ENVIRONMENTAL ASPECTS OF PLASTICS RECYCLE

BY

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Overview

- Source Reduction
- Recycling
- Degradation
- Landfill
- Incineration
- Regeneration
- Total product life cycle
- Future

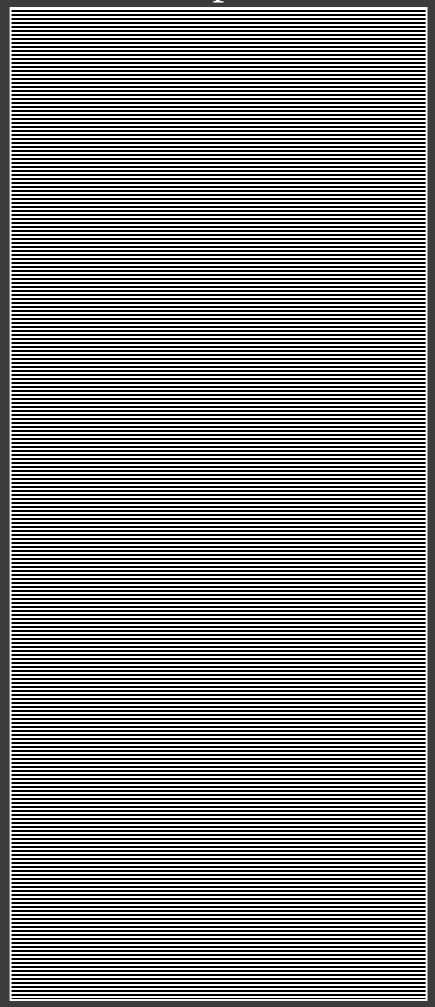
Source Reduction

- Replacing bulky/heavy products with properly engineered, lighter, lower volume per part products

"In a comparison of the two types of grocery bags, Associate producers concluded that the manufacture of plastic bags produced considerably less air pollution, water borne wastes, and industrial solid-waste than the manufacture of paper. Because plastic bags are lighter, they also produce less post-consumer solid waste, taking up less space in landfills. Researchers found that plastic sacks have these advantages even when grocery store clerks pack less in each bag, thereby using 1.5 or 2 times as many plastic bags to pack the same groceries as paper."

Paper or Plastic

Paper

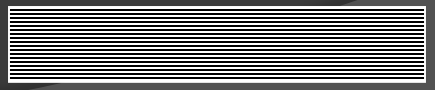


46 inches

Weight = 140 pounds

1000 Grocery sacks of both paper and plastic (to scale)

Plastic

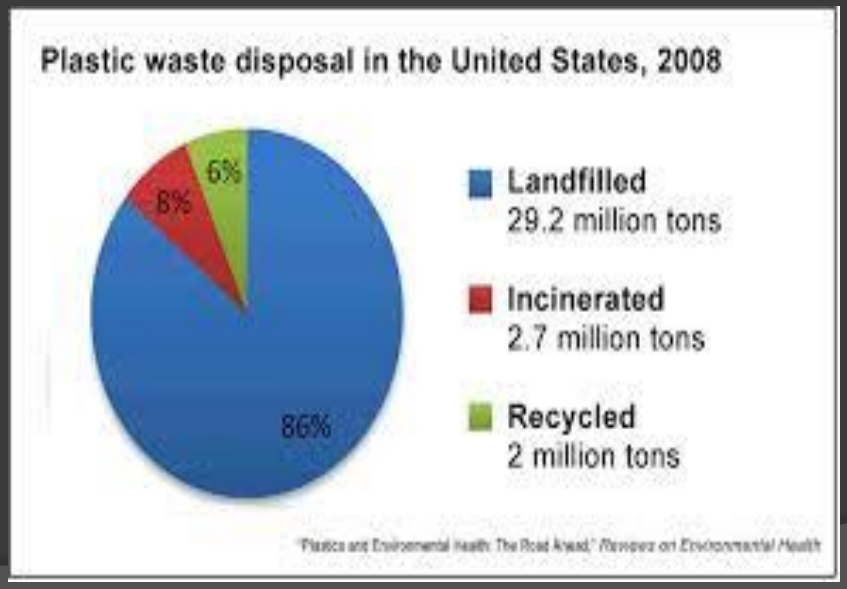


3.5 inches

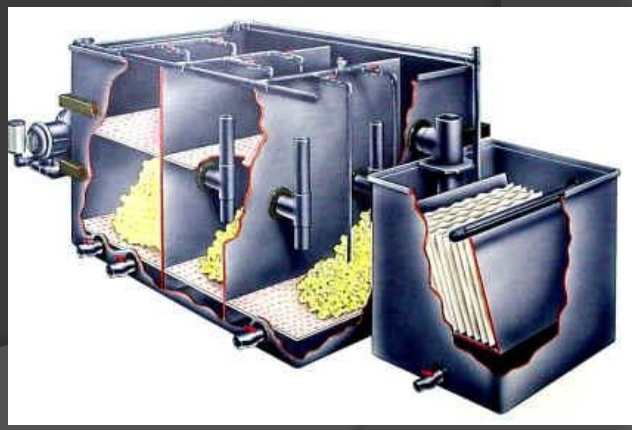
Weight = 15.6 pounds

Recycling

- Reprocessing and refabrication of a material that has been used and discarded by a consumer
- Postconsumer recycle (PCR)

