

### 5.16.15. Utilizing Fly Ash as Bricks

Fly ash, a waste material of pulverised coal fired thermal power stations, has been utilized as building bricks.

About 80% of the ash from the coal fed to the boiler is collected in the form of fly ash and about 20% is collected as bottom ash. Fly ash is by nature very fine about 60 to 70% below 76 micron, whereas bottom ash is a coarse, spongy material.

### 5.17. SOLID WASTE MANAGEMENT

It is a planned system of effectively, controlling the production, storage, collection, transportation on processing disposal or utilization of a solid waste in a sanitary aesthetically acceptable and economical manner. It includes all administrative, financial, legal and planning functions as well as the physical aspects of solid waste handling.

The main objects of solid waste management are—to remove discarded materials from inhabited places for preventing spread of disease, to reduce aesthetic insects and method used for management are environmentally acceptable. To assess the management possibilities it is important to consider :

1. Materials flow in society.
2. Reduction in raw materials usage
3. Reduction in solid waste quantities
4. Refuse of materials
5. Materials recovery
6. Energy recovery
7. Day-to-day solid waste management.

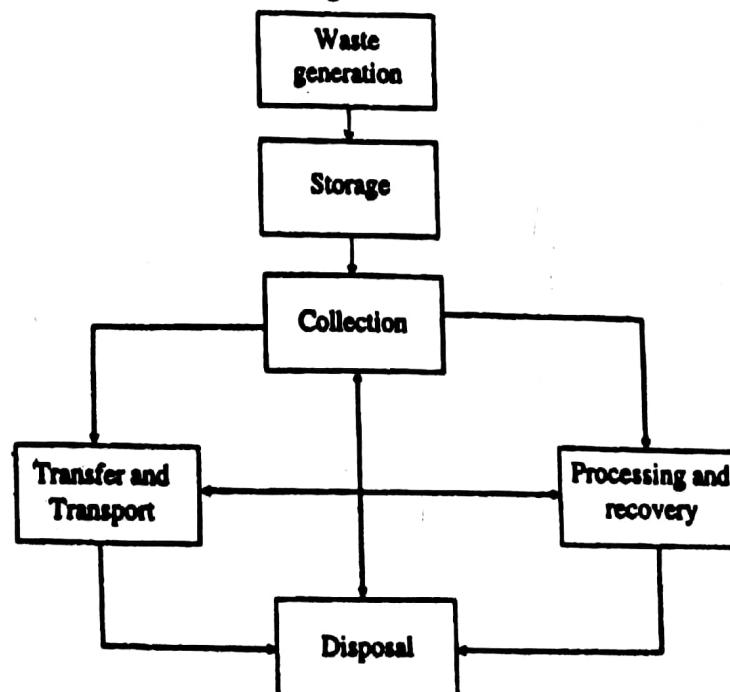


Fig. 5.10. Activities of solid waste management with their relationship.

The various activities involved with the management of solid wastes, from the point of generation of final disposal. These are :

- (a) Waste generation
- (b) On-site handling, storage and processing
- (c) Collection
- (d) Transfer and transport
- (e) Processing and recovery
- (f) Disposal.

These functional elements are described in Table 5.1

**Table 5.1 Functional Elements Governing the Solid Management**

S. No.	Functional element	Description
(i)	Waste generation	Those activities, in which materials are identified as no longer being of value and, are either thrown away or gathered together for disposal.
(ii)	On-site handling, storage and processing	Those activities, which are (associated with the handling, storage and processing of solid wastes, at or near the point of generation.
(iii)	Collection	Those activities, which associate with the gathering of solid wastes and hauling of wastes, after collection, to where the collection vehicle is emptied.
(iv)	Transfer and transport	Those activities associated with (i) the transfer of wastes from the smaller collection vehicle to the larger transport equipment, and (ii) the subsequent transport of the wastes usually over a long distance to the disposal site.
(v)	Processing and recovery	Those techniques, equipments and facilities, used both to improve the efficiency of the other functional elements and to recover usable materials, conversion products of energy from solid wastes.
(vi)	Disposal	Those activities, which are associated, with ultimate disposal of solid waste, including those which are collected and transported directly to a landfill site, semi-solid wastes (sludge) from wastes water treatment plant, incinerator residue, compost or other substances from the various solid waste processing plants that are of no further use.

