4. Transfer and Transport

Definition:

- A transfer station is a building or processing site for the temporary deposition of waste. Transfer stations are often used as places where local waste collection vehicles will deposit their waste cargo prior to loading into larger vehicles. These larger vehicles will transport the waste to the end point of disposal in an incinerator, landfill, or hazardous waste facility, or for recycling.
- In the future, transfer stations could be equipped with material recovery facilities and with localized mechanical biological treatment systems to remove recyclable items from the waste stream.
- A materials recovery facility or materials reclamation facility or materials recycling facility (MRF - pronounced "murf") is a specialized plant that receives, separates and prepares recyclable materials for marketing to end-user manufacturers. Generally, there are two different types: clean and dirty MRFs.

4.1 Benefits of transfer station:

- Costs: The main reason for waste transfer is to optimize the productivity of vehicles and collection crews as they remain closer to routes, while larger vehicles make the longer trip to processing and disposal sites and ultimately reduces overall costs. It can also be integrated with other functional elements of integrated waste management options (recycling, resources recovery & waste –to-energy facility) to improve overall waste mgt. performance.
- Minimize collection vehicle routing complexities: Makes the planning process more flexible and a combination of simple and more sophisticated vehicles with hydraulic or pneumatic system can be used

in different areas depending on the accessibility to those areas and collection method.

- Provide an opportunity to increase waste density: In areas where compaction vehicles are not available, transfer station may be used to compact the waste so that greater quantities can be carried (most economical) at once to the final disposal sites.
- Minimize illegal waste dumping: Particularly in developing countries where the human-and – animal powered and small motorized vehicles are used for the collection of waste are often unsuitable for traveling long distances.
- Can serve as a controlled place for sorting and processing the waste- Particularly in many low income countries where a thriving informal economy exists in recycling of waste, these stations can minimize health hazard and may limit the amount of waste picking that is done in the streets, which will reduce the amount of waste that is scattered around communal bins and waste accumulation points.
- Minimize traffic congestion: It reduces the no. of vehicles for long distance haulage and may reduce fuel consumption thus reduce environmental pollution.
- Reduce maintenance costs of collection vehicles: These vehicles stay on well paved roads and are not traveling on rough roads, particularly in landfill sites.
- Improve waste dumping efficiency at final disposal site– A reduced no. of vehicles at the disposal sites.

The main problems of transfer station:

- Increased traffic volume, noise and air pollution in the surrounding areas .
- Unless they are properly maintained there is a potential for environmental damage (leachate, odour, disease carriers, aesthetic and similar problem) in surrounding areas.

In the planning and design of transfer station a no. of factors should be considered:

- Location- governed by the proximity of the collection route, access to the major haulage routes, isolation from the community.
- Quantity of waste to be transferred/ handled
- Types & no. of primary and secondary vehicles served.
- Types of transfer operations (recycling, resource recovery, garage for vehicles etc.).
- Equipment requirements (depends on activities at a particular transfer station).
- Waste characteristics.
- Climate.
- Sanitation provision.
- Costs.

Transfer and transport operations become a **necessity** when Haul distances to available disposal sites or processing centers increase to the point that direct hauling is no longer economically feasible (typically more than 10 mile [1 mile = 1.60934 km]).

They also become a necessity when disposal sites or processing centers are in remote locations and cannot be reached directly by highway.

4.2 Compare Direct Haul and Transfer

Before designing a transfer station, a waste planner should determine if it makes economic sense to transfer waste from community collection vehicles. This holds true for planning of a single facility or a regional network of transfer stations. It may in fact be less costly to direct haul rather than transfer. A general rule of