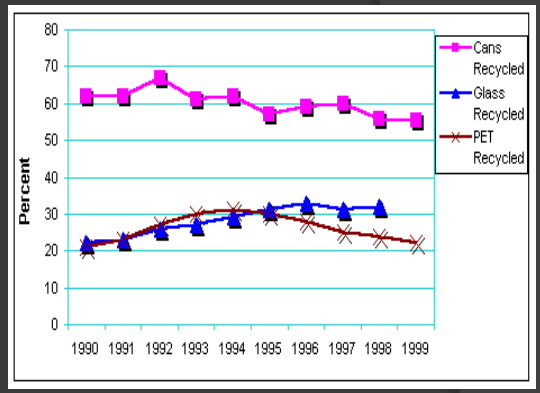


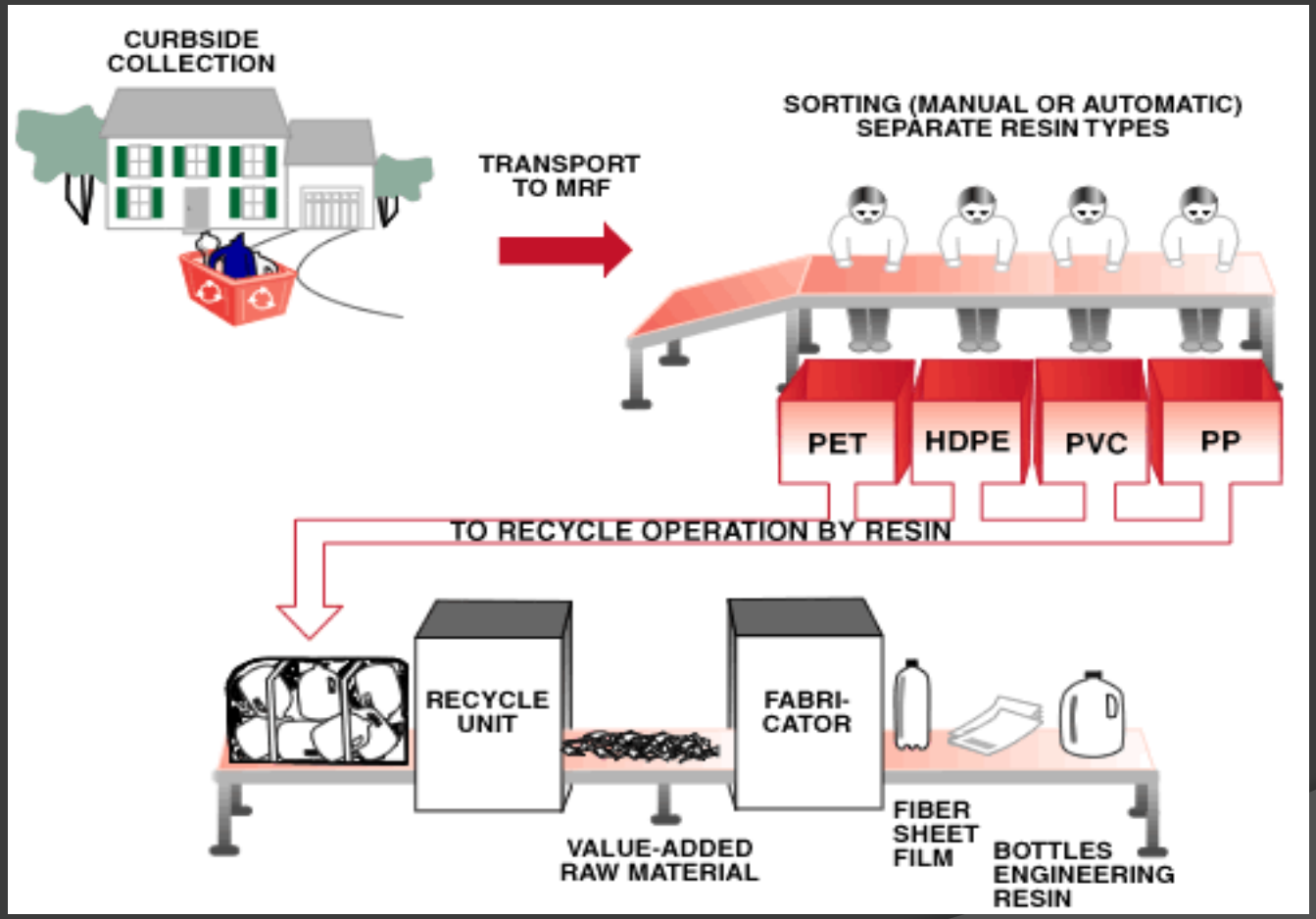
- Collection
- Handling/Sorting
- Reclamation/Cleaning
- End uses



Collection

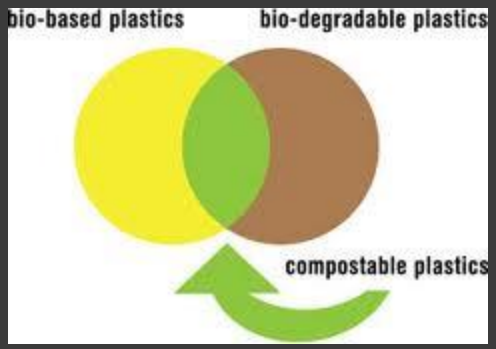
- Voluntary recycling by the consumer is the most single factor in improving recycling of all materials
- However, consumers do not sort their solid waste but rather mix all materials together
- For many plastics, the cost of virgin plastics is about the same as the cost involve in recycling- create problem in recycling process (different case with recycling of aluminium cans)




