Solid Waste Management

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Types of Solid Wastes

- Municipal solid wastes (MSW) vary greatly in quantity and composition
- Medical waste is defined as the disposal of any human infectious agent or equipment that is capable of transmitting disease to humans
- Industrial wastes are widely varied – have the potential of being hazardous
- Agricultural wastes are typically organic residuals – biodegradable and recyclable

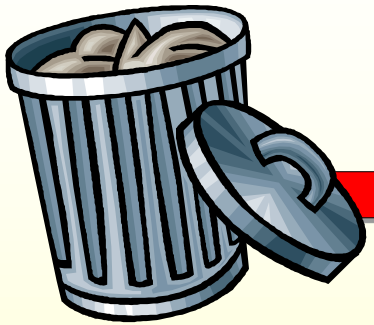
Other Types of Solid Waste

- Discarded appliances, furniture, cars, etc.
- Street sweepings and liter
- Construction and demolition debris
- Dead animals
- Hazardous wastes from homes and industry
- Sludge from water and wastewater treatment plants.
- Conclusion: the solid waste management engineer must be prepared to deal with a wide variety of materials

Breakdown of Solid Waste

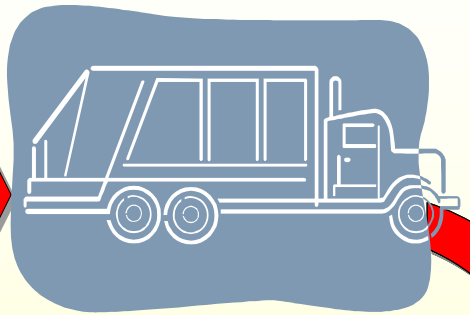
Waste Type	Cairo	Alexandria	Egypt	US
Organic Waste	56	66	60	21
Paper	19	13	10	39
Plastic	5	3	12	9
Glass	7	8	3	7
Metals	4	1	2	8
Textiles	1	3	2	4
Other	8	6	11	12

Solid Waste Management System

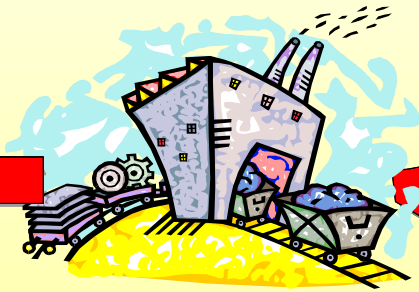


I- Waste Storage

II- Collection



III- Transportation



IV- Processing

V- Final Disposal

The goal is to identify the lowest cost and the most environmentally sound solid waste management system.

Municipal Solid Waste Management System

I- Storage

II- Collection

III- Transportation

IV- Processing

V- Disposal

I- Storage

- Responsibility of the generator of solid waste
- Cans
- Bags (sale can support cost of collection)
- Bins or dumpsters
- Waste separation of recyclables

