# 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

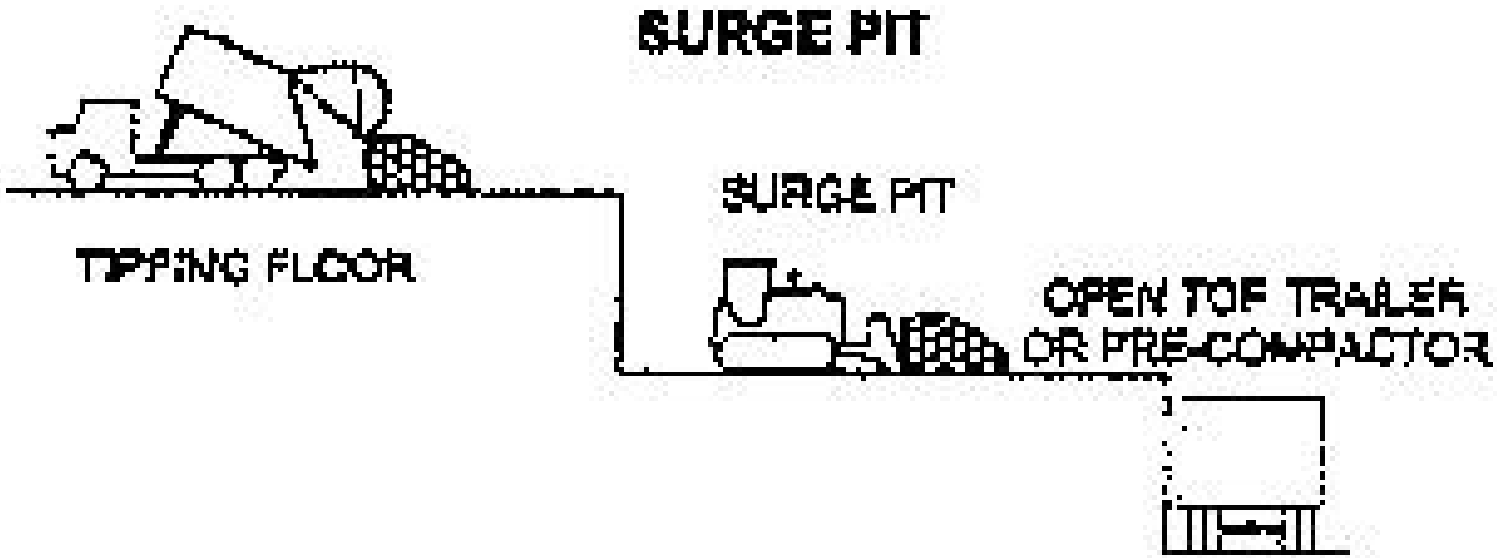
# Types

- Direct discharge – waste pushed into open trailers
- Storage pit – tip onto floor, into hoppers to compactor that pushes waste into vehicle

