SOLVED QUESTION PAPER

UNIT 1

1. Explain the different sources and types of solid wastes (Jan 10/Dec11/Jan 13)

Sources of Solid Waste
MSW, Municipal Solid Waste, is the primary focus of this course, which excludes industrial, mining and agricultural wastes.

A. Residential and Commercial
   - Residential: Generated by me and you: Organic (combustible) and inorganic (non-combustible), food, paper, garden trimmings, glass, white goods, waste oil, spent cans of insecticide.
   - Commingled. Mixed wastes, not separated at the source.
   - Putrescible, wastes that will decompose rapidly primarily food.
   - Plastics, contain a numerical code, 1 through 7, which is stamped on the bottom of the container inside a small triangle.
     - Polyethylene terephthalate (PETE/1), 2-liter soda bottle
     - High-density polyethylene (HDPE/2), milk bottles
   - Special Wastes:
     - Bulky items: furniture, lamps.
     - Electronics
     - Major appliances (white goods)
     - Batteries, oil and tires
       - Household hazardous wastes:
         - paint
         - cleaners
         - bug and garden sprays

B. Institutional and others
   - Generated by government buildings, schools, prisons and hospitals.
   - Does not include medical wastes which are typically incinerated and manufacturing wastes from prisons.
   - Construction and Demolition. Road repair, sewer jobs, renovations: wood, concrete, steel, shingles, electrical parts.
   - Municipal Services. Street cleaning, parks, catch basins: trimmings, food, paper, sweepings, dead animals, abandoned vehicles.
   - Treatment Plant Sludges.

C. Industrial Wastes
   - SIC (Standard Industrial Classification) codes. Excludes process and hazardous wastes.
Solid waste management

- SIC 32 - Stone, clay and glass products from the manufacture of flat glass etc., yielding glass, gypsum (sulfur source) abrasives, etc.

D. Agricultural Wastes
   Enormous quantities from planting, harvesting from row, field, tree and vine crops and animal husbandry, feedlots.

2. Briefly explain the inter-relationship of different functional elements in a solid waste management system (Dec 12/Jan 13)
   
   1. Waste generation
   2. Handling, storage and processing
   3. Collection
   4. Transfer & transport
   5. Processing & recovery
   6. Disposal

3. Define Solid Waste Management. Explain the different sources of Solid waste (Dec12/Jan13)

Solid wastes are the wastes arising from human activities and are normally solid as opposed to liquid or gaseous and are discarded as useless or unwanted.

Solid waste management is the control of:
- generation, materials are identified as being no longer value
- storage, management of wastes until they are put into a container
- collection, gathering of solid wastes and recyclable materials and the transport of these materials where the collection vehicle is emptied. 50% or higher of the total cost.
- processing, source separated (at the home) vs. commingled (everything together) is a big issue.
   Includes: physical processes such as shredding and screening, removal of bulky material, and chemical and biological processes such as incineration and composting.
- transfer and transport, small trucks to the biggest trucks allowable
- disposal of solid waste, landfilling with or without attempting to recover resources.

in a manner that is in accord with:
- public health
- economics
- engineering
- conservation
- aesthetics
- public attitudes

Final disposal at the turn of the century included:
- dumping on land
- dumping water
- plowing into soil
- feeding to hogs
- incineration

4. **Estimate the energy content of solid waste sample with the following composition. Assume moisture content = 21%, Ash content = 5%. What is the energy content on dry basis and on ash free dry basis?** (Dec 2010)

<table>
<thead>
<tr>
<th>Component</th>
<th>Food waste</th>
<th>Paper</th>
<th>Card board</th>
<th>Plastic</th>
<th>Garden trimming</th>
<th>Wood</th>
<th>Tincans</th>
</tr>
</thead>
<tbody>
<tr>
<td>% by mass</td>
<td>15</td>
<td>45</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Energy content</td>
<td>4650</td>
<td>16750</td>
<td>16300</td>
<td>32600</td>
<td>6500</td>
<td>18600</td>
<td>700</td>
</tr>
</tbody>
</table>

Sol: Energy content = 14740 KJ/kg
EC on dry basis = 14740(100/(100-21)) = 18658KJ/Kg
EC on ash free basis = 14740*100/(100-5-21) = 19919KJ/kg

5. **Explain briefly the factors affecting the generation of solid waste** (Dec 2010)