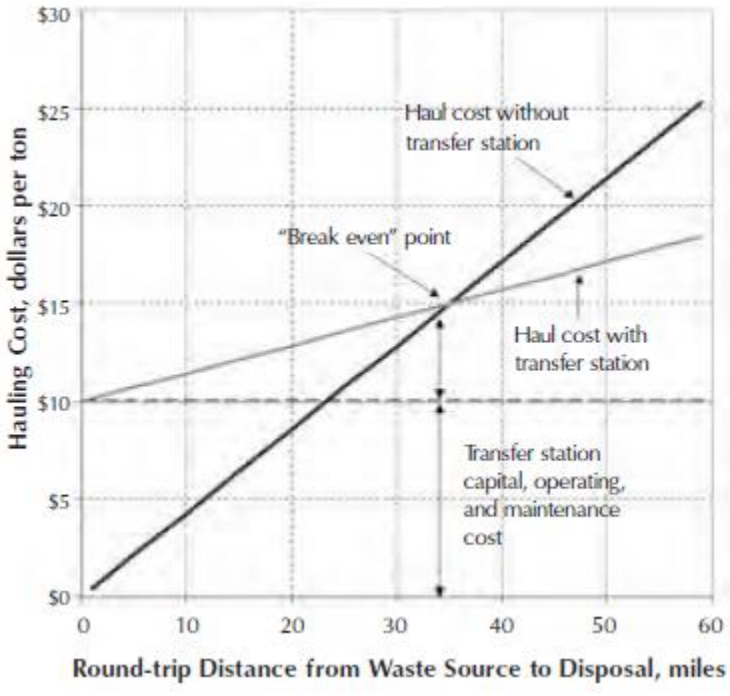
thumb is that transfer station may be more economical where haul distances are greater than 25 or 35 km. As transportation costs increase and labour cost for collection staff increase, this could change. A more reasonable approach to comparing these costs is to determine a 'break even' point. This is the point at which it is more economical to transfer than direct haul and is calculated by determining the following values:

- Transfer station cost to build, own, and operate in $/ton
- Direct haul payload in tones
- Transfer haul payload in tones
- Trucking cost for direct haul or transfer haul in $/Km
- Distance of haul (2 way distance) km

With these values known, the following formulas are used to calculate the different costs
Cost of Direct Haul = distance (km) x trucking cost ($/km) /direct haul payload ((tons)

Cost of Transfer = TS cost ($/tone) + distance (km) x trucking cost ($/km) /transfer haul payload (tons)

Using these calculations for various distances, the break even point can be determined by plotting these values on a graph as illustrated in Figure 4.1



The following assumptions were used to create this sample comparison:

Cost to build, own, and operate transfer station—dollars per ton $10

Average payload of collection truck hauling directly to landfill—tons 7

Average payload of transfer truck hauling from transfer station to landfill—tons 21

Average trucking cost (direct or transfer hauling)—dollars per mile $3

The comparison shows a break-even distance of about 35 miles (round-trip). In other words, for this example, using a transfer station is cost-effective when the round-trip distance exceeds 35 miles. When the round-trip distance is less than 35 miles, direct haul is more cost-effective. Although the same economic principles apply, break-even distances will vary in different situations based on the site-specific input data.

4.3 Types of transfer stations

Transfer stations may be classified with respect to capacity as follow: small, less than 100 tons /day; medium, between 100 and 500 tons/day; and large, more 500 tons / day. Depending on the method used to load the transport vehicles, transfer stations may be classified into three types: direct discharge, storage discharge, combined direct and storage discharge as shown in Fig. (4.1).

4.3.1 Direct discharge (Large)

In a large-capacity direct-discharge transfer station, the wastes in the collection vehicles usually are emptied directly into the vehicle to be used to transport them to a place of final disposition. To accomplish this, these transfer stations usually are constructed in a two-level arrangement. The unloading platform from which wastes from collection vehicles are discharged into the transport trailers can be elevated, or the transport trailers can be located in a depressed ramp. The layout of medium- and small-capacity transfer stations depends on the specific application and the site conditions. The decision to enclose a transfer station usually depends on local weather conditions and environmental concerns.