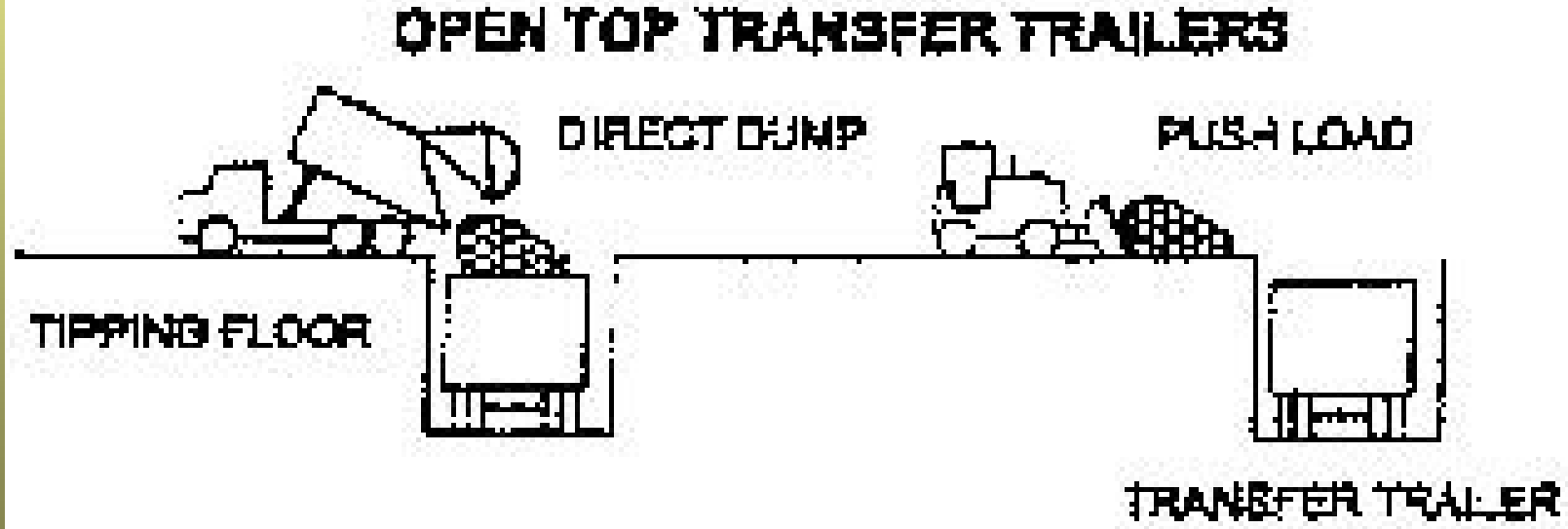
# Transfer Station Tipping Floor

# Compacter

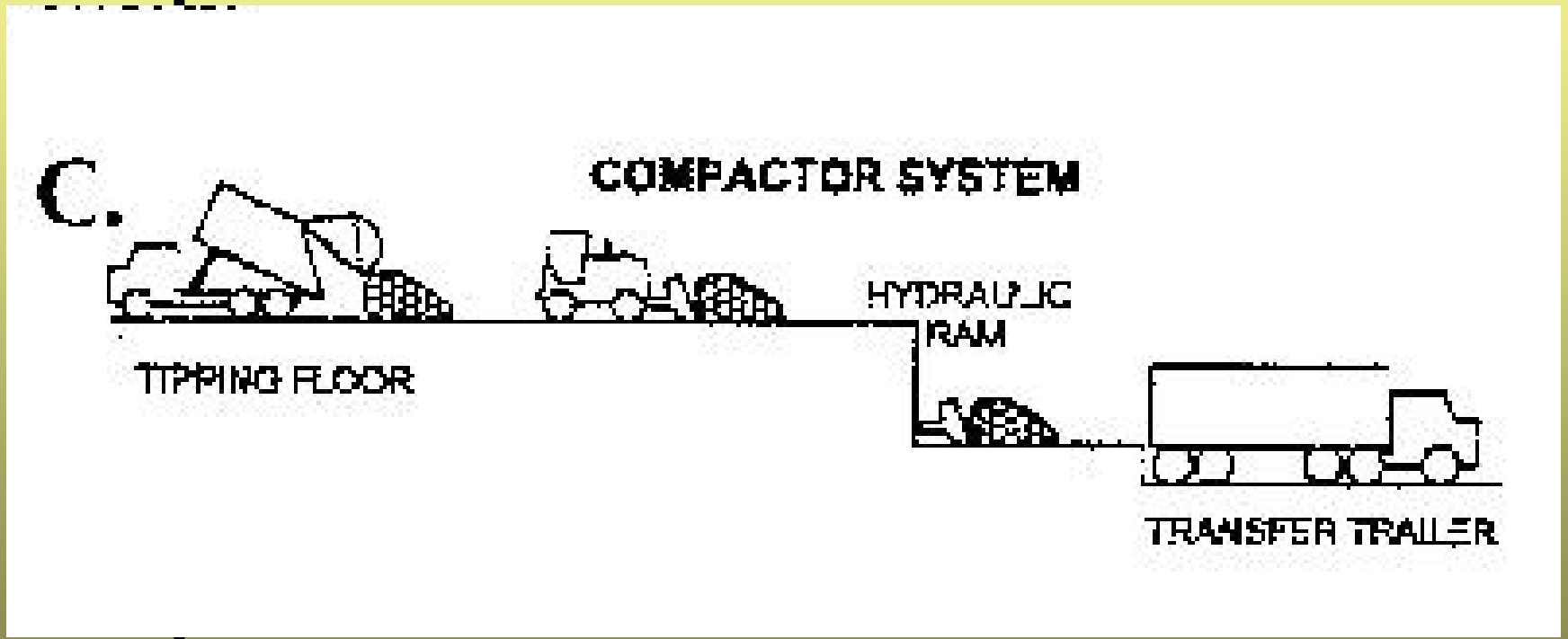
