



\* Title :- List the factors generating solid waste in given specific area.

\* Course outcome :-

Identify the different sources of solid waste.

\* Practical outcome :-

Submit your observation along with your comments on physical parameters of different solid waste by viewing the relevant simulation / video / photographs.

\* Theoretical Background :-

The physical characteristics include size of material in waste which is importance in recovery and separation of material when mechanical means of are used like screen and magnet separator.

① Specific weight :-

Weight of waste per unit volume e.g. tons/m<sup>3</sup>. This weight is require in design of various equipment like processing unit for estimating required capacity of disposal size.



② Particle size and Size Distribution :-

It is important to be considered recovery, composting, incineration.

③ Field capacity :-

It is defined as total amount of moisture held in a waste sample under gravitational force.

It is important parameters as it affect the quantity of leachates generation permeability. It is defined as it's wt weight of water in solid waste.



i] physical parameters of Domestic waste municipal solid waste.

### ① Waste composition :-

Municipal solid waste is a mixture of wastes that are primarily of residential and commercial origin.

May categories of MSW. Are found such as food waste, rubbish, commercial waste, institutional waste, street sweeping waste, Industrial waste, construction and demolition waste and sanitation waste. MSW contain organic matter (fruit, food waste), recyclable (papers, plastic, glass etc) toxic substances (paints, pesticides used batteries, medicine) MSW composition at generation sources and collection points determined on a wet basis consist mainly of large organic fraction (40-60%) ash and fine earth (30-40%) papers (3-6%) and plastic, glass and metals leach less than 1%).

### ② Water content :-

The water content of typical MSW may include both water held in macro or freely draining pores and water absorbed into micro pores within individual waste component such as paper, carbards, textiles, food etc.

In general water content of MSW within a



landfill vary between the initial water content on collection and a water content representing fully saturated condition, moisture content measured were ranged from 90.1. to 145.1. on dry weight basis equivalent to 47.1. to 55.1. on wet weight basis.

### ③ Specific Gravity :-

Pycnometer method was employed to determine sp. gr. for MSW in laboratory for finding the specific gravity of MSW. Specific gravity of MSW in the present study found to be 2.22. The lower value of sp. gr. can be attributed to the presence of decomposed organic matter.

### \* Conclusion :-

The municipal solid waste was collected from open dumping area near city. The characterization include the waste composition, water content, sp. grav. etc properties were measured in MSW passing the 10mm sieve measured measured was ranged from 90.1. to 145.1. on dry wt basis. The sp.gr. is 2.22 the lower value of sp.gr. can be attributed to presence decomposed organic matters.



### \* Conclusion :—

The agricultural waste is collected and transferred to reuse and recycle plant.

The characterization include the wasted feed, wasted water, flush water, precipitation, evaporation, breeding, Biological activity. Municipal Solid waste, Industrial waste, are collected in proper method.

It is found that with increase in the global population and rising demand for food and others population and rising demand for food and other essential there has been rises in amount of waste being generated daily by each household. The ~~hazardous~~ waste are a serious health hazard and lead to the spread of infections disease.

# PRACTICAL NO :- 2



Title :- Suggest the relevant transportation system for transporting the solid waste at the given location with justification.

\* Course Outcome :-

Execute the relevant method of collection and transportation of solid waste.

\* Practical Outcome :-

Under take survey through internet to prepare a report on the methodology used in collection and transportation of solid waste including equipment specification used therein.

\* Theoretical Background :-

Municipal Solid Collection method of solid waste pick up from various sources like household, institutions, commercial centers etc.

and then taken to nearest transfer station by hauling vehicle.

Following are the methods used to collect the solid waste :-

- (1) Curb System
- (2) Alley Service
- (3) Set-out Service
- (4) Set out set back Service
- (5) Back yard service



### \* Transportation of solid waste methods :-

Transportation of MSW includes carrying waste from transfer station to final disposal site therefore it should be economical and effective for transportation following vehicles are used.

- 1) Animal cart
- 2) Tractor or trailerless
- 3) Trucks
- 4) Compactor vehicle
- 5) Dumper

### \* Tools and equipment used to collect solid waste :-

- 1) Litter Bin
- 2) Hand cart
- 3) Pedal tricycles
- 4) Movable Bin
- 5) Stationary Bin
- 6) Boom
- 7) Shovel
- 8) Mechanical and sweepers.

# \* Report \*



Page No. :  
3

Methodology used to collection and treatment of solid waste including equipments.

## I Domestic waste :-

A) Method of collection of Domestic waste :-  
Due to rapid urbanization there has been an increasing in Domestic solid waste collection as well as municipal waste. Municipal spent in maintaining public health around the world. Waste of collection from point of production to the point of disposal. Following method used to collect domestic waste.

- 1) Curb System
  - 2) Alley Service
  - 3) Set out service
  - 4) Back yard service.
- These method make more effective collection of solid waste. Due to collect problems created. It reduce the unplanned or whatever waste in correct way or method in proper manner.



### Transportation of Solid waste / Domestic waste :-

- The transportation of waste is the movement of waste over a specific area by trolley's tankers, barges or others vehicles. Hazardous waste may be transported to be treated stored off disposed off near station water and solid container is required to collect the waste.
- Tractor also collect the waste and transport.
- Recently used of animal cart for means transportation of waste.

### Equipment used to collect domestic waste :-

- The refuse compactor vehicle use the solid waste collection equipment designed for lifting and unloading the garbage from garbage bins / containers. Compaction of to dumping station plants. The refuse compactor are having of volume  $8\text{ m}^3$ .
- Litter bin is used to collect waste in house they may be made of iron, plastic. the size of litter bin is different.
- Hand used foot household. Suitable for congested & narrow street. Size is about  $0.4\text{ m}^3$ . Capacity 200kg.
- Wheelbarrow used for garbage collection size is usually five cubic feet.
- Pedal tricycle use transfer of waste. These are made up of metal. It loads up  $1.5\text{ m}^3$ .
- Broom are excellent tools for collecting dust &

Sand as well sweeping leaves. It mad up of long transport to take long smoke.

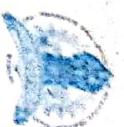
### \* Industrial waste :-

#### A) Collection method :-

- The hazardous wastes can be demaded to a large degree by such low-cost measures as restricting access. Lencing off the storage area to minimize any wind blow nuisance providing separate covered storage for combustible or hazardous waste ensuring regular and frequent collection.
- The municipal authority can also collect industrial waste Industries must pay the charge which will be based on quantity and nature of the waste.
- Waste are travelled by hand into storage container and loaded manually into carriers.
- The people undertaking salvaging do so mainly by hand picking out useful item usually not even wearing gloves. Although these may not be health risk in handling clean waste paper.