4.3.2 Storage Discharge

In the storage discharge transfer station, wastes are emptied either into a storage pit or onto a platform from which they are loaded into transport vehicles by various types of auxiliary equipment.

4.3.3 Combined Direct and Storage Discharge

In some transfer stations, both direct-discharge and storage discharge methods are used. Usually these are multipurpose facilities designed to service a boarder range of users than a single-purpose facility.

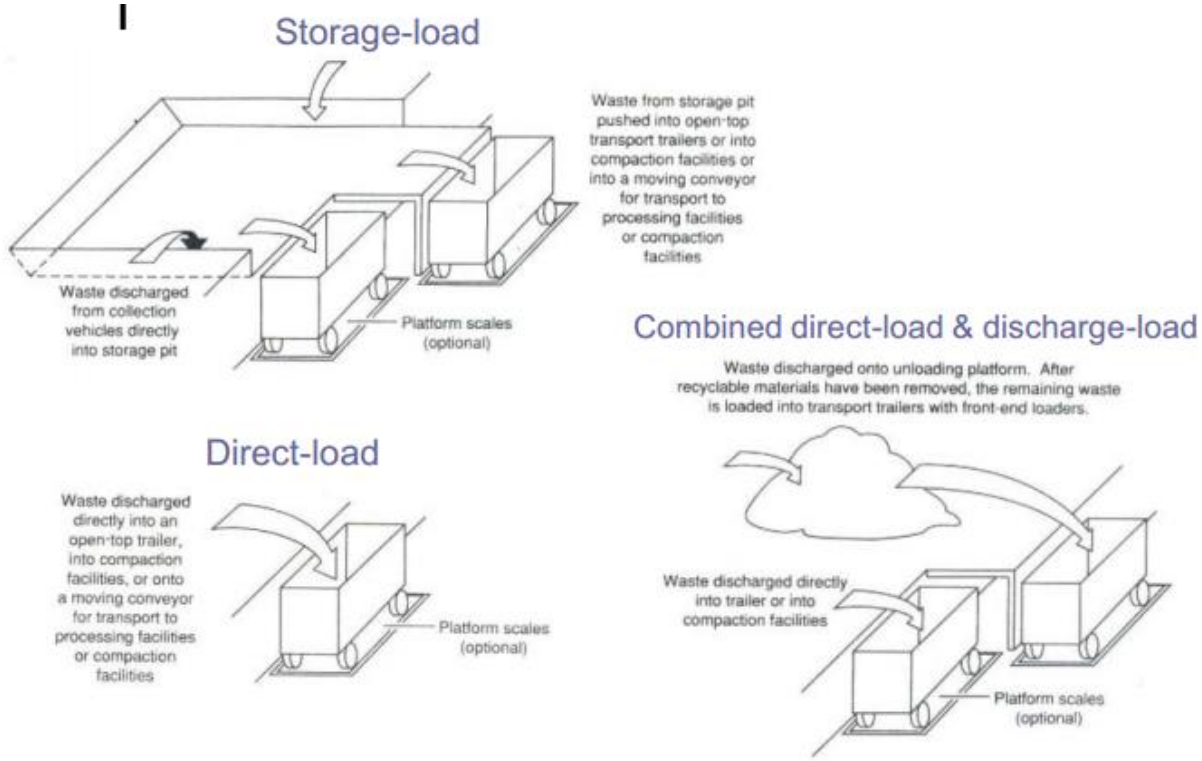


Fig. (4.1) Direct, Storage Discharge and combined **Discharge**

Fig. (4.2): Transfer Station

4.4 Sanitation requirements

By proper construction and operation, the objectionable features of transfer stations can be minimized. Most of the modern, large transfer stations are

1. Enclosed and
2. Constructed of materials that can be maintained and cleaned easily
3. Fire proof construction is used.
4. Special attention must be given lo the problem of blowing papers. Windscreens or other barriers are commonly used.
5. Regardless of the type of station, the design and construction should be such that all accessible areas where rubbish or paper can accumulate are eliminated.