CURBSIDE COLLECTION
TRANSPORT TO MRF
SORTING (MANUAL OR AUTOMATIC) SEPARATE RESIN TYPES
PET
HDPE
PVC
PP
TO RECYCLE OPERATION BY RESIN
RECYCLE UNIT
FABRI-CATOR
VALUE-ADDED RAW MATERIAL
FIBER SHEET FILM
BOTTLES ENGINEERING RESIN

Degradation

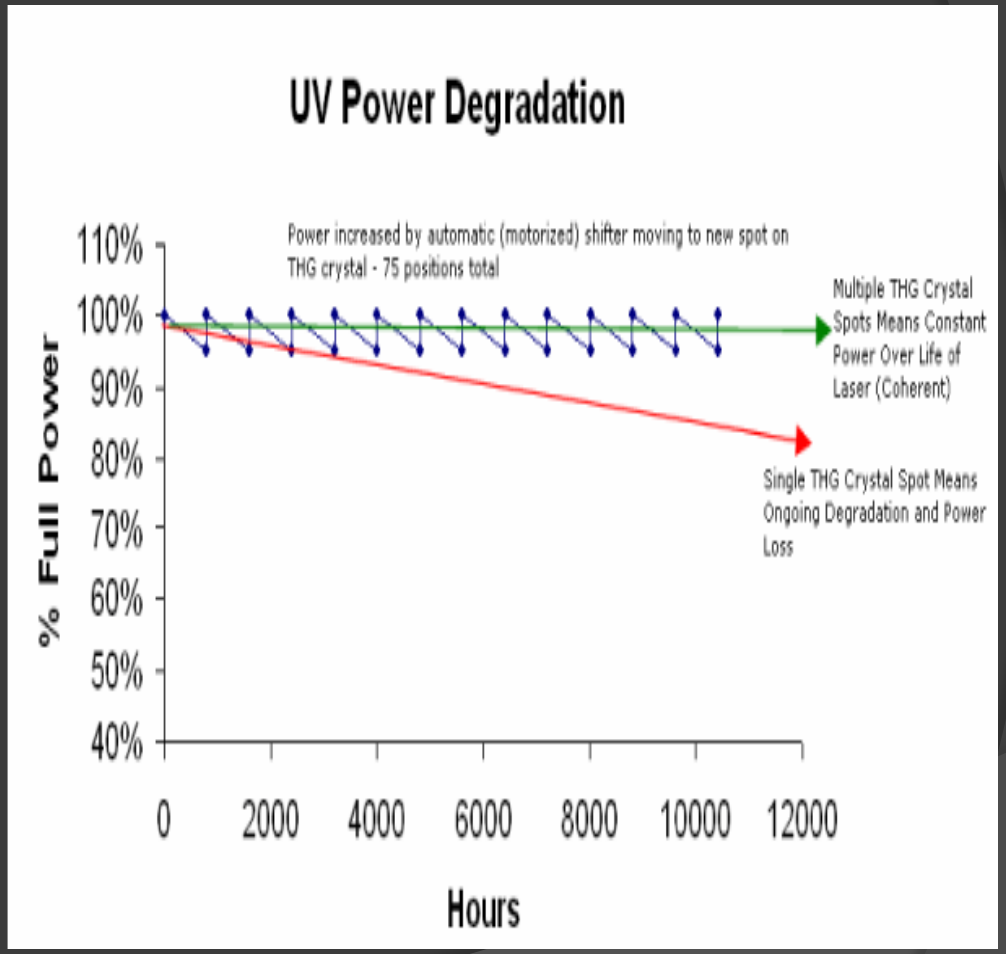
- Plastics that can break down into smaller molecules by natural means are degradable
- Degraded by products are sometimes more dangerous than original product
- The bio-degradable plastics are current trend, which are easily degraded and sometimes it can be renewable.



Degradation:

Physical or Chemical attack:

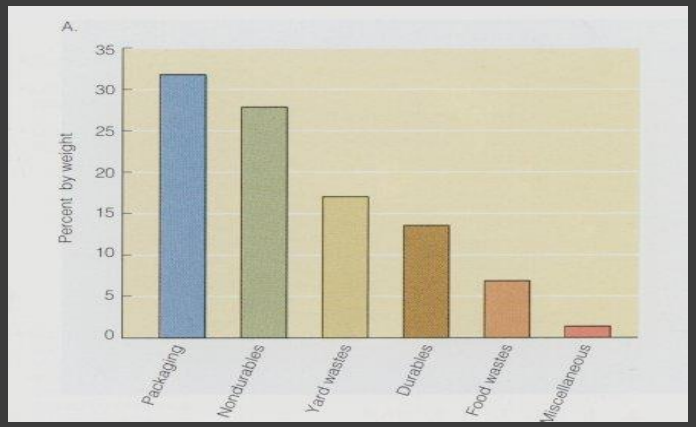
Plastics are best corrosion resistance material. Plastics are susceptible to chemical attack and degradation. Degradation of plastics is also caused by heat, stress and radiation. Generally Crystalline plastics offer better environmental resistance than Amorphous. Nylon 66, PEEK & PPS. Noknown solvent at room temperature for PP, PE, PPS & PEEK.