#### 3) Transportation of Industrial waste :-

- Transportation of waste of industrial is metropolis areas of developing countries is generally not by purpose built vehicle such as skip carrying losing but open trucks. The waste are not covered during transportation. It is typical for a firm not to have any standing arrangements with one contractor but to allow





collection by wherever is the contractor quoted lowest rate.

There are certain measures in a municipal authority can take to control the streams-position of industrial waste, even if it does not want to become actually involved itself.

### (c) Equipment used to collect Industrial waste :-

- Storage containers used to collect waste
- It should be strong, watertight, not easily corrosible, insect resistance is it not easily corrosible less than 20 & not more than 33 gallons capacity.
- Bulk container
- Dumpster unit
- Each storage device ~~is kept clean~~ expect when covers shall not be removed
- Covers shall not be removed except when necessary to place garbage and refuse in the storage containers.



### 3) Bio-medical waste :-

A) Collection of Bio-medical waste :-

- Done at point of generation of waste.
- Process where wastes of different types, hazardous nature and consistency are separated.
- As per the categories.
- Colours coded containers.
- Wheeler should be display.
- Local language.

### 4) Transportation of solid waste :-

- Vital link
- Source - Intersit - storage site → final disposal
- Secured from the public as well as waste handlers
- Minimum effort, spillage or disturbance to the waste
- Frequency & timing of transport should be informed.
- keep proper documentation of frequency.

### 5) Equipment used in bio-medical waste :-

- Needles
- Ampules
- Broken glasses
- Blades
- Razors
- Staples
- Tractors



g) Red container or Red liner in containers :-

- Inflection waste
- Blood product (albumin)
- Contaminated personal protective equipment
- Cultures stocks.

g) Trace chemo yellow container

- Empty vials, ampules
- Empty syringes, needles
- Empty IVs
- Gowns
- Tubing
- Appoons
- Wipes
- packaging

g) RCRA HAZ EPA RCRA Hazardous Black container :-

- Hazardous meds
- Half / partial doses
- Hazardous Bulk meds
- P. listed drugs, packing
- Bulk chemo
- pathological waste

g) PHARM BLUE / WHITE CONTAINER :-

- Pills
- Injectables
- Antibiotics.

## \* Report \*



Page No : 9

### \* Physical parameters of Agricultural waste :-

1) Wasted feed :-  
Wasted feed can add nutrients and solids to the waste stream. Even though management can minimize the amount of feed wasted the certain amount of feed that is presented to livestock and poultry will not be eaten.

### 2) Flush water :-

Flush water added to the waste streams will affect the consistency of the manure to the extent fresh water is added to the system. Using recycled water for flushing minimize the amount of water added and needing to be managed.

### 3) Precipitation / Evaporation :-

Precipitation and evaporation can impact the physical characteristics of manure significantly depending on the region. In the region high precipitation the added water can impact the consistency of the manure unless management exclude it. Evaporation on the other hand can reduce the amount water in the manure. But again management of the manure will determine its impact e.g. allowing a const to form on a waste storage pound will reduce evaporation.



### ④ Bedding :-

Live stock productivity use wide range of bedding materials as influenced by availability, cost and properties both organic and inorganic material have been substantially used for bedding of materials commonly used for dairy cattle.

### ⑤ Wasted wastes :-

Wasted wastes must be expected and controlled. Excess moisture content increased waste volume can hamper equipment operation and limit the capacity of manure handling and storage facilities. Faulty wastes and leaky distribution lines causes severe limitation.



BIOT  
Page No.: //

## Physical parameters of Industrial waste :-

### Total Solid :-

The total solid in a waste water consist of the insoluble or suspended solids and the Soluble compound dissolved in water. The suspended solid content is found by drying & weighing the residue removed by the filtering of the sample.

When the residue is ignited the volatile solids are burned off. Volatile solids are presumed to be organic matter although some organic matter will not burn and some inorganic salts break down at high temperature. The former are known as volatile solids, the latter as fixed solid usually volatile solids are organic.

### Colour :-

Colour is a qualitative characteristics that can be used to assess the general condition of waste waters.

Waste water that is light brown in colour is less than 6h old, while light light to medium grey colour is characteristics of waste water that have undergone some degree of composition or that have been in the collector ion system for some time.



### \*Conclusion :-

Citizen in this city are concerned about the illegal littering and uncontrolled dumping. To increase the awareness of people to use appropriate method of collection and transportation as well as and equipment require to collect such as transport the solid waste, agricultural waste, municipal industrial and transport. Improve the collection and action of the waste will positivity mounted contribution towards the well environment.

# PRACTICAL NO 3

Page No. :

1

**Title :-** Propose the organization chart required to manage solid waste for the given village/town/city of your locality.

**Course Outcome :-**

Execute the relevant method of collection and transportation of solid waste.

**Practical outcome :-**

view the relevant video / simulation / photographs Print material / non print material of the operation in transferstation to draw the flow chart for same.

**Theoretical background :-**

**Transfer station:-**

- These are open or closed structure build by competent authority at various location in the city of waste collected by handling vehicle is initially transfer to these station from where it is transported to disposal site like compost plant incinerator or landfill.

Transfer station should be constructed at suitable location so as to minimize the haul distance.

