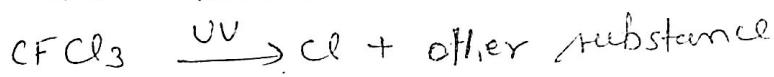


Ozone layer depletion : \Rightarrow 90% of the total ozone content of our atmosphere occurs in the stratosphere at altitude between 15 to 50 Km.

- the ozone layer acts as a filter for Ultra-Violet radiation from the sun & serves as a protective shield to human life against the adverse effects of UV like burn be harmful to life on this earth. Hence ozone layer termed as ozone umbrella.
- Primary reason for ozone layer depletion is CFC (Chlorofluoro carbon) or freons.
- Ozone is destroyed due to the photolytic reaction of CFC as shown below:



- Protection : \rightarrow Methane, destroys Cl and thus affords protection to the ozone layer.
- NO₂ reacts with Cl and helps to prevent the depletion of ozone layer.
 - When there is no Cl present in fluorocarbons, they are called hydrofluorocarbons. This is the very important replacement for CFC to protect the ozone layer.
 - VIENNA Convention & MONTREAL Protocol was concerned with ozone layer depletion.

- ① Green House Gas \Rightarrow global Warming : The atmospheric gas which are permeable to short wave solar radiation like U.V or visible, but are strong absorbers of long wave radiation (IR) emitted from the surface of earth and do not allow their escape from the atmosphere are known as greenhouse gases.
- Exq: \rightarrow CO_2 , CH_4 , nitrous oxide (N_2O), CFCs, O_3 \Rightarrow Water Vapour (H_2O)
- These gases in the lower level of atmosphere behave like the glass covering of a greenhouse.
- greenhouse gases do not allow these radiation to escape from the atmosphere & increase the temp of earth that is already present on the earth's surface. This result in an increase in temp. and is commonly known as greenhouse effect.
- Global Warming \Rightarrow Climate change defined as. Change in average surface temp of the globe due to increasing concentration of greenhouse gases in the atmosphere.

Solid Waste Management

① Solid Waste arising from
human and animal
They are normally solid and hence are useless or unwanted.

Types of Solid Wastes

① Municipal wastes ② Industrial waste ③ Hazardous waste.

Municipal waste → generated from different zone of the city. also known as Community refuse.
→ consists of refuse, trash,
(garbage & rubbish)

Refuse : Non-hazardous solid waste

Garbage : highly decomposable (putrescible) food, meat scraps.
(150 to 900 kg/m³) waste, vegetables and meat scraps.
(liable to decay)

Rubbish : mostly dry, non decomposable (non putrescible)
(50 to 400 kg/m³) material → glass, rubber, tin cans, etc.

Combustible material → paper, textiles, wooden etc.

Ashes : incombustible waste products from hearths and furnaces, and houses or industry.

→ 700 to 850 kg/m³

Industrial Waste : → generated from industrial activities
non hazardous hazardous.

Some Common industry waste are

- (I) Paper and pulp
- (II) metallurgical industries
- (III) Pesticides / insecticides
- (IV) Fertilizers
- (V) Plastics
- (VI) Refineries

Hazardous Waste : → those substance contribute to increased mortality, illness or hazard to human health and environment (Resource Conservation and Recovery Act).

→ According to RCRA (Resource Conservation and Recovery Act)
USA, [] define in fair part

- (I) Ignitability → 3HW1-4abS,II
- (II) Corrosivity
- (III) Reactivity
- (IV) Toxicity

Some Common Hazardous Waste : →

- (I) ferrous, Non ferrous industries
- (II) foundries
- (III) Cement industry
- (IV) Petroleum "
- (V) Chemical

Biomedical Waste : → Produced from Hospital & Medical Store.

E waste : → Electronic Waste

→ (T.V., Computer, chip, memory Card, Mobile etc.)

Agriculture Waste : → agricultural operation from farms,
Poultry houses & slaughterhouses.

Collection and transportation of Solid Waste

- In India, refuse is generally collected in individual houses in small containers and from there it is collected by sweepers in small hand driven lorries/carts and then dumped into the community storage bins made by municipalities placed at intervals of 50-200m depending on the layout of street and density of population.
- While transporting, spreading & scattering should be avoided.
- Transport vehicle should be cleaned periodically.
- Community storage bin as well as transport vehicle should be covered.
- Transport vehicle should be water tight.
- Mechanical device should be installed in these vehicle for lifting the body to the sides so that empty it quickly and easily.
- For transported the waste material for large and densely populated area should be selected in order to optimize the collection system.

Disposal of Solid Waste :-

- ① open dumping
- ② Sanitary land fill → Gmp
- ③ Composting
- ④ Pulverisation (shredding)
- ⑤ Incineration
- ⑥ Pyrolysis

① open dumping commonly adopted in our country.
→ very simple method and commonly adopted in low lying areas
→ In open dumping, SW dumped in low lying areas located far off from the city.
→ Not at all. This method is highly unacceptable as it gives nuisances, obnoxious smell and is a breeding place for flies and mosquitoes.
→ Still in practice in semi-urban and rural areas.

Gmp By sanitary land filling

- Important terms included in
- ① Site selection
 - ② Landfilling method & operation
 - ③ Occurrence of gases and leachate in landfills
 - ④ Movements and control of landfill gases and leachate.