- Geographic location
- Season of the year
- Collection frequency
- Use of Kitchen grinders
- Characteristics of populace
- Extent of salvaging and recycling
- Public altitudes
- Legislation
- Food habit
- Economic status of people

6. **Define solid waste. Explain the importance of solid waste management** (Jan 10/Dec 12)

Solid wastes are the wastes arising from human activities and are normally solid as opposed to liquid or gaseous and are discarded as useless or unwanted. Focused on urban waste (MSW) as opposed to agricultural, mining and industrial wastes. Integrated Solid Waste Management (ISWM) is the term applied to all the activities associated with the
management of society's wastes. In medieval times, wastes discarded in the streets led to the breeding of rats and the associated fleas which carried the bubonic plague. The lack of management of solid wastes thus led to the Black Plague which killed half of 14th century Europe. USPHS has traced 22 human diseases to improper solid waste management. Solid wastes also have a great potential to pollute the air and water. Mining tailings from Colorado gold and silver mines will probably being spilling arsenic into the water supply forever. Just finished toxic metal treatment facility in Park City, Utah. Materials Flow - The best way to reduce solid wastes is not to create them in the first place. Others methods include: decrease consumption of raw material and increase the rate of recovery of waste materials. Technological advances - Increased use of plastics and fast, pre-prepared foods.

**Solid Waste Management**

Solid waste management is the control of:

- generation, materials are identified as being no longer value
- storage, management of wastes until they are put into a container
- collection, gathering of solid wastes and recyclable materials and the transport of these materials where the collection vehicle is emptied. 50% or higher of the total cost.
- processing, source separated (at the home) vs. commingled (everything together) is a big issue. Includes: physical processes such as shredding and screening, removal of bulky material, and chemical and biological processes such as incineration and composting.
- transfer and transport, small trucks to the biggest trucks allowable
- disposal of solid waste, landfilling with or without attempting to recover resources.

In a manner that is in accord with:

- public health
- economics
- engineering
- conservation
- aesthetics
- public attitudes
- Final disposal at the turn of the century included:
- dumping on land in
- dumping water
- plowing into soil
- feeding to hogs
- incineration

7. Discuss physical, chemical and biological properties of MSW (Jan 10/Jan 13)
Physical properties
- Identification of the individual components that make up MSW
- Analysis of particle size
- Moisture content
- Density of solid waste

Chemical composition
- Proximate analysis
- Fusing point of ash
- Ultimate analysis
- Heating value

8. Estimate the moisture content and density of 1000kg solid waste sample using the data given in the table below (Jan 10/Dec11)

<table>
<thead>
<tr>
<th>Component</th>
<th>Mass by %</th>
<th>Moisture content (%)</th>
<th>Density kg/m³</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food waste</td>
<td>20</td>
<td>70</td>
<td>290</td>
</tr>
<tr>
<td>Paper</td>
<td>30</td>
<td>6</td>
<td>85</td>
</tr>
<tr>
<td>Plastics</td>
<td>10</td>
<td>2</td>
<td>65</td>
</tr>
<tr>
<td>Textile</td>
<td>5</td>
<td>10</td>
<td>65</td>
</tr>
<tr>
<td>Leather</td>
<td>5</td>
<td>10</td>
<td>160</td>
</tr>
<tr>
<td>Wood</td>
<td>10</td>
<td>20</td>
<td>240</td>
</tr>
<tr>
<td>Glass</td>
<td>10</td>
<td>2</td>
<td>195</td>
</tr>
<tr>
<td>Garden trimmings</td>
<td>10</td>
<td>60</td>
<td>105</td>
</tr>
</tbody>
</table>

Sol:

<table>
<thead>
<tr>
<th>Component</th>
<th>Mass by %</th>
<th>Moisture content (%)</th>
<th>Dry mass, kg</th>
<th>Density kg/m³</th>
<th>Volume, m³</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food waste</td>
<td>20</td>
<td>70</td>
<td>4.5</td>
<td>290</td>
<td>0.689</td>
</tr>
<tr>
<td>Paper</td>
<td>30</td>
<td>6</td>
<td>28.2</td>
<td>85</td>
<td>3.53</td>
</tr>
<tr>
<td>Plastics</td>
<td>10</td>
<td>2</td>
<td>9.8</td>
<td>65</td>
<td>1.538</td>
</tr>
<tr>
<td>Textile</td>
<td>5</td>
<td>10</td>
<td>4.5</td>
<td>65</td>
<td>0.77</td>
</tr>
<tr>
<td>Leather</td>
<td>5</td>
<td>10</td>
<td>4.5</td>
<td>160</td>
<td>0.312</td>
</tr>
<tr>
<td>Wood</td>
<td>10</td>
<td>20</td>
<td>8</td>
<td>240</td>
<td>0.4166</td>
</tr>
<tr>
<td>Glass</td>
<td>10</td>
<td>2</td>
<td>9.8</td>
<td>195</td>
<td>0.5128</td>
</tr>
<tr>
<td>Garden trimmings</td>
<td>10</td>
<td>60</td>
<td>4</td>
<td>105</td>
<td>0.9523</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td>77.3</td>
<td></td>
<td>8.72</td>
<td></td>
</tr>
</tbody>
</table>