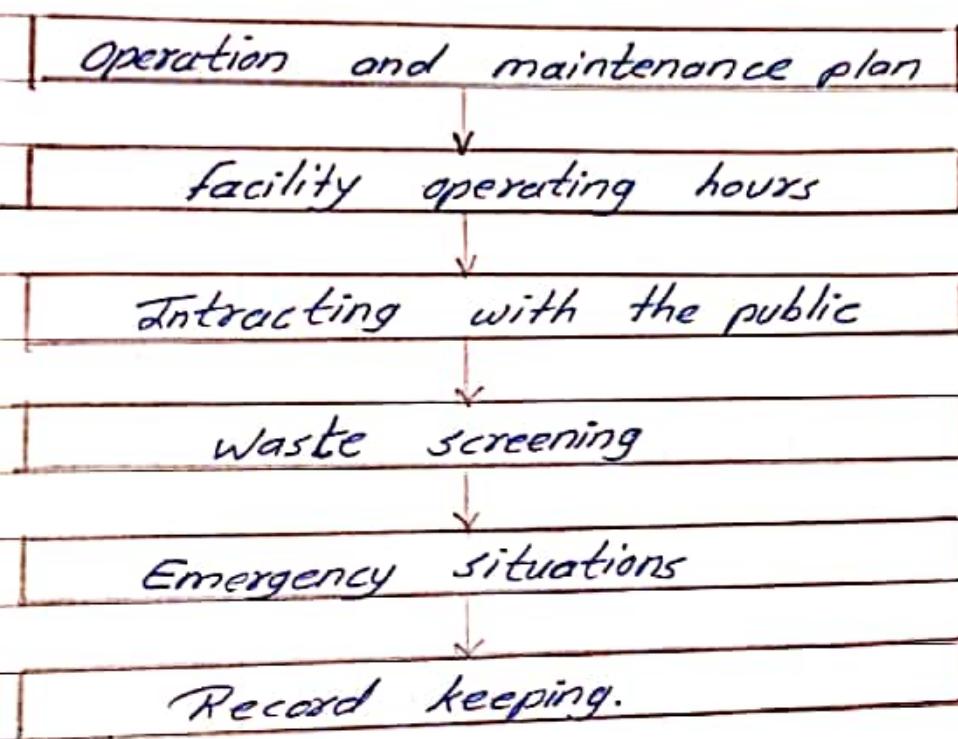


### Necessity of transfer station.

- 1) It helps in preventing scattering of MSW
- 2) It prevent nuisance due to scattered solid waste to nearby area.
- 3) Reduces hauling distance.
- 4) Provide facility for proper storage and collection of MSW from diff. area.

## Observation

In transfer station operation is as follow.



### Operation and maintenance plan.

- Although a transfer station's basic function as a waste consolidation and transfer facility is straightforward, operating a successful station involves properly executing many different tasks. Some tasks are easily understood, while others are too difficult to conduct properly without step-by-step direction. To help ensure proper operation, transfer station should have written operation & maintenance plan. This plan often requires all state, tribal or local regulations.



- facility operating schedule, including days of the week, hours each day & holiday.
- Description of acceptable & unacceptable wastes, & procedure for diverting restricted waste before and after unloading.
- Operating methods for each component of the facility, including waste-screening method, truck-weighting procedure, tipping floor operation, transfer vehicle loading onsite & offsite litter cleanup & waste water collection system operation.
- Employee training, safety rules & regulations, Record keeping procedure, Emergency procedure etc. includ in operation & maintenance plan

### Facility operating hours

- A transfer station's operating hours must accommodate the collection of schedule of vehicle delivering waste to the site facility. Operating hours need to consider the local setting of the transfer station, including neighboring land uses, as well as the operating hours of the disposal facility receiving waste from the transfer station.

- operating hours vary considerably depending on individual circumstances. Many large facility located in urban, suburban industrial zones operate 24 hours 7 days per week, urban, suburban & rural transfer station of various size commonly open nearly in the morning (6am to 7.am) & close in late afternoon (4.p.m. to 5pm) In case of many, the last trailer must be loaded with sufficient time to reach the disposal site before it closes (typically 4pm to 6pm).
- Transfer station that serve both the general public & waste hauling hauling companies typically operate 6 or 7 days per week. Facilities that are not open to public typically operate 5 or 6 days per week because many waste hauling companies are not operate on sunday & have limited operation on saturday. Many smaller & rural facilities operate only on certain days of the week & have limited hours.
- When transfer station is open to receive waste from customers. Operation often extend beyond the "operation open for customers" hours, however, as worker load waste into transfer vehicle, clean the facility & perform equipment maintenance.



## Interacting with public.

- Every transfer station has neighbors, whether they are industrial, commercial, residential or merely vacant land. The term "neighbor" should be broadly interpreted, as some of those impacted might not be immediately adjacent to the transfer station.  
e.g. Vehicle traveling to and from transfer station could significantly affect a residential neighborhood a mile away if those vehicle travel on residential streets.
- When developing a community outreach plan, transfer station operator should consider following.
  - Develop clear explanation of the need for the transfer station & the benefit it will provide to the immediate community & surrounding area.
  - Develop a clear process for addressing community concerns that is communicated to the neighborhood even before the facility becomes operational.
  - offer support services such as newspaper drives, household hazardous waste drop-off days, and spring cleaning disposal at the facility.



## Waste screening

- As described in the section on unacceptable wastes in the planning & siting a Transfer station chapter, some type of waste are not appropriated for handling at a transfer station. These unacceptable wastes might be difficult to handle, dangerous, prohibited at the disposal facility where the waste is sent or subject to a recycling mandate. Transfer station operators should screen for unacceptable material before, during & after customer where they can dispose of wastes inappropriate for that transfer station.
- Some unacceptable waste might not become apparent until the unloading process. Operator should observe waste unloading & examine suspected unacceptable wastes. Waste unloaded into the floor or into a pit is easier to monitor than waste unloaded directly a transfer container or vehicle. Ideally unacceptable waste would be noticed before the delivery vehicle has left the site.



## Emergency situation

Most days at a transfer station involve routine operation. Transfer station operator should prepare for emergencies, however & include emergency procedure in their written operation plans. State regulatory agencies often require submission of plan of operation & a contingency plan for review & approval. At minimum the following emergency events should be anticipated.

- 1) Power failure
  - 2) Unavailability of transfer vehicle.
  - 3) Unavailability of scales
  - 4) Fire
  - 5) Spill containment
  - 6) Discovery of hazardous material
  - 7) Injuries to employee or customers.
  - 8) Robbery
- Emergency plan should include a list of emergency contact, including daytime & evening phone number for facility management, facility staff, emergency response team, frequent customers & regulatory agencies.



## Recordkeeping :-

- Detailed operating records enables both facility managers & regulatory overseers to ensure that the transfer station is operating efficiently & in accordance with its permit requirement. Medium & large transfer stations typically record the as follow.

- 1) Incoming loads
- 2) Outgoing loads
- 3) Facility operating
- 4) Complaint log
- 5) Accident or release
- 6) Testing result.
- 7) Maintenance record.
- 8) Employee health & safety report.
- 9) Employee training & operator certification documentation?

- Some transfer station operator particularly at smaller facility, find it to necessary to record only some of the above items. In order to avoid the cost of installing & operating a scale, some small & medium size transfer station substitute estimated load volume instead of weighing loads. When loads can't be easily viewed, cubic yard are generally based on the vehicles capacity loads in cars & pickup trucks are typically charged a minimal flat fee.



### Conclusion:

As the trend to transport waste from transfer station to remotely located landfill continues, transfer station owner will incorporate changes in siting, planning & design to insure flexibility & the ability to remove waste in the most effective manner.



\* Title :-

Propose the organization chart required to manage solid waste for the given village/town/city of your locality.

\* Course Outcome :-

Execute the relevant method of collection and transportation of solid waste.

\* To practical outcome :-

Design the organization chart for the agency managing solid waste for a given area with a report on with on with respect to population to the serve pattern, machineries, equipment manpowers used.