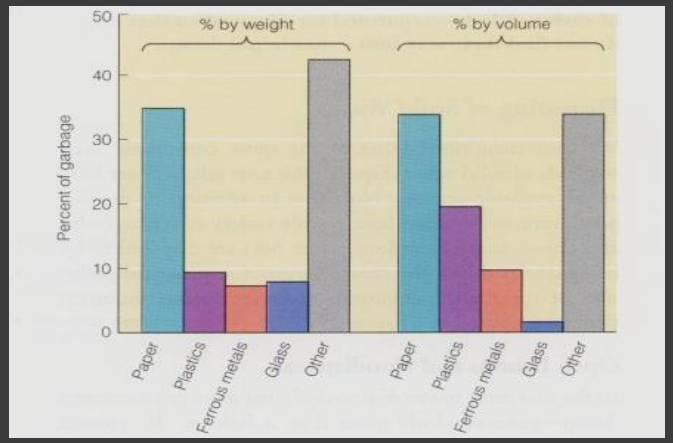


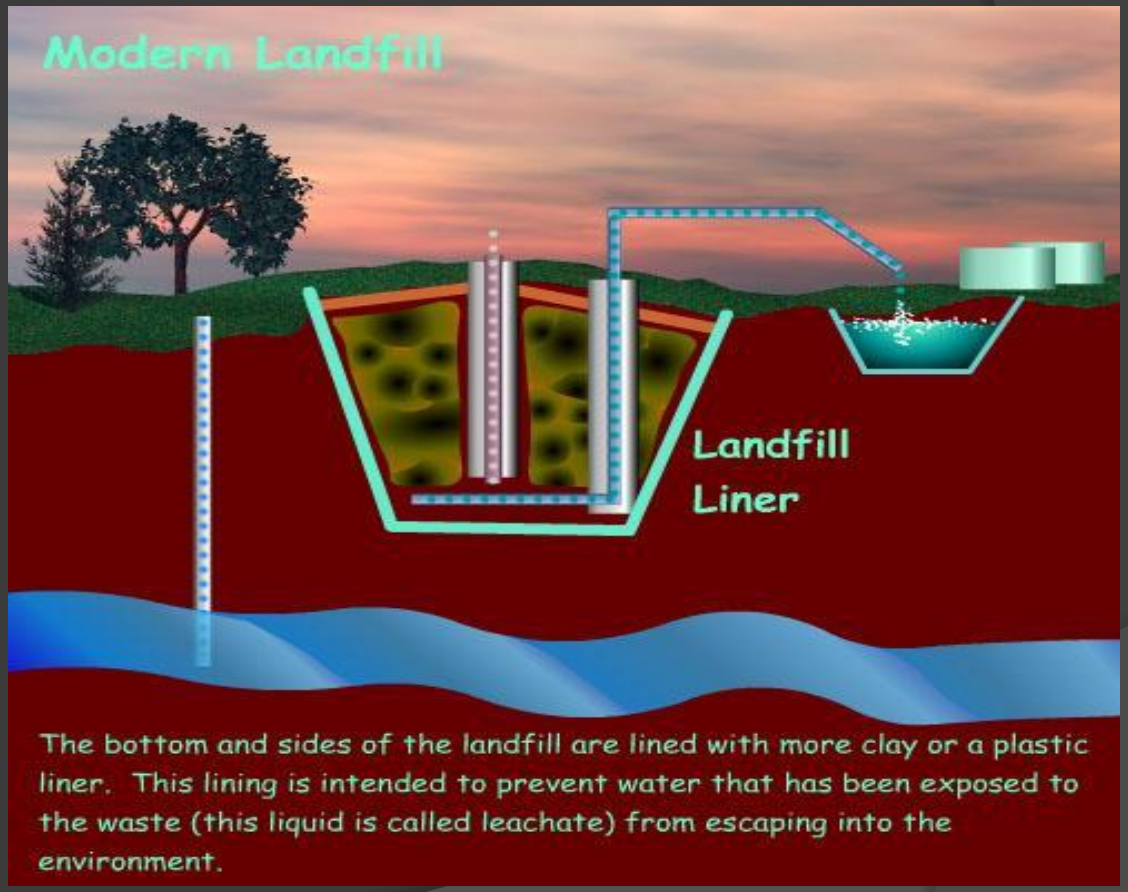
Land Fill

- Land filling with plastics are major concern, which requires special attention to be addressed to every citizen.
- Land fills cannot be cleared in short duration, in India land fill by plastics and product are prevent the land by manure.
- Otherwise these often flushed to the sea, causes severe damage to saline water ecosystem and causes aquatic pollution.