Moisture content = 22.7%
Density = 114 kg/m³
UNIT 2

1. Explain hauled container system and stationary container system (Dec & Jan 10/Dec 11/Jan 13)

   A. Hauled Container Systems
   - The container is sited at a location. In accordance with some cycle, the container is picked up and hauled off to the disposal area where the container is emptied and returned to the original location. The truck had no container, per se; the container is carried by the truck. A variation is start with an empty container.
   - Advantages:
     - Useful when the generation rate is high and the containers are large.
     - May eliminate spillage associated with multiple smaller containers.
     - Flexible. Need more capacity, use a larger container.
   - Disadvantage:
     - If the containers are not filled, low utilization rate.
   - Types:
     - Hoist truck - similar to an emergency truck, but dumsters are picked up or hoisted instead of cars, smaller volumes, bulky items.
     - Tilt-frame - assembly on truck allows sliding of large containers on and off the truck.
     - Trash-trailer The slider assembly is not part of the truck, but part of the trailer

   B. Stationary container system
   - The waste container remains in the vicinity of where the waste is generated. The waste is unloaded into a bigger truck. A large container is an integral part of the truck. When fully loaded from multiple waste containers, the truck travels to and from the landfill as opposed to the waste container.
   - Types:
     - Mechanically loaded. Larger containers. Wheeled residential pickup and commercial pickup
     - Almost all contain internal compaction equipment
   - The major advantage is that the vehicle does not travel to the disposal area until it is full yielding higher utilization rates.
   - The major disadvantages include:
- The system is not flexible in terms of picking up bulky goods.

- Wastes e.g. demolition that makes damage the relatively delicate mechanisms.

  - Large volume generations may not have room for storing large containers

2. Explain different types of transfer stations (Dec 10/Dec 12/Jan 13)
   - Direct discharge
   - Storage discharge
   - Combined direct and storage discharge

3. An area consisting of 400 houses contributes solid waste. Estimate the solid waste generation rate, if the observation is a local transfer station and period of generation is one week. The waste is carried out in two types of vehicles Viz, compactor trucks and flat bed trucks. (Dec 2010)
   
   No. of compactor truck load = 10 ; No. of flat bed truck load = 20
   
   Vol of each compactor truck = 15m$^3$ ; Vol of each flat bed truck = 1.25m$^3$

   Density of waste of compactor truck = 295 kg/m$^3$ ; Density of waste of flat bed truck = 110 kg/m$^3$ ; No. of persons in each house = 6

   Sol: Total quantity of waste generated = 47000 kg
   No. of people = 2400
   Per capita SW generated = 2.79kg/capita/day

4. From the following data estimate the waste generation rate per day for a residential area consisting of 1200 houses. The observation location is a local transfer station that receives all the waste collected for disposal. The observation period is for one week. Also estimate per capita generation rate assuming 4 persons per house (Jan 10)

<table>
<thead>
<tr>
<th>Vehicle type</th>
<th>No. of loads</th>
<th>Volume of vehicle (m$^3$)</th>
<th>Specific wt of solid waste kg/m$^3$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compactor truck</td>
<td>10</td>
<td>15.3</td>
<td>296.5</td>
</tr>
<tr>
<td>Flat bed load</td>
<td>08</td>
<td>1.53</td>
<td>133.4</td>
</tr>
<tr>
<td>Private cars/trucks</td>
<td>25</td>
<td>0.23</td>
<td>88.9</td>
</tr>
</tbody>
</table>

   Sol: Total quantity of waste generated = 47508 kg
   No. of people = 4800
   Per capita SW generated = 1.41kg/capita/day
UNIT 3

1. **Explain the factors to be considered in evaluating onsite process techniques (Dec10/Dec12/Jan 13)**

   Recovery of separated materials.