### (A) Solid Waste Generation

Solid wastes are generated from domestic, industrial, municipal etc. Solid waste generation depends upon the sources. The quantity and general composition of the waste material that is generated is of critical importance in the design and operation of solid waste management systems. Reliable quantity and composition data of wastes are difficult to obtain because most measurements are of the quantities collected or disposed off at a landfill. Factors that influence the quantity of municipal wastes generated are :

- (1) Geographic location

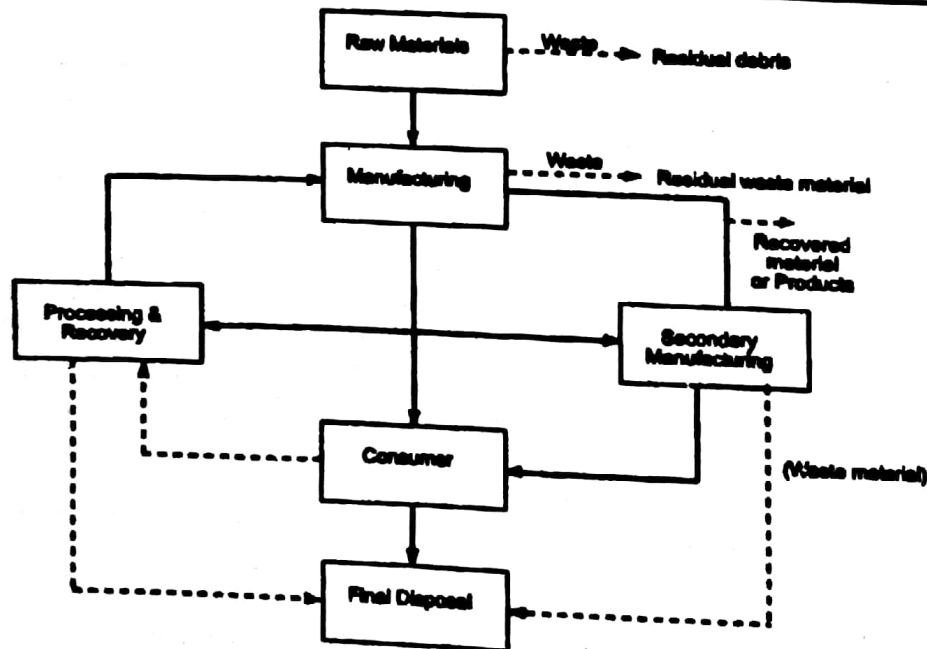
- (2) Season of the year
- (3) Use of kitchen waste grinders
- (4) Collection frequency
- (5) Characteristics of populace
- (6) Extent of salvaging and recycling
- (7) Public attitude
- (8) Legislation.

Significant reductions in the quantities of solid wastes that are generated will occur when and if the public and consumer-oriented companies are willing to change on their own volition to conserve national resource and to reduce the economic burdens associated with management of solid wastes.

The following generation rates are for the municipal refuse on the basis of its source:

**Table 5.2. Generation Rates for Municipal Refuse (kg/Capita/Day)**

Category	Rate
Residential Refuse	0.3 to 0.6
Commercial Refuse	0.1 to 0.2
Street Sweeping	0.05 to 0.2
Institutional Refuse	0.05 to 0.2
Industrial Waste	0.1 to 1.0



**Fig. 8. Flow of materials and the generation of solid waste in society**

### (B) Storage of Solid Wastes

Storage of solid wastes after generation is next step of solid waste management process. Storage of solid wastes includes following main points :

1. The type of container to be used for storage
2. The container location
3. Public health and aesthetics
4. The collection methods to be used. Containers used for waste should be different in size.

### (C) Collection of Wastes

Collection and transportation of wastes are essential parts of the solid waste management programme because of these two constitute about 75% of the total cost. The basic mode of refuse collection in India is from communal storage point. These refuses collected into stored bin having capacities 100 to 500 litres. Refuse must be collected daily otherwise organic matter present in refuse tends to decompose rapidly in India climate. The refuse is usually removed by a shovel and a basket from the bin and dumped into the waiting vehicle.

Other collection method used in developed countries are block collection and kerb side collection. In block collection refuse is brought in containers by individuals to a waiting vehicle and the containers are emptied. In kerbside collection, waste is brought in containers and placed on the foot way in advance of the collection time to be retrieved later. Two different types of collection systems are also used for solid waste collection. These are :

✓ (i) **Hauled container system.** In this system containers are hauled to the processing, transfer or disposal site, emptied and returned to their original location. These are two types (1) Tilt frame container (2) Trash trailer.

✓ (ii) **Stationary container system.** In this system containers remain at the point of waste generation. There are two main types of stationary container system :

- (1) Those in which self loading compactors are used.
- (2) Those in which manually loaded vehicles are used.

### (D) Transportation of Wastes

Transportation of wastes from collection point to disposal site is another part of solid waste management. In India no single mode of transport can prove effective, economical and efficient due to congested and narrow lanes and streets in towns and cities. Thus various types of vehicles used for transportation, these include handcarts to modern mechanized vehicles. Handcarts are used in narrow streets and small cities whereas large vehicles are used for transporting of refuse in well planned cities.

There are three methods of transportation of solid waste from generation site to disposal site :

(i) **Direct discharge method.** In this method, wastes from the collection vehicle usually are emptied directly into the vehicle to be used to transport them to a place of disposal site.

(ii) **Storage discharge methods.** In this, wastes are emptied into a storage pit or onto a platform from which they are loaded into transport vehicles.

