BHARATHIDASAN UNIVERSITY
Tiruchirappalli- 620024, Tamil Nadu, India

Programme: M.Sc., Environmental Science

Course Title: Solid and Hazardous Waste management
Course Code : CC07

Unit-II

Solid Waste-Collection, Transportation and Transfer stations

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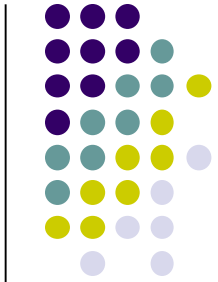
Solid waste collection



- Collection is the first fundamental function of Solid waste Management.
- Collection refers to the gathering of solid wastes from different places.
- 2 methods of collection:
  - Hauled container system
  - Stationary container system

Hauled container system

- The container is hauled from the collection point to the final point of disposal, processing facility or transfer station.

- The container is sited at a location. In accordance with some cycle, the container is picked up and hauled off to the disposal area where the container is emptied and returned to the original location.

- The truck had no container, the container is carried by the truck. A variation is start with an empty container.

Advantages and Disadvantages

Advantages:

- Useful when the generation rate is high and the containers are large.
- May eliminate spillage associated with multiple smaller containers.
- Flexible. Need more capacity, use a larger container.

Disadvantage:

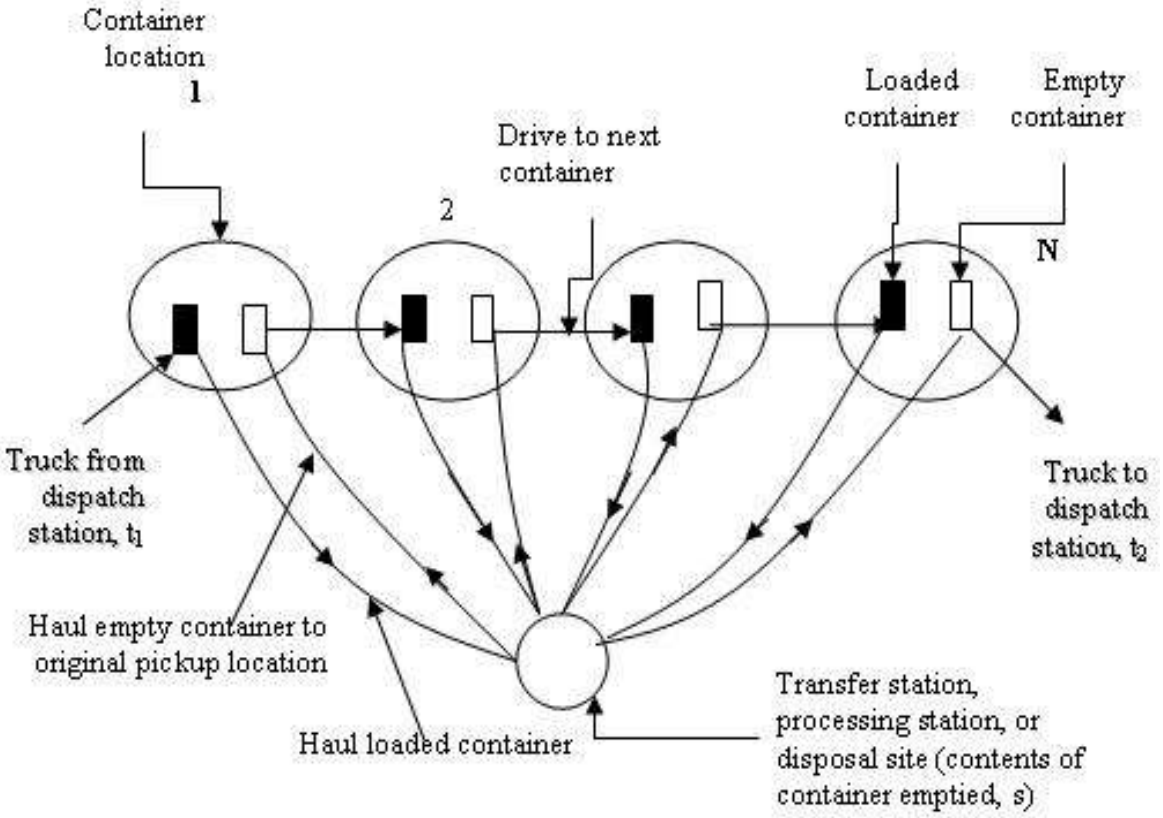
- If the containers are not filled, low utilization rate.

Types

- Hoist truck - similar to an AAA emergency truck, but dumpsters are picked up or hoisted instead of cars, smaller volumes, bulky items.