   Separation and processing of solid waste components

   Transformation processes

2. **Explain the following (Jan 10/Dec11/Jan 13)**

   1. **Mechanical volume reduction**

      Typically 90% volume reduction of the materials that were combusted. Demolition wastes, white goods, cars etc. were never considered.

      Always a residue and ash left over after combustion consisting of glass, tin cans, iron and steel

   2. **Mechanical size reduction**

      Size reduction is the process by which *as collected* materials are mechanically reduced in size.

      Object is to obtain a uniform final product that is reduced in size potentially reducing storage and shipping course. Size reduction does not necessarily mean volume reduction. Shredded paper occupies more space than the parent stock.

      Shredders include hammer mill, flail mill and shear shredder and usually involve metal parts revolving against one another.

      Glass crushers.

      Wood grinders include chippers, such as local tree cutters use, to reduce the branches to chips and tub grinders. Once the wood is broken up, the finer pieces can be used as raw material for composting and the larger pieces can be used as a fuel.

3. **Explain briefly, the processing techniques involved in the treatment of MSW as well as material recovery (Jan 10/Dec11/12)**

   - Preprocessing MSW
- Segregating degradable matter, removing engine blocks, tin cans.
- moisture content.
- fertilizer content perhaps by adding sewer sludge

- Decomposition
  - windrow
  - static pile
  - in-vessel

- Preparation for market.
  - grinding
  - screening
  - blending
  - additives
UNIT 4

1. With the aid of a neat sketch explain the process of incineration (Jan 10/13)

2. Explain the role of 3T’s in incineration (Jan 10/Dec 12/Jan 13)
   Temperature
   Turbulence
   Time

3. Briefly explain the pyrolysis process (Dec 10/Dec 11/Jan 13)
   - It is defined as heating the solid waste at very high temperature in absence of air.
   - Pyrolysis is carried out at a temperature between 500\degree C to 1000\degree C to produce three component streams.
   - Gas: It is a mixture of combustible gases such as hydrogen, carbon dioxide, methane, carbon mono-oxide and some hydrocarbons.
   - Liquid: It contains tar, pitch, light oil, and low boiling organic chemicals like acetic acid, acetone, methanol etc.
   - Char: It consists of elemental carbon along with inert material in the waste feed.
   - The char liquid and gases have high calorific values.
   - It has been observed that even after supplying the heat necessary for pyrolysis, certain amount of excess heat still remains which can be commercially exploited.
UNIT 5

1. **Explain Indore process and Bangalore process of composting of MSW (Dec 10/Dec 11/Jan 13)**

    **Indore Method of Composting:**

    In this method solid waste night soil and animal dung etc. are placed in brick lined pits 3 m x 3 m x 1 m deep in alternate layers of 7.5 to 10 cm height, till the total height becomes 1.5 m. Chemical insecticides are added to prevent fly breeding. The material is turned regularly for a period of about 8 to 12 weeks and then stored on ground for 4 to 6 weeks. In about 6 to 8 turnings and period of 4 months time compost becomes ready for use as manure. Insecticide used in Indore method was DDT but now because of very high half life of DDT in nature other suitable insecticide is recommended, e.g. Gamaxine.

    **Bangalore Method**

    The solid waste is stabilized anaerobically. Earthen trenches of size 10 x 1.5 x 1.5 m deep are filled up in alternate layers of solid waste and night soil/cow dung. The material is converse with 15 cm earthen layer and left for biodegradation. In about 4-5 months the compost becomes ready to use, normally a city produces 200 to 250 kg/capita/year of refuse and 8 to 10 kg / capita/year of night soil. Composting will produce about 5600 to 6750 of compost annually from above waste.

2. **Write short on ‘Vermi-composting’ (Dec 11/12/Jan 13)**

    It is the product of composting utilizing various species of worms, usually red wigglers, white worms, and earthworms to create a heterogeneous mixture of decomposing waste. Vermicast, also known as worming casting, worm humus or worm manure, is the end product of the breakdown of organic matter by species of earthworm

3. **Discuss the factors affecting the composting process(Dec 10/Jan 2013)**

    - Organisms
    - Moisture
    - Temperature
    - C/N ratio
    - Aeration
    - Addition of sewage and sewage sludge
4. **Explain briefly mechanical process of composting (Jan 10/Dec 11)**

The composting by trenching and open window composting methods require very large area. The process is laborious and time consuming. In large cities the larger area may not be available and therefore mechanical composting is adopted which is very fast. Mechanical devices are employed in turning the solid waste undergoing composting. The stabilization of the wastes takes only about 3 to 6 m days.