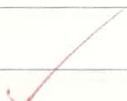


## \* Types of different solid waste :-

- 1) Domestic waste
- 2) Industrial waste
- 3) Commercial waste
- 4) Agricultural waste
- 5) Biomedical waste
- 6) Market waste
- 7) E-waste
- 8) Institutional waste

## \* Method of disposal of solid waste :-

- 1) Incineration
- 2) Landfilling
- 3) Composting



- a) Indoors method
- b) Bangalore method  
composting.



# \* REPORT \*

Organization plan of solid waste management for pune city.

Collection

Storage

Segregation recycle  
and reuse

Transportation

Processing

Scientific  
Disposal



### \* Collection :-

- 1] Door to door collection.
- 2] Gate collection from household by ghantagadi directly.
- 3) Community bin collection by Dampers places.
- 4) chronic spots.

### \* Storage :-

- All waste are collected at site and transfer next procedure for recycle & reuse of want.



Papers	-	6.1.
plastic	-	5.1.
metal	-	3.1.
Glass	-	5.1.
Organic	-	33.1.
Leather Rubber	-	1.1.
Inert material	-	25.1.
miscellaneous	-	22.1.



## \* Transportation :-

- From DEO DTDC to transfer station.
- From transfer station to processing / land fill.
- Lack of secondary transportation in only 70%.
- Insufficient number of bulk refuse carriers leading to pile up of primary collection vehicle at transfer station.
- Only 20% vehicle drivers are avoidable.

## \* Transportation equipment :-

- 1) MS box type garbage containers
- 2) Gantagadi
- 3) Dustbin
- 4) Tipper
- 5) Rickshaw dustbin
- 6) closet body tipper
- 7) Auto Dustbin



## \* Processing :-

- After transportation waste are go to disposal processing.

Following landfill method are used

- 1) Wet
- 2) Dry
- 3) Mixed
- 4) Specialized
- 5) Scientific landfill

- Since June 2010: Scientific processing scientific landfiling.

1) Bhumi Green solution :- • 200 TPD, compost

- Hadapsar Ramp and Tekdi Industrial Estate.

2) Mechanical compact :- • 50-100 TPD; Vermi st and compost

- 13 decentralized

3) Biomethanation :- • 125 TPD Electricity and compost.

- 25 Decentralized plants.



## Awareness programs

### Organised area

- Rallies and meetings with housing societies
- poster exhibition and video on Segregation shown in society.
- Games to help spread awareness about Segregation.
- Surprise visit to check compliance of segregation.
- Issue notice from pinc for compost pits and Segregation of garbage

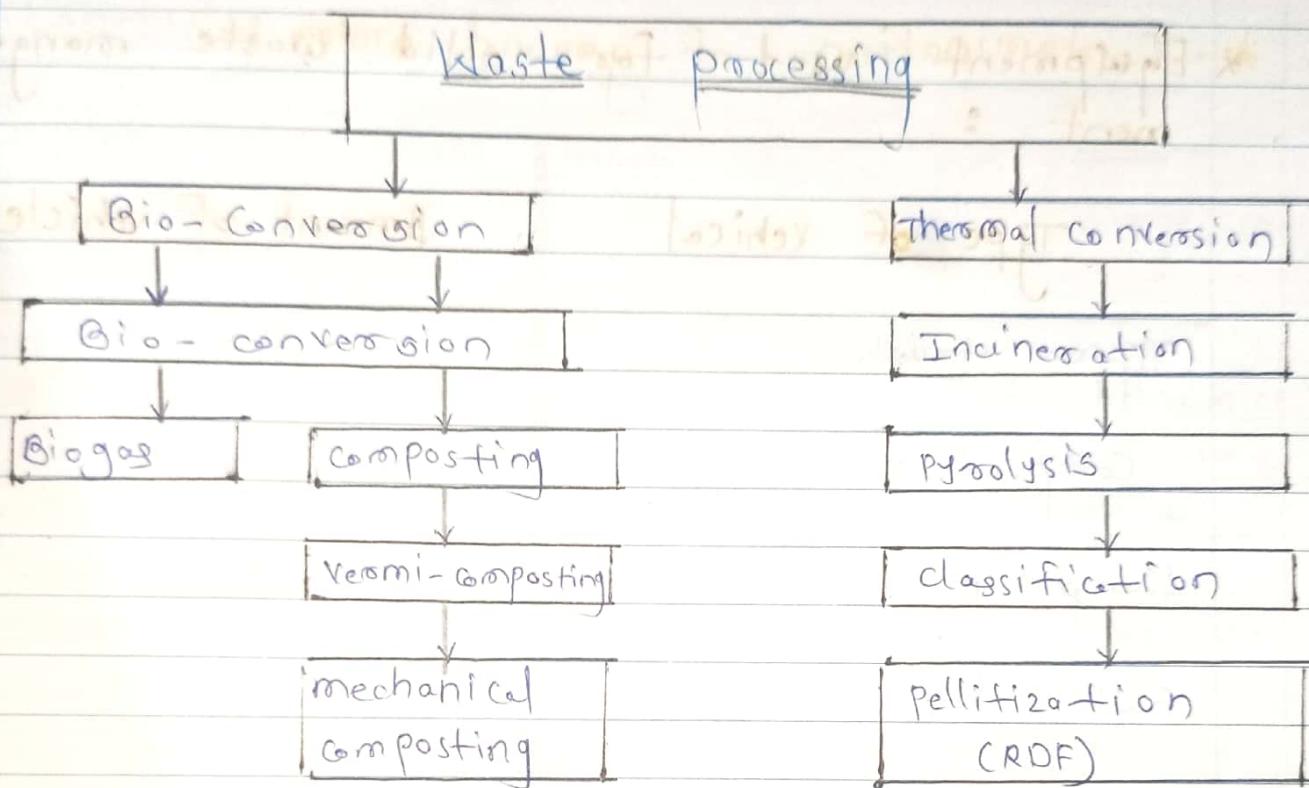
### Un-organized area

- Awareness Rallies
- Door to door awareness.
- Street play, puppet shows.
- Surprise Audit to check compliance of Segregation.
- Meeting with others Ganesh madals and others.



## \* - Contamination of ground waters :-

- ① During landfill site operation a liquid known as leachats in produce.
- ② It is a mixture of organic degradation product liquid waste and rainwater.
- ③ It has a high organic carbon content, high concentration of nitrogen and is usually slightly acidic.
- ④ The liquid is highly toxic and can pollute land and waterway.



### \* Scientific treatment of waste :-

- The total CO<sub>2</sub> equipment emission could have been 5.58 times the current emission in case pmc had not installed the scientific technologies to process MSW in pune city.