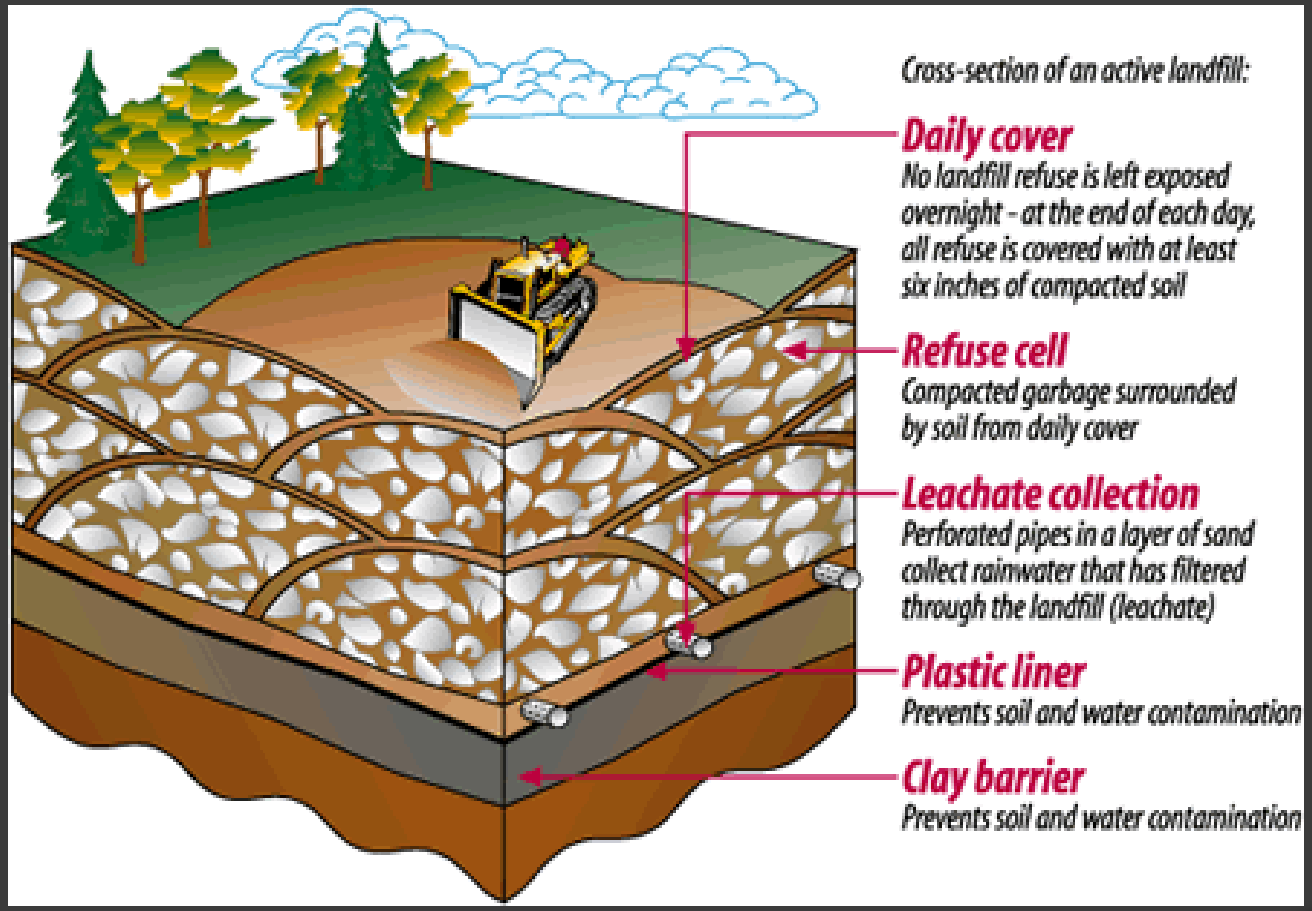
Landfill Waste

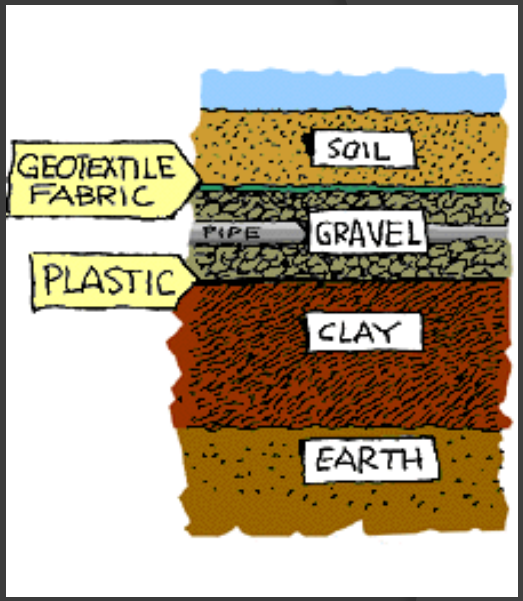






Landfills


Cross-section of an active landfill:
Daily cover
No landfill refuse is left exposed overnight - at the end of each day, all refuse is covered with at least six inches of compacted soil
Refuse cell
Compacted garbage surrounded by soil from daily cover
Leachate collection
Perforated pipes in a layer of sand collect rainwater that has filtered through the landfill (leachate)
Plastic liner
Prevents soil and water contamination
Clay barrier
Prevents soil and water contamination