The operation involves:

(1) Reception and refuse
(2) Segregation
(3) Shredding
(4) Stabilization
(5) Marketing the humus.
UNIT 6

1. Explain the various factors to be considered in the selection of a site for a sanitary land fill (Dec10/Dec11/Jan 13)

   Site selection
   Available land area
   Impact of resource recovery
   Haul distance
   Soil condition and topography
   Climatic condition
   Surface water hydrology
   Geological and hydrogeological conditions

2. Explain area method and trench method of land filling techniques(Jan 10/Jan 13)

   Area method
   The Area Method is used when the terrain is unsuitable for the excavation of trenches in which to place the solid wastes. The filling operation usually is started by building an earthen against which wastes are placed in thin layers and compacted as the fill progresses until the thickness of the compacted wastes reaches a height of 2 to 3 m at the end of day’s operation a 150 mm to 300 mm layer of cover material is placed over the compacted fill. The cover material must be hauled in by truck or earth-moving equipment from adjacent land or from borrow-pit areas. A final layer of cover material is used when the fill reaches the final design height

   Trench method
   The trench method is suited to areas where an adequate depth of cover material is available at the site and where the water table is well below the surface. To start the process To start the process, a portion of the trench is dug with a bulldozer and the dirt is stockpiled to form an embankment behind the first trench. Wastes are then placed in the trench, spread into thin layers and compacted. The operation continues until the desired height is reached. Cover material is obtained by excavating an adjacent trench or continuing the trench that is being filled.

3. What is a leachate? What are its effect on ground water(Jan 13)

   Leachate is a liquid generated as a result of percolation of water or other liquid through landfilled waste, and compression of the waste as the weight of overlying materials increases. Leachate is considered to be a contaminated liquid, since it contains many dissolved and suspended materials. Good management techniques that can limit adverse impact of leachate on ground and surface waters include control of leachate production and discharge from a landfill, and collection of the leachate with final treatment and/or disposal.
4. With neat sketches, explain the methods control of gas movement, with vents and barriers (Jan10/Dec11/Dec12)

![Figure 3-4: Typical Berm Detail.](image)

The minimization and containment of leachate within a landfill ultimately depends on the design of the landfill. Providing an impervious cover, minimizing the working face of the landfill, and limiting liquids to household containers and normal moisture found in refuse, are all methods that will minimize leachate production.

Gas control

**Production.** Although gas generated within some types of landfills may be negligible, most landfills are expected to generate a significant quantity of gas. The quality of gas depends mainly on the type of solid waste. As with leachate, the quality and quantity of landfill gas both vary with time. The following discussion on gas quality and quantity pertains mainly to landfills with municipal type wastes, which would be expected at most installations.

**Quality.** Landfill gases, specifically methane gas, are natural by-products of anaerobic microbial activity in the landfill. The anaerobic process requires water and the proper mix of nutrients to maintain optimal conditions. The quality of gas varies with time, and may be characterized by four distinct phases.

**Quantity** The quantity of gas generated depends on waste volume, waste composition, and time since deposition of waste in the landfill, as summarized above. Methane production ranges from 0.04-0.24 cubic feet per pound of waste per year. Gas production may be increased by adding nutrients, such as sewage sludge or agricultural waste, the removal of bulky metallic goods, and the use of less daily and intermediate cover soil.
5. **Determine the landfill area required for municipality, with population 50000. Given that (Dec 2011)**
   1. Solid waste generation = 450g/p/d
   2. Compacted density of landfill = 504 kg/m$^3$
   3. Average depth of compacted solid waste = 5m
   Sol: Total volume of solid waste generated = 44.65 m$^3$
   Landfill area = 8.93 m$^2$

6. **Determine the area and size of landfill required for a municipality with a population of 50000. (Dec 2012)**
   Sol: Total volume of solid waste = 150 m$^3$
   Landfill area = 50 m$^2$
UNIT 7

1. Explain briefly the various methods of solid waste disposal (Jan 10/Jan 13)

Generally there are several methods of solid waste disposal that can be utilized. These methods are:
1. Ordinary open dumping
2. controlled tipping/burial
3. Hog feeding
4. Incineration
5. Sanitary landfill
6. Composting
7. Grinding and discharge in to sewer
8. Dumping into water bodies