\* Equipment used for solid waste management :

Type of vehicle	Amount of vehicle
Tipper truck	160
Compactor	24
Dumper places	85
Bulky Reduce carriers	59
mechanical sweeper	02
other	119

\* Areal population :-

- Pune is the 5<sup>th</sup> largest city in India 2<sup>nd</sup> in Maharashtra.
- population :- about 4.5 to 5 million
- Household :- Nearly 1.2 million
- Area - 333.56 Sq. Km
- 41 Electoral Ward
- 15 - Administrative zone

Estimated per capita daily waste generation is 364 gm.  
1040 metric tonne.



## \* Conclusion :-

- the city has taken multi dimensional approach to overcome the challenge of urbanization.
- The solution lies in using different technologies tailored made to solve the specific needs the problems at local level.
- Citizen and Governance have come together and mutually agreed to execute solution.
- Pune - An Emerging Eco-friendly

Ans



\* Title :- Describe the relevant solid waste disposal plant of given location with justification.

\* Course outcome :-

Execute the action plan for disposal solid waste.

\* Practical outcome :-

Submit your observation along with your comment on solid waste disposal plant by viewing the relevant video simulation / photographs.

\* Theoretical - Background :-

Disposal of solid waste by composting, landfilling  
Incineration.

In composting of solid waste decomposed by controlled aerobic or anaerobic process.

Composting is done by following method :-

- ① Indoors method / window method.
- ② Bangalore method
- ③ Mechanical composting
- ④ Vermi-composting meth.
- ⑤ Incineration.



In composting, process is done in three stages : Mainly :-

- ① Preparation of solid waste.
- ② Decomposition of solid waste.
- ③ Marketing of final product.

In composting process first step rubber, plastic metals are removed organic material form. Solid waste start decomposition micro-organism present in waste convert solid waste in to soil conditioner.

- Bacteria oxidize organic matter to carbon dioxide & liberate heat.
- Bacteria thermophile take over and continue decomposition in  $45^{\circ}\text{C}$  temperature.
- During process temp. rises further upto  $60^{\circ}$  which destroys pathogenic bacteria. In about 4 to 5 weeks biodegradable matter gets consumed and complete stabilization occurs 2 to 8 weeks.
- The end point of composting is drop in temperature.
- One should take proper care as far as moisture content is concerned because excessive moisture will make it difficult to maintain aerobic bacteria.
- As excessive moisture is dangerous for aerobic bacteria.



### \* Landfilling method :-

- In this method refuse is filled or dumped into cells in layers of about 1.5m thick and then it is covered with good earth of about 15-20cm thick.
- Filled refuse will get stabilized due to decomposition by a aerobic as well as anaerobic bacteria process.

### \* Advantages :-

- ① Public health problems are minimum.
- ② No air pollution due to burning.
- ③ Looks aesthetically good.
- ④ Minimize moisture entering into refuse.
- ⑤ Supports regulation.

### \* Disadvantages :-

- ① It may pollute ground waters.
- ② May result bad odour if not treated properly.

### \* Method of land filling :-

- ① Area method.
- ② Trench method.
- ③ Ramp method.
- ④ Valley method.



## \* Incineration of waste :-

- Incineration is one of the most effective disposal method in which solid organic waste are subjected to combustion and convert them reduce and gaseous products.
- Most combustible material is converted into ash and carbon-dioxide.
- The combustible garbage is burnt in the furnaces.
- The residual of their waste after burning are used to produce low grade concrete.

## \* Advantages :-

- ① All pathogens and insects are burnt and destroyed.
- ② Procedure will not cause dust nuisance.
- ③ There is no odour as require less space for disposal.

## \* Limitations :-

- ① If the function of incineration is not proper it may cause smoke and odours nuisance.
- ② Some what costly treatment.
- ③ Require large energy for burning solid waste.
- ④ More transport vehicle for are required.

# \* Report \*



**BIOT**

Page No.: 5

## \* Report \*

\* Area of city :- Latur

\* population of city :- 6.84 Lakhs

\* Waste generate per day :- 150 tonne

70-80 tonne Dry waste

40-50 tonne wet waste

50-60 tonne Drainage dirt.

\* Vechicle for collecting waste :- 84 tractor for door to door collection of waste.

\* Types of machinery used in this plant :-

Warrior 600 → 2000000 l-

Rotary Screen Trommel → 1800000 l-

\* Area of disposal plant :- [22 acre]

Latur has emerged as the top national corporation in the best solid waste management under clean survey in 2019 & has won the first national level award. An elevation from a city with a population of 3 to 10 lakhs has been awarded this award.



A clean survey campaign was implemented by the central government. The central government squad under this mission evaluated Latur municipal solid waste management. Latur municipal corporation tops the first. Latur municipal corporation has been successful in classifying and disposing dry and wet waste. Fertilizer generation project in road no 5 & 18 have been setup at govt. colony. fruit market. A dry waste disposal project has also been set up at government colony. The garbage depot at Yavanti has a huge pile of garbage and large processing system has been set up for thousand of tonnes of waste every day. Latur municipal corporation has done very well by painting the public walls of city by ghantagadi govt. division No.5 for first time Latur municipal corporation for set up a fertilizer production project for the first time.



## Conclusion :-

Solid waste management in developing of our countries. There is no doubt or tendency that waste management in cities needs to radically change from current practices. Indeed rules (2000) current practices signify a right direction for solid waste management. Proper disposal is needed for particular waste for avoiding congestion of waste pollution and reduce the waste to use proper or appropriate treatment on the waste.

JAL



\* Title :- Describe different steps of executing the relevant method of disposal composting for the given site.

\* Course outcome :-

Execute an action plan for disposal of solid waste.

\* Practical Outcome :-

Submit your observation along with your comments on composting plant by viewing the relevant video.

\* Theoretical Background :-

\* Composting :-

- Composting is organic matters that has been decomposed in a process called composting.
- composting is a biological decomposition of organic waste under controlled aerobic condition .
- In composting solid waste is converted into a humus like material that which is manure by decomposition of solid waste under aerobic condition .
- This humus has demand as fertilizers for farms.



\* Advantages :-

- 1) It produce manure which is useful for increasing yield of crops.
- 2) Method is easy for disposal of waste.
- 3) Improve soil aeration.
- 4) Prevent erosion of soil.

\* Factors affecting composting process :-

- 1) Particle size.
- 2) Temperature.
- 3) PH.
- 4) Carbon Nitrogen ratio.
- 5) Moisture content.
- 6) Bleeding and seeding.

\* Method of composting :-

- a) Manual method
- i) Indoors method
- ii) Bangalore method.



b) Mechanical method

c) Vermi-composting method.



## \* Report \*

Name of city :- Latur.