# Surge Pit


SURGE PIT
SURGE PIT
TIPPING FLOOR
OPEN TOP TRAILER
OR PRE-COMPACTOR

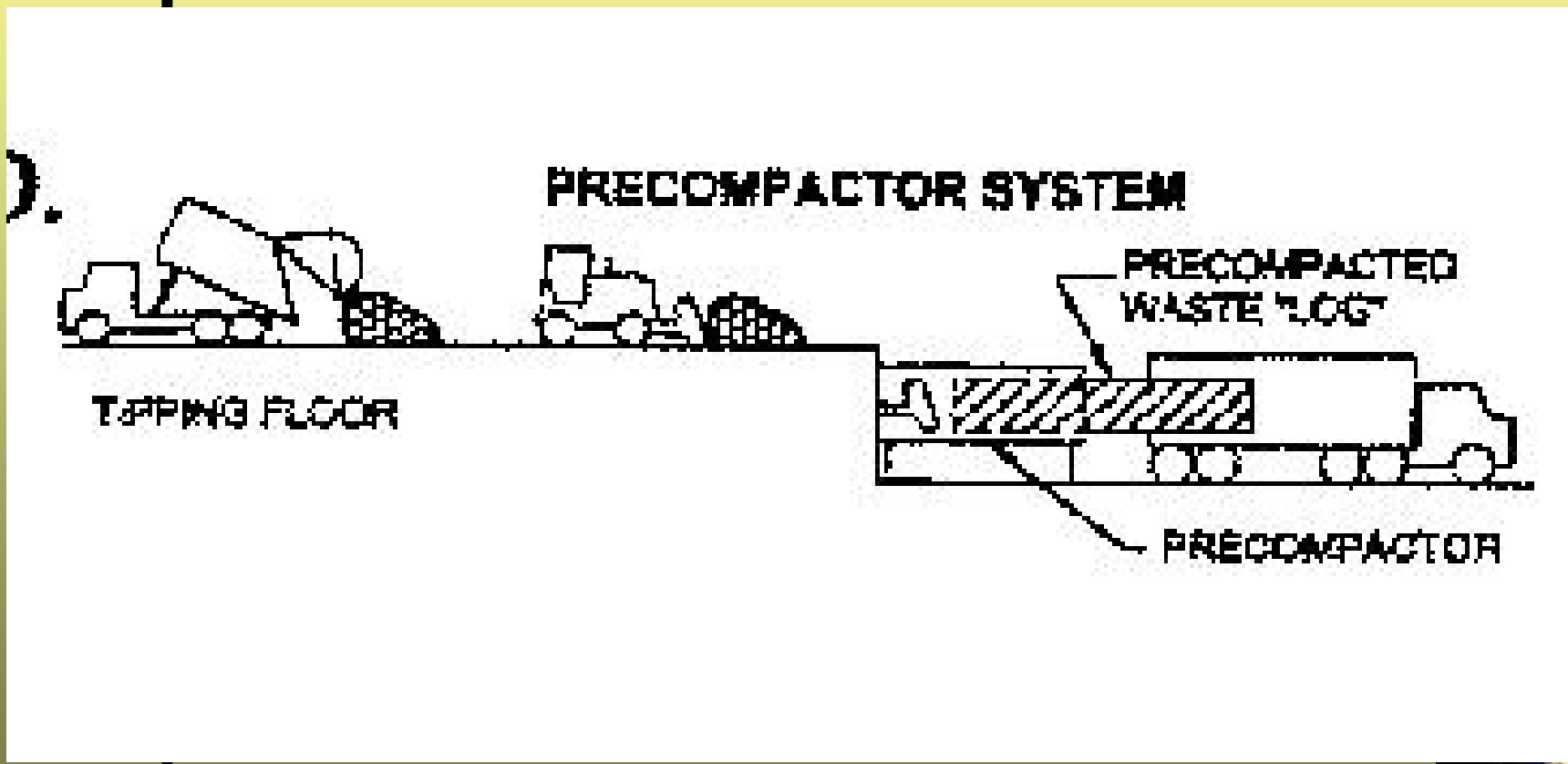