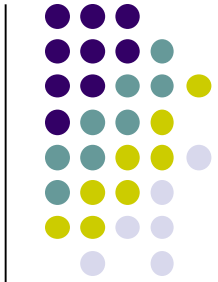
- Tilt-frame - assembly on truck allows sliding of large containers on and off the truck.

- Trash-trailer The slider assembly is not part of the truck, but part of the trailer.



(a) Hauled container.

Stationary container system



- Containers are emptied at the collection point or container location.
- The waste container remains in the vicinity of where the waste is generated.
- The waste is unloaded into a bigger truck. A large container is an integral part of the truck.
- When fully loaded from multiple waste containers, the truck travels to and from the landfill as opposed to the waste container.

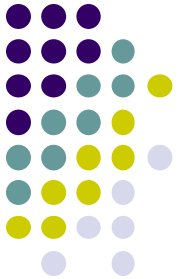
Types

- 2 types:

- One is which the containers are large and must be emptied by mechanical means-Wheeled residential pickup and commercial pickup

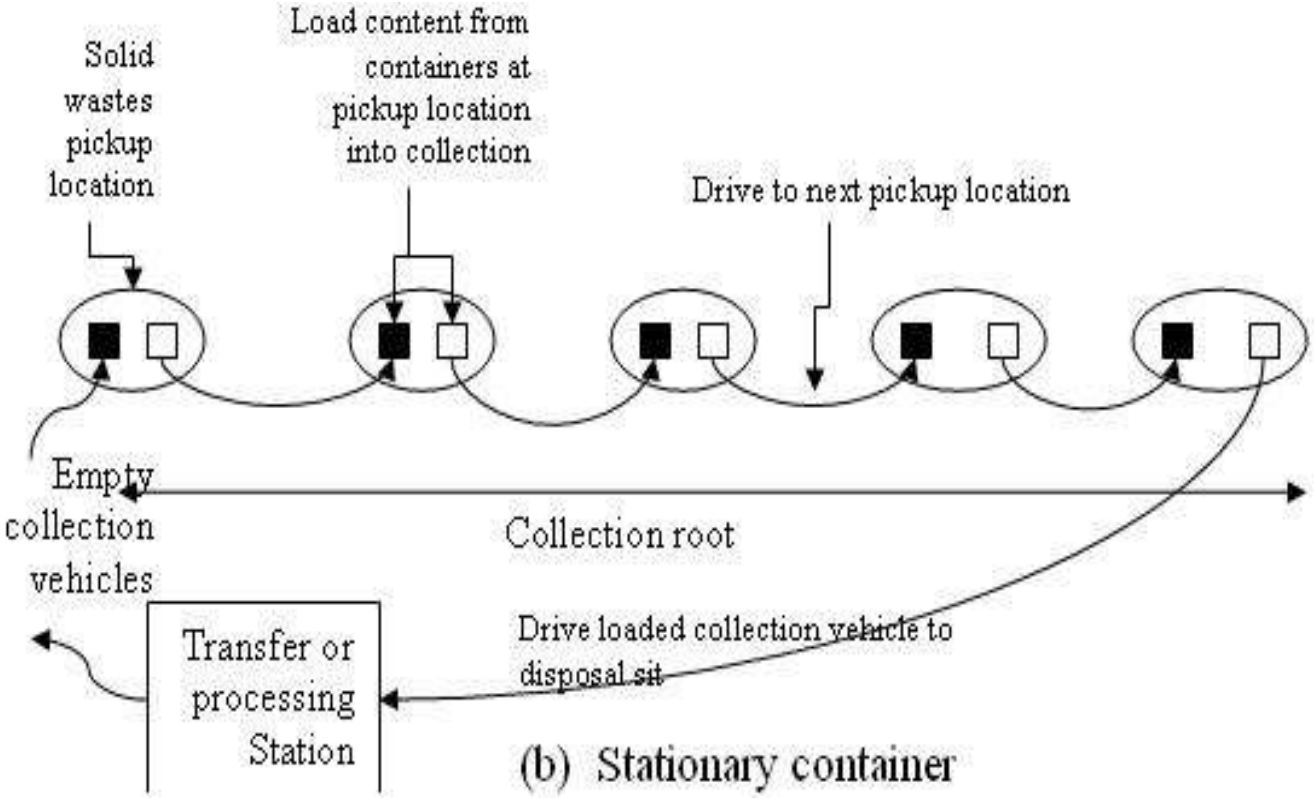
- Second is that which containers are small and can be simply emptied-Residential pickup

Advantages and Disadvantages



- The major advantage is that the vehicle does not travel to the disposal area until it is full yielding higher utilization rates.
- The major disadvantages include:

- The system is not flexible in terms of picking up bulky goods.
- Wastes e.g. demolition, that make damage the relatively delicate mechanisms.
- Large volume generations may not have room for storing large containers


Solid wastes pickup location
Load content from containers at pickup location into collection
Drive to next pickup location
Empty collection vehicles
Collection root
Transfer or processing Station
Drive loaded collection vehicle to disposal sit
(b) Stationary container

Analysis of Collection Systems

Pickup (P_{hcs} or $_{scs}$)

P_{hcs}: The time spent:

- driving to the next container after an empty container has been deposited.
- the time spent pickup the loaded container.
- the time required to redeposit the container after it has been emptied.

