

# Chapter 4

## **Types of collection systems**

# 1. Hauled Container System (HCS)

- Container is hauled to disposal sites, emptied, and returned to original location or some other location
- Suitable for areas w/ higher wst. generation
- Types:
  - » Hoist truck : 2 - 10 m<sup>3</sup>
  - » Tilt frame container: 10 - 40 m<sup>3</sup> -
  - » Trash trailer - for heavy, bulky rubbish (construction, commercial, usually open top container);
  - » 2 crew per vehicle.

## 2. Stationary Container System

- The container is fixed on the truck
- the container is used to collect waste from the point of generation;
- Types include:
  - Mechanically-loaded system
  - Manually-loaded collection vehicle(more common).
- Used for residential/commercial sites.
- Vehicle w/ internal compaction mechanism or un-compacted (open top lorry - side loaded.

### 3. Transport costs

- Estimates of the costs per km and per hour to move the waste after collection from the end of collection route to the various facility locations in the study.
- Unit transport cost (USD/km) for various types of vehicles :
  - i. Collection vehicle
  - ii. Transfer vehicles
  - iii. Residue and/or ash vehicles

- Labor costs (driver + crew in USD/hr unit cost) only for **(i)** and **(iii)**.
- For **(ii)** - labor costs should be included as part of the annual labor cost of the transfer station.

# **4. Factors Affecting SW Collection Productivity:**

## **a. Service Level Related:**

- collection point, frequency, waste material

## **b. Route related:**

- Containers, Distance, constraints, topography, delays, road conditions

## **c. Collection Methodology Related/Climate Related:**

- Crew size, collection procedures, wind, rain.

## 5. Analysis of collection systems

- Must be optimized to save collection time and costs.
- Important to determine vehicle and labor requirements
- Activities involved 4 units: pick-up, haul, at-site and off-route.

## 6. Transfer station

- a centralized facility, where waste is unloaded from smaller collection vehicles and re-loaded into large vehicles for transport to a disposal or processing site.
- frequently accompanied by removal, separation or handling of waste.
- smaller collection vehicles and the low hauling cost of solid waste, using larger vehicles, make a transfer station viable.
- use of transfer station proves reasonable, when there is a need for vehicles servicing a collection route to travel shorter distances, unload and return quickly to their primary task of collecting the waste.



➤ Other factors that affect the selection of a transfer station:

- Types of waste received.
- Processes required in recovering material from wastes.
- Required capacity and amount of waste storage desired.
- Types of collection vehicles using the facility.
- Types of transfer vehicles that can be accommodated at the disposal facilities.
- Site topography and access.

➤ The main challenge in the establishment of a transfer station is securing a suitable site due to:

- Stored solid wastes and recyclable materials, if not properly handled, will attract flies and other insect vectors.
- Odors from the transferred solid wastes will also be a nuisance, if not properly controlled.
- the traffic and noise due to small and large collection vehicles, collectors, drivers, etc., invite the resentment of the communities living in the vicinity of transfer stations

# 7. Types of Transfer Station

- Small to medium transfer stations
- Large transfer stations:

➤ **Small to medium transfer stations:**

- generally small (less than 100 tonnes/day) and medium (100 to 500 tonnes/day).
- site aesthetics and environmental concerns, transfer operations of this size may be located either indoor or outdoor.

- The required overall station capacity (i.e., the number and size of containers) depends on the size and population density of the area served and the frequency of collection.
- More complex small transfer stations are usually attended during hours of operation and may include some simple waste and materials processing facilities.

## ➤ **Large transfer stations**

- Designed for heavy commercial use by private and municipal collection vehicles.
- The typical operational procedure for a larger station:
  - When collection vehicles arrive at the site, they are checked in for billing, weighed and directed to the appropriate dumping area;
  - Collection vehicles travel to the dumping area and empty the wastes into a waiting trailer, a pit or a platform;

- After unloading, the collection vehicle is weighed and vehicle leaves the site.
- Transfer vehicles are weighed either during or after loading. If weighed during loading, trailers can be more consistently loaded to just under maximum legal weights and this maximizes payloads and minimizes weight violations.

## ➤ ***Designs for larger transfer operations***

- Several different designs for larger transfer operations are common, depending on the transfer distance and vehicle type.

## ➤ **Determination of Capacity of Transfer of Station**

- A transfer station should :
  - have enough capacity to manage and handle the wastes at the facility throughout its operating life.
  - are usually designed to have 1.5 – 2 days of storage capacity



- In designing capacity of a transfer station, designers should:
  - consider trade-offs between the capital costs associated with the station and equipment and the operational costs.
  - plan adequate space for waste storage and, if necessary, waste processing.
  - Provide the waste storage area and sometimes a waste sorting area.
  - allow adequate space for vehicle and equipment maneuvering.

- Factors that should be considered in determining the appropriate capacity of a transfer facility:
- capacity of collection vehicles using the facility;
  - desired number of days of storage space on tipping floor;
  - time required to unload collection vehicles;
  - number of vehicles that will use the station and their expected days and hours of arrival;

- waste sorting or processing to be accomplished at the facility;
- transfer trailer capacity;
- hours of station operation;
- availability of transfer trailers waiting for loading;
- time required, if necessary, to attach and disconnect trailers from tractors or compactors.

## 8. Viability of Transfer Station

- Transfer stations offer benefits such as lower collection costs,
  - reduced fuel and maintenance costs for collection vehicles,
  - increased flexibility in selection of disposal facilities,
  - opportunity to recover recyclables or compostable at the transfer site and the opportunity to shred or scoop wastes prior to disposal.

- The benefits must be weighed against the costs to develop and operate the facility.
- Economic viability of operating a transfer station compare:
  - Add the unit cost of the transfer station to the cost of hauling using large vehicles,
  - the cost of hauling directly to the disposal site using the smaller vehicles that service the collection area.

- The cost of hauling using small vehicles is the sum of
- the depreciation cost of the vehicle,
  - driver's salary,
  - salary of the collection crew (if they are on standby waiting for the vehicle to return to the collection area) and,
  - fuel cost.

- The transfer station cost is the sum of
  - the transfer station's depreciation cost
  - the operating and maintenance costs of transfer station divided by its capacity.
- The cost of using the large vehicle is the sum of
  - the vehicle depreciation,
  - fuel cost and
  - driver's salary.

- The cost-effectiveness of a transfer station depends on
  - the distance of disposal site from the generation area, and
  - a distance of 10 – 15 km is usually the minimum cost-effective distance (Phelps, et al., 1995).



- The distance between the disposal site and collection area is one of the principal variables in deciding whether to
  - use a transfer station or
  - haul the solid wastes directly from the collection area to the disposal site

## Cost Analysis to Determine Viability of Transfer Station