# Open Top Transfer Trailers



# Compactor System

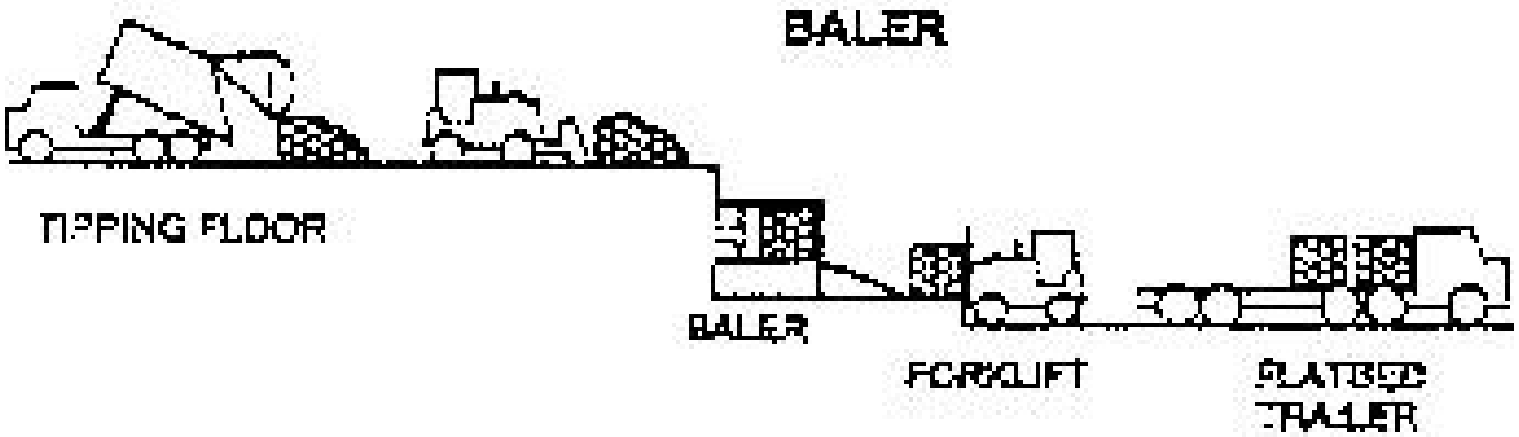


# Precompactor System



# Baler

E.