Municipal Solid Waste Management System

I- Storage

II- Collection

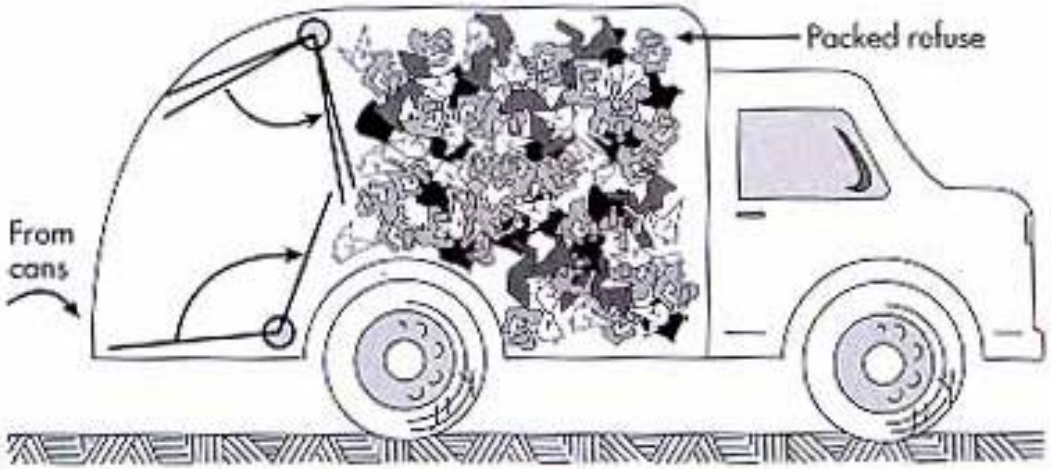
III- Transportation

IV- Processing

V- Disposal

II- Collection

- Type of collection service
  - Self
  - Curbside pickup (most common)
- Frequency of collection
  - Daily (large generators)
  - Once per week
  - Twice per week
  - On demand
  - Less frequent for recyclables
- Crew size (1 to 3 for curbside pick up)


Packed refuse
From cans

Municipal Solid Waste Management System

I- Storage

II- Collection

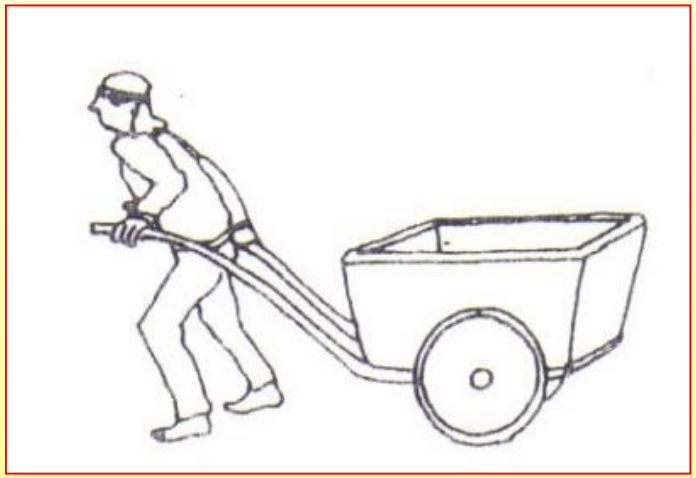
III- Transportation

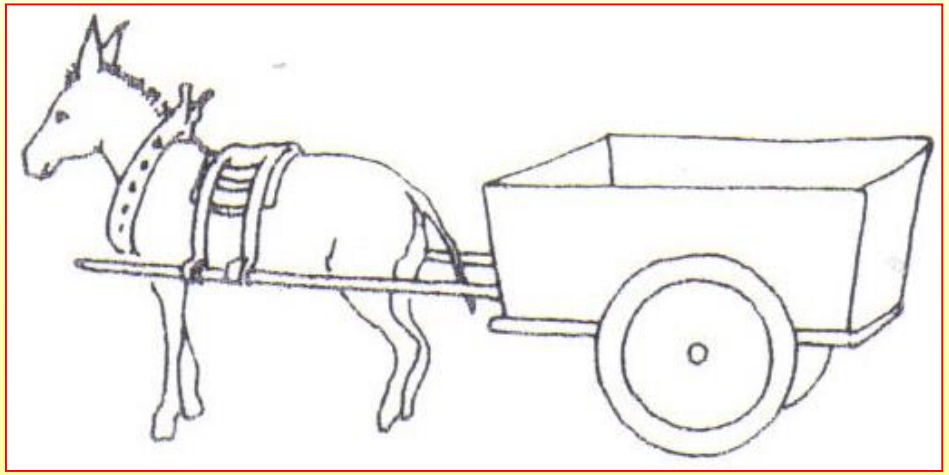
IV- Processing

V- Disposal

III- Transport/Transfer

- If disposal sites are near the collection area, the collection vehicle also hauls the full load to the site.