P_{scs}: Refers to the time spent loading the vehicle, beginning with the stop to load the first container and ending when the last container has been loaded.

HCS- The time required to reach the location where the waste will be emptied, starting when the container has been loaded on the truck and continuing through unloading until the truck arrives at the location where the empty container is to be re- deposited.

SCS - The time required to reach the location where the full vehicle will be emptied and continuing until the truck arrives at the location where the first container will be emptied for the next route.

3.) At-Site (s)

The time spent at the site (landfill, MRF, transfer station) where the system is unloaded including waiting time.

4.) Off-Route (W)

Non-productive activities

- Necessary - Check in, check out, meeting, breaks.
- Unnecessary - Personal errands, extended coffee breaks

Typically 15%

Collection Routes

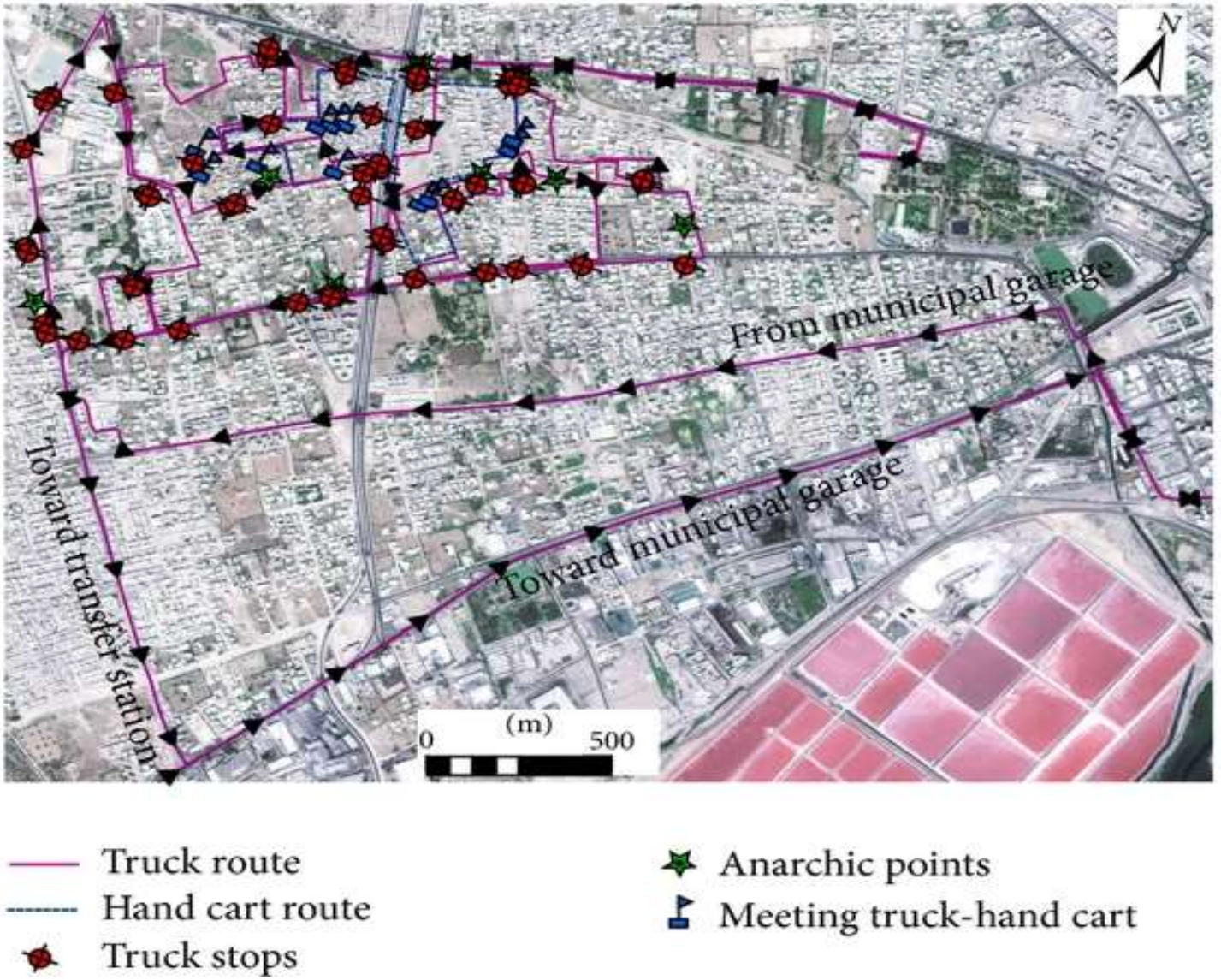
Use a heuristic (common sense), trial and error approach consistent with the philosophy of collecting the most waste with least resources in the context of constraints such as equipment breakdowns, holidays and vacations, good labor practices and the following guidelines:

Elaborate on the issues to be considered before deciding the route for collection and transport of solid wastes.