# Intermodal Container System

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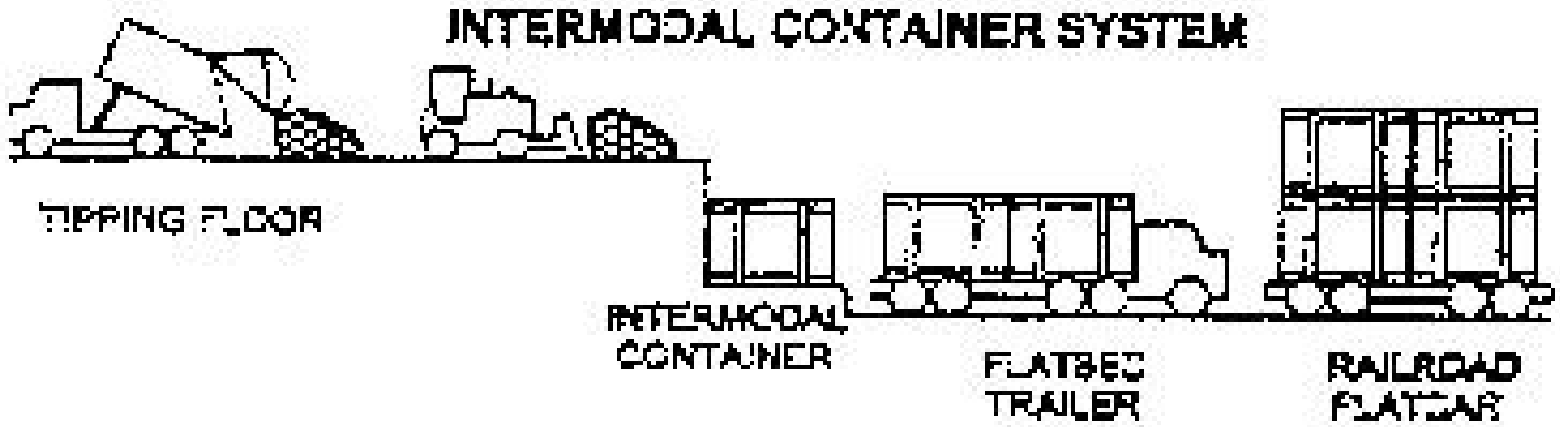
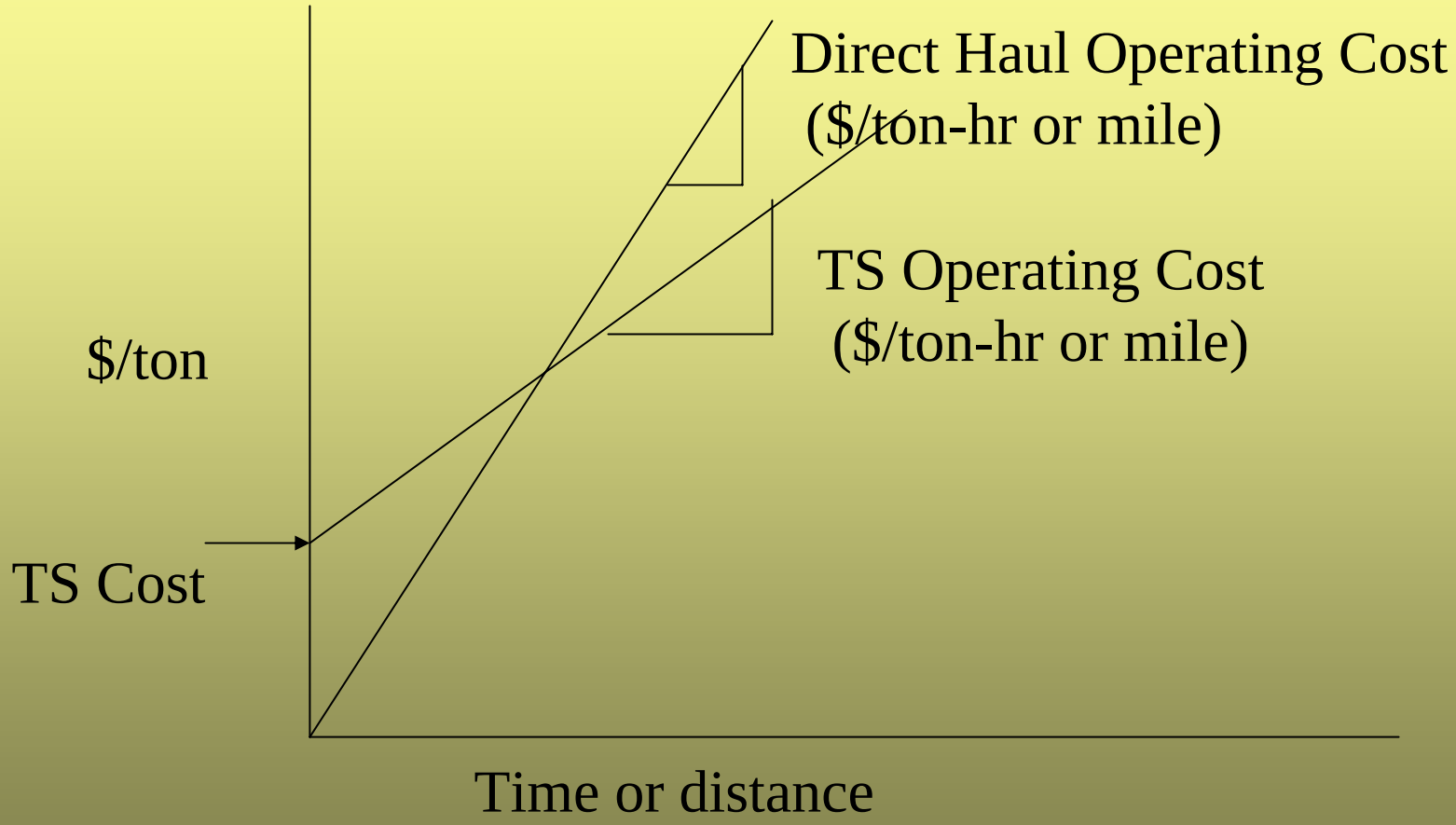



Direct Haul Operating Cost
($/ton-hr or mile)
TS Operating Cost
($/ton-hr or mile)
$/ton
TS Cost
Time or distance

# 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/$yd^3$ = 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/$yd^3$:
(\$525000/yr)/300,000 $yd^3$/yr = \$1.75/$yd^3$