The best way to maintain overall sanitation of a transfer station is:

1. To monitor the operation continually.
2. Spilled solid wastes should be picked up immediately or in any case should not be allowed to accumulate for more than 1 or 2 h
3. Overhead water spray often used to keep the dust down in the storage area of a storage discharge transfer station.
4. To prevent dust inhalation workers should wear dust masks.

4.5 Location of transfer stations

Whenever possible, transfer- stations should be located

(I) as near as possible to the weighted center of (the individual solid waste production areas to be served,

(2)Within easy access to major arterial highway routes as well as near secondary or supplemental means of transportation,

(3) Where there will be a minimum of public and environmental objection to the transfer operations, and

(4) Where construction and operation will be most economical

حسب تعليمات رقم (3) لسنة (2011) المحددات البيئية لآنشاء المشاريع ومراقبة سلامة تنفيذها فان المحطات التحويلية تصنف ضمن صنف (ج) الماده (74). أما معامل الفرز فتخضع للمادة (48) صنف (ب).

المادة –٧٤– المحطات التحويلية للمخلفات البلدية : أمكان لتجميع مخلفات البلدية الصلبة دون فرزها ولا تشمل مخلفات الرعاية الصحية والنفايات الخطرة ومخلفات المجازر وأي مخلفات تحتوي على سوائل ويلزم لانشائها إتباع ما يأتي :

اولا– اقامتها داخل حدود البلدية وضمن المناطق المخصصة (خدمات عامة) وان تبعد عن التجمعات السكانية والمستشفيات والمراكز الصحية والمنشآت التعليمية بانواعها مسافة لاتقل عن (٢٥٠) مائتين وخمسين متراً وعن الطريق العام مسافة لاتقل عن (١٠٠) مائة متر .

ثانيا- تبليط الموقع بالخرسانة الصقيلة وبإستعمال السمنت المقاوم للاملاح والشوارع بالكونكريت أو الاسفلت الكونكريتي .

ثالثا- تجميع النفايات ضمن سقائف محكمة ومسيطر عليها وفق تصميم محدد .

رابعا- إجراء عمليات التفريغ والتحميل داخل سقائف محكمة .

خامسا- إنشاء أحواض تعفين تتناسب وكمية المياه المصرفة من الاستخدامات البشرية وتنظيف الارضيات الخاصة بالمحطة ونقلها إلى محطات معالجة مياه الصرف الصحي .

سادسا- تسييج الموقع بسياج لا يقل إرتفاعه عن (٢) مترين من مواد إنشائية مع وجود بوابه للدخول وأخرى للخروج .

سابعا- تأمين مصدر للمياه ورفع النفايات يومياً ونقلها على مواقع الطمر الصحي .

ثامنا- توفير ميزان جسري لوزن النفايات الداخلة وتوثيق الاوزان .

المادة-٤٨- معامل فرز وتدوير النفايات : اماكن تجميع نفايات البلدية وفرز المواد التي يمكن الاستفادة منها بأعادة تدويرها ونقل ما يتبقى منها الى مواقع الطمر الصحي ويلزم لأنشائها اتباع ما يأتي :-

اولا- اقامتها خارج حدود البلدية وان تبعد عن التجمعات السكانية مسافة لا تقل عن (١) كيلومتر واحد .

ثانيا – تبليط الموقع بالخرسانة الصقلية .

ثالثا- تجميع النفايات في سقائف محكمة ومسيطر عليها وفق تصميم محدد .

رابعا- اجراء عمليات التفريغ والتحميل داخل سقائف محكمة .

خامسا- انشاء احواض تعفين تتناسب وكمية المياه المصرفة من الاستخدامات البشرية وتنظيف الارضيات الخاصة بالمحطة ورفع النفايات المتبقية يوميا ونقلها الى مواقع الطمر الصحي.

سادسا- احاطة الموقع بسياج من مواد انشائية لا يقل ارتفاعه عن (٢) مترين .