Area for solid :- 22 acre.  
waste management

Type of waste :- Municipal waste

Quantity of different waste :-

Dry waste  
40-50 tone

wet waste  
70-80 tone

Process used for  
composting of waste :- Biomining and segregation.

Total waste :- 140-150 tone per day.

Workers work in composting process :- 15 approx.

Fund of municipality :- ₹ 1,89,00,000/- per month.



Composting means decomposition of organic matter by approximate method or this method adopted by studying about type of waste e.g. method of composting depends upon type of waste.

In Latur city we had seen the Biomining and segregation process for decomposition of waste.

In biomining process near about 15 workers are work on it. They separate the dry waste e.g. the waste which can't decompose (non-degradable waste). For this process 45 days are to be taken for composting of waste. This process is done by collect waste in small pit and separation of non-degradable waste. Each day any one activity done on it first of all wet the wet waste by watering and spray the bioculture on it then turning of waste is take place by machine like JCB.

Biomining process is only for wet waste. This method is economic.

## \* Segregation process :-

In this process dry waste is decomposed by using machines. In this process separate out the different size of waste in 35mm, 16mm and 4mm screen and then go to error marketing or agriculture used as manure.

In this site 3.5 lakhs tone waste is present 80000 tone waste decompose waste upto days. Separation is done in rotary Trommel. cost of this machine work at night and capacity of decomposting waste 100tonne/day.

## \* Conclusion :-

In conclusion, during the composting of agricultural wastes the addition of animal manure can enhance the degradation process whilst of the composting of municipal waste and kitchen waste it is important to measure the metal content because of its toxicity.

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\* Title 8- Suggest the design criteria adopted in exhibition of vermi-composting for given area with justification.

\* Course-Outcome 8-

Execute an action plan for disposal of municipal solid waste.

\* Practical outcome 8-

Prepare the specification of Vermicomposting plant for the given type of building with suggested action plan to implement it by viewing the relevant video/ simulation/ photograph.



## \* Theoretical Background :-

### Vermi stand for earthworm

When the organic matter like food waste recyling material such as paper and card board, leave etc. Subjected to decomposition with the help of earthworm the final product is vermicompost and the process to make it is called as Vermicomposting.

- It is low cost effective waste management technology in which the earthworm are used to consumer and used to consume and digest the organic waste which further give rise to excreta in the form of granules called vermicomposting.
- Earthworm eat the soil and various organic matters which undergo complex biomedical change in their intestine & excrete out in the form of granular mass.
- It improve the quality of fruits & vegetables.



## \* Specification \*

- It is the product of the decomposition process using various species of worm usually red wiggler, white worm and others earthworm to create mixture of decomposing vegetable or food waste, bedding material and Vermicompost cast.
- Vermicompost also called worm casting worm humus, worm manure or worm faeces is the end product of breakdown of organic matter by the earthworm.
- Vermicompost contain water soluble nutrient and is an excellent, nutrient rich organic fertilizer and soil conditioner.
- It is used in farming & small scale sustainable, organic farming, it is applied for treatment of sewage.



## \* Suitable worm species :-

- One of the species most often used for composting is the red wiggler or larger worm. *Lumbricus rubellus* earthworm is used but does not adapt as well as to the shallow compost bin as does  *Eisenia fetida*.
- European nightcrawlers may also be used uses refers to European nightcrawlers including *dendrobena*, *dendras* and nightcrawlers.
- These species commonly are found in organic soil throughout Europe and North America and live in cutting vegetation, compost and manure piles.
- Composting worm are available to order online, from nurseries, mail order suppliers.



## \* Small Scale Vermicomposting \*

- For vermicomposting at home, a large variety of bins are commercially available. They may be used as they are or made of wood, old plastic containers, wood, styrofoam or metal containers. The design of small bin usually depends on where an individual would like to feed worms.
- Some materials are less desirable than others in worm bin construction. Metal containers often conduct heat too readily and are prone to rusting and may release heavy metals into the vermicomposting.
- Some cedar, yellow cedar, hemlock, and other wood species that may be used to build worm bins.



## \* Large scale Vermicomposting \*

Large scale Vermicomposting is practiced in India, Japan, the United States.

The Vermicomposting may be used for farming, landscaping, to create compost tea. Some of those operations produce worms for both home Vermicomposting.

- There are two main methods of large scale vermiculture. Some systems use windows, which consist of adding material for the earthworms to live in and act as large bin.

- The window method and compost window turns were developed by Fletcher Sims Jr. of the Compost Corporation in Canyon, Texas.

- The window composting system is noted as sustainable, cost efficient way for farmers to manage dairy waste.



### \* Soil Conditioner :-

- Vermicompost can be mixed directly into the soil, or mixed with water to make liquid fertilizers known as worm tea.
- The dark brown waste liquid or leachate that drain into bottom of some Vermicomposting system is not to be confused with worm tea.
- The pH nutrient and microbial content of these fertilizers varies upon the inputs fed to worm. be added to system to raised pH.
- The vermicomposting widely used for on site institutional processing of food scrap such as in hospital, shopping mall & correctional facilities. it is used in medium scale on site organic material recycling.



## Conclusion :-

In this practical we study the design criteria adopted in exhibition of the vermi-composting and various specification and uses of Vermicomposting.



\* Title :- Compare the characteristics of given type of biomedical waste with other given type of waste material.

\* Course-outcome :-

Implement the relevant method for disposal of biomedical waste.

\* Practical-outcome :-

Submit your observation along with your comments on disposal of biomedical waste by viewing the relevant video simulation.

\* Theoretical Background :-

\* Def'n of biomedical waste :-

The waste generated by hospital, nursing or maternity homes, clinic, dispensary Veterinary institution, animal house, pathological laboratory and institutions, blood bank which is either putrescible or potentially infectious to the human health & the environment is called as biomedical waste.

Provision in the law for safe disposal of biomedical waste.



• Disposal of biomedical waste is now a legal requirement in India. The ministry of environment & forests notified the biomedical waste rule 1998 in July 1999. In accordance with these rules.

- the duty of every occupier i.e person who has the control over the institution or its premises to take all steps to ensure that waste generated is handled without any adverse effect to human health and environment.

- The hospitals, nursing homes, clinics, dispensaries, pathological laboratories etc.

- Biomedical waste rules have six schedule are as follows :-

Schedule I :- classification of biomedical waste in various categories.

Schedule II :- colour coding and type of container to be used for each other category of biomedical waste.

Schedule III :- proforma of label to be used on containers bag.



Schedule IV :- Proforma of label for transport of waste container/bag.

Schedule V :- Standards for treatment and disposal of waste.

Schedule VI :- Deadline for creation of waste treatment.