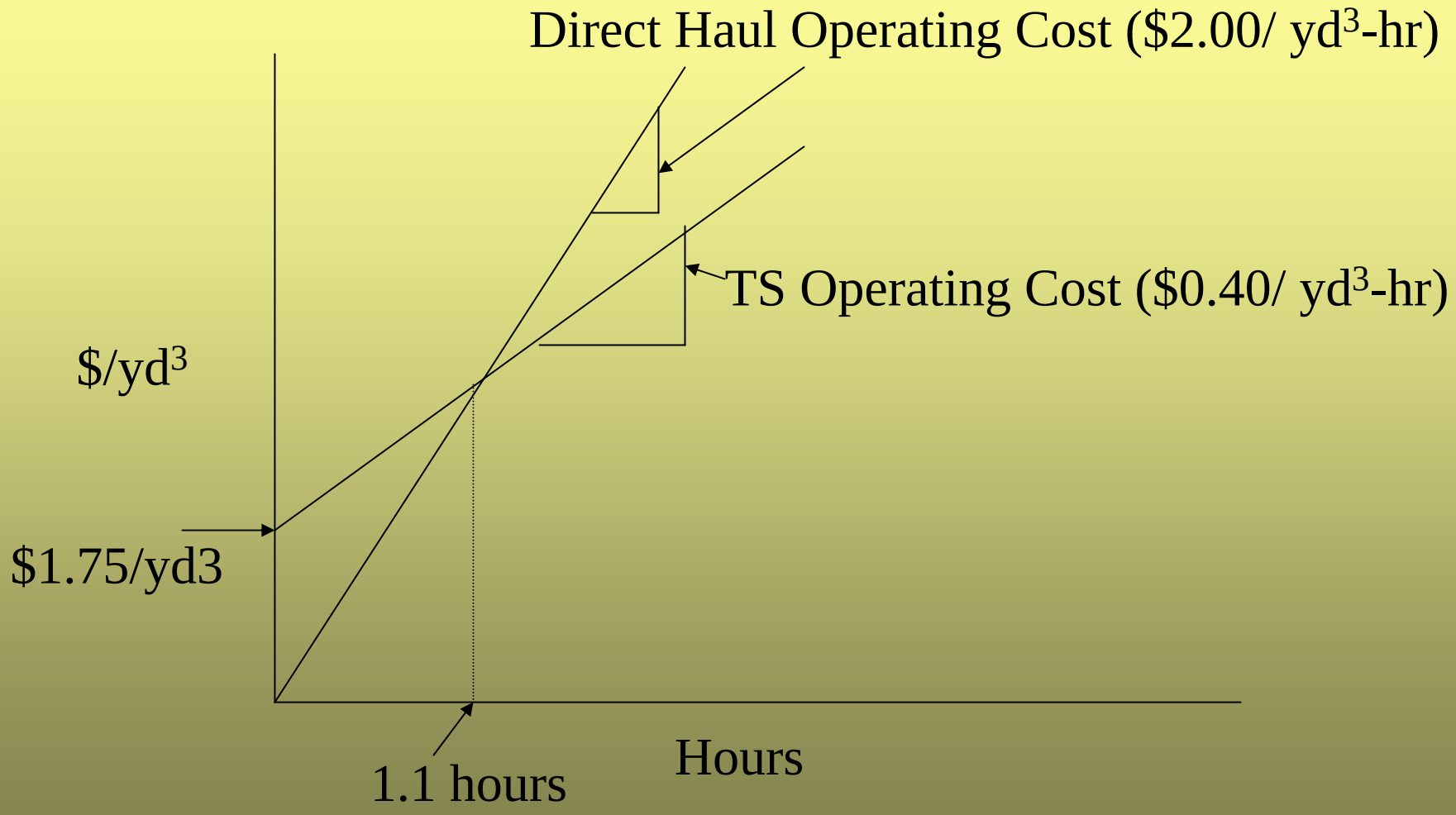
# Step 1b: Calculate Hauling Operating Cost

TS trailer haul operating cost =

$40/hr/100 $yd^3$ = $0.40/hr-$yd^3$

Direct haul operating cost =

$20/hr/10 $yd^3$ = $2.00/ hr-$yd^3$


Direct Haul Operating Cost ($2.00/ yd3-hr)
TS Operating Cost ($0.40/ yd3-hr)
$/yd3
$1.75/yd3
1.1 hours
Hours

# Equate Direct Haul Costs to Transfer Station Costs to Calculate the Break Even Haul Time (x)

$\$2.00/hr\text{-}yd^3\ x = \$1.75/yd^3 + \$0.40/\ hr\text{-}yd^3\ x$

$x = 1.1$ hours

# Class Example

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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