SOLID WASTE TRANSFER SYSTEMS IN DEVELOPING COUNTRIES

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WHAT IS A TRANSFER SYSTEM?

- A Transfer System Consists of a Transfer Station and a Fleet of Large Capacity Vehicles Which Provide Long Haul for Refuse -- So That the Fleet of Small Capacity Collection Vehicles Is Enabled to Focus on the Job of Collection.
Transfer Systems Enable Reducing Collection Haul Distance, Vehicle Emissions and Costs By 20 To 50 Percent
Determine Transfer Breakpoints:

- Each type and size of collection vehicle has a different transfer breakpoint
- Traffic speed affects the transfer breakpoint
- Consider transfer for hauls over 30 minutes

COST ($US/Tonne) FOR COLLECTION AND TRANSFER SYSTEMS - GOVERNMENT SERVICE - Georgetown, Guyana- 1999
Transfer Systems Enable Implementation Of Regional Safe Disposal Systems that Achieve Economies-of-Scale.

- Landfills should be at least 300 tonnes/day to have landfill bulldozers and wheeled loaders fully utilized
- Roads, fences, weighbridges, gatehouses, utilities are fixed costs that should be applied to large waste quantities
Landfill Economies-of-Scale

Landfill Costs - Trinidad and Tobago, 1999

Cost in $US/Metric Tonne

Investment Cost/Tonne - Clay and Geomembrane

Total Cost/Tonne - Clay and Geomembrane

- 40 TPD
- 550 TPD
- 1100 TPD
Transfer Stations have Carbon Finance Opportunities

- All transfer vehicles are parked and fueled at the station and able to operate with clean fuels and upgraded emission controls.
- Collection haul distances are dramatically reduced, and thus their emissions are reduced.
- Reductions are easy to monitor because of weighbridges required at transfer stations.
What Are The Main Elements Of A Major Transfer Station?

- Site of 2+ Hectares
- Access to a Major Road Which Can Carry Long Haul Vehicles of 50 C.M. Capacity
- Parking, Maintenance and Repair Facilities for Transfer Fleet
- Weigh-Bridge to Record in-Coming Payloads
- Multi-Level Transfer Building, Unloading on Top, Loading on Bottom
Typical 2-Level Transfer Stations

Manila, Philippines, 1993

Quito, Ecuador, 1998
Which Design Issues Need Careful Analysis?

- Station Layout for Efficient Traffic Flow of Collection and Transfer Vehicles
- Unloading Method from Collection Vehicles
- Loading Method of Transfer Vehicles
- Transfer Vehicle Style and Material
- Discharge Method from Transfer Vehicles
Direct Unloading to Transfer Truck

• Waste Is Discharged Directly from the Collection Vehicles into the Loading System of the Transfer Vehicles

• No Waste Storage, Therefore Less Need for Odor and Vector Control

• Usually Used for Small Stations Only
Direct Unloading to Transfer Truck

Hyderabad, India, Skip Container Lift Collection Truck, Unloads to Open Tipping Truck, 2001
Unloading-to-Storage Area

• Waste Is Discharged to a Storage Area from which It Is Then Moved into the Loading System of the Transfer Vehicles

• Storage Enables Collection Vehicles to Operate on Their Optimum Schedule and Transfer Vehicles to Operate on Their Optimum Schedule

• Provides a Safe-Guard if Their Is Down-Time in the Loading System for Transfer Vehicles
Unloading to Storage Floor
Style Options:

• Light-Weight Open Top Trailers
  – for direct open top loading

• Light-Weight Closed Top Trailers
  – for pre-load compactor loading

• Compactor-Compatible Closed Top Trailers
  – for stationary compactor loading

• Self-Contained Compactor Trailers
  – for self-contained compactor loading
Types of Transfer Vehicles

- US, lightweight, filled by extrusion from a compaction chamber
- US, lightweight open topped, filled by gravity from hopper
Types of Transfer Vehicles

Singapore, Body filled by Stationary Compactor, 1993

Mexico, on-board Compactor, 1985
Material Options:

- **Aluminum** -
  - lighter (by 15 to 20%) but more costly (by 40 to 60%)

- **Steel**
  - more flexible, less likely to crack or tear, easier to repair
Discharge Options:

• **Push-Blade Mounted at Front of Trailer**
  – Takes up 10 to 15% of Trailer Capacity

• **Live-Floor Mounted on Floor of Trailer**
  – Takes up 2 to 3% of Trailer Capacity, More Moving Parts Require More Maintenance
Discharge Systems

Izmir, Turkey, On-board Ram Compactor also unloads, 1994

US, Walking Floors are Most Common
Discharge Systems

Landfill tipping machine allows transfer trucks to be avoid the weight of an onboard unloading mechanism

US, large landfills with long transfer haul distances, able to lift 10 trucks per hour
Choices Affect Costs

• **Choice of Loading System Can Affect**
  – Investment Cost by 35%
  – Total O,O&M Cost by 25%

• **Choice of Vehicle Material Can Affect**
  – Investment Cost by 50%
  – Total O,O&M Cost by 20%

• **Choice of Discharge System Can Affect**
  – Investment Cost by 20%
  – Total O,O&M Cost by 50%
Transfer Stations are the Heart of Economic Solid Waste Systems:

- Enable performance monitoring of collection by weighbridge and computerized MIS.
- Allow collection systems to be rationalized.
- Allow fuel to be conserved.
- Allow bundling of waste into inter-municipal regions for economic sanitary landfill.
Paper and film of presentation available at:

• http://www.worldbank.org/urban/uswm

Thank you for your kind attention 😊