III- Transport/Transfer

- If disposal sites are far from the collection area, engineer should consider transferring the waste to a larger vehicle (e.g., semi trailer, rail car, barge) at transfer station

Transfer Station

Municipal Solid Waste Management System

I- Storage

II- Collection

III- Transportation

IV- Processing

V- Disposal

IV- Waste Processing

- Objectives of Processing include
  - Volume reduction (shredding, incineration)
  - Size reduction (shredding, grinding)
  - Component separation (hand sorting, screening, magnetic separation, air classification)
  - Resource recovery (composting, energy recovery, materials recovery)

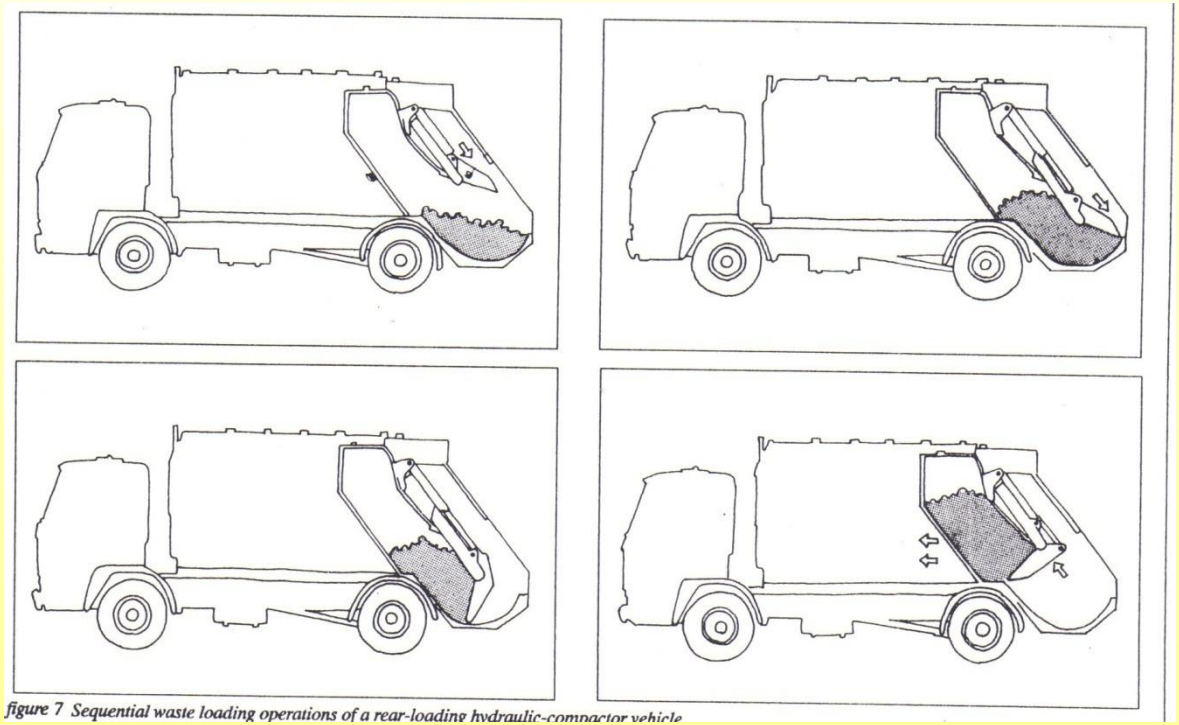
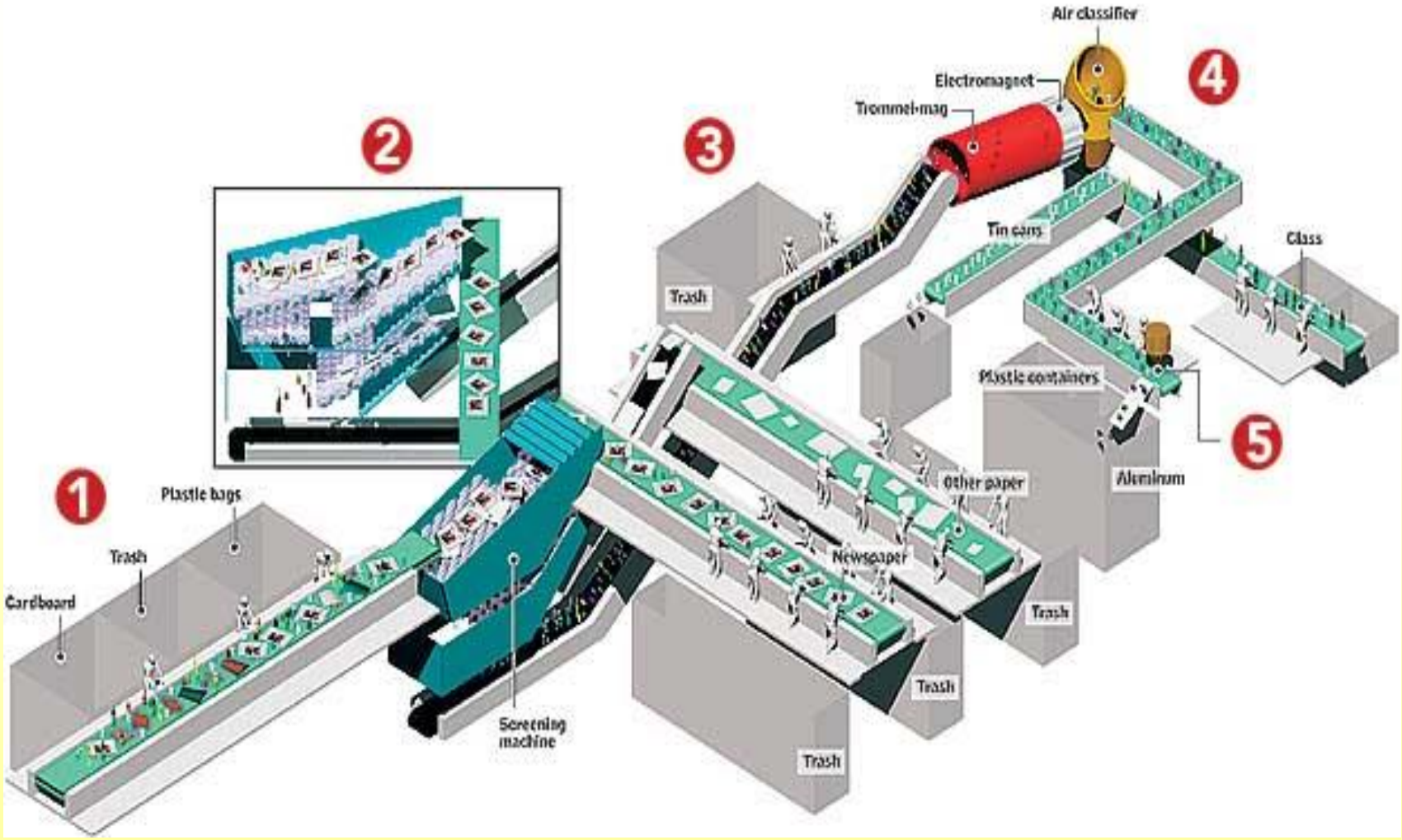