Methods in sanitary land filling

- Select the area for dumping operation.
- Entire area divided into grid patterns (smaller portion)
- It involves a controlled disposal of SW on or in the upper layer of the earth's surface.
- Refuse is dumped and compacted in layers of 0.3 to 0.6 m and after the day work when depth of filling becomes about 1.5 m, it is covered by earth layer of about 15 to 30 cm thickness.
- Before dumping the second layer, compaction is done by movement of bulldozers etc.

- A minimum clearance distance of 6m from the surrounding area.
- Insecticides like DDT, creosote etc. should be sprayed to prevent mosquito breeding.

Land filling method divided into → 3 Part

- ① **Area Method** → When the ground is unsuitable for trench excavation especially when the water table is high.
→ entire area is divided into subarea & same procedure follow as above.
- ② **Trench Method** → Ideally suitable where adequate depth of cover material is available at the site and where the water table is well below the surface.
→ In this method, a trench is excavated and then filled with waste & cover by earth cover. as describe earlier.
- ③ **Depression Method** → At location where natural or artificial depression exist. it is possible to use them effectively for land filling operations. Canyons, ravines, dry borrow pits and quarries have all been used for this purpose.

Steps involving refuse stabilisation

- Due to absence of O_2 , anaerobic and facultative bacteria develop to decompose the organic matter and H_2 and CO_2 gases produce through acidogenic activity
- Methanogenic bacteria etc gets stabilised the organic matter and produce methane gas.
- Within 2 to 4 months, original heights settle down by 20-40% and can be used for park, green land etc.

Gases and leachates in land fill \Rightarrow

Gases: \rightarrow air, NH_3 , CO_2 , CO , H , H_2S , CH_4 , N_2 , O_2

\hookrightarrow CO_2 & CH_4 are principal gases

- movement of land fill gases can be controlled by the land fill sealants.

(Compacted clay is most commonly used)

Leachate \Rightarrow may be defined as liquid that has percolated through solid waste & soil ~~& goes do contact to~~ this leachate pollute the soil & ground water.

- Control \Rightarrow clay liners, synthetic liners, geotextiles use for controlling the leachate.

(3) Composting Method → It is the natural process of decomposition of organic waste which contains 35% to 40% organic matter & very rich in nutrients.

- Composting is a biological process in which micro-organisms mainly fungi and bacteria, convert degradable organic waste into humus like substance.
- This end product looks like soil, is high in carbon and nitrogen and is an excellent medium for growing plants.

(4) Pulverisation (Shredding)

- Refuse is pulverized in grinding machine & reduce its volume & change its physical character.
- This pulverized refuse, contains fertilising elements like potash, Phosphorous and N₂ material yet cannot be suitably used as a manure. It has, therefore, to be further disposed of by filling in trenches, or digested in open windrows or closed digestors.

(5) Incineration

- Reducing the volume and weight of SW by burning it in a well designed furnace.
- When the available land is scarce, disposal requirements are string out and destruction of toxic water is necessary, incineration is the best method for treatment of SW.
- Estimation of O₂ requirements and heat balance are very vital for efficient functioning for the incineration process.

6 Pyrolysis : → Most organic compounds can be converted into gaseous, liquid and solid fraction through a combination of thermal cracking and condensation reaction in absence of oxygen.
→ This process is known as pyrolysis and destructive distillation.

Recycling of Solid Waste :

① energy recovery, ② sanitary land fill, ③ Onsite Sanitation
(above topics)

① Energy Recovery / ITT

① Reuse : Waste being used for the same purpose again (such as refilling a soft drinks bottle);
② Recovery : Processing of waste material so that it can be used again as the same material, such as the processing of ~~waste~~ waste paper to make pulp and then new paper.
③ Conversion : Processing the waste to make something different like → Padding from clothing
Sleeping Bag from plastic bottles
Compost (LNG) from food waste
so that the heat can be used for heating water of swimming pools.

Another method of energy recovery is to collect the gas that is produced in very large sanitary land fills and use it as a fuel or to generate electricity

④ Thermo Chemical Conversion \rightarrow

④ Biochemical Conversion : →

used when high percentage of organic material
(like food, vegetable etc.)

- anaerobic Method is adopted.
- absence of O_2
- Produce biogas → used in electricity & Heat
- Residue of anaerobic digester → used in Agriculture field. & work or soil conditioner.

⑤ On Site Sanitation : →

On site sanitation is the whole of action related to the treatment and disposal of excreta & waste water,
~~that~~ that cannot be carried away by an off site
Sanitation system because of low density of population.

off site Sanitation : → It is appropriate for large scale
exploitation based on technical and economic feasibility studies
(sewer networks, run off water drains, etc.)

Characteristics of on site Sanitation

Individual on site sanitation : Single home

grouped on site sanitation : when many individual
house are linked to a network of small communities
leading to a single treatment system.

Methodologies of Sanitation

- On Site Sanitation is low cost disposal methods, like septic tank, Soak Pit. etc.
- find the capacity of particular located field like school hospital, industry etc. for designing of excreta tank.

- S
- Adopt Better Methodology for the implementation of technologies developed for construction of hygienic toilets for on site sustainable sanitation facilities and prevention of environmental pollution on a large scale in urban area as well as thousands of villages.
 - Consultancy services are provided in the field of sanitation. It organize seminars/conference to bring about a change in socio cultural attitude related to toilet.
 - Workers are getting job for construction & maintenance of toilets.

EFFECTS :-

- Preventive health care due to safe disposal of human excreta.
- Prevention of ~~defecation~~ defecation in the open.
- Provision of privacy and dignity to women and girls.
- Prevention of environmental pollution of water bodies i.e. ponds, rivers and lakes.
- Reduction of emission of gases in the atmosphere which reduce green house effects.