GEOTEXTILE FABRIC
SOIL
PIPE
GRAVEL
PLASTIC
CLAY
EARTH

Incineration

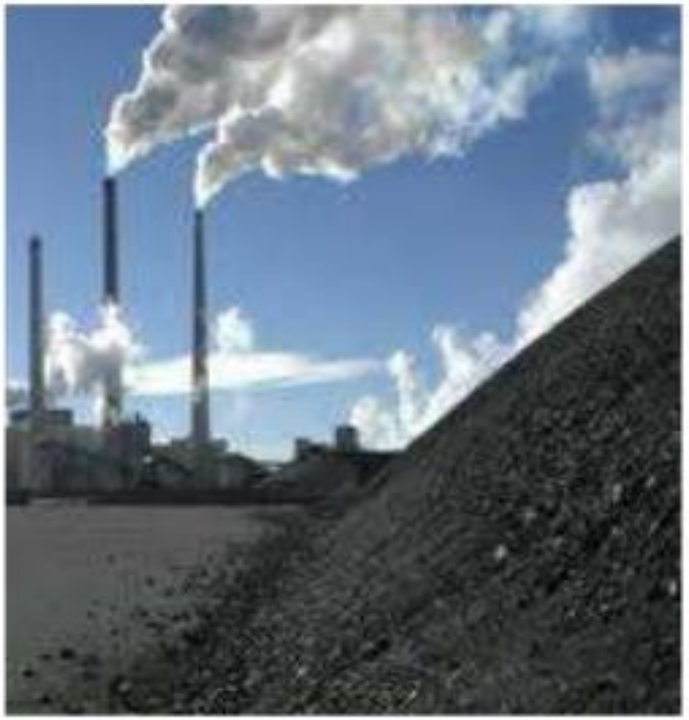
- British Thermal Units (BTU) is the standard for measuring heat generated from incineration
- Particulate Parts per Million (PPM) is one standard unit of measure to determine pollution when burning

MATERIAL	FUEL VALUE(BTUs)
Polyethylene	19,900
Polypropylene	19,850
Newspaper	8,000
Fuel Oil	20,900

Air quality standards in the US are determined by the EPA and in accordance with international treaties. Any kind of incinerator must comply with these regulations

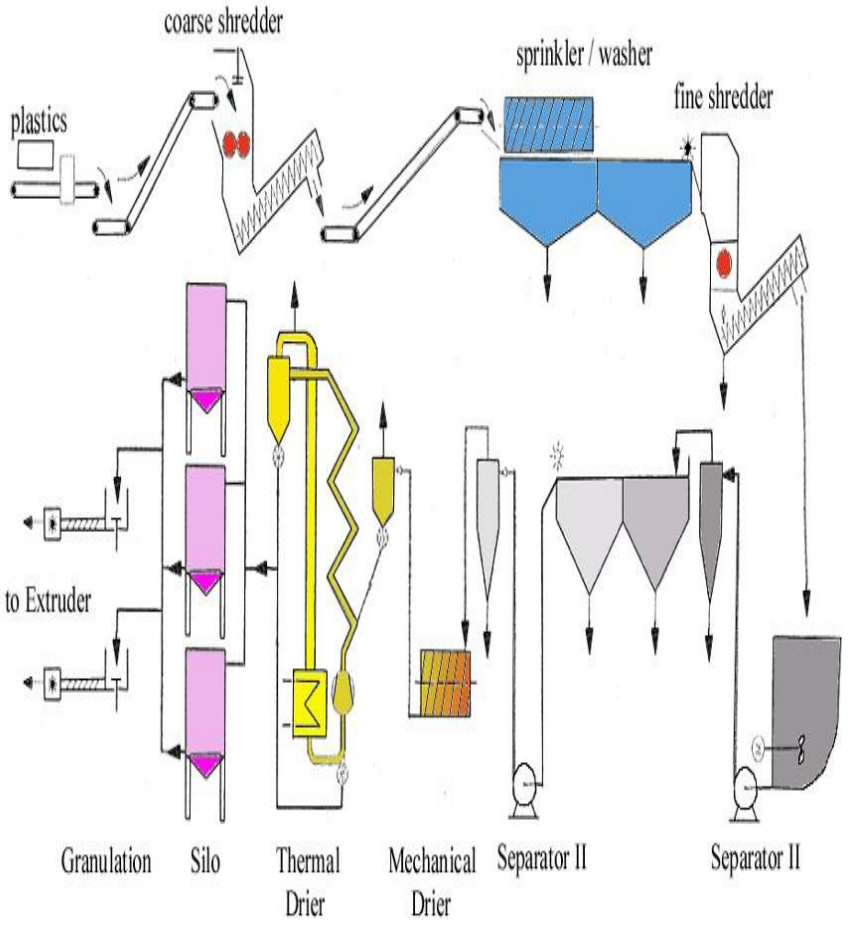
A New Vision - *Incineration*

- **Incineration**, the combustion of organic material such as waste with energy recovery, is the most common WtE implementation. The method of using incineration to convert municipal solid waste (MSW) to energy is a relatively old method of WtE production. Incineration generally entails burning waste (residual MSW, commercial, industrial and RDF) to boil water which powers steam generators that make electric energy and heat to be used in homes, businesses, institutions and industries. One problem associated with incinerating MSW to make electrical energy, is the potential for pollutants to enter the atmosphere with the flue gases from the boiler.



- Plastics with plasticizers and resins can not be efficiently or economically recycled
  - cost and energy required to produce bottles can never be recovered
  - Incineration plants are constructed with energy recovery in mind
- Gases rise into a furnace section
- Heat from furnace is transferred to water pipes
- Heated water is sent through steam producing system

Processing Plant of Recycled Plastic

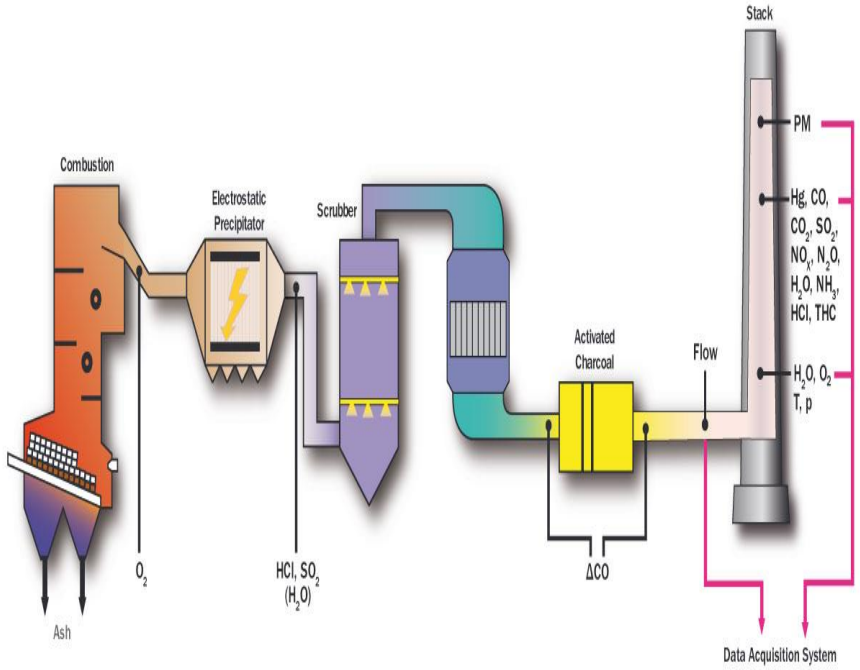


Waste Incineration

SICK
Sensor Intelligence.

Process Control

Emission Monitoring



Regeneration

- Breaking down the polymer molecules in the plastic in the basic chemicals
- The chemicals are then used to create new polymers
- The regeneration plastics are vastly apply heal by its own, if undergoes cracking and damage.

Plastic packing & coastal erosion

plastic reefs could become reclaimed land

Using cement/concrete blocks generates lots of CO_2

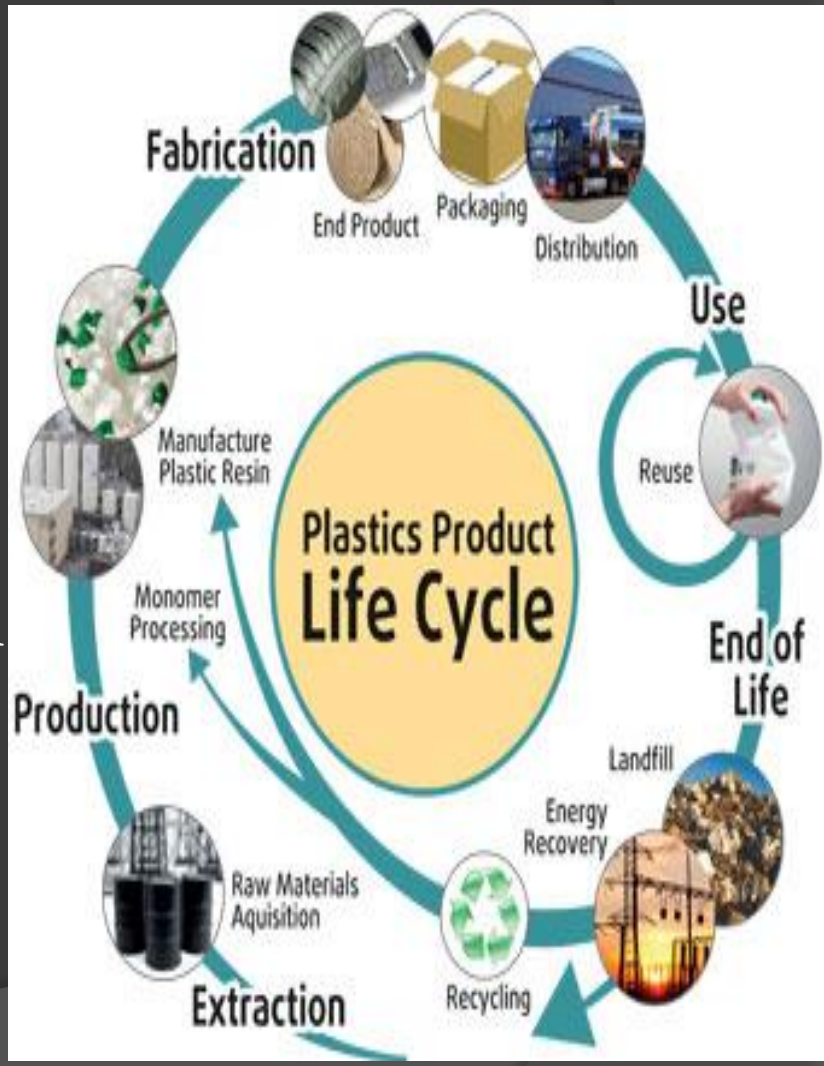
Using treated plastic blocks reduces both carbon emissions and landfill use

Total Product Life Cycl

Item	Detail	Paper Cup	Plastic Cup
Raw mat'l	Wood, oil	25g	3.4g
Finish wt		10.1g	1.5g
Utilities	Steam, etc	10,000kg	5,000kg
Water	Volume	100m^3	3m^3
Air	Emissions	13kg	40kg (pent.)
Recycle	Consumer	Difficult	Easy
Heat content	Incineration	20MJ/kg	40MJ/kg

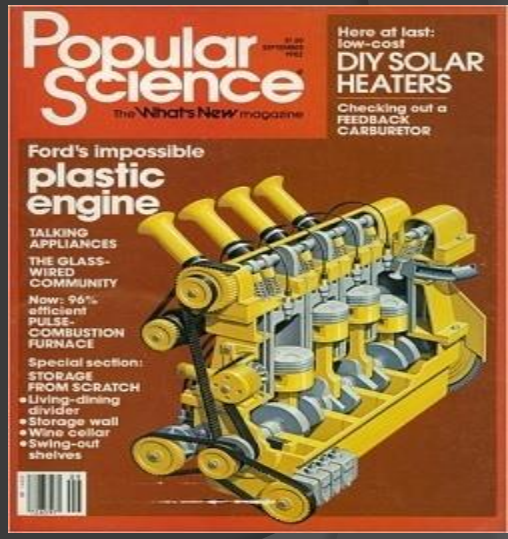
Total Product Life Cyc

- Where do we look for production materials
- How can we plan/engineer products so that they can be more readily reused/recycled/regenerated
- Think ahead

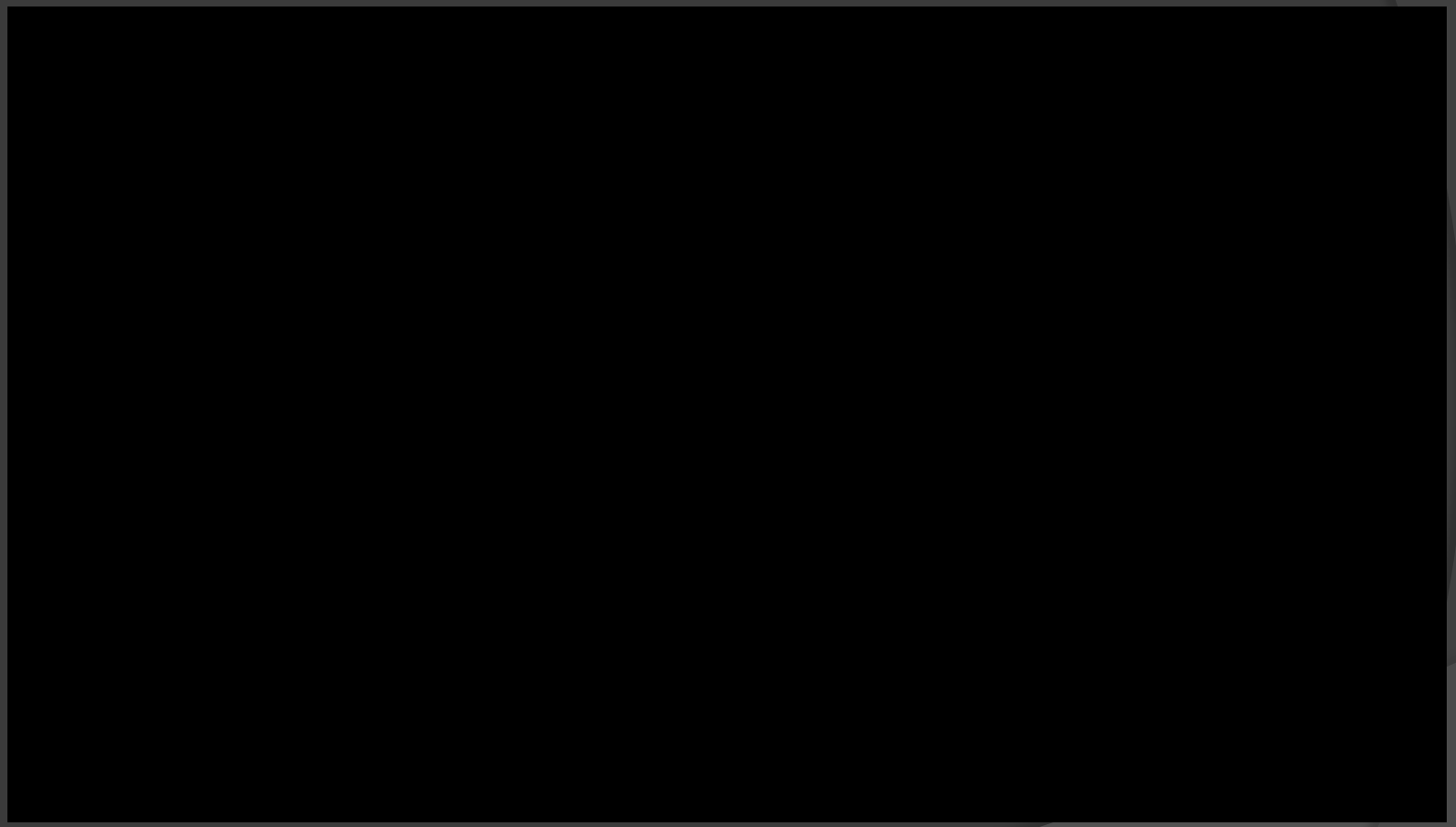


Future

- Rational analysis of each product type and its own particular use
- Be open to suggestions from environmental lobbyists
- Put aside emotional issues in favor of reasoned positions based on scientific principles
  - The recently commissioned study revealed that reusable/returnable plastic crates require less total energy, produce less total solid waste and generate less total GWP than the two corrugated options.



Waste plastic recycle machine



REFERENCE

- Plastic related books which published majorly from CIPET.
- www.ipc.in.
- www.apet.com.
- www.plasticsinfo.co.za.
- www.worldofteaching.com.

THANK YOU FOR YOUR UNDIVIDED ATTENTION AND

GOOD LUCK TO RECYCLING!