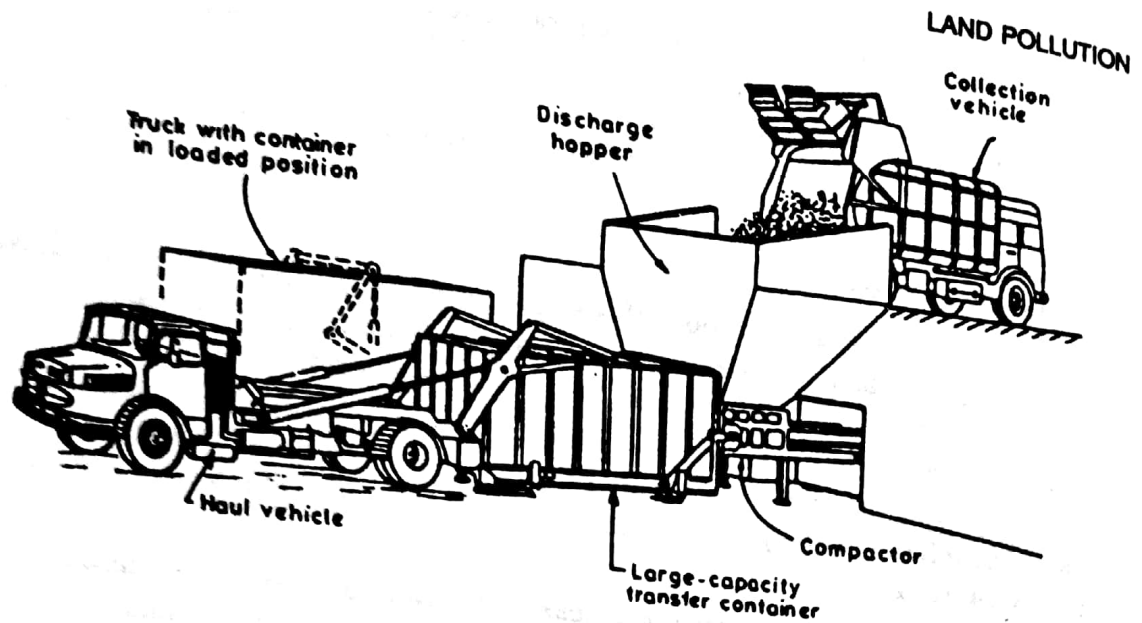


Fig. 2.9. Typical direct-discharge transfer station.

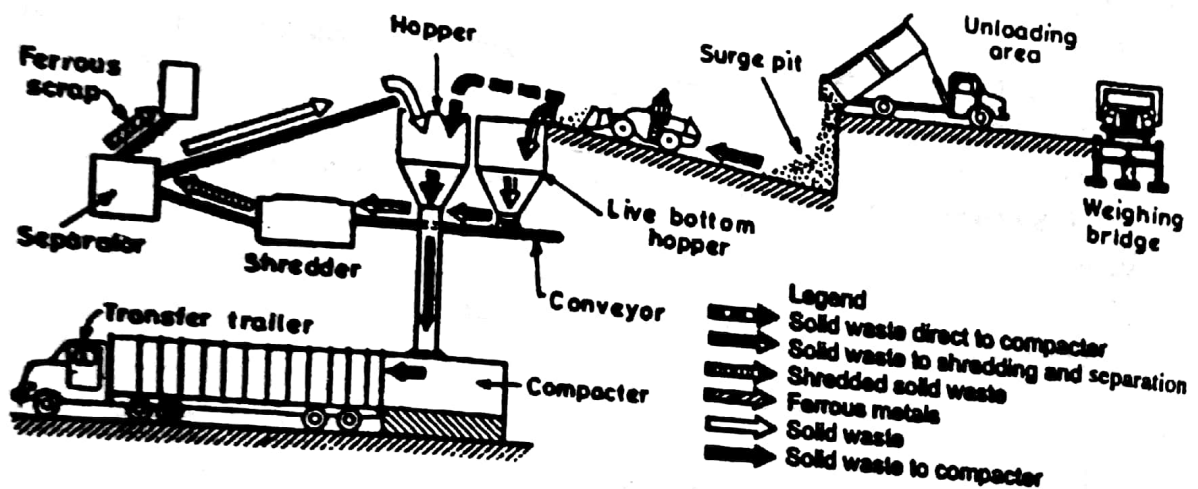


Fig. 2.10. Typical storage-discharge transfer station.

(iii) **Combined Direct and Storage Method.** In this method, both direct discharged and storage discharged methods are used. These are multi-purpose facilities designed to service a broader range of users than a single purpose facility.

### (E) Processing and Recovery Techniques

Processing techniques are used in solid waste management system to improve for recovering resources and for preparing materials for the recovery of conversion products and energy. Important processing techniques used routinely are compaction, thermal volume reduction (incineration) and manual separation of waste components. The main objects related to the processing and recovery are—

- (1) To determine appropriate time and place for processing process**
- (2) To establish priorities**
- (3) To recognize that most of the available recovery technology**
- (4) To identify commercial place for the sale of recovered materials**
- (5) To assess the impact of market stability on the waste management materials.**

**(F) Disposal of Waste**

**Final disposal of solid waste is the last step of solid waste management. Different methods are used for disposal of waste those are discussed earlier in same chapter.**

---