figure 7 Sequential waste loading operations of a rear-loading hydraulic-compactor vehicle



Materials recovery facilities

IV- Waste Processing

- Recycling
- Composting
- Incineration

Recycling

Recycling

Recycling allows valuable raw materials such as paper, glass,
aluminum, and iron to be recovered from waste and to be reused.

Benefits included a reduction if waste volume, conservation of
raw materials, less poisoning of the environment, and conservation
of valuable land.

Public education and responsible policies
(including implementation) are key elements for success.

Recycling in Egypt

(GARBAGE)

DUMP

Paper *Plastics* *Rags* *Other*

Food Residues

RECYCLING

FED TO PIGS & GOATS

Composting

What Is Composting?

- It is not “Land Application”
- It is a natural process that reduces the volume of organic waste while producing a natural fertilizer in the form of humus.
- It is a much more environmentally beneficial and safe management approach than incineration, landfilling or land application


LYRIC

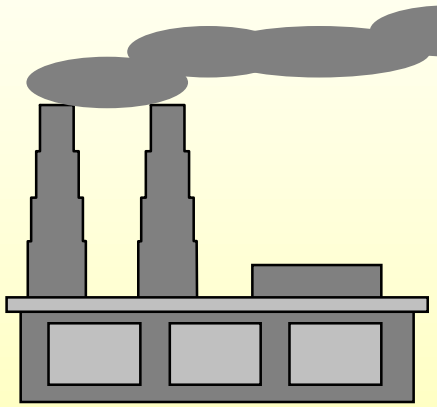
Incineration

Incineration

- Incineration systems use high temperature combustion under controlled condition to convert wastes to inert mineral residues and gases.

Incineration is often viewed as an easy alternative since you can burn waste to generate energy. But this is a very high risk alternative that can damage the environment
(emissions of chemicals and disposal of the ash containing heavy metals).

Incineration By-Products



Incinerator

Smoke (CO, Dioxine)

Smoke residues (flying ashes, hothouse effect, salt..)

Ashes + Scorias

Processing OF SOLID WASTES

WASTE FRACTION	(%)	RECYCLING	COMPOSTING	INCINERATION	LAND FILLING
PAPER/ CARDBOARD	25	A		B	C
PLASTICS/ TEXTILES	15	A		B	C
FOOD/KITCHEN/GARDEN	35		A	B	C
METALS	5	A			D
GLASS	10	A			C
ASHES/SOIL	10				A

A = most desirable; B =acceptable; C= possible, less desirable;

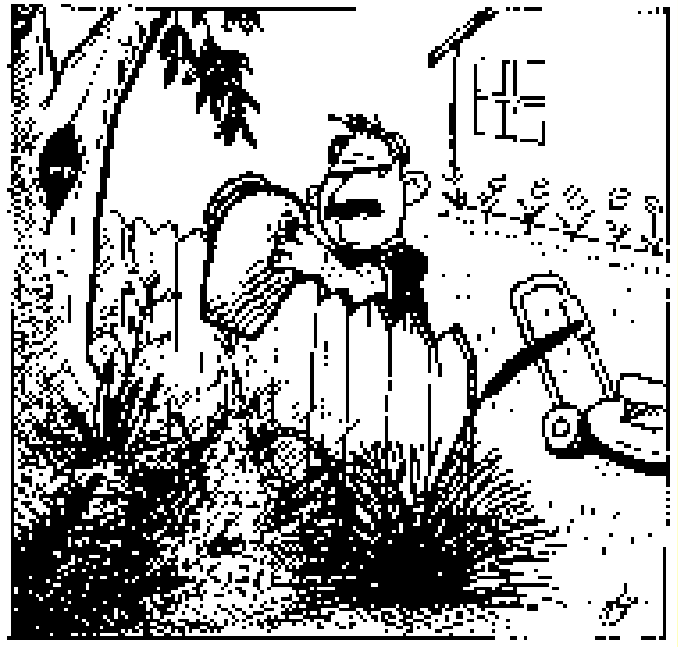
D = not desirable

V- Waste Disposal

- No matter what processing is done, there will be some residue that needs to be disposed of safely

Where to Dispose Waste?

Citing Issues



- NIMBY

  Not In My Back Yard
- NIMET

  Not In My Elected Term
- BANANA

  Build Absolutely Nothing Anytime Near Anyone


This also included sending trash to Poor Countries
Now technically illegal


Out of Sight
Out of Mind

The Sad Tale of Moboro

This garbage barge sailed from NY to NC. "Go Away" was the message from NC, and five other states. So, try the Bahamas, Mexico and Belize. Sorry, nothing doing After 57 days it returns to NY feeling unwanted. They don't want it either so it sits there, getting ripe, for 3.5 months. The NY burned it.

