JECRC Foundation

JAIPUR ENGINEERING COLLEGE AND RESEARCH CENTRE

JAIPUR ENGINEERING COLLEGE AND RESEARCH CENTRE
DEPARTMENT OF CIVIL ENGINEERING

Class – VI Semester /III Year
Subject –S&HWM
Chapter – 6(Treatment and disposal of solid waste)
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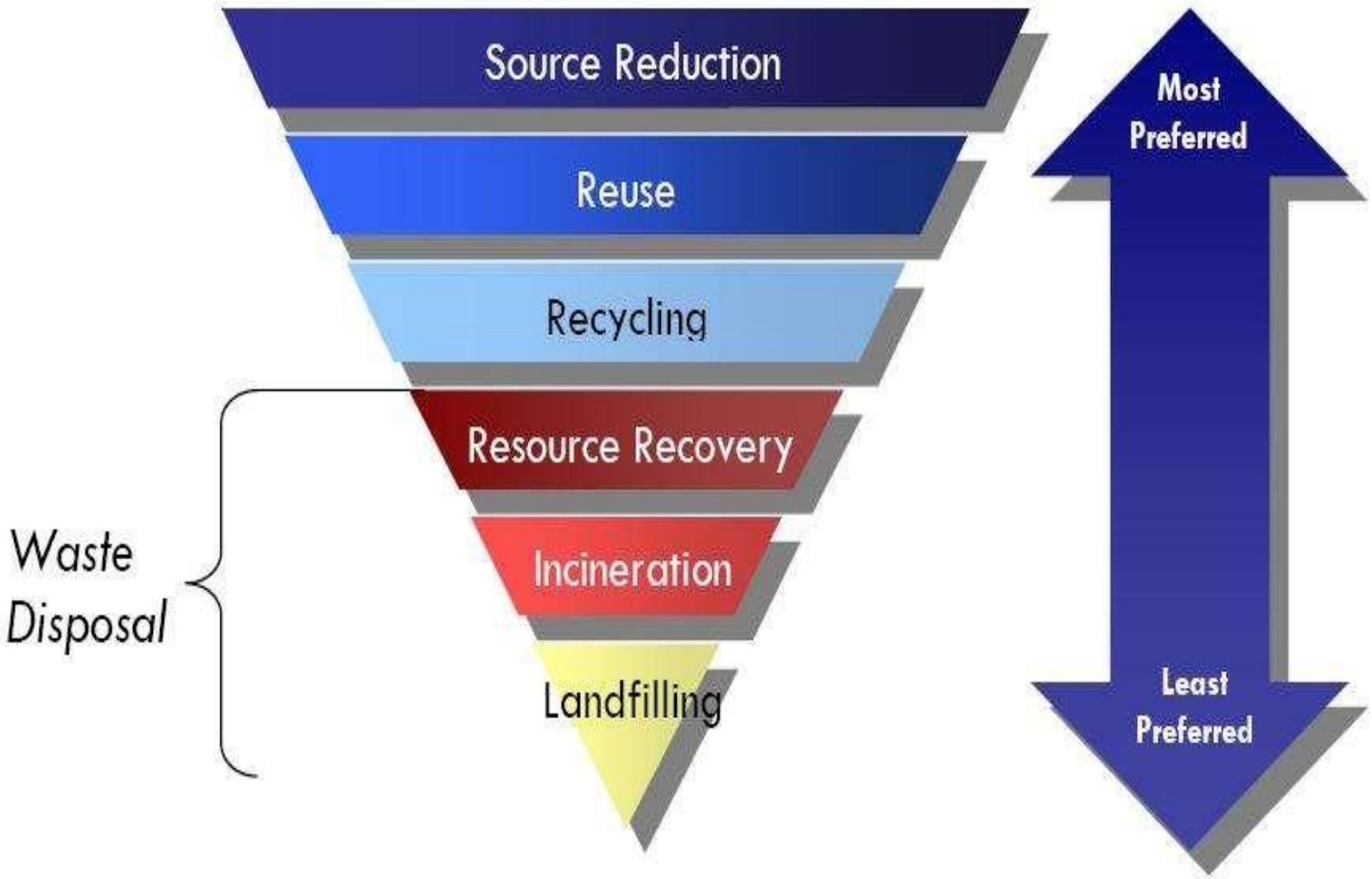
Treatment and disposal of solid waste

Several methods are used for treatment and disposal. These are:

1. Composting
2. Incineration
3. Landfilling
4. Pyrolysis
5. Recycling

Figure 3-1. The Solid Waste Management Hierarchy



Composting

- It is a process in which organic matter of solid waste is decomposed and converted to humus and mineral compounds.
- Compost is the end product of composting, which used as fertilizer.
- Three methods of composting:
  - (a) composting by trenching
  - (b) open windrow composting
  - (c) mechanical composting

Composting by trenching

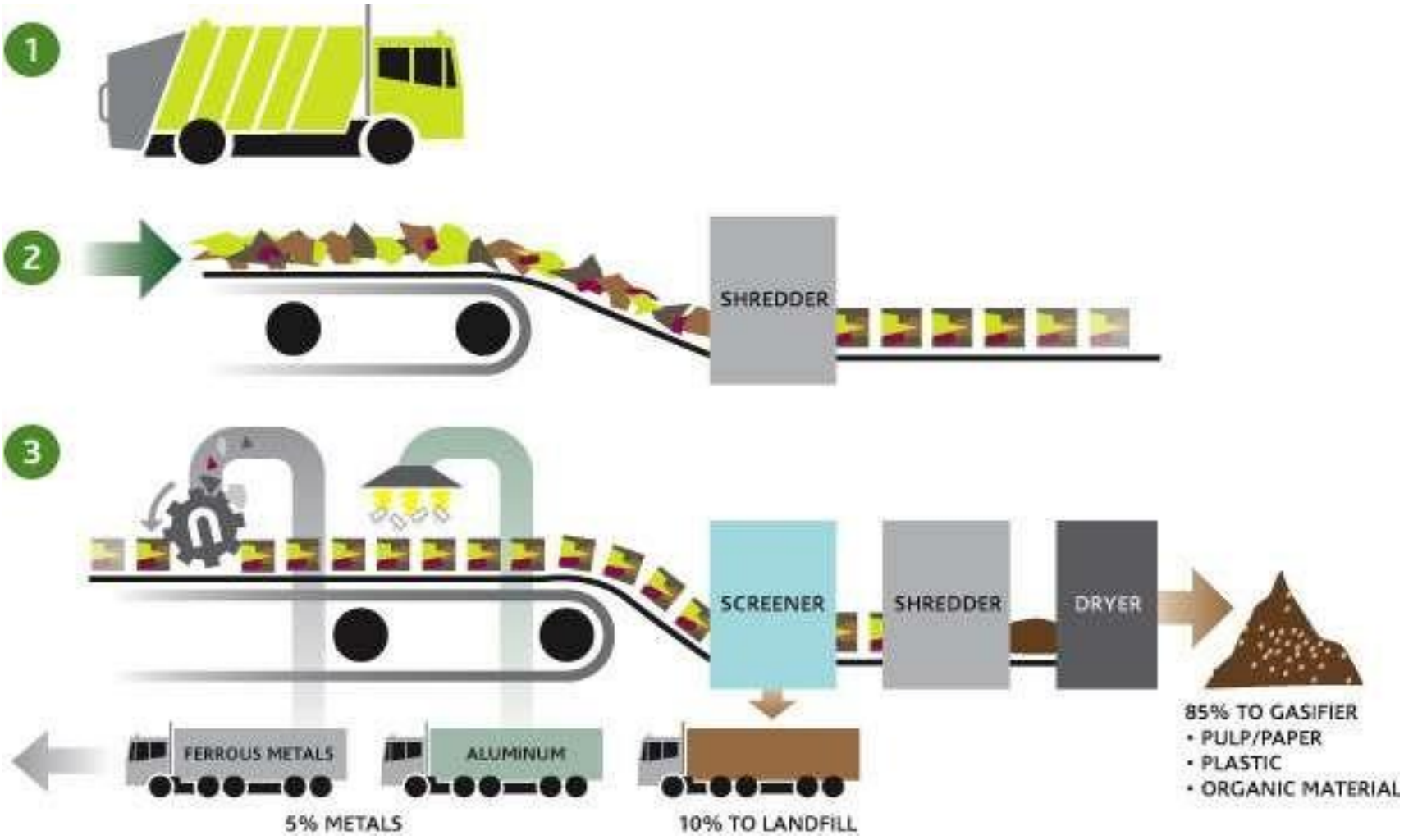
- Trenches 3 – 12 m long, 2 – 3 m wide and 1- 2 m deep with spacing 2 m.
- Dry wastes are filled up in 15 cm. On top of each layer 5 cm thick sandwiching layer of animal dung is sprayed in semi liquid form.
- Biological action starts in 2- 3 days and decomposition starts.
- Solid waste stabilize in 4- 6 months and changed into brown colored odorless powdery form known as humus.