2. Briefly explain the advantages and disadvantages of the disposal method of open dumping (Dec 10/Dec 2011/Dec 12)

Some components of solid waste such as street sweepings, ashes and non combustible rubbish are suitable for open dumping. Garbage and any other mixed solid wastes are not fit or suitable because of nuisance and health hazard creation. Generally, solid waste is spread over a large area, providing sources of food and harborage for flies, rats and other vermin. It causes unsightly odor and smoke nuisance and hazards. Carefully selected rubbish must be disposed in order to prevent fire accidents that might occur. The location of open dumping must be carefully chosen so that there will be a minimum chance of complaints from nearby residents.

Advantage of open dumping
- Can take care of all types of solid wastes except garbage
- It causes less health problem if proper site is selected.
- Needs less labor and supervision

Disadvantage of open dumping
- Attraction of flies, mosquitoes and other insects as well as stray dogs, rats, and other animals.
- Creation of breeding sites for rodents, arthropods and other vermin
- Creation of smoke, odor and nuisance
- It makes the lands and other surrounding areas useless.
- It leads to cuts and wounds.
- It attracts scavengers, both humans and animals.
The following points should be kept in mind and must be considered before selection and locating sites for open dumping.

Sources of water supply and distance from it

Direction of wind

Distance from nearest residents near by farm areas and main land

Distance that flies can travel from disposal site to the living quarter as well as the distance that the rodents can travel from disposal areas and living quarters.

Negligence to these and some other factors would lead unforeseen health problems; if at all this method is selected.
UNIT 8

1. Describe the reuse and recycling of solid waste material (Dec 10/Dec12)

Reduction: Reduction in generation, reduction in amount of material, increase lifetime, or eliminate the need
Recycle - used, reused, or reclaimed, use of the material as a source raw material, involves physical transformation
Reused: The direct use or reuse of a secondary material without prior reclamation
Reclaimed: regeneration of wastes or recovery of usable materials from wastes (e.g., regenerating spent solvents in a solvent still). Wastes are regenerated when they are processed to remove contaminants in a way that restores them to their usable condition materials that must be reclaimed/recycled prior to use or reuse
Recovery - Process to recover useful material from mixed waste (energy is an example)
Materials are solid wastes (and potentially hazardous waste) if they are recycled in the following ways:

Used in a manner constituting disposal - Directly placing wastes or products containing wastes on the land is considered to be use constituting disposal.
  – If, however, direct placement on the land is consistent with its normal use (e.g., pesticides), then the material is not regulated as a solid waste.
  – For example, heptachlor can potentially be a P-listed waste. This pesticide is not regulated as a solid waste, however, when it is used as a pesticide.

Burned for energy recovery
Reclaimed (with some exceptions) - materials that must be reclaimed/ recycled prior to use or reuse
Accumulated speculatively

Materials that are not solid waste (and therefore not hazardous wastes) when recycled:

(i) Used or reused as ingredients in an industrial process to make a product, provided the materials are not being reclaimed; or
(ii) Used or reused as effective substitutes for commercial products; or

Returned to the original process from which they are generated, without first being reclaimed or land disposed
2. Explain re-use and recycling of paper, plastic and glass (Jan10/Jan 13)

Paper Recycling

- ~ 50% of consumed material and growing
- Goal 55% by 2012
- Strong markets for old corrugated cardboard (OCC) and newsprint (ONP)
- Expanding domestic and international demand
- Office paper lower demand
- Expanding economy – increased steel demands; China and India biggest markets
- 36.4% of steel is recycled
- Use of plastic for automobiles is a problem
- One ton steel recycled saves 2500 lb of iron ore, 1000 lb of coal, 40 lb of limestone, and significant energy savings

Glass Recycling

- Glass always lags other recyclables
- Transportation of heavy glass is expensive
- Raw materials are inexpensive
- Contamination is an issue
- Reuse used to be common practice; however as manufacturing plants became larger and decreased in number, bottles had to be carried further for refilling.
- More colored glass is imported than used domestically

Plastic Recycling

- Light weight, bulky, low density
- Wide variety of polymers
- Concerns over contamination for reuse
- Difficult to differentiate among types
- PET and HDPE have high prices due to domestic and international demand
- Curbside recycling is down, driving prices up