Transfer Stations
Transfer Station

- Alternative to direct haul
- Justified when cost to transport waste from generation point to disposal site is greater than cost to transport from generation point to transfer station plus haul to the disposal site
Benefits

- Large trailers replace many collection vehicles
- Get collection vehicles back to work rapidly
- Locate disposal site far from population areas
- Opportunity to inspect waste
- Opportunity to process waste
- Use multiple disposal sites
Need

- Presence of illegal dumps and litter
- Remote disposal sites
- Small capacity collection vehicles
- Low density residential areas
Types

- Direct discharge – waste pushed into open trailers
- Storage pit – tip onto floor, into hoppers to compactor that pushes waste into vehicle
Transfer Station Tipping Floor
Compacter
Surge Pit

TIPPING FLOOR

SURGE PIT

OPEN TOP TRAILER OR PRE-COMPACTOR
Open Top Transfer Trailers
Compactor System
Precompactor System

TIPPING FLOOR

PRECOMPACTOR SYSTEM

PRECOMPACTED WASTE "LOG"

PRECOMPACTOR
Baler
Intermodal Container System

F.

INTERMODAL CONTAINER SYSTEM

TIPPING FLOOR

INTERMODAL CONTAINER

FLATBED TRAILER

RAILROAD FLATCAR
Problem Statement

- Determine the break-even haul time between a direct haul system and a transfer station operation with the following properties:
- Direct haul system uses a 10 \( yd^3 \) container
- Direct haul cost = $20/hr
- The transfer trailer has a capacity of 100 \( yd^3 \)
- Tractor-trailer haul cost = $40/hr
TS Facility Costs

- Function of amortized capital cost, capacity, operating costs
  - Cost $3,750,000 (for bldg, equipment, tractor/trailer)
  - Capacity of 300,000 yd$^3$ per year
  - CRF is 0.08 (capital recovery factor is a function of interest rate and years to pay off - converts capital cost to $/yr), yr$^{-1}$
  - TS operating cost is $225,000/yr

- Normalize all costs by capacity
Step 1a: Calculate Capital Cost Elements (TS)

TS total cost/yd³ = annual capital cost plus annual op cost

Amortize Capital cost:
= $3,750,000 x 0.08 = $300,000/yr

Total annual costs:
($300,000 + $225,000) yr⁻¹ = $525,000/yr

Cost/yd³:
($525000/yr)/300,000 yd³/yr = $1.75/yd³
Step 1b: Calculate Hauling Operating Cost

TS trailer haul operating cost =

$40/hr/100 yd³ = $0.40/hr-yd³

Direct haul operating cost =

$20/hr/10 yd³ = $2.00/ hr-yd³
Hours

$/yd^3

$1.75/yd^3

$1.75/yd^3

1.1 hours

Direct Haul Operating Cost ($2.00/ yd$^3$-hr)

TS Operating Cost ($0.40/ yd$^3$-hr)
Equate Direct Haul Costs to Transfer Station Costs to Calculate the Break Even Haul Time ($x$)

\[ 2.00/\text{hr-yd}^3 \times = 1.75/\text{yd}^3 + 0.40/\text{hr-yd}^3 \times \]

\[ x = 1.1 \text{ hours} \]
A community which generates waste at a rate of 90 tons/day (7 days/wk) is considering the use of a transfer station. The community already owns collection vehicles so their cost can be ignored. Develop the appropriate cost equations and determine the break-even haul time for the following conditions:
Problem Data – Direct Haul

- **Direct Haul System**
  - Vehicle Capacity = 8 tons
  - Hauling Cost = $30/hr
Problem Data - TS

- Present day Facility cost (operating and capital) = $5000 per ton of capacity/day
- Trailer cost = $30,000 ea
- Trailer capacity = 30 ton
- Trailer hauling cost = $35/hr
- Work Week = 5 days*
- Use 1 tractor and 3 trailers
- CRF = 0.12
- Tractor cost = $50,000 ea

*Hint: determine the design capacity of the station
Based on a 5 day work week. Calculate total facility cost using this value.
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