Solid Waste Disposal

A. Dump Site

B. Sanitary Landfill

C. Bioreactor

Open Dumps, Sanitary Landfills and Bioreactor Landfills: *a Natural Progression??*

Solid Waste Disposal

A. Dump Site

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Dump Sites

Past: We started with Open Dumps……..

(until someone showed that it is not a good practice)

But, still common practice in most developing countries!!!!!

Dump Sites

6th October Dump Site

Problems of Dump Site:

1. Fire and explosion.
2. Inhalation of toxic gases in nearby homes.
3. Injury to children playing on or around the dump site.
4. Diseases carried by mosquitoes, flies, and rodents.
5. Contamination of streams, rivers and lakes.
6. Contamination of soil, ground water and drinking water.
7. Damage of lands and wildlife habitats.
8. Decrease in the quality of life to nearby residents and the local community.

Solid Waste Disposal

A. Dump Site

B. Sanitary Landfill

C. Bioreactor

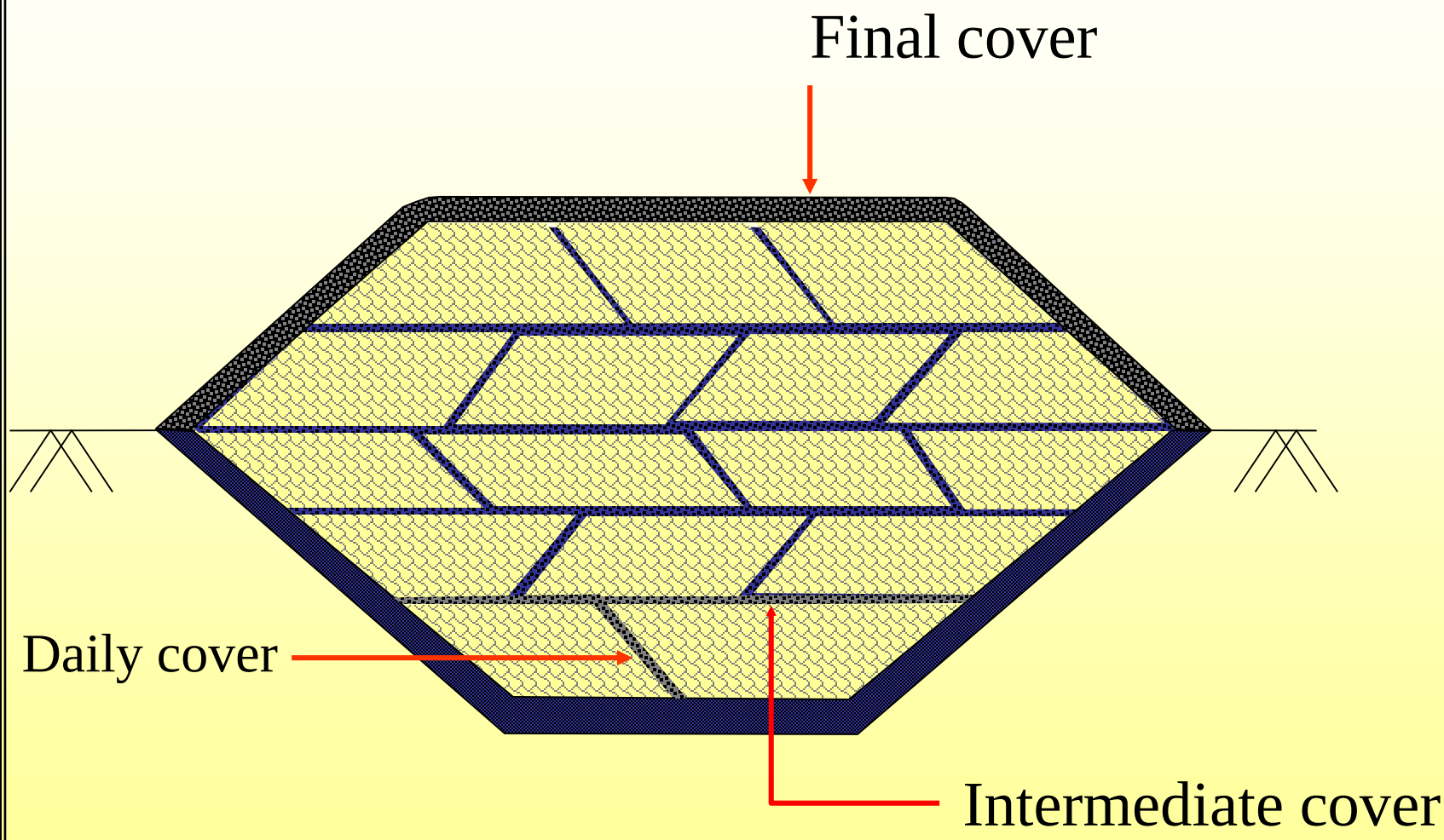
Today: We have converted Open Dumps to Sanitary Landfills …..