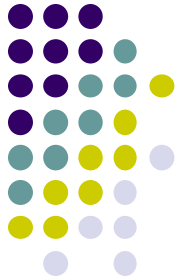
- Crew size and vehicles must be known and coordinated.
- Routes should begin and end near arteries
- Routes should not overlap
- Topographic and physical boundaries should be route boundaries.
- Start at the top of a hill and work downward.
- Last collection point should be near disposal site.
- Traffic problems should be dealt with early in the morning.
- Extremely large load should be dealt with early in the morning.
- Collect a street on both sides.
- Select a consistent collection pattern.

Layout of Collection Routes

- Location maps showing data concerning the sources including location, collection frequency, number of containers.
- Data analysis, try to balance the routes in accordance with pickups and time.
- Preliminary layout of routes, start at the depot and do a route. An idea of truck capacity vs. loads is in order.
- Fine tune the preliminary design.


N
From municipal garage
Toward municipal garage
Toward transfer station
0
(m)
500
Truck route
Hand cart route
Truck stops
Anarchic points
Meeting truck-hand cart

Transfer Stations



- A transfer station is a facility where the wastes collected may be stored temporarily or transferred from the smaller vehicles for transportation to the destination point.
- Waste transfer stations are facilities where municipal solid waste is unloaded from collection vehicles and briefly held while it is reloaded onto larger long-distance transport vehicles for shipment to landfills or other treatment or disposal facilities.
- By combining the loads of several individual waste collection trucks into a single shipment, communities can save money on the labor and operating costs of transporting the waste to a distant disposal site.

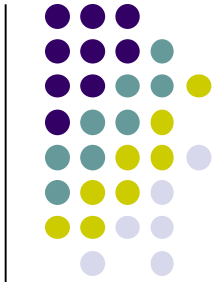
- They can also reduce the total number of vehicular trips travelling to and from the disposal site.
- Although waste transfer stations help reduce the impacts of trucks travelling to and from the disposal site, they can cause an increase in traffic in the immediate area where they are located.
- If not properly sited, designed and operated they can cause problems for residents living near them.

- 2 types-
- Direct discharge transfer:

  Collection vehicles dump their loads directly into larger transportation vehicles.
- Storage transfer station:

  The solid wastes are emptied into storage pits or platforms.
- The wastes are then loaded into big transport vehicles for hauling to destination points.

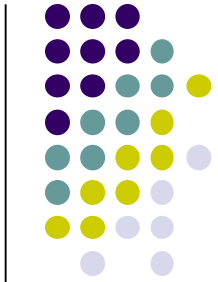
Types of wastes Handled at transfer stations



- Municipal solid waste (MSW)
- Yard waste (green waste) commonly includes leaves, grass clippings,
- Household hazardous waste (HHW) includes hazardous materials
- Recyclables include discarded materials that can be reprocessed
- Unaccepted Wastes:

  They are prohibited by state or federal regulations (e.g., PCBs, lead acid batteries, radioactive materials).

Transfer Station Design



What are transfer stations? What are the criteria to be satisfied?

Site design plans typically show the following features:

- Road entrances and exits.
- Traffic flow routes on site.
- Queuing areas.
- The scale house.
- Primary functions at the transfer station building.
- Buildings. Including entrances and exits
- Parking
- Public conveniences
- Space for future expansion of the main transfer building.
- Buffer areas- Open space, landscaping,
- Holding area- For inspecting incoming Loads
- Main Transfer Area Design

QUESTIONS

2 MARKS

- What do the following terms refer to Phcs,Pscs ?
- What do the terms s and h refers to ?
- How is Pscs calculated ?
- Name the containers systems used for the collection of solid wastes

5 MARKS

- Discuss about the containers systems used for the collection of solid wastes.
- Elaborate on the issues to be considered before deciding the route for collection and transport of solid wastes.
- What are transfer stations? What are the criteria to be satisfied?

10 MARKS

- Is it possible to transfer the solid wastes efficiently from the residential areas?
- Elaborate on the transport stations of solid wastes.

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