### \* Methods of disposal of Biomedical waste \*

#### ① Autoclaving :-

- Thermal treatment is typically used for sharp and certain other type of infectious waste. An autoclave is like a large pressure cooker that uses high pressure/temperature and steam to deeply penetrate all material and kill any micro-organism.
- Depending on the type and amount of waste you will need to sterilize.

#### ② chemical treatment :-

- It is used to deactivate liquid waste, chemical treatment is designed to decontaminate or deactivate certain waste on site rather than packing and sending them to a separate facility.
- Depending on the type of waste, chemical



like chlorine, sodium hydroxide or calcium oxide can be used. Chemical treatment has to be executed carefully and by knowledgeable staff.

### ③ Micro wave treatment :-

A microwave treatment system, similar to an autoclave also uses heat to decontaminate medical waste. These systems work best for waste that is not 100% dry or solid as moisture allows the heat penetrate deeper and the steam sterilizes.

### ④ Incineration :-

- Incineration is typically used for pathological and pharmaceutical waste.
- Incineration of medical waste should be performed in a controlled facility to ensure complete combustion and minimize any negative effects for the environment.

### ⑤ Land disposal :-

- Land disposal is typically used for shredded, treated and decontaminated waste.
- In certain cases, it can also be used for hazardous waste or other untreated waste that can.



## \* Observations \*

- ① Autoclaving
- ② chemical treatment
- ③ Microwave treatment
- ④ Incineration
- ⑤ Land disposal
- ⑥ Deep Burial.

Biomedical waste disposed by first making it safe through a sterilization process. Waste that can't be recycled, like gaze or needles, still needs to be made sanitary and non-hazardous before it can be disposed of. The process is usually done by using autoclave. A medical autoclave is ~~that uses~~ steam to sterilize equipment and other object. This means that all bacteria, viruses, fungi and spores are that no bacteria can survive and thus the items are deemed safe for recycling or disposal.



- Waste dispose of their categories.
- Red, yellow, black & white containers are used for collect biomedical waste.

### Red bag bag :-

- It include needles, humps, broken glass, blades staples, tissues. It all include the of infectious waste, blood product.

### yellow container

- It include gloves, tubing, spoons, wipes, packaging empty vials etc.

### Black container

- It include hazardous meds, bulk chemo, pathological waste etc.

### Blue container :-

- It include pills, injectables & Antibiotics waste.

### \* Conclusions :-

The biomedical waste treatment & disposal need to be in a complete management to ensure the safety workplace & maintain our health use appropriate method of disposal of biomedical waste to avoid the various infectious as well as affect on health & environment.



\* Title :- Describe the different sources of generating given type of biomedical waste and classify with basic of given criteria.

\* Course-outcome :-

Execute the relevant method for disposal of biomedical waste.

\* Practical Outcome :-

Prepare the specification for disposal of biomedical waste by viewing relevant / video / simulation.

\* Theoretical Background :-

- Provision in law for disposal of biomedical waste.

- Disposal of biomedical waste now a legal requirement in India. The ministry of environment and forests the biomedical waste rule 1998 in July. In accordance with these rules following are made.



\* Some are the disposal method of biomedical waste are as follows :-

① Autoclaving :-

Thermal treatment is typically used for sharps and certain others types of infectious waste. An autoclaving is like a large pressure cooker that uses high temp & steam to deeply penetrate all materials and kill any organisms.

② chemical treatment :-

It is used to be applied some non liquid infectious wastes but they would typically need to be shredded first to ensure that all part of waste are exposed to material.

③ Microwave treatment :-

A microwave treatment system to an autoclave, also uses heat to decontaminate medical waste. These system work best for waste that is not 100% dry or solid as the moisture allows the heat to penetrate deeper and sterilize.



Duty of every occupier. i.e. person who has the control over the institution or its premises, to take all steps to ensure that waste generated is handled without any adverse effect to human health and environment.

The biomedical waste rules have six Schedule below :-

Schedule I :- classification of biomedical waste in various categories.

Schedule II :- colour coding and types of containers to be used for each category of biomedical waste

Schedule III :- Proforma of label for transport of waste container.

Schedule IV :- Proforma of label for to be written on carry bag.

Schedule V :- Standards for treatment & disposal of waste.

Schedule VI :- Deadline for creation of waste treatment.



### ④ Incineration :-

It's typically used for pathological and pharmaceutical waste.

### ⑤ Land disposal :-

It is used for shredded, treated and decontaminated waste. In certain of cases, it can also be used for hazardous waste or other untreated waste that can't be decontaminated by other means.

### ⑥ Deep Burial :-

A pit or trench is excavated in about 2m deep. It is half filled with waste and then covered with lime within 50cm of surface, then filling the remaining portion with soil. cover is provided at top with lack facility.



## \* Specification \*

### ① Suppliers Responsibility :-

The supplier must provide evidence and reference of being a recognized supplier or manufacturer of biomedical waste disinfection device applying microwave technology and shall provide all necessary test certificates and other existing documents to verify that equipment is commercially available and functioning advice and provide technical documentation and specification for use of equipments as deemed necessary.

### ② Personnel in the field :-

The waste suppliers appoint a primary contact point for undo and will responsible for the service of supplier and especially for the installation. All staff deployed /must be suitably qualified and in possession of the necessary valid permit in to work in india for the duration of contract.

### ③ Import duties & taxes :-

The requirement condition for delivery at site. ie. each end user in state shall be inclusive of all tax.



including VAT.

#### ④ Guaranteed warranty requirements :-

All delivered good shall be guaranteed for manufacture defect for a period of 24 months from date issue of certificate of acceptance. A warranty period of 24 months starting from the issuance of certificate of acceptance is therefore required.

In the unlikely event that the equipment will be found not compliant with the respected specifications as sp. in section 2 contractor shall replace the equipment within maximum six months.

#### ⑤ Delivery terms :-

If is sole responsibilities of the supplier to deliver the goods to the named place of destination upon delivery of goods, the supplier is responsible to obtain certificate acceptance that the goods have been delivered in good condition.

#### ⑥ Delivery period :- The waste can deliver as soon as possible. the bidder shall reconfirm the possibility of the earliest delivery date of good after receipt of the signed purchase orders.



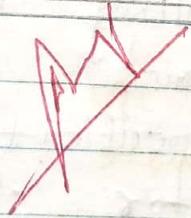
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## Conclusion :-

From this practical we know that specific of biomedical disposal. We need to dispose of biomedical waste as per their category.



-> Biost. part 7



\* Title :- Explain the relevant measure provisions of municipal solid waste management rules 2016 for disposal of the given type of solid waste.

\* Course outcome :-

Implement the relevant laws related to solid waste management.

\* Practical outcome :-

Interpret the municipal solid waste management rules 2016 by viewing relevant video / searching.

\* Theoretical Background :-

- Waste management include the activity & action required to manage the waste from its inception to its disposal.

- It include the collection transport treatment and disposal of waste together with monitoring and regulation of waste management process.

- Solid waste management, the collecting treating and disposing of solid waste

material that is discarded because it has served its purpose or is no longer useful.

- Improper disposal of municipal solid waste can create unsanitary condition and these condition and in turn can lead to pollution and of the environment.

### \* Observations \*

#### SWM Rule, 2016 :-

- The rule are now applicable beyond municipal area and extent to urban agglomeration census, town, notified industries township, special economic zones state & central gov. organization, place of pilgrims & historical importance.
- The source segregation of waste has been mandated to channelize the waste to wealth by recovery reuse and recycle.
- Gender will have to pay "user fee" to waste collector & for "spot fine" for littering and non segregation.



- The development of special economic zone, industrial waste, Industrial park to earmark at least 5% of the total area of the plot or minimum 5 plots / sheds for recovery and recycling facility.
- All brand owner who sale their product in such packaging material which are non biodegradable should put in place a system to collect back the packaging waste generated due to their production.
- High calorific waste shall be used for coprocessing in cement or thermal power station.
- Horticulture waste and garden waste generated from his premises should be disposed as per the directions of local authority.
- Construction & demolition waste should be stored separately displayed off, as per const. & demolition waste management rule.



- All manufacture brand owners or marketing companies should educate the masses for wrapping for & disposal of their product.
- An event or gathering organisers of more than 100 person at any licensed / unlicensed place should be ensure segregation of waste at source & handling by local authority.
- The biodegradable waste should be processed treated and disposed of through composting or biomethanation which within the premises as far as possible. The material residual waste shall be given to the waste collection or agency as directed by local authority.
- The developers of special economic zones industrial park to embark at least 5% of the total area of plot or minimum 5 plots / sheds for recovery and recycling facility.



### \* Conclusion :-

From this practical, I understand the rules 2016 for disposal of municipal solid waste management also the rules for transporting and collecting of solid waste management.

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## PRACTICAL NO: 11

# TITLE: Interpret the construction and demolition waste management rules 2016 by viewing the relevant video/simulations/search engine.

# COURSE OUTCOME: Implement the relevant laws related to solid waste management.

### # THEORETICAL BACKGROUND:

Municipal solid waste management rules:

- The Union ministry of environment, forests and climate change (MoEF and CC) recently notified the SWM rules 2016. These will replace the solid waste rules, 2000 which have been in place for the past 16 years.
- These rules are the sixth category of waste management rules brought out by the ministry. As it has earlier notified plastic, e-waste, biomedical, hazardous and construction and demolition waste management rules.
- According to MoEF, 62 million tonnes of waste is generated annually in the country at present, out of which 5.6 million tonnes is plastic waste.

## # OBSERVATIONS:

construction and waste management rules, 2016

## Salient Features:

- According to all the rules, all generators of C and D waste must segregate it into four categories - concrete, soil, steel and wood, plastics, brick and mortar - and either deposit it at collection centres setup by the local authority or hand it over to processing facilities.

But out of all cities in the country, only Delhi has waste processing facilities - one in Burari and the other at Shahdara.

Large generators (generating more than 20 tonnes of C and D waste a day or 300 tonnes of C and D per project in a month) must prepare an environment management plan detailing the environmental issues that can stem from the storage, transportation, disposal and reuse of C and D waste.

They must also prepare a waste management plan, submit it to a local authority and get their approval before starting any construction, demolition, renovation work.

They are also required to pay a relevant charge to service providers and contractors for collection and transport of C and D waste and to a waste processing facility for processing and disposal of this waste.

Local authorities in their turn, are required to use 10-20 percent materials made from C and D waste in municipal and government contracts and give incentives to waste generators who process and recycle their waste in-situ.

This is an important intervention that would need detailing with tax and policing measures in cities; There are two ways of encouraging in-situ recycling, one is a 'waste tax' approach, in which you tax waste generators for availing waste processing facilities, The other is by incentivizing in-situ recycling further, the new rules mandate that all service providers and contractors are required to remove and prepare a waste management plan for the waste generated in their jurisdiction within six months.

## # CONCLUSIONS:

From the above practical I understood the construction and <sup>demolition</sup> waste management rule 2016 for collection, transportation and disposal of waste.

## PRACTICAL NO:12

# TITLE : Explain the Hazardous and other Waste management rules 2016, by viewing the relevant video/simulation/search engine.

# COURSE OUTCOME : Implement the relevant laws related to solid waste management.

# PRACTICAL OUTCOME : Interpret the hazardous and other waste management rules 2016, by viewing the relevant video/simulation/search engine.

### # THEORETICAL BACKGROUND:

- MoEF and CC recently notified the new solid waste management rules (SWM), 2016.
- These rules are the sixth category of waste management rules brought out by the ministry as it has earlier notified plastic, e-wastes, biomedical, hazardous and construction and demolition waste management rules.
- The new rules are now applicable beyond municipal areas and have included urban agglomeration, census towns, notified industrial townships.

### # OBSERVATIONS:

Salient features of SWM Rules, 2016.

(i) Bio-medical waste management rules, 2016:

The new rules mandate a bar code system for bags and containers containing bio-medical waste which is a good move as this will restrict the entry of waste in the recycling illegal market. It will also be beneficial for rag-pickers and people dealing with infected solid waste and working in recycling industry.

(ii) Plastic waste management rules, 2016:

minimum thickness of plastic bag, carry bag has been increased from 40 microns to 50 microns. The rules which will be implemented across the country in six month are not clear about the fine amount to be imposed on plastic performance. The new plastic waste management rules are aimed at reducing 6000 tonnes of uncollected plastic waste generated daily by the forgetting manufacturers and industries by using a new principle called Extended Producers Responsibility (EPR) Act. This was done to improve the collection of plastic waste.

(iii) E-waste management rules 2016:

The rules have extended to bulk consumers like companies that buy electronic goods in mass. The bulk consumers must collect the item and hand them over to authorized recyclers and it will be the responsibility of the one buying in bulk.

#### civ) Hazardous waste management, Rule, 2016:

Solid plastic waste has been prohibited from import into the country - including in special economic zones and by export oriented units.

Exports of silk waste have been given exemption from requiring permission from the ~~MOEF~~ MOEF and CC.

#### # CONCLUSION:

In year 2000, municipal solid wastes rules 2000 for the first time affected that dealt comprehensively with municipal solid waste and which have been in place for the past 15 years until solid waste management rules 2016 replaced until 2000.