Conventional Sanitary Landfills are designed and constructed to eliminate problems associated with "Open Dumps"

Sanitary Landfill

Land disposal site employing an engineered method of disposing of solid wastes in a manner that minimizes environmental hazards by spreading the solid wastes to the smallest practical volume, and applying and compacting cover material at the end of each day.

Landfill Construction



Landfill Problems

- Increasing public resistance to landfill citing.
- Significant Source of Pollution

1- Air pollution (Gas emission)

2- Soil Pollution

3- Ground water Pollution (Leachate)

Solid Waste Disposal

A. Dump Site

B. Sanitary Landfill

C. Bioreactor

What is a Bioreactor Landfill?

A sanitary landfill that accelerates the biological decomposition of organic wastes in a landfill by promoting conditions necessary for the microorganisms that degrade the waste. In practice, this is accomplished by controlling the addition and removal of moisture from the waste mass, the collection and extraction of landfill gas, and in some instances the addition of air.

What is a Bioreactor Landfill?

Advantages of Bioreactor Landfills

- Waste is actively degraded rather than decomposed slowly
- Leachate will be re-circulated and monitored
- Gas generated is collected and flared

Medical Waste

- ***Medical waste*** is defined as the disposal of any human infectious agent or equipment that is capable of transmitting disease to humans.
- Medical waste includes syringes and scalpel blades.
- All medical waste must be either treated and disposed of as solid waste or shipped off-site for additional processing to render it non-recognizable.

Medical Waste

Sharp - Infectious

Laboratory waste

Sharp

Infectious

?

Medical Waste Treatment Methods

- 1. INCINERATION
- 2. SHREDDING AND STERILISATION BY STEAM

Result after Shredding and Sterilization

BEFORE

AFTER

Hazardous Waste

Definition

- Hazardous waste is a waste with properties that make it dangerous or harmful to human health or the environment.

The universe of hazardous wastes is large and diverse.

- Hazardous wastes can be liquids, solids, contained gases, or sludge.

- They can be the by-products of manufacturing processes or discarded commercial products, like cleaning fluids or pesticides.

Hazardous Waste Disposal Options

- Hazardous Waste could be handled in different ways as follows:

  - Direct disposal into landfill
  - Treatment/stabilization of wastes and then disposal into landfill
  - Direct incineration
  - Pre-treatment and incineration
  - Pre-treatment, incineration and disposal of incineration ash in landfill
  - Waste processed for fuel/industrial bye products for recycle
  - Others

Consumerism

- There would, of course, be far less trash if we *acquired far less stuff*
- But, there seems to be no logic nor limit to our desire to acquire.

THANK YOU!