Open windrow composting

- Large materials like broken glass, stone, plastic articles are removed.
- Remaining solid wastes is dumped on ground in form of piles of 0.6 – 1 m height.
- The width and length of piles are kept 1- 2 m and 6 m respectively.
- Moisture content maintained at 60%.
- Temp. increases in side pile.
- After pile for turned for cooling and aeration to avoid anaerobic decomposition.
- The complete process may take 4- 6 week.

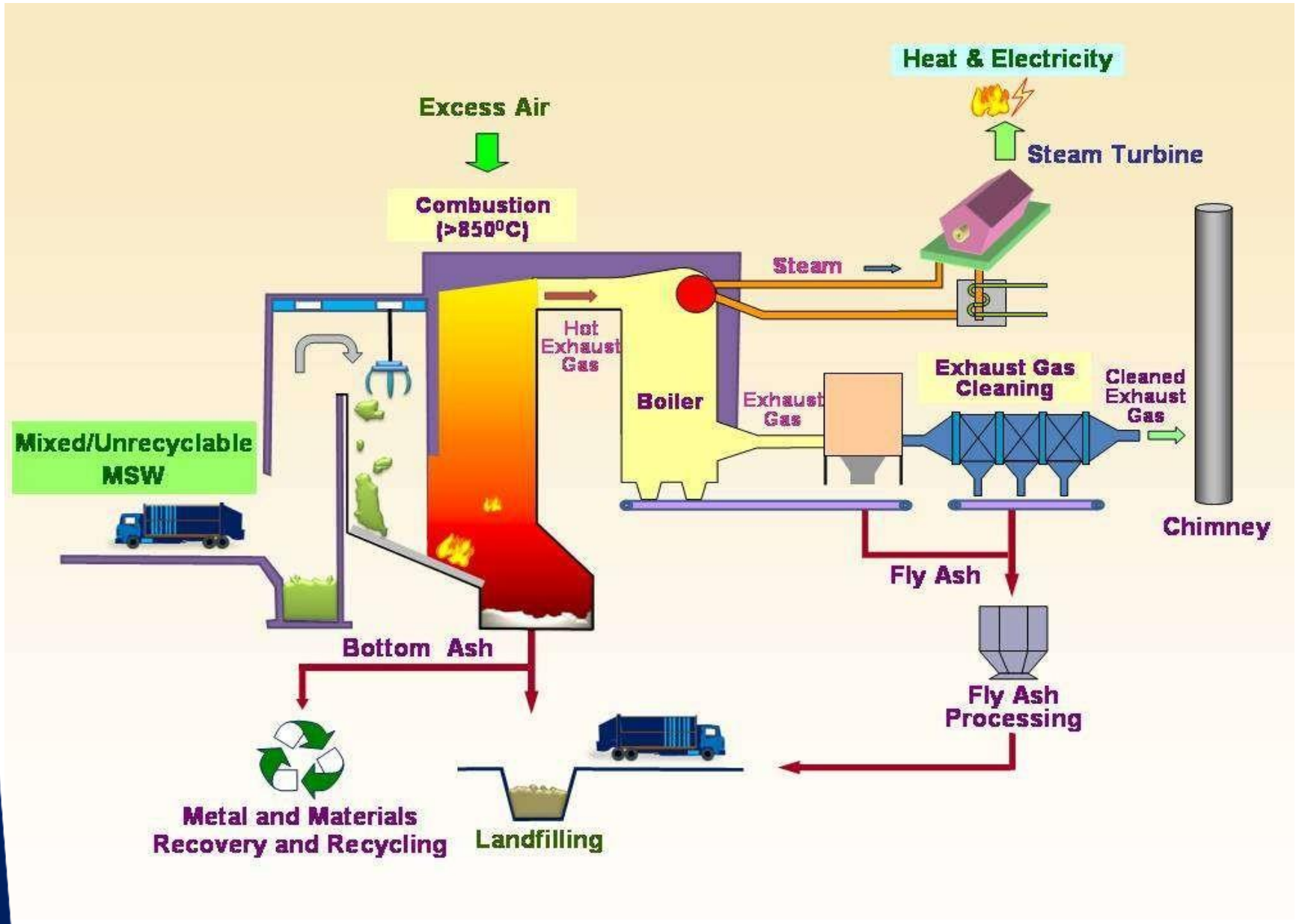
Mechanical composting

- It requires small area compare to trenching and open windrow composting.
- The stabilization of waste takes 3- 6 days.
- The operation involved are
  - reception of refuse
  - segregation
  - shredding
  - stabilization
  - marketing the humus


1
2
SHREDDER
3
SCREENER
SHREDDER
DRYER
85% TO GASIFIER
• PULP/PAPER
• PLASTIC
• ORGANIC MATERIAL
FERROUS METALS
ALUMINUM
5% METALS
10% TO LANDFILL

Incineration

- Incineration is a waste treatment process that involves the combustion of organic substances contained in waste materials.
- Incineration and other high temperature waste treatment systems are described as "thermal treatment".
- Incineration of waste materials converts the waste into ash, flue gas, and heat.
- Incinerators are used for this process.


Heat & Electricity
Excess Air
Steam Turbine
Combustion
(>850°C)
Steam
Hot
Exhaust
Gas
Boiler
Exhaust
Gas
Exhaust Gas
Cleaning
Cleaned
Exhaust
Gas
Mixed/Unrecyclable
MSW
Chimney
Fly Ash
Bottom Ash
Fly Ash
Processing
Metal and Materials
Recovery and Recycling
Landfilling

Important points regarding incineration

- Supplying of solid waste should be continuous.
- Waste should be proper mixed with fuel for complete combustion.
- Temp. should not less than 670 °C.

Advantages

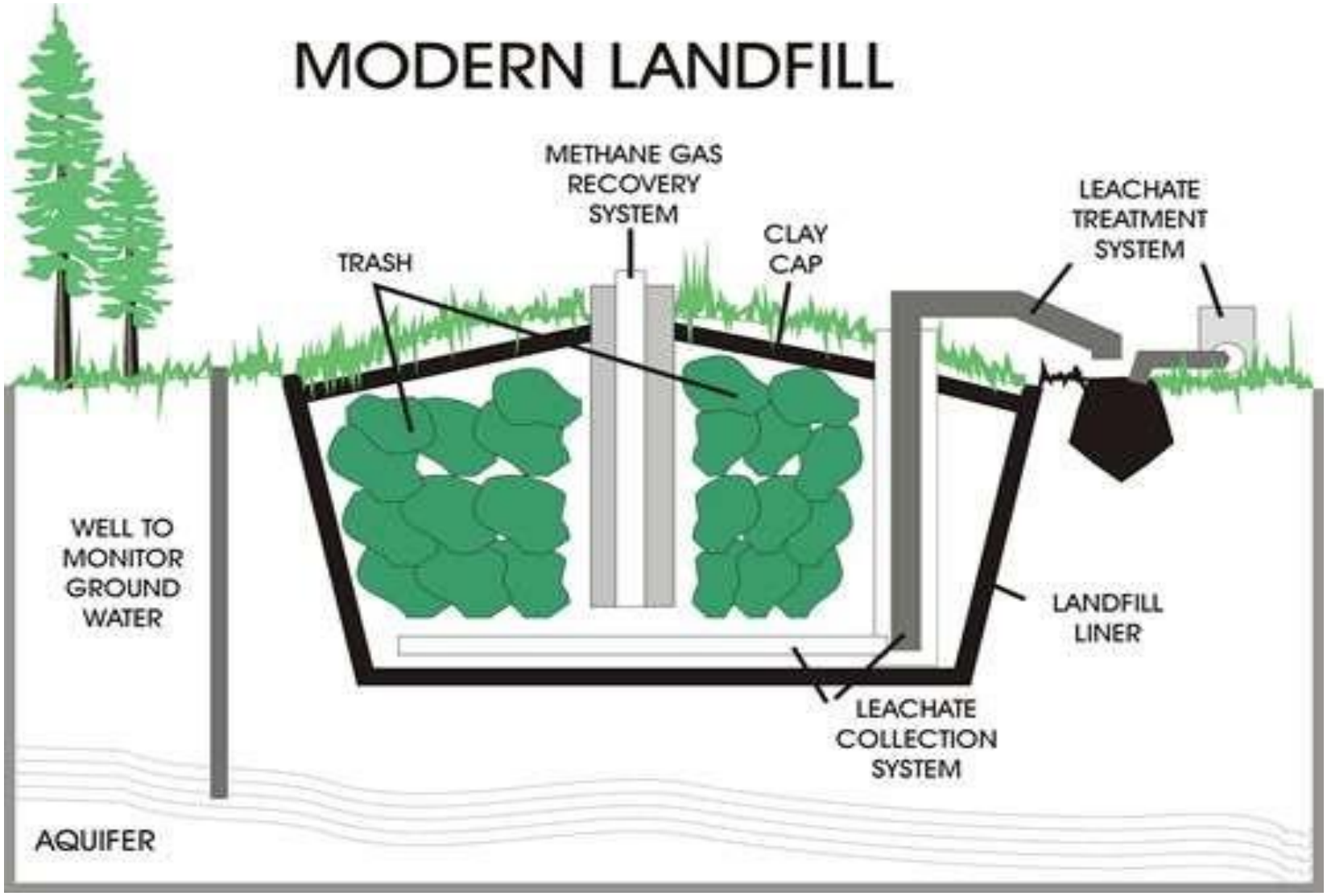
- Most hygienic method.
- Complete destruction of pathogens.
- No odor trouble.
- Heat generated may be used for steam power.
- Clinkers produced may be used for road construction.
- Less space required.
- Adverse weather condition has no effect.

Disadvantages

- Large initial expense.
- Care and attention required otherwise incomplete combustion will increase air pollution.
- Residues required to be disposed which require money.
- Large no of vehicles required for transportation.

Landfilling

- A landfill site is a site for the disposal of waste materials by burial and is the oldest form of waste treatment.
- Historically, landfills have been the most common methods of organized waste disposal and remain so in many places around the world.
- The dumping is done with layers of 1- 2 m.
- The layer is covered with soil of 20 cm thickness.


MODERN LANDFILL
METHANE GAS RECOVERY SYSTEM
TRASH
CLAY CAP
LEACHATE TREATMENT SYSTEM
WELL TO MONITOR GROUND WATER
LANDFILL LINER
LEACHATE COLLECTION SYSTEM
AQUIFER

Advantages

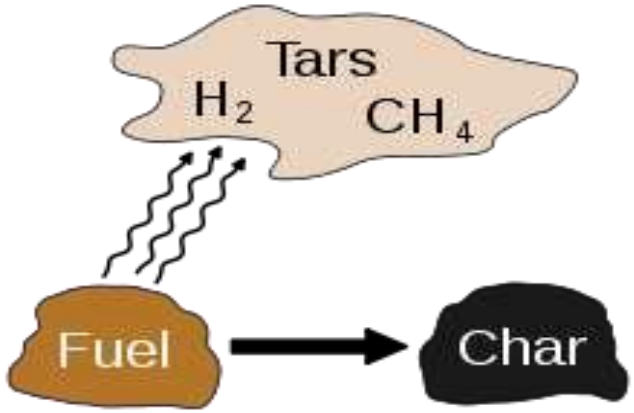
- Simple method.
- No costly plant required.
- No residues or by products need to be disposed.
- Separation not required.
- Unused land can be used.
- Methane gas can be used ass fuel.

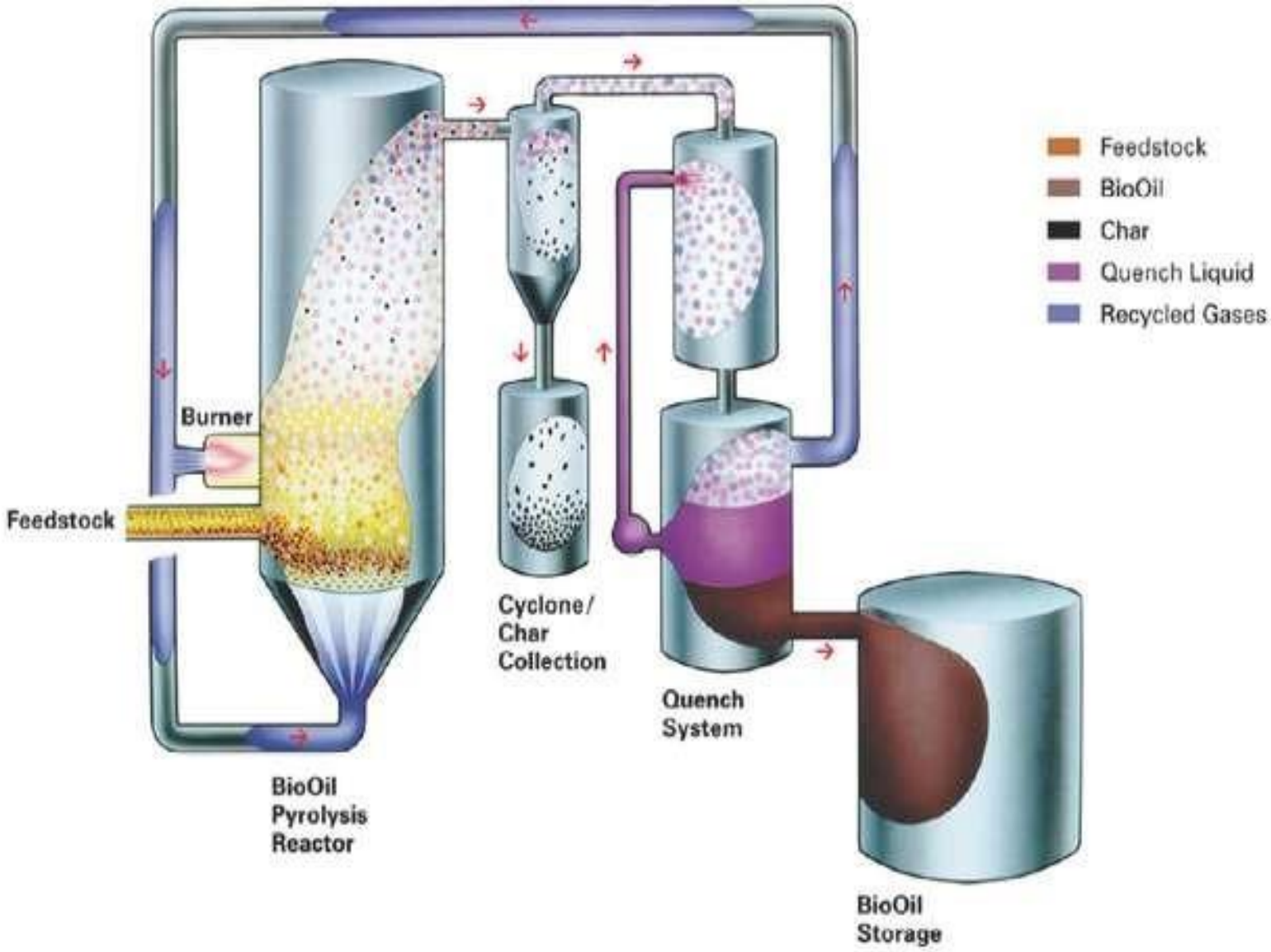
Disadvantages

- Large land required.
- Proper dumping site may not be available.
- Odor problem.
- Use of insecticides required.
- Leachate should be collected regularly.
- Methane gas should be collected properly.
- Green house gas problem.

Pyrolysis

- Heating of the solid waste at very high temp. in absence of air.
- Carried out at temp. between 500 ˚C – 1000 ˚C.
- Gas, liquid and chars are the by products.




Feedstock
BioOil
Char
Quench Liquid
Recycled Gases
Burner
Feedstock
Cyclone/
Char
Collection
Quench
System
BioOil
Pyrolysis
Reactor
BioOil
Storage

Recycling

- Recycling is processing used materials into new products .
- It reduce the consumption of fresh raw materials, reduce energy usage, reduce air pollution (from incineration) and water pollution (from landfilling).
- Recycling is a key component of modern waste reduction and is the third component of the "Reduce, Reuse, Recycle" waste hierarchy.

- Recyclable materials include many kinds of glass, paper, metal, plastic, textiles, and electronics.
- Although similar in effect, the composting or other reuse of biodegradable waste – such as food or garden waste – is not typically considered recycling.
- Materials to be recycled are either brought to a collection centre or picked up from the curbside, then sorted, cleaned, and reprocessed into new materials.


WASTE RECYCLING
Low Cost Rugs
Carpet Waste,
Cutouts & Rejects
Cardboard &
Paper Waste
Recycled Paper
Extrusion & Backing
Offcuts Waste
Ash
Plastic Tables & Chairs
Waste Yarn & Fibres
Low Cost Housing
Carpet Underlay