, type of neighborhood, whether residential or commercial.
- II. Disposal methods have changed over time and vary around the world.
  - A. Although they have been largely eliminated from developed countries, **open dumps** are still common in most developing countries. Illegal dumping is still a problem in developed countries, however. It is expected that this problem will worsen as acceptable disposal sites become more scarce and costs increase.
    1. In many open dumps, trash is burned. The problem is that trash doesn't burn well and produces lots of smoke which includes heavy metal and other pollutants as well as toxic ash.
  - B. **Ocean dumping** over the last few decades has contributed to an ever-increasing amount of garbage in the open ocean. Beaches worldwide are littered with nondegradable trash. Until recently, many cities in the US dumped their trash in the ocean. The last to stop doing this was New York city in 1992.
  - C. In the 1970s, Canada and the US began switching to **sanitary landfills**. In Canada, cheap disposal and plentiful available space means there is little incentive for recycling or combustion.
    1. Each day the trash is covered by a thin layer of soil to control smell, pests, and to promote decomposition. The problem with this practice is that the dirt occupies as much as 20% of the landfill space.
    2. The landfill is lined with an impermeable clay or plastic lining to prevent **leachate** from finding its way into the groundwater. As rainwater percolates through MSW, a toxic leachate containing various heavy metals from rusting cans, batteries, and appliances, paints, pesticides, cleaning fluids, newspaper inks, and other chemicals, is produced. Drainage systems are installed in and around the liner to catch the chemicals that may be leaking into the leachate. It is assumed that 100% of landfills will eventually leak.
      - a. Careful consideration is now given to siting new landfills. They are kept away from rivers, lakes, and aquifer recharge areas. Citizens have become more concerned and vocal about health hazards and aesthetics of landfills, making finding new sites more challenging - nobody wants a landfill nearby.

3. One positive trend in landfill management is **methane** recovery. MSW is about 2/3 organic so it will decompose. The general lack of oxygen in a landfill means the decomposition will be mostly anaerobic and will produce methane. Normally this methane seeps upward and escapes into the atmosphere. Landfills are now responsible for 25% of methane emissions in Canada. The methane can be collected and used to produce electricity.
  4. The lack of oxygen also means that decomposition is slow and some items (like plastic) do not decompose at all. The incomplete decomposition makes the landfill prone to settling which means the land cannot be built on after the landfill is closed.
- D. As space runs out and costs increase, alternatives to landfills are being sought.

**Incineration** (or **waste to energy** (WTE)) is one possible solution.

1. This technology has several advantages:
  - a. The energy in the trash can be extracted and used to produce electricity. The resulting ash is only 10-20% of the volume of the original trash so this saves landfill space as well.
  - b. Toxic substances are easier to handle. The fly ash - the ash that escapes through the smokestack - can be captured from the combustion gases. The fly ash contains most of the toxins. The bottom ash - the ash that remains in the incinerator - has few toxins and can be used as fill in construction or road building or made into concrete.
  - c. The metals can be removed for resale.
  - d. No changes have to be made in trash collection or people's behavior.
2. There are also disadvantages:
  - a. Trash doesn't burn completely so air pollution increases despite some measures to clean the exhaust gases.
  - b. Incinerators are expensive to build, maintain, and run. Also, where recycling is successful, there might be shortages of trash to keep the incinerator operating. the result can be competition between incineration and recycling.

III. The cost of waste disposal is sure to continue to rise and at the same time our concern for environment protection is growing. The most attractive option for addressing both of these is to reduce the amount of waste we generate. We have all heard of the three Rs - reduce, reuse, recycle.

A. **Recycling** is the reprocessing of discarded materials into new, useful products. Some people incorrectly say "recycling" when they really mean "reusing." For example, if you refill your water bottle, you are reusing it, not recycling it. Primary recycling is when the same product is produced. For example, aluminum cans and glass bottles are turned into new aluminum cans and glass bottles. Secondary recycling means the product is made into something else. In other cases, they are turned into something different. For example, old newspaper can be turned into insulation. Estimates are that between 75-90% of MSW is recyclable so this represents a huge potential to reduce our waste production.

1. Recycling does have problems.
  - a. One problem for recycling programs is that the price of goods is not stable. In some areas citizens have done such a good job of recycling that the amount of goods surpasses the market and the recyclables are simply dumped in the landfill. Government subsidies often reduce the price of new raw materials below their real price so it can be hard for recycling to compete. If the cost of goods included the environmental cost, the picture would change dramatically.

- b. Another problem is contamination. A tiny amount of the wrong type of plastic in a shipment can ruin it. Plastics are marked with a recycling number but few consumers know what they mean. Also, in some places, all plastics are mixed together in recycling programs.
        2. The benefits of recycling should be obvious. It saves money, energy, raw materials, and land space, while also reducing pollution. Recycling also tends to increase awareness of our resource use. The cost of collecting recyclables is usually less than the cost of disposing in a landfill. In fact, if they're run efficiently, many recycling programs cover their own cost by the sale of the recyclable materials.
- B. How do we get people to recycle?
1. In many cases, legislation can help. Laws can increase fees for collecting trash but make recycling free, ban recyclable items from landfills, introduce mandatory separation of trash. We could require regions to handle their own trash, thereby removing the "Trash Fairy" effect and causing people to produce less trash. Municipal, free curbside recycling would increase the convenience. Surveys indicate that over two thirds of households would recycle if given the chance for convenient, curbside collection. This can also create jobs. Educating consumers to increase the awareness of this issue would also help.
- C. **Reducing** waste volume simply means producing less trash. This is good for two reasons: less waste volume is produced and raw materials are conserved. **Reusing**, the third R, means using items repeatedly or finding other uses for items we are finished with. These are preferable to recycling because we even save the energy